Consultation:

Proposed Amendments to UK Acceptable Means of Compliance and Guidance Material for UK Regulation (EU) 2019/945 and 2019/947

CAP 3171

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Enquiries regarding the content of this publication should be emailed to uavenquiries@caa.co.uk, marked for the attention of the RPAS Policy Team, although all responses should be made via the Citizen space web page.

The latest version of this document is available in electronic format at: www.caa.co.uk

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List of Abbreviations

The definitive list of abbreviations and terms / definitions that are relevant to UAS operations within the UK are centralised within CAP 722D UAS Definitions and Glossary. A link to CAP 722D can be found here.

How to Use this Document

This CAP sets out the proposed updates to AMC and GM for UK Regulation (EU) 2019/947 and 2019/945 as part of a series of updates described in CAP 3170 Consultation Document.

This document should be read alongside the consultation document, and contains specific drafting that relates to the proposals in the consultation.

Feedback on this document should be made by using the corresponding consultation questions in the consultation document, via the Citizen space consultation web page.

In some cases, where helpful for context, updated *regulation* has also been included, where corresponding regulation is likely to be changed by Statutory Instrument. This wording is not necessarily the final wording, although reflects changes suggested as part of previous regulatory consultations. We are not seeking feedback as part of this consultation, on these regulatory changes, which have already been consulted on.

This CAP does not contain the entire package of AMC/GM for these regulations, it only contains sections where there are changes proposed.

Changes are indicated by:

- Proposed new text highlighted Grey
- Proposed text to be deleted ~~struck through~~

Regulation

Sections under a blue banner are regulation.

AMC

Sections under an orange banner are Acceptable Means of Compliance.

GM

Sections under a green banner are Guidance Material

CHAPTER 1

Amendments to EU 2019/945 AMC and GM - Market Surveillance Authority

Article	Paragraph	Title/Subject	AMC/GM
Art. 4	1	Product Requirements	AMC1: providing an overview of the applicable UAS class compared to the UA MTOM
	2		AMC2: Products shall not only comply with class marking requirements Highlighting that products shall also comply with general product requirements of the Supply of Machinery (Safety) Regulation 2008 How to select applicable requirements from the Supply of Machinery (Safety) Regulation 2008
	1		GM1: Providing an overview of how to put products on the market
Art. 5	All	Making available on the market	GM1: Products shall also not endanger the health and safety of people, e.g. by the materials they use, chemicals they use or design solutions that are not safe
Art. 6	4	Obligations of manufacturers	AMC1: How to manage product concerns, recalls and communication with distributors
	9		AMC2: How to manage non-conforming products
	3, 9, 10, 11		AMC3:

			How to engage with the MSA and how to inform MSA
Art. 7	2	Authorised representatives	AMC1: How to engage with the MSA, how to communicate with the MSA and how to cooperate with the MSA
Art. 8	2	Obligations of importers	AMC1: How to manage product concerns
	7		AMC2: How to manage non-conforming products
	2, 7, 9, 10		AMC3: How to engage with the MSA
Art. 9	2	Obligations of distributors	AMC1: How to check product compliance as distributor
	4, 5		AMC2: How to engage and communicate with the MSA
Art. 10			
Art. 18	1, 2	Approval of Conformity Assessment Bodes	GM1: Guidance for CABs to achieve MSA approval
Art. 36	1	Procedures for dealing with products presenting a risk at national level	AMC1: Evaluation by the MSA
	1		AMC2: Management of corrective actions
	3		AMC3: Recall of products

Art. 38	1, 2	Compliant product which presents a risk	AMC1: Update of compliant products and recertification and corrective actions
Art. 39	1	Formal non-compliance	AMC1: Update of non-compliant products and recertification

Article 4 Product Requirements

1. The products referred to in paragraph 1 of Article 2 shall meet the requirements set out in Parts 1 to 6, 16 and 17 of the Annex.

2. UAS ~~that are not toys within the meaning of the Toys (Safety) Regulations 2011~~ shall comply with the relevant health and safety requirements set out in the Supply of Machinery (Safety) Regulations 2008 only in relation to risks other than those linked to the safety of the UA flight.

3. Any updates of software of the products that have already been made available on the market may be made only if such updates do not affect the compliance of the product.

GM1 to Article 4(1)

APPLICABILITY OF CLASS MARKING REQUIREMENTS

All products intended for use in the Open category must bear the correct class marking label and meet the requirements set out in the corresponding part of the Annex to the Regulation. The correct class is determined by the UA's maximum take-off mass, as summarised in the table below.

Weight	Class	Annex
Less than 100g	Voluntarily UK0	Part 1
Less than 250g	UK0 (mandatory)	Part 1
Less than 900g	UK1	Part 2
Less than 4 kg	UK2	Part 3
	UK3	Part 4
Less than 25 kg	UK4	Part 5
	UK5 (+UK3)	Part 16 (+Part 4)

	UK6 (+UK3)	Part 17 (+Part 4)

Please note that UAS of class UK5 or UK6 have to comply with the requirements of class UK3 as in addition to UK5 or UK6 requirements.

AMC1 to Article 4(2)

COMPLIANCE WITH OTHER REGULATIONS

According to Article 4, UAS shall comply with the Supply of Machinery (Safety) Regulation 2008 (SMR 2008) for design aspects not related to the safety of the flight.

These non-flight functions may include, but are not limited to, mechanical hazards, electrical safety during charging, or safe handling on the ground. Provisions of SMR 2008 that would interfere with flight safety, such as emergency stop functions that would disrupt the flight, need not be applied. The applicable standards depend on the designer's system's configuration and on the use of off-the-shelf components (COTS). However, the following essential health and safety requirements of SMR 2008 shown in the table below might be taken into account to achieve compliance with the relevant regulations and comply with UK class marking and class identification requirements, which may lead to further regulations being applicable and triggered by the SMR, such as the Electrical Equipment (Safety) Regulations 2016. Sections of Schedule 2 Annex I of SMR 2008 not listed below are considered not to be applicable for UAS.

SMR 2008 Annex I section	Subject
1.1.2 (a), paragraph 2	Principles of safety integration
1.1.2 (e)	
1.1.3	Materials and products
1.1.5	Design of machinery to facilitate its handling
1.2.2	Control devices
1.3.1	Risk of loss of stability
1.5.1	Electricity supply
1.5.2	Static electricity
1.5.4	Errors of fitting
1.5.6	Fire

SMR 2008 Annex I section	Subject
1.5.7	Explosion
1.5.10	Radiation
1.5.11	External radiation
1.5.12	Laser radiation
1.5.13	Emissions of hazardous materials and substances
1.7.3	Marking of machinery
1.7.4.3	Sales literature

Article 5 Making available on the market

Products shall only be made available on the market if they satisfy the requirements of this Chapter and do not endanger the health or safety of persons, animals or property.

GM1 to Article 5

OTHER REQUIREMENTS FOR HEALTH AND SAFETY

Only products that do not endanger the health or safety of people, animals or property may be made available in the UK. This includes not only safety of the product during flight, but also its broader safety as a manufactured item.

In addition to demonstrating compliance with the applicable provisions of Article 4, economic operators, with a special focus on manufacturers, may consider general product safety principles to ensure the design and manufacturing of the product does not introduce hazards due to unstable structures, unsafe energy sources or hazardous substances. This may include the assessment of chemical and material risks in accordance with Regulation (EC) No. 1907/2006 (REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)) and The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (RoHS (Restriction of Hazardous Substances) Regulations).

In addition, the Radio Equipment Regulations 2017 and Electromagnetic Compatibility Regulations 2016 may apply, depending on the specific product's design, but particularly where the product includes wireless communication modules or emits electromagnetic signals.

Article 6 Obligations of manufacturers

1. When placing their product on the market, manufacturers shall ensure that it has been designed and manufactured in compliance with the requirements set out in Parts 1 to 6, 16 and 17 of the Annex.

2. Manufacturers shall draw up the technical documentation provided for in Article 17 and carry out the relevant conformity assessment procedure referred to in Article 13 or have it outsourced.

Where compliance of the product with the requirements set out in Parts 1 to 6, 16 and 17 of the Annex has been demonstrated by that conformity assessment procedure, manufacturers shall draw up a declaration of conformity and affix the UK marking.

3. Manufacturers shall keep the technical documentation and the declaration of conformity for 10 years after the product has been placed on the market.

4. Manufacturers shall ensure that procedures are in place for series production to remain in conformity with this Chapter. Changes in product design, characteristics or software, and changes in the harmonised standards or in technical specifications by reference to which conformity of a product is declared shall be adequately taken into account.

When deemed appropriate with regard to the risks presented by a product, manufacturers shall, to protect the health and safety of consumers, carry out sample testing of marketed products, investigate, and, if necessary, keep a register of complaints about non-conforming products and product recalls, and keep distributors informed of any such monitoring.

5. Manufacturers of UAS shall ensure that the UA bears a type and a unique serial number allowing for its identification, and if applicable, compliant with the requirements defined in the corresponding Parts 2 to 4, 16 and 17 of the Annex. Manufacturers of class C5 accessories kits shall ensure that the kits bears a type and a unique serial number allowing for their identification. Manufacturers of remote identification add-ons shall ensure that the remote identification add-on bears a type and a unique serial number allowing for their identification and compliant with the requirements defined in Part 6 of the Annex. In all cases, manufacturers shall ensure that a unique serial number is also affixed to the declaration of conformity or to the simplified declaration of conformity referred to in Article 14.

6. Manufacturers shall indicate on the product their name, registered trade name or registered trademark, website address and the postal address at which they can be contacted or, where that is not possible, on its packaging, or in a document accompanying

it. The address shall indicate a single point at which the manufacturer can be contacted. The contact details shall be indicated English.

7. Manufacturers shall ensure that the product is accompanied by the manufacturers' instructions and information notice required by Parts 1 to 6, 16 and 17 of the Annex in English. Such manufacturers' instructions and information notice, as well as any labelling shall be clear, understandable and legible.

8. Manufacturers shall ensure that each product is accompanied by a copy of the declaration of conformity or by a simplified declaration of conformity. Where a simplified declaration of conformity is provided, it shall contain the exact internet address where the full text of the declaration of conformity can be obtained.

9. Manufacturers who consider or have reason to believe that products which they have placed on the market are not in conformity with this Chapter shall immediately take the corrective measures necessary to bring that product into conformity, to withdraw it or recall it, if appropriate. Where the product presents a risk, manufacturers shall immediately inform the market surveillance ~~authorities~~ authority to that effect, giving details, in particular, of the non-compliance, of any corrective measures taken and of the results thereof.

10. Manufacturers shall, further to a reasoned request from ~~a~~ the market surveillance authority, provide it with all the information and documentation in paper or electronic form necessary to demonstrate the conformity of the product with this Chapter, in English. They shall cooperate with that authority, at its request, on any action taken to eliminate the risks posed by the product which they have placed on the market.

11. When placing on the market a class C5 or C6 UAS or a class C5 add-on, manufacturers shall inform the market surveillance authority

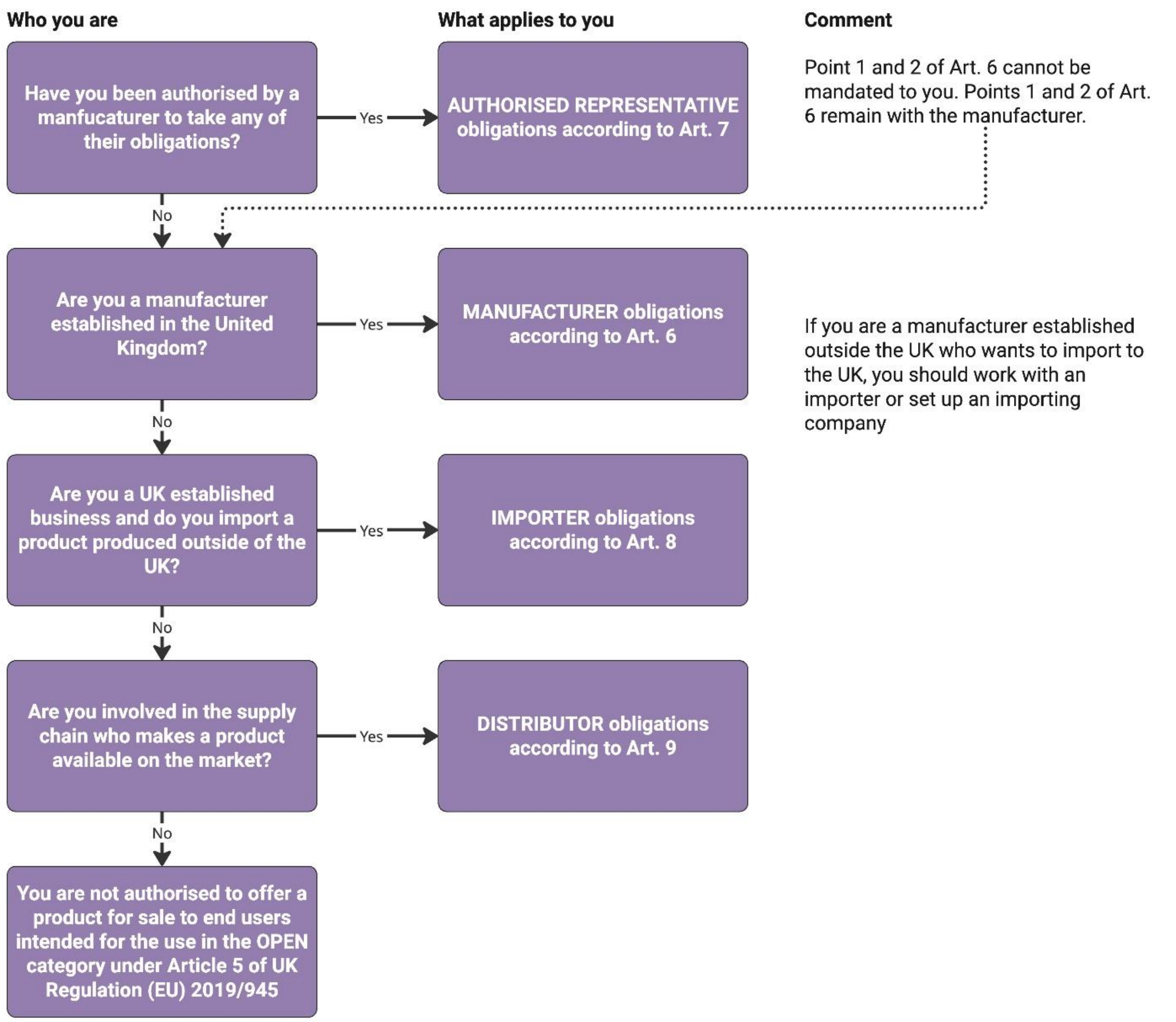
12. Where a manufacturer places a product of a particular type on the market for the first time, the manufacturer must give the market surveillance authority a notice consisting of

a) A statement that the manufacturer has placed a product of this type on the market for the first time,
b) The name of the manufacturer of the product,
c) The unique code assigned by the manufacturer to this type, and
d) If the manufacturer assigns, to products of this type, serial numbers which indicate the product type or other features of the product, an explanation of how the serial numbers indicate the product type or other features of the product.

GM1 to Article 6

ECONOMIC OPERATORS AND ROLES

Determining the individual economic operator's role in the supply chain is essential to identifying applicable obligations. The decision logic illustrated below may help to identify the correct role and set of obligations.



It is the responsibility of the relevant economic operator to ensure that the UAS intended for the use in the Open category, class C5 accessories kits and remote identification add-ons comply with the requirements of Part 1 to 6, 16, and 17 of the Annex to this Regulation.

GM2 to Article 6

REQUIREMENTS FOR ECONOMIC OPERATORS

The following table provides an overview of the obligations applicable to the relevant economic operators. Everywhere, the table shows an "X" where an obligation applies to the economic operator outlined in the specific column.

If an importer or distributor places a product on the market solely under their name, the obligations of manufacturers apply to them in full.

Requirement	**Economic Operator**			
	Manufacturer	**Auth. Rep.**	**Importer**	**Distributor**
Product design complies requirements for UK1 – UK6, UK5 accessories kits or remote ID add-on modules	X			
Draw up technical documentation	X			
Ensure technical documentation is drawn up	X		X	
Carry out conformity assessment procedure	X			
Ensure conformity assessment is carried out	X		X	
Draw up declaration of conformity	X			
Technical documentation storage for MSA disposal for 10 years	X	X	X	
Declaration of conformity storage for MSA disposal for 10 years	X	X	X	
Procedures for conformity assurance in series production	X			
Sample testing of marketed products	X		X	
Register of complaints	X		X	
Register of product recalls	X		X	
Register of non-conforming products	X		X	
Ensure UA bears type	X		X	
Ensure UA bears serial number	X		X	
Name/registered trade name/ registered trademark, website	X		X*	X**

address and postal address on product or packaging or additional document				
Ensure product bears UK marking and UA class identification and indication of the sound power level (when required)	X		X	X
Ensure product is accompanied by manufacturers' instructions	X		X	X
Ensure product is accompanied by information notice	X		X	X
Ensure product is accompanied by a copy of the declaration of conformity	X		X	X
Take corrective measures in case of product non-conformity	X		X	X
Withdraw or recall product (if appropriate) in case of product non-conformity	X		X	X
Inform MSA where a product presents a risk	X		X	X
Provide all information and documentation necessary to demonstrate conformity to MSA upon reasoned request	X	X	X	X
Provide all information and documentation to border control upon request		X		
Cooperation with MSA upon request on products posing a risk	X		X	X
Cooperation with MSA and border control authorities upon request on products posing a safety risk		X		
Informing MSA when placing UK5/UK6 or UK5 add-on on the market	X		X	

Informing manufacturer of health and safety risks			X	
Informing manufacturer and importer of risks				X
Not placing non-conforming products on the market	X		X	X
Storage and transport conditions do not lead to non-compliance or non-conformity			X	X
X must ensure both their own and the manufacturer's name, registered trade name or registered trademark, website and postal addresses are included* *X** must ensure both the manufacturer's and importer's name, registered trade name or registered trademark, website and postal addresses are included. These details are not necessary for the distributor.* *Note:* *Manufacturer's obligations are provided in Article 6.* *Authorised representative's obligations are provided in Article 7.* *Importer's obligations are provided in Article 8.* *Distributor's obligations are provided in Article 9.*				

AMC1 to Article 6(4)

PRODUCTION CONFORMITY AND MONITORING (FOR MANUFACTURERS)

To ensure that series production continues to conform with the requirements, manufacturers shall implement a documented and proportionate procedure to monitor the consistency and compliance of their products, taking into account changes in design, software, or applicable standards and technical specifications. The procedures should include a system for monitoring post-market performance and addressing non-conformities. Manufacturers may want to establish and maintain a system to receive, log, and investigate complaints received from end users and other stakeholders. This may include a clustering and trend analysis of recurring complaints, and allow the tracking of corrective actions and investigations undertaken. This register may consist of specific information on the affected model, hardware and software version identifiers, class label, and distribution routes. The registry may also be maintained by using sample testing results and information.

Sample testing may include, but is not limited to:

- A review of the documentation provided with the product

- The labelling affixed to the product or packaging
- Inspection of the information notice supplied with the product
- Power-up and functional verification
- Tests of essential features, including the remote identification function
- Visual inspections for material integrity or wear
- Verification of serial numbers and manufacturer details

Sample tests and complaint analysis may not be performed by the same personnel who are involved in the development of the technical documentation, packaging, or development, but may be fulfilled by an independent quality management function and personnel qualified for quality management and independent check performance. They should ensure proportionality to the complexity of the system and the number of products put on the market.

Manufacturers may want to maintain a record or registry of all sample tests performed, including the date, methodology, product identification and any conclusions, actions taken, or improvement activities triggered and where applicable, inform the relevant design and manufacturing processes to be updated by incorporating corrective actions or improvement actions.

Distributors shall be informed of any safety-related product monitoring, identified non-conformities, recalls, or corrective actions. This may include the provision of technical bulletins or safety communications where appropriate.

AMC1 to Article 6(9)

MANAGEMENT OF NON-CONFORMING PRODUCTS (MANUFACTURERS)

Where a manufacturer identifies or has reason to believe that a product placed on the market does not conform with the applicable requirements of this Chapter, they shall take immediate and appropriate corrective measures to bring the product into conformity or recall it, as necessary. This includes situations where the product, although in compliance, presents a risk.

Non-conformities that appear as part of the conformity assessment must be managed by the manufacturer and be resolved with the CAB assessing the product or organisation as per the applicable Conformity Assessment Scheme procedures.

If a manufacturer considers or has reason to believe that a product they have placed on the market poses a risk, even in the absence of a confirmed non-compliance, they shall inform the MSA within 72 hours, via email to MSAenquiries@caa.co.uk . The notification should include a description of the issue, affected product identifiers, the scope of distribution, corrective measures taken or proposed actions, and potential results of internal investigations or information on planned investigations. Where the product poses a risk to health and safety in the absence of a confirmed non-compliance, manufacturers may also inform and collaborate with the CAB involved in the chosen conformity assessment procedure.

If a manufacturer has reason to believe that a product they have placed on the market is not in conformity with this Regulation or any other relevant enactment, the manufacturer is encouraged to notify any relevant economic operators and inform the MSA without undue delay. The MSA may be contacted via the UK CAA website or directly by email at MSAenquiries@caa.co.uk.

Corrective measures may include software patches, physical updates, retrofit kits, product advisories, or full product recalls or replacements. These actions should be defined, initiated and communicated in coordination with the MSA to end users and other relevant stakeholders. Communications should include detailed product identifications to ensure accuracy and traceability. Relevant identifiers may consist of model name, serial number, marketing product name, hardware and software version identifiers, production dates, the date the product was first made on the market, or relevant batch numbers. Communications to end users may include formal notifications, market outreach via distributors, video messages, e-mail, social media or contacting media outlets.

Where a product is recalled from the market, manufacturers shall collect evidence of the recall effort, which may include copies of public or customer-facing notifications, records of serial numbers of returned or replaced products, photo or video documentation, user confirmations and acknowledgements, and internal audit trails of the recall process. Such evidence may be retained as part of the manufacturer’s complaint and post-market monitoring systems to support traceability for future reference.

AMC1 to Article 6(3), (10) and (12)

DOCUMENTATION AND COOPERATION WITH THE MARKET SURVEILLANCE AUTHORITY (MSA)

In line with paragraph 3, manufacturers shall retain the technical documentation and the declaration of conformity for a period of 10 years following the date the product has been placed on the market. The requirement applies to deviating product versions requiring new technical documentation or a new or updated declaration of conformity. The following example illustrates this case:

> *A product is placed on the market for the first time on 20 January 2026, leading to a minimum documentation storage deadline of 19 January 2036. The product undergoes significant changes, finally leading to another version requiring an update or new issue of the declaration of conformity on 1 July 2027, leading to a minimum documentation storage deadline of 30 June 2037 for the updated version.*

Technical documentation and the declaration of conformity should be stored securely and in a manner that ensures accessibility throughout the retention period. Where documents are maintained in digital format, systems should include redundancy and data integrity measures to protect against hardware failures, fire, cyber threats or data corruption. Manufacturers are encouraged to implement IT security practices that support long-term data availability and traceability.

In line with paragraph 10, furthermore, upon receiving a reasoned request from the MSA the manufacturer should supply all necessary documentation to demonstrate product conformity. Such documentation may include, but is not limited to: technical documentation, declarations of conformity, design specifications or technical drawings, test reports and compliance statements, product photographs and labelling evidence, user manuals and instructions or certificates of conformity issued by a CAB, where applicable.

The manufacturers should cooperate with any investigation undertaken by the MSA to ensure risks posed by the product are eliminated. This includes responding to queries, providing supplementary information upon request, and supporting the authority in identifying the cause of non-compliance or risk.

To comply with the manufacturer's obligation, especially at paragraph 12, of informing the MSA when placing UK0 - UK6 UAS, remote ID add-ons or UK5 add-ons on the market, the manufacturer may contact the MSA via MSAenquiries@caa.co.uk.

Manufacturer's personnel who want to provide reports to the MSA as part of a whistleblowing activity are encouraged to contact the MSA by filing the whistleblowing report at https://www.caa.co.uk/our-work/make-a-report-or-complaint/report-something/make-a-whistleblowing-report/.

Article 7 Authorised Representatives

1. A manufacturer may, by a written mandate, appoint an authorised representative. The obligations laid down in paragraph 1 of Article 6 and the obligation to draw up the technical documentation referred to in paragraph 2 of Article 6 shall not form part of the authorised representative's mandate.

2. An authorised representative shall perform the tasks specified in the mandate received from the manufacturer. The mandate shall allow the authorised representative to do at least the following:

a. keep the declaration of conformity and the technical documentation at the disposal of market surveillance ~~authorities~~ authority for 10 years after the product has been placed on the market;
b. further to a reasoned request from a market surveillance or border control authority, provide that authority with all the information and documentation necessary to demonstrate the conformity of the product;

c. cooperate with the market surveillance or border control authorities, at their request, on any action taken to eliminate the non-conformity of the products covered by the authorised representative's mandate or the safety risks posed by it.

AMC1 to Article(7)

DELEGATED AUTHORISED REPRESENTATIVE TASKS AND COMMUNICATION WITH THE MSA

Authorised representatives shall retain the technical documentation and the declaration of conformity for a period of 10 years following the date the product has been placed on the market. The requirement applies to deviating product versions requiring new technical documentation or a new or updated declaration of conformity. The following example illustrates this case:

> *A product is placed on the market for the first time on 20 January 2026, leading to a minimum documentation storage deadline of 19 January 2036. The product undergoes significant changes, finally leading to another version requiring an update or new issue of the declaration of conformity on 1 July 2027, leading to a minimum documentation storage deadline of 30 June 2037 for the updated version.*

Technical documentation and the declaration of conformity should be stored securely and in a manner that ensures accessibility throughout the retention period. Where documents are maintained in digital format, systems should include redundancy and data integrity measures to protect against hardware failures, fire, cyber threats or data corruption. Authorised representatives are encouraged to implement IT security practices that support long-term data availability and traceability.

If the authorised representative is responsible for monitoring a product after it has been placed on the market, it may be appropriate to establish a system for managing complaints and incidents that can log, cluster and investigate received reports. This register could include identifiers such as the product's model and class labels, as well as the versions of its hardware and software, and its batch or serial numbers. Clusters may include differentiation between reports relating to product safety, non-conformity or non-compliance (which would be subject to MSA reporting and corrective measures) and reports relating to product quality and features.

Where the authorised representative is mandated to undertake sample testing after the product has been placed on the market, the scope of such checks may include but is not limited to:

- Verification of labelling, UK class marking, and affixed serial numbers;
- Inspection of physical condition and material integrity;
- Review of instructions, packaging and information notices;
- Functional checks such as power-on tests, or remote identification behaviour;
- Document and software version confirmation.

Sample testing may be supported by internal quality assurance personnel.

Where the authorised representative is delegated to liaise with the MSA, they may act as the initial contact points. They should cooperate fully with requests for technical files, declarations, test documentation, or other evidence required to demonstrate product conformity. The MSA may be contracted directly at MSAenquiries@caa.co.uk.

In cases where the authorised representative identifies a non-conformity or potential risk – through an investigation, sample testing, or otherwise – they should notify the manufacturer and engage with the MSA where such communication forms part of their mandate. This includes situations where a compliant product presents a safety concern.

Investigations into non-conforming products may follow a structured methodology such as PRISM (Product Safety Risk Assessment Methodology) published by the Office for Product Safety and Standards. The PRISM framework supports consistent, evidence-based decision-making and is used by the market surveillance authority. Using PRISM for investigations performed by the authorised representative will support effective and efficient collaboration and communication between the manufacturer and the MSA. PRISM includes the following elements:

- Identification of the non-compliant product or product version;
- Risk assessment and determination of the risk level;
- Risk evaluation and assessment of whether the risk might be acceptable due to being too minor and remote; and
- Risk management and definition of corrective measures.

Where the authorised representative is delegated to take corrective measures, such measures initiated or communicated by the authorised representative may include software patches, physical updates, retrofit kits, product advisories, or full product recalls or replacements. These actions should be defined, initiated and communicated in coordination with the MSA to end users and other relevant stakeholders. Communications may include detailed product identifications to ensure accuracy and traceability. Relevant identifiers may consist of model name, serial number, marketing product name, hardware and software version identifiers, production dates, the date the product was first made on the market, or relevant batch numbers. Communications to end users may include formal notifications, market outreach via distributors, video messages, e-mail, social media or contacting media outlets.

Where a product is recalled from the market, authorised representatives mandated to do so should collect evidence of the recall effort, which may include copies of public or customer-facing notifications, records of serial numbers of returned or replaced products, photo or video documentation, user confirmations and acknowledgements, and internal audit trails of the recall process. Such evidence may be retained as part of the representative's complaint and post-market monitoring systems to support traceability for future reference.

Furthermore, upon receiving a reasoned request from the MSA or a competent border control authority, the authorised representative should supply all necessary documentation to demonstrate product conformity. Such documentation may include, but is not limited to: Technical documentation, Declarations of Conformity, design specifications or technical drawings, test reports and compliance statements, product photographs and labelling evidence, user manuals and instructions or certificates of conformity issued by a CAB, where applicable.

The authorised representative is encouraged to fully cooperate with any investigation undertaken by the MSA. This includes but is not limited to responding to queries, providing supplementary information upon request, and supporting the authority in identifying the cause of non-compliance or risk.

Article 8 Obligations of importers

1. Importers shall only place products compliant with the requirements set out in this Chapter on the market.

2. Before placing a product on the market, importers shall ensure that:

a. the appropriate conformity assessment procedure referred to in Article 13 has been carried out by the manufacturer;
b. the manufacturer has drawn up the technical documentation referred to in Article 17;
c. the product bears the UK marking and, when required, the UA class identification label and the indication of the sound power level;
d. the product is accompanied by the documents referred to in paragraph 7 and 8 of Article 6;
e. the manufacturer has complied with the requirements set out in paragraphs 5 and 6 of Article 6.

Where an importer considers or has reasons to believe that a product is not in conformity with the requirements set out in Parts 1 to 6, 16 and 17 of the Annex, they shall not place the product on the market until it has been brought into conformity. Furthermore, where the product presents a risk for the health and safety of consumers and third parties, the importer shall inform the manufacturer and the market surveillance ~~authorities~~ authority to that effect.

3. Importers shall indicate on the product their name, registered trade name or registered trademark, website and the postal address at which they can be contacted or, where that is not possible, on its packaging or in a document accompanying the product. The contact details shall be in English.

4. Importers shall ensure that the product is accompanied by the manufacturers' instructions and information notice required by Parts 1 to 6, 16 and 17 of the Annex in English. That manufacturers' instructions and information notice, as well as any labelling, shall be clear, understandable and legible.

5. Importers shall ensure that, while the product is under their responsibility, its storage or transport conditions do not jeopardise its compliance with the requirements set out in Article 4.

6. When deemed appropriate with regard to the risks presented by a product, importers shall, in order to protect the health and safety of end-users and third parties, carry out sample testing of products made available on the market, investigate, and, if necessary, keep a register of complaints, of non-conforming of products and product recalls, and shall keep distributors informed of any such monitoring.

7. Importers who consider or have reason to believe that a product which they have placed on the market is not in conformity with this Regulation or any other relevant enactment shall immediately take the corrective measures necessary to bring that product into conformity, to withdraw it or recall it, if appropriate. Furthermore, where the product presents a risk, importers shall immediately inform the market surveillance ~~authorities~~ authority to that effect, giving details, in particular, of the non-compliance and of any corrective measures taken.

8. Importers shall, for 10 years after the product has been placed on the market, keep a copy of the declaration of conformity at the disposal of the market surveillance authorities and ensure that the technical documentation can be made available to those ~~authorities~~ authority, upon request.

9. Importers shall, further to a reasoned request from a market surveillance authority, provide it with all the information and documentation in paper or electronic form necessary to demonstrate the conformity of the product in English. They shall cooperate with that authority, at its request, on any action taken to eliminate the risks posed by the product which they have placed on the market.

10. When placing on the market a class C5 or C6 UAS or a class C5 add-on, importers shall inform the market surveillance ~~authorities~~ authority.

AMC1 to Article 8(2)

IMPORTER VERIFICATION BEFORE MARKET PLACEMENT

Before placing a product on the UK market, importers are expected to verify that the manufacturer has undertaken all necessary conformity actions and that the product satisfies the conditions of this Regulation. This includes confirming that an appropriate conformity assessment procedure has been carried out. The following assessment routes can be considered acceptable:

- Internal production control for class UK0, UK4, UK5, and UK6 marked UAS or remote ID add-ons;
- Internal production control for UK1, UK2, and UK3 marked UAS bearing an equivalent EU class marking (C1, C2, C3) until 31 December 2027;
- Type examination followed by production conformity to type for UK0-UK5 UAS and remote ID add-ons; This includes UK1, UK2, and UK3 marked UAS bearing an equivalent EU class marking (C1, C2, C3) from 01 January 2028 onwards.
- Full quality assurance using an approved quality management system for UK0-UK6 classed products

Where one class is referred to in more than one option above, the manufacturer may choose one conformity assessment pathway and does not have to comply with all options.

Importers must verify that the technical documentation has been compiled by the manufacturer and includes, at minimum, a complete product description with supporting illustrations, software or firmware versions, installation instructions, conceptual and manufacturing drawings, supporting explanatory material, and a list of fully or partially applied designated standards. Documentation should also include the declaration of conformity, test reports, type examination certificates (if applicable), supporting evidence of design solutions, address of places for manufacture and storage and any documentation submitted to the CAB.

Importers shall also confirm that the product bears:

- The UKCA marking
- The UA class identification label
- The sound power level indication for class UK1, UK2, and UK3 UAS, with levels for UK1 and UK2 complying with the thresholds defined in Part 15 of the Annex.

Each product is expected to be accompanied by the manufacturer's instructions, an information notice, and a copy of the declaration of conformity. Importers should also verify that the importer and manufacturer are identified by name, registered trade name or trademark, website and postal address. If this information cannot be reasonably affixed to the product due to size or design limitations, it may be included on the packaging or supporting documentation.

Where one or more of these conditions are not met, importers shall not place the product on the market. Instead, the issue should be communicated to the manufacturer, with clear reasoning provided.

If a product is found to present a potential risk to the health or safety of consumers or third parties, importers shall not proceed with market placement and shall notify the manufacturer and the MSA without delay.

AMC1 to Article 8(7)

MANAGEMENT OF NON-CONFORMING PRODUCTS (IMPORTERS)

Where an importer identifies or has reason to believe that a product placed on the market is not in conformity or presents a potential risk, appropriate corrective measures are expected to be taken without undue delay. This may apply even where the product formally complies with applicable requirements. Non-conformities that appear as part of the conformity assessment must be managed by the manufacturer and be resolved with the CAB assessing the product or organisation as per the applicable Conformity Assessment Scheme procedures.

Depending on the nature and severity of the issue, corrective measures could include software updates, add-on kits, hardware replacements, user advisories, or full product recalls. To ensure an informed and evidence-based approach to corrective measures, importers may adopt structured methods such as the PRISM (Product Safety Risk Assessment Methodology) framework. PRISM supports consistent investigations, and its key steps include:

- Identification of the non-compliant product or product version;
- Risk assessment and determination of the risk level;
- Risk evaluation and assessment of whether the risk might be acceptable due to being too minor and remote; and
- Risk management and definition of corrective measures.

Relevant identifiers may consist of model name, serial number, marketing product name, hardware and software version identifiers, production dates, the date the product was first made on the market, or relevant batch numbers. Communications to end users may include formal notifications, market outreach via distributors, video messages, e-mail, social media or contacting media outlets.

Evidence of such corrective activities may be gathered and retained by the importer, including:

- Records of end-user notifications;
- Details of products returned, replaced, or modified;
- Supporting visuals or acknowledgements from users;

- Internal audit trails of the recall or correction process.

This information may support future audits, MSA inquiries, or manufacturer coordination. In all cases, importers are expected to act in a timely and proportionate manner, especially where a product may pose a serious risk to health and safety.

AMC1 to Article 8(2), (7), (8), (9) and (10)

IMPORTER ENGAGEMENT WITH THE MARKET SURVEILLANCE AUTHORITY (MSA)

In line with paragraph 8, importers shall retain the technical documentation and the declaration of conformity for a period of 10 years following the date the product has been placed on the market. The requirement applies to deviating product versions requiring new technical documentation or a new or updated declaration of conformity. The following example illustrates this case:

> *A product is placed on the market for the first time on 20 January 2026, leading to a minimum documentation storage deadline of 19 January 2036. The product undergoes significant changes, finally leading to another version requiring an update or new issue of the declaration of conformity on 1 July 2027, leading to a minimum documentation storage deadline of 30 June 2037 for the updated version.*

Technical documentation and the declaration of conformity should be stored securely and in a manner that ensures accessibility throughout the retention period. Where documents are maintained in digital format, systems should include redundancy and data integrity measures to protect against hardware failures, fire, cyber threats or data corruption. Importers are encouraged to implement IT security practices that support long-term data availability and traceability.

If an importer considers or has reason to believe that a product they have placed on the market poses a risk, even in the absence of a confirmed non-compliance, they shall inform the MSA and manufacturer within 72 hours, via email to MSAenquiries@caa.co.uk and relevant contact details for the manufacturer. The notification should include a description of the issue, affected product identifiers, the scope of distribution, corrective measures taken or proposed actions, and potential results of internal investigations or information on planned investigations. Where the product poses a risk in the absence of a confirmed non-compliance, importers may also inform and collaborate with the CAB involved in the chosen conformity assessment procedure.

If an importer has reason to believe that a product they have placed on the market is not in conformity with this Regulation or any other relevant enactment, the importer is encouraged to notify any relevant economic operators and inform the MSA without undue delay. The MSA may be contacted via the UK CAA website or directly by email at MSAenquiries@caa.co.uk.

Upon receipt of a reasoned request from the MSA, importers must provide all information and documentation necessary to demonstrate product conformity. This may include, but is not limited to: technical documentation, Declarations of Conformity, design specifications or technical drawings, test reports and compliance statements, product photographs and labelling evidence, user manuals and instructions or certificates of conformity issued by a CAB, where applicable.

Importers are encouraged to fully support investigations initiated by the MSA. This may involve responding to queries, supplying additional evidence upon request, and assisting in clarifying any concerns related to product conformity, risks, or non-compliance. Where appropriate, importers are encouraged to work jointly with the manufacturer and the MSA to identify the source of the risk and define appropriate corrective measures. These actions may include repair, update, withdrawal, or recall of the affected product group.

Importer's personnel who want to provide reports to the MSA as part of a whistleblowing activity are encouraged to contact the MSA by filing the whistleblowing report at https://www.caa.co.uk/our-work/make-a-report-or-complaint/report-something/make-a-whistleblowing-report/.

Article 9 Obligations of distributors

1. When making a product available on the market, distributors shall act with due care in relation to the requirements set out in this Chapter.

2. Before making a product available on the market, distributors shall verify that the product bears the UK marking and, when applicable, the UA class identification label and the indication of the sound power level, is accompanied by the documents referred to in paragraphs 7 and 8 of Article 6 and that the manufacturer and the importer have complied with the requirements set out in paragraphs 5 and 6 of Article 6 and in paragraph 3 of Article 8. Distributors shall ensure that the product is accompanied by the manufacturers' instructions and information notice required by Parts 1 to 6, 16 and 17 of the Annex in English. Those manufacturers' instructions and information notice, as well as any labelling, shall be clear, understandable and legible.

Where a distributor considers or has reason to believe that a product is not in conformity with the requirements set out in Article 4, he shall not make the product available on the market until it has been brought into conformity. Furthermore, where the product presents a risk, the distributor shall inform the manufacturer or the importer to that effect, as well as the market surveillance ~~authorities~~ authority.

3. Distributors shall ensure that, while a product is under their responsibility, its storage or transport conditions do not jeopardise its compliance with the requirements set out in Article 4.

4. Distributors who consider or have reasons to believe that a product which they have made available on the market is not in conformity with this Regulation or any other relevant

enactment shall make sure that the corrective measures necessary to bring that product into conformity, to withdraw it or recall it, if appropriate, are taken. Furthermore, where the product presents a risk, distributors shall immediately inform the market surveillance ~~authorities~~ authority to that effect, giving details, in particular, of the non-compliance and of any corrective measures taken.

5. Distributors shall, further to a reasoned request from a market surveillance authority, provide it with all the information and documentation in paper or electronic form necessary to demonstrate the conformity of the product. They shall cooperate with that authority, at its request, on any action taken to eliminate the risks posed by the product which they have made available on the market.

AMC1 to Article 9(2)

DISTRIBUTOR VERIFICATION BEFORE MARKET AVAILABILITY

Before making a product available on the UK market, distributors are expected to verify that key compliance elements have been satisfied by the manufacturer and importer. This verification process shall include confirming that the product is appropriately marked with the UK marking and the relevant class identification label. For products in class UK1, UK2, and UK3, the distributor may also check that the sound power level is indicated, and that the declared values for UK1 and UK2 products fall within the limits defined in Part 15 of the Annex.

In addition, distributors shall ensure that each unit is accompanied by the manufacturer's instructions, an information notice, and a copy of the declaration of conformity. These documents and any attached labelling should be clear, legible, and presented in English. Information such as the name, registered trade name or trademark, website and postal address of the manufacturer and importer is expected to be affixed to the product. Where the size or design does not allow for visible placement of this information, the details may be presented on the product packaging, or in a document accompanying it.

Distributors shall also confirm that the manufacturer has prepared a complete set of technical documentation, including details on the design, means of compliance, and supporting test results. While distributors are not expected to conduct a technical assessment, a basic confirmation that the declaration of conformity is valid and references appropriate standards may support confidence in product compliance.

Where any expected conditions are not met, distributors shall refrain from making the product available on the market.

If a distributor considers or has reason to believe that a product they have placed on the market poses a risk, even in the absence of a confirmed non-compliance, they shall inform the MSA, manufacturer and importer within 72 hours, via email to MSAenquiries@caa.co.uk and relevant contact details for the manufacturer and importer.

The notification should include a description of the issue, affected product identifiers, the scope of distribution, corrective measures taken or proposed actions, and potential results of internal investigations or information on planned investigations. Where the product poses a risk in the absence of a confirmed non-compliance, distributors may also inform and collaborate with the CAB involved in the chosen conformity assessment procedure.

If a manufacturer has reason to believe that a product they have placed on the market is not in conformity with this Regulation or any other relevant enactment, the manufacturer is encouraged to notify any relevant economic operators and inform the MSA without undue delay. The MSA may be contacted via the UK CAA website or directly by email at MSAenquiries@caa.co.uk.

AMC1 to Article 9(4) and (5)

DISTRIBUTOR ENGAGEMENT WITH THE MARKET SURVEILLANCE AUTHORITY (MSA)

If a distributor considers or has reason to believe that a product they have placed on the market poses a risk to, even in the absence of a confirmed non-compliance, they shall inform the MSA, manufacturer and importer within 72 hours, via email to MSAenquiries@caa.co.uk and relevant contact details for the manufacturer and importer. The notification should include a description of the issue, affected product identifiers, the scope of distribution, corrective measures taken or proposed actions, and potential results of internal investigations or information on planned investigations. Where the product poses a risk in the absence of a confirmed non-compliance, distributors may also inform and collaborate with the CAB involved in the chosen conformity assessment procedure.

Distributors shall take corrective measures and bring the product back into conformity if they become aware of a non-conformity. Corrective measures may include updates to product software, provision of modification kits, safety notices, or, where warranted, full product recalls. Distributors may coordinate with manufacturers, importers and the MSA to define, initiate, and communicate such actions. Communications may reference product identifiers such as model name, serial number, version of hardware or software, and relevant production or batch dates to ensure traceability.

Upon receipt of a reasoned request from the MSA, distributors must provide all information and documentation necessary to demonstrate product conformity. This may include, but is not limited to: technical documentation, Declarations of Conformity, design specifications or technical drawings, test reports and compliance statements, product photographs and labelling evidence, user manuals and instructions or certificates of conformity issued by a Conformity Assessment Body (CAB), where applicable.

Distributors are expected to fully support investigations initiated by the MSA. This may involve responding to queries, supplying additional evidence upon request, and assisting in clarifying any concerns related to product conformity, risks, or non-compliance. Where appropriate, importers are encouraged to work jointly with the manufacturer, importer and the MSA to identify the source of the risk and define appropriate corrective measures. These actions may include repair, update, withdrawal, or recall of the affected product group.

Distributor's personnel who want to provide reports to the MSA as part of a whistleblowing activity are encouraged to contact the MSA by filing the whistleblowing report at https://www.caa.co.uk/our-work/make-a-report-or-complaint/report-something/make-a-whistleblowing-report/.

Article 13 Conformity assessment procedures

1. The manufacturer shall perform a conformity assessment of the product using one of the following procedures with a view to establishing its compliance with the requirements set out in Parts 1 to 6, 16 and 17 of the Annex. The conformity assessment shall take into account all intended and foreseeable operating conditions.

2. The procedures available to conduct the conformity assessment shall be the following:

- (a) internal production control as set out in Part 7 of the Annex, when
  - (i) assessing the compliance of a product with the requirements set out in Parts 1, 5, 6, 16 or 17 of the Annex, subject to the condition that the manufacturer has applied the designated standards, for all the requirements for which such standards exist; or
  - (ii) the conditions in paragraph 3 are satisfied
- (b) type examination followed by conformity to type based on internal production control as set out in Part 8 of the Annex;
- (c) conformity based on full quality assurance as set out in Part 9 of the Annex, excepted when assessing the compliance of a product which is a toy within the meaning of the Toys (Safety) Regulations 2011.

3. The conditions in this paragraph are -

- (a) that the conformity assessment is conducted before 1st January 2028,
- (b) that the assessment is of the compliance of a product with the requirements set out in Parts 2, 3 or 4 of the Annex, and
- (c) that the product is covered by a type examination under Part 8 of the Annex to Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems as it has effect in EU.

AMC1 to Article 13(2) and (3)

When using internal production control procedures under point 2, designated standards must be applied if they exist. The absence of designated standards does not preclude the use of internal production control procedures. Economic operators must establish procedures to ensure that their products comply with the requirements of this regulation. Products bearing an EU class label may comply by following existing EU standards, which can be used to ensure product compliance under internal production control procedures in the absence of a designated standard, where they cover the requirements of this regulation.

In line with point 3, the internal production control procedures can also be used for products bearing an EU class label and an EU type examination certificate based on a conformity assessment performed by an accredited and approved CAB for UK1, UK2 and UK3 UAS, provided that the procedure is applied before January 2028.

The following table provides an overview of the conformity assessment requirements for the different product groups:

UAS Class	**Conformity assessment requirement from 01/01/2026**	**Conformity assessment requirement from 01/01/2028**
UK0 (Part 1) UK4 (Part 5) UK5 (Part 16) UK6 (Part 17) Remote ID add-on (Part 6)	Internal production control providing the UAS has an EU label (irrespective of whether the product has a type examination certificate from an EU-approved CAB)	Internal production control
UK1 (Part 2) UK2 (Part 3) UK3 (Part 4)	Internal production control providing the product has a type-examination certificate from an EU-approved CAB	Type examination certificate from a UK-approved CAB

Article 18 Approval of Conformity Assessment Bodies

1. The ~~Secretary of State~~ market surveillance authority may approve bodies to carry out third-party conformity assessment tasks under this Regulation.

2. The ~~Secretary of State~~ market surveillance authority may not approve a body to carry out third-party conformity assessment tasks under paragraph 1 unless satisfied the body meets the criteria specified in Article 22.

3. Where a body demonstrates its conformity with applicable designated standards or parts thereof, it shall be presumed to meet the requirements set out in Article 22 insofar as the applicable designated standards cover those requirements.

4. The ~~Secretary of State~~ market surveillance authority must—

a. assign an approved body identification number to each approved body;
b. compile and maintain a register of approved bodies containing in relation to each body—
    i. the approved body identification number,
    ii. details of the activities for which the body is approved, and
    iii. any restrictions on the activities for which the body is approved.

5. The register referred to in paragraph ~~2~~ 4 must be made publicly available.

AMC1 to Article 18(1) and (2) and Article 22

APPROVAL OF CONFORMITY ASSESSMENT BODIES (CABS)

Organisations seeking approval to conduct third-party conformity assessment activities under this Regulation may apply directly to the MSA. Applications are submitted via the UKMCAB portal and are reviewed in accordance with Article 22 of this Regulation.

To be considered for approval, an applicant is generally expected to:

- Be established as a legal entity within the United Kingdom or a member country of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which includes Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Vietnam.
- Hold a current certificate of accreditation issued by the United Kingdom Accreditation Service (UKAS) for the relevant conformity assessment activities.

As part of the application, bodies are invited to provide:

- A clear description of their conformity assessment scope, identifying the modules and product types for which competence is claimed;
- A record of past conformity assessment activities, where applicable;
- Declarations and supporting evidence of impartiality and independence, including relevant internal procedures, organisational charts, shareholder listings, staff CVs and lists of existing and intended clients.

Applicants are advised to demonstrate independence from any organisation or product they assess. This includes not engaging in the design, manufacture, construction, supply, marketing, installation, maintenance, or ownership of the relevant products. Similarly, applicants typically refrain from offering consultancy services that could affect impartiality for any organisation they are assessing.

Personnel involved in assessments are expected to operate with professional integrity, without external influence, commercial pressure, or incentives that may compromise objectivity. Assessment staff may not be rewarded based on the number of inspections or certifications performed. The assessment process also considers the availability of qualified personnel to support the applied scope.

Applicants are encouraged to maintain robust procedures distinguishing work performed under UK CAB approval from other business operations. In addition, CABs may be expected to demonstrate participate actively in standardisation and regulatory activities relevant to the product categories they assess and must demonstrate they carry appropriate liability insurance.

All applications and relevant documentation are processed using the UKMCAB system. Approved CABs are listed publicly in the UKMCAB register, including the approved body number, approval scope, and applicable limitations.

The MSA may request additional information or clarification during the application or reapproval process. CABs are expected to cooperate with such requests. Additionally, CABs are advised to notify the MSA of any forthcoming accreditation renewals and submit proof of reaccreditation once obtained to maintain approval status. Where applicable, the MSA may require verification through tools such as the CertCheck service.

Following a successful review, the MSA issues formal notification of approval or reapproval. Continued approval is conditional on ongoing compliance with applicable requirements and the retention of accreditation by UKAS.

Applicants may want to send enquiries to or seek clarification from the MSA prior to or during the approval process. Requests can be sent to the MSA via MSAenquiries@caa.co.uk.

Article 36 Procedures for dealing with products presenting a risk at national level

1. Where the market surveillance authorities have sufficient reason to believe that a product presents a risk to the health or safety of persons or to other aspects of public interest protection covered by this Chapter, they shall carry out an evaluation in relation to the product concerned, covering all applicable requirements laid down in this Chapter. The relevant economic operators shall cooperate as necessary with the market surveillance ~~authorities~~ authority for that purpose.

Where, in the course of the evaluation referred to in the first subparagraph, the market surveillance ~~authorities~~ authority find that the product does not comply with the requirements laid down in this Chapter, ~~they~~ it shall, without delay, require the relevant economic operator to take all appropriate corrective actions to bring the product into compliance with those requirements, to withdraw the product from the market, or to recall it within a reasonable period, commensurate with the nature of the risk, as ~~they~~ it may prescribe. The market surveillance ~~authorities~~ authority shall inform the Secretary of State accordingly. Article 21 of Regulation (EC) No 765/2008 shall apply to the measures referred to in the second subparagraph of this paragraph.

2 . . . .

3. The economic operator shall ensure that all appropriate corrective action is taken in respect of all products concerned that it has made available on the market

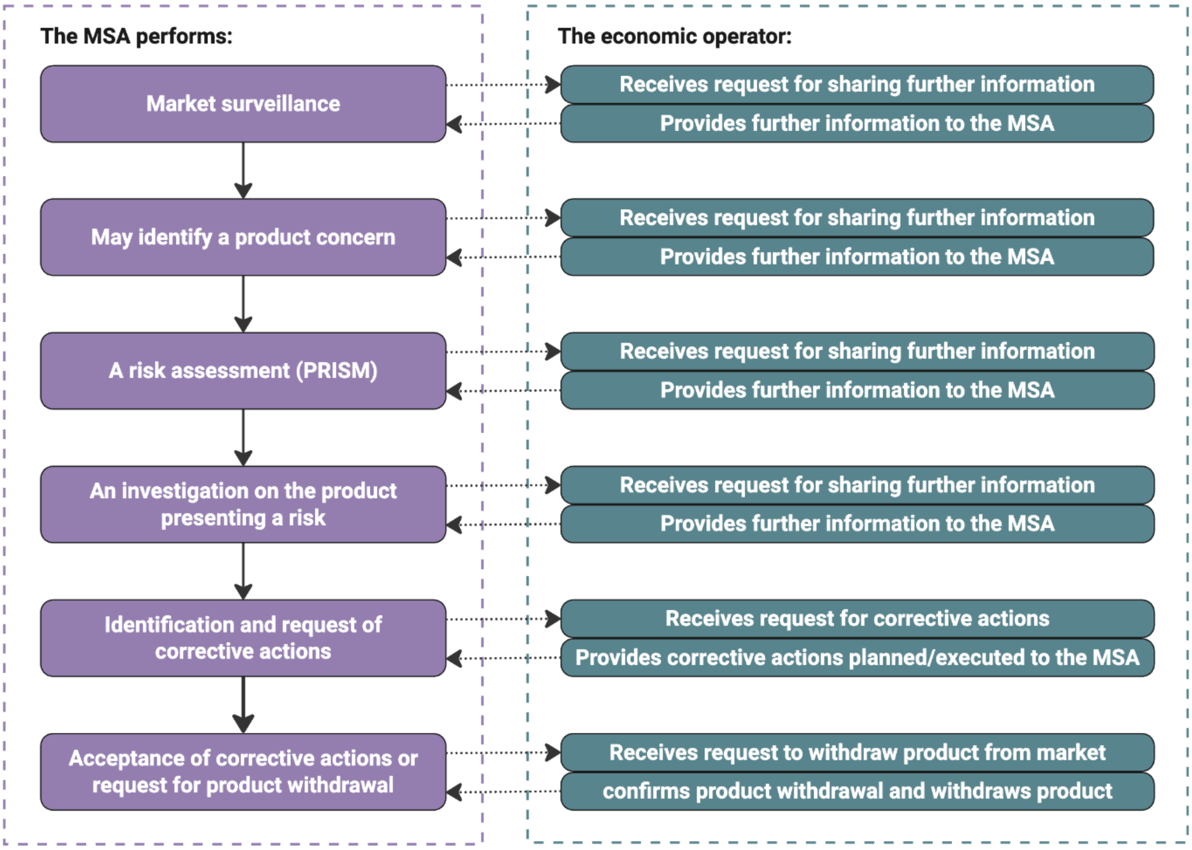
4. Where the relevant economic operator does not take adequate corrective action within the period referred to in the second subparagraph of paragraph 1, the market surveillance ~~authorities~~ authority shall take all appropriate provisional measures to prohibit or restrict the product being made available on their national market, to withdraw the product from that market or to recall it.

AMC1 to Article 36(1)

RISK EVALUATION AND COOPERATION WITH MARKET SURVEILLANCE AUTHORITY (MSA)

When the MSA identifies a potential risk associated with a product placed on the market, an evaluation may be initiated to determine compliance with the applicable requirements of this Chapter. This evaluation typically follows a structured engagement sequence, beginning with a request for information and progressing, where necessary, through stages of risk assessment, investigation, and the proposal or implementation of corrective actions.

A high-level flow chart illustrates the typical progression from identification of concern through to case resolution or potential withdrawal, as shown below. Throughout the process, the economic operator may be asked to provide additional documentation, clarification, or follow MSA instructions. These inputs may relate to technical documentation, conformity procedures, test records, or post-market surveillance results. Cooperation with such requests is considered essential in ensuring accurate and timely evaluation.



The MSA will use risk relevant methodologies such as the PRISM framework (Product Safety Risk Assessment Methodology) for its evaluations and risk assessments. PRISM offers a structured framework, including identifying and characterising the non-conforming product or version, assessing and classifying the risk level, evaluating whether the risk may be considered negligible or acceptable, and formulating and proposing proportionate corrective actions.

When a product is found to be non-conforming or posing a risk, corrective actions are expected within a timeframe proportionate to the severity of the issue. In such cases, details of product withdrawals or recalls will be reflected in the UK Product Safety Database and inform annual OPSS product safety reports.

The MSA will notify the Secretary of State of the outcome of product withdrawals and recalls.

AMC1 to Article 36(3)

IMPLEMENTATION OF CORRECTIVE ACTIONS BY ECONOMIC OPERATORS

When a corrective action is required, whether as a result of a direct request from the MSA or identified through the economic operator's own investigation, the action is expected to be both proportionate and effective in mitigating the identified risk and restoring product conformity.

Corrective measures may include but are not limited to software updates, retrofit kits, component replacements, or information campaigns. Before implementation, if the MSA initially requested that the economic operator define the corrective action, the economic operator shall submit the final selection of a corrective action to the MSA for acceptance. Economic operators should demonstrate how the proposed action addresses the specific non-conformity or risk, supported by relevant data, test evidence, or conformity assessment outcomes. Once implemented, economic operators should notify the MSA and provide proof of completion, such as updated conformity declarations, revised technical documentation, or verification test reports and shall seek final acceptance of the corrective actions from the MSA.

Where the MSA provides a specific timeframe for action, the economic operator should confirm that the timeline can be met or provide a reasoned proposed timeframe back to the MSA. If constraints such as supply chain delays or technical limitations arise, the MSA should be informed immediately, and a revised plan with justification and mitigation measures should be submitted. Economic operators may confirm the timeline for implementation and describe when and how actions will be carried out.

In executing the corrective action, operators should

- Identify all affected product types and versions;
- Review and update the relevant technical documentation and conformity assessment results;
- Plan and manage communications with end users, distributors, and other supply chain entities;
- Provide practical support, such as update instructions, physical modification kits, or return procedures;
- Consider legal and commercial implications where end users do not implement the required actions.

The economic operator should also keep the MSA informed throughout the implementation phase. Updates might include the overall strategy, the implementation timeline, outreach plans, and progress status.

Should corrective actions fail during rollout or the MSA determine that they are insufficient, the operator may be asked to reconsider or initiate a full product recall. In such cases, documentation of the efforts undertaken and reassessing the remaining risks may support subsequent regulatory decisions.

Corrective actions are typically considered complete only when the MSA has received confirmation of completion and reviewed supporting evidence demonstrating that the product no longer poses a risk and complies fully with applicable requirements.

AMC1 to Article 36(4)

RECALL OF PRODUCTS

Where an economic operator does not undertake appropriate or timely corrective action following a risk evaluation under Article 36(1), the MSA may consider further steps to prevent the product from remaining on the market. In such cases, the MSA may formally notify the operator advising that the product should no longer be made available on the UK market and may require its withdrawal or recall.

The decision to mandate product withdrawal or recall is generally regarded as a measure of last resort. The MSA typically explores all available avenues to enable the continued presence of compliant and safe products on the market. However, the protection of health and safety remains the MSA's primary consideration, and this takes precedence in all cases of confirmed or potential product risk.

If the economic operator fails to act in accordance with a withdrawal or recall request, the MSA may engage with relevant enforcement bodies and pursue legal options to ensure compliance with regulatory obligations.

Operators are encouraged to maintain an open dialogue with the MSA throughout the corrective process and to cooperate with honest intent. Timely communication of implementation progress, challenges, or inability to comply with MSA instructions may help mitigate enforcement outcomes and support proportionate regulatory responses.

Article 38 Compliant product which presents a risk

1. Where, having carried out an evaluation under paragraph 1 of Article 36, ~~a~~ the market surveillance authority finds that, although the product is in compliance with this Chapter, it presents a risk to the health or safety of persons or to other aspects of public interest protection covered by this Chapter, it shall require the relevant economic operator to take all appropriate measures to ensure that the product concerned, when placed on the market, no longer presents that risk, to withdraw the product from the market or to recall it within a reasonable period, commensurate with the nature of the risk, as it may prescribe.

2. The economic operator shall ensure that corrective action is taken in respect of all the products concerned that he has made available on the market.

AMC1 to Article 38(1) and (2)

MANAGEMENT OF COMPLIANT PRODUCTS PRESENTING A RISK

Where a product is found to present a risk to health or safety, despite complying with all applicable requirements, the MSA may initiate appropriate risk mitigation measures. This scenario may arise, for example, due to unforeseen technological developments, changes in operating environments, or newly identified vulnerabilities.

The economic operator is typically expected to cooperate fully with the MSA in such cases. This may include the following requests for corrective actions, conducting internal investigations into the identified risk, and engaging with the CAB originally involved in the assessment. Economic operators should also support MSA-led investigations by providing technical documentation, data on product usage, and expert input.

Economic operators should identify and assess potential corrective actions, such as software updates, retrofit kits, or usage restrictions, and prepare a risk mitigation and corrective action implementation strategy. This strategy might include:

- Identification of all affected products and versions;
- An assessment of the severity and likelihood of the risk;
- A proposed corrective action plan with expected outcomes.
- A communication strategy targeting end users, distributors, and partners across the supply chain.

The strategy should also include an implementation timeline and contingency planning for cases where the corrective actions are not feasible or fail to resolve the issue. In such instances, a product recall or withdrawal from the market may be reconsidered in consultation with the MSA.

Throughout this process, the economic operator should keep the MSA informed. Updates may include that the risk is being addressed, that mitigation steps have been initiated, and that communication with the affected parties is underway. Regular status reports help ensure alignment with regulatory expectations and demonstrate proactive post-market product stewardship.

Corrective actions are generally considered complete once they are implemented across all impacted products placed on the market, and evidence has been provided that the residual risk has been sufficiently reduced.

Article 39 Formal non-compliance

1. Without prejudice to Article 36, where ~~a~~ the market surveillance authority makes one of the following findings concerning products covered by this Chapter, it shall require the relevant economic operator to put an end to the non-compliance concerned:

a. the UK marking has been affixed in violation of Article 30 of Regulation (EC) No 765/2008 or of Article 15 or Article 16 of this Regulation;
b. the UK marking or type has not been affixed;
c. the identification number of the approved body, where the conformity assessment procedure set out in Part 9 of the Annex is applied, has been affixed in violation of Article 16 or has not been affixed;
d. the UA class identification label has not been affixed;
e. the indication of the sound power level if required has not been affixed;
f. the serial number has not been affixed or has not the correct format;
g. the manual or the information notice is not available;
h. the declaration of conformity is missing or has not been drawn up;
i. the declaration of conformity has not been drawn up correctly;
j. technical documentation is either not available or not complete;
k. manufacturer's or importer's name, registered trade name or registered trademark, website address or postal address are missing.

2. Where the non-compliance referred to in paragraph 1 persists, the Secretary of State concerned shall take all appropriate measures to restrict or prohibit the product being made available on the market or ensure that it is withdrawn or recalled from the market.

AMC1 to Article 39(1)

ADDRESSING FORMAL NON-COMPLIANCES

Where a formal non-compliance has been identified, the economic operator should undertake a systematic evaluation of the affected processes, product variations, and associated documentation. Effective communication with other relevant economic operators involved in the supply chain may support timely resolution and ensure consistency across the impacted units.

For non-compliance related to markings, including the UK marking, class identification label, approved body number, sound power level indication or serial number, corrective measures may begin with a process-level investigation. Economic operators may examine which procedural step resulted in omission or error, determine which models or production batches are affected, and assess whether the preconditions for affixing such markings were fully met.

Where an approved body number has not been affixed or affixed incorrectly, the economic operator may check whether the identification number was issued and confirm whether the conformity assessment procedure was correctly followed and documented.

If sound power level markings are missing, a review may be conducted to confirm whether the required tests were completed, the measured value complies with the applicable limits of Part 15 of the Annex, and the value has been correctly recorded and incorporated into the product labelling process and documentation.

For missing or improperly formatted serial numbers, economic operators should verify whether serial number data exists, assess whether unique identifiers can be retrospectively assigned, and confirm alignment with any required formatting standard.

When the user manual or information notice is missing or incomplete, economic operators may review whether all relevant user-facing documentation has been prepared, whether it reflects current product specifications and includes necessary safety instructions, and whether processes are in place to distribute this information in English to end users.

For incomplete technical documentation, economic operators may verify that documentation is prepared in accordance with Article 17 and Part 10 of the Annex. This includes, but is not limited to:

- A comprehensive product description, including illustrations;
- Software or firmware version identifiers;
- Installation instructions;
- Design and manufacturing drawings with supporting explanations;
- A list of designated standards applied in part or full;
- Test reports and, if applicable, the type examination certificate;
- Evidence submitted to the CAB;
- A copy of the declaration of conformity.

Where the declaration of conformity is absent, incomplete or incorrect, economic operators may review the applicable conformity assessment route, the required content of the declaration, and ensure alignment with the product’s class marking and design features. This includes confirming the correct identification of the product, applicable standards, and the conformity assessment module applied.

Economic operators may seek to close non-compliance cases by submitting proof to the Secretary of State or the Department for Transport that the corrective measures have been fully implemented. Where necessary, further engagement with relevant CABs, review of conformity assessment processes, or resubmitting updated technical documentation may support resolution.

CHAPTER 2

Amendments to EU 2019/947 AMC and GM

GM1 Article 2(11) Definitions

DEFINITION OF 'DANGEROUS GOODS'

For the purpose of assessing the risk of the transport of dangerous goods by an unmanned aircraft operators should also consider articles and substances that fall within the definition of dangerous goods contained in the Technical Instructions.

GM1 Article 3 Categories of UAS Operations

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~~ Near People (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 operationa~~l~~, and technical characteristics of the operation.

For example, mid-flight the RP transitions the UA from a built-up environment to open farm land. The operational intent and authorisation do not change.

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.

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

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, including solid, liquid or gas whilst in flight.

AMC1 Article 5(2) Specific Category of UAS operations

CARRIAGE OF DANGEROUS GOODS

Mitigating measures in relation to the carriage of dangerous goods within the 'Specific' category will be considered adequate when conducted in accordance with the Technical Instructions including its supplement and any other addenda or corrigenda.

This relates only to the aspects of the carriage of dangerous goods and do not replace the need for a specific safety risk assessment in accordance with Article 11.

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

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.~~

There may be hazards unique to UAS operations that are not addressed in the Technical Instructions, for example: when an UAS operating in the Specific Category is carrying dangerous goods and where there is a high risk to third parties in the event of an accident, a crash-protected container must be used. A Crash Protected Container (CPC) is a containment device that is designed and tested to be capable of falling from an operational height and preventing the leakage / dispersion of its contents dangerous goods after impacting terrain in case of an accident.

Generally, dangerous goods carried in excepted quantities and those in Division 6.2, Category B as defined by the Technical Instructions, will not be required to be carried in a crash-protected container.

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

UK UAS regulatory requirements

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 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 Assimilated 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 metres;

(2) operating unmanned aircraft with a maximum cruise speed above 200 metres 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 km^2.

(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

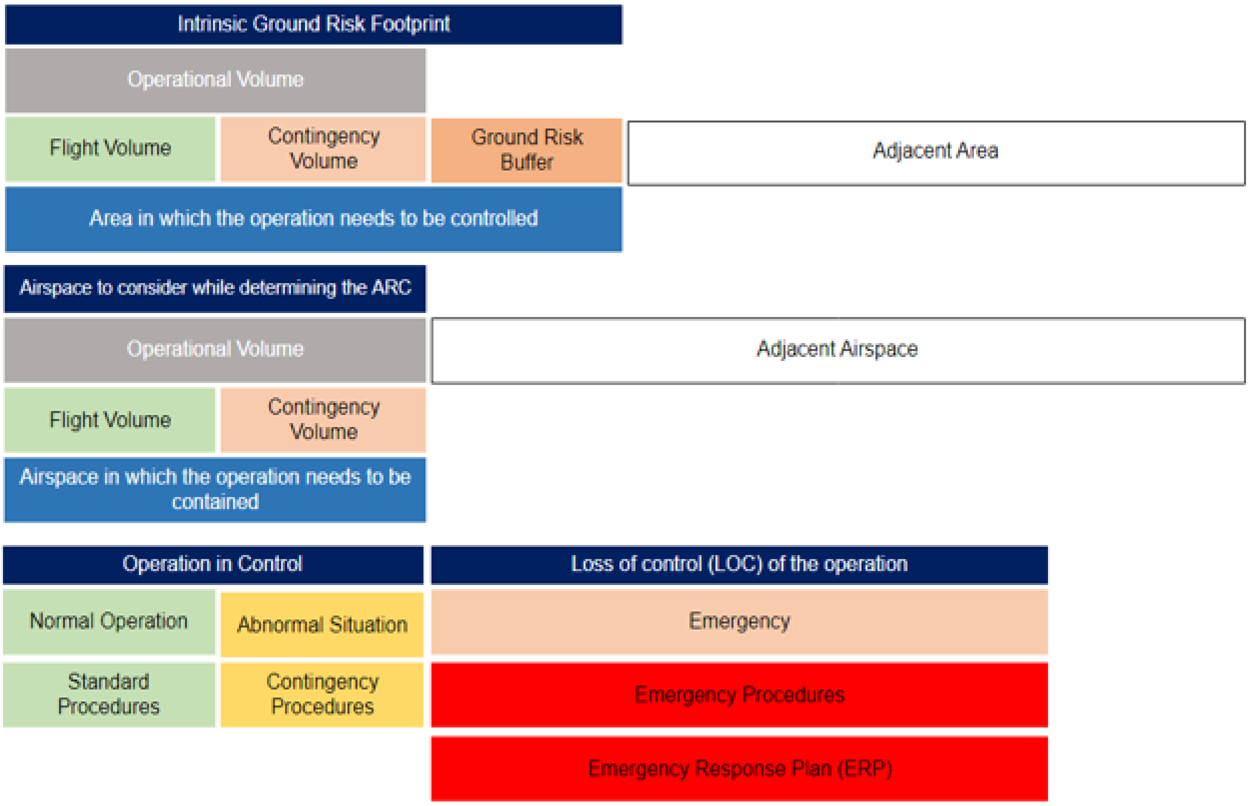
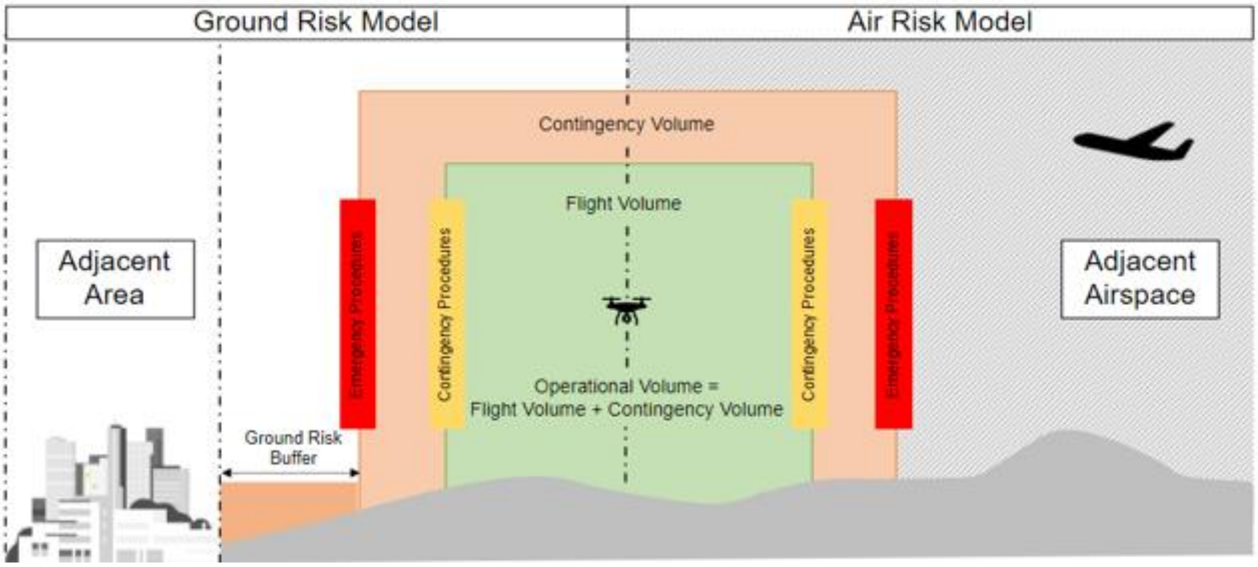


Figure 2 - The Operational Volume



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 UK SORA Annex A for ~~JARUS SORA 2.5 Annex A~~ 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~~. The adjacent area represents the area adjacent to the outer edge of the ground risk buffer where a UA after a loss of control may crash only under extraordinary scenarios.

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 lateral outer limit of the adjacent area is calculated using the UA performance as distance flown.

The adjacent airspace

1.29 The adjacent airspace is the airspace where only under extraordinary scenarios ~~it is reasonably expected that~~ that a UA ~~an unmanned aircraft~~ may fly after a loss of control. The adjacent airspace is the airspace adjacent to the operational volume.

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

Operation in Control		Loss of control (LOC) of the operation
Normal Operation	Abnormal Situation	Emergency
Standard Procedures	Contingency Procedures	Emergency Procedures
		Emergency Response Plan (ERP)

Abnormal Situation

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/or 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~~ entering the adjacent area.

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

	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 containment compliance evidence
2	11	Provide OSO 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 (when rotors are in furthest apart position)

(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 UK SORA Annex B;

(iii) **Maximum Operational speed:** This is defined as the maximum speed of the UA set by the operator. Refer to UK SORA Annex A for more information.

(iv) **Maximum operational weight:** This is defined as the maximum operational weight set by the operator. The maximum operational weight must be lower than or equal to the maximum take-off weight. This must consider the designer defined UA weight and the operational payload weight.

(v) **Maximum take-off weight**: This is defined as the maximum possible weight of the UA including all payload, as specified by its designer.

Determination of the iGRC

1.62 Table 3 shows how the iGRC is determined.

Table 3 - iGRC Determination

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**
Maximum population density					
Controlled Ground Area	iGRC 1	iGRC 1	iGRC 2	iGRC 3	iGRC 3

5 people/km2	iGRC 2	iGRC 3	iGRC 4	iGRC 5	iGRC 6
50 people/km2	iGRC 3	iGRC 4	iGRC 5	iGRC 6	iGRC 7
500 people/km2	iGRC 4	iGRC 5	iGRC 6	iGRC 7	iGRC 8
5,000 people/km2	iGRC 5	iGRC 6	iGRC 7	iGRC 8	iGRC 9
50,000 people/km2	iGRC 6	iGRC 7	iGRC 8	iGRC 9	iGRC 10
>50,000 people/km2	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.

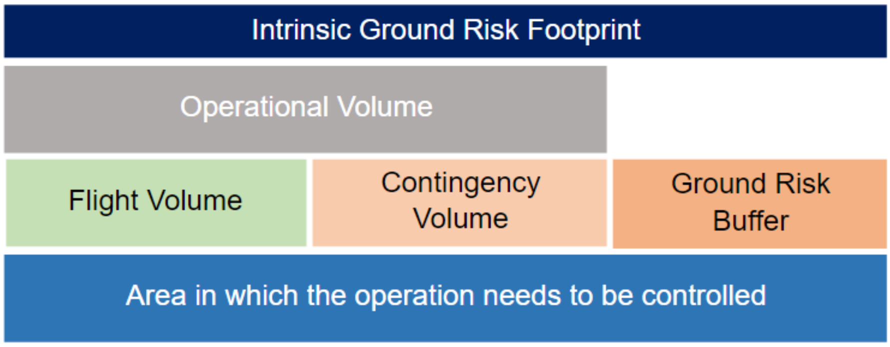
1.64 A UA expected to not penetrate a standard ~~dwelling~~ structure will get a -1 GRC reduction in Step 3 from the M1(A) sheltering mitigation when not overflying large open-air assemblies of people. See Annex B for additional details.

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/km2) more than 50,000**

1.82 Descriptor: Densest populated residential, commercial and industrial areas consisting mainly of tall multistorey 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~~ UK SORA Annex A for further guidance.

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.

Note: Applicants wishing to use Annex F to calculate the iGRC should contact the CAA via uksora@caa.co.uk to obtain further guidance on the application and review process. The applicant should be aware that this process may take additional time and may incur an extra hourly charge in line with the published Scheme of Charges.

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 Meters	Suggested Optimal Grid Size (meter x meter)
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

1.91 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

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

1.93 Acceptable mitigations may reduce the intrinsic risk of an uninvolved person ~~being struck by a UA during a LOC~~ on the ground being significantly injured due to the impact of a UA. 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

1.94 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

		Low Robustness	Medium Robustness	High Robustness
M1(A)	Strategic mitigation - Sheltering	-1	-2	N/A
M1(B)	Strategic mitigations - Operational restrictions	N/A	-1	-2
M1(C)	Tactical mitigations - Ground observation	-1	N/A	N/A
M2	Effects of UA impact dynamics are reduced	N/A	-1	-2

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

Application of Ground Risk Mitigations

1.96 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.

1.97 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.

1.98 When applying all the mitigations, the final GRC may not be reduced to a value lower than the lowest value in the applicable column in Table 3. This is because it is not possible to reduce the number of people at risk below that of a controlled ground area.

1.99 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.

1.100 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)

1.101 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.

1.102 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.

1.103 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

1.104 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).

1.105 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.

1.106 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.

1.107 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.

1.108 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.

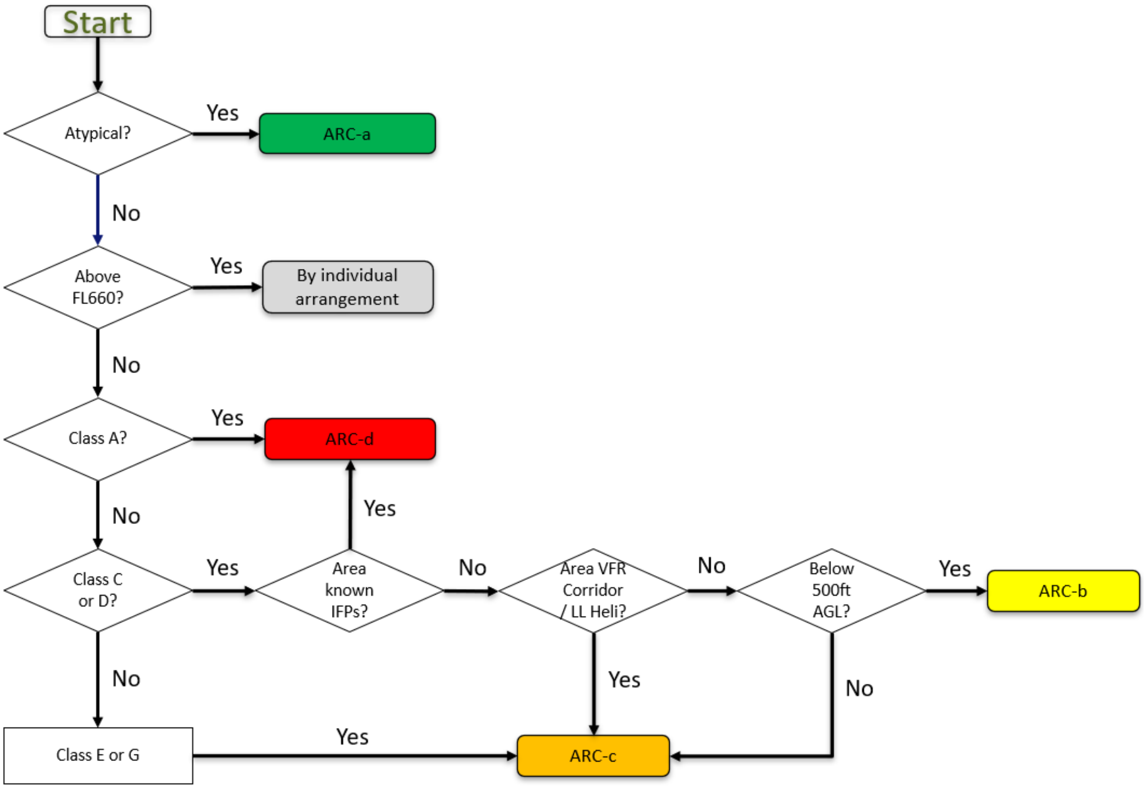
1.109 The requirement for such restrictions, and hence the scalability of the BVLOS solution, is determined largely by the assured performance capability of the UAS DAA system.

Quantitative air risk flow chart

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

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

Figure 5 - Quantitative Air Risk Flowchart



Encounter Types

1.112 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).

1.113 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.

1.114 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)

1.115 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).

1.116 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:

1.117 **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.

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

1.119 **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 cannot 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.

1.120 **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.

1.121 **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.

1.122 **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, 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.

1.123 **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.

1.124 **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

1.125 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.

1.126 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.

1.127 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).

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

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

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

1.130 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.

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

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

1.133 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

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

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

Table 6 - SAIL Determination

	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			

Step 7 - Operation Details

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

1.137 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

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

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

1.140 Make the required Phase 1 payment when prompted.

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

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

Step 9 - Final SAIL Decision

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

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

1.145 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.

1.146 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

1.147 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.

1.148 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.

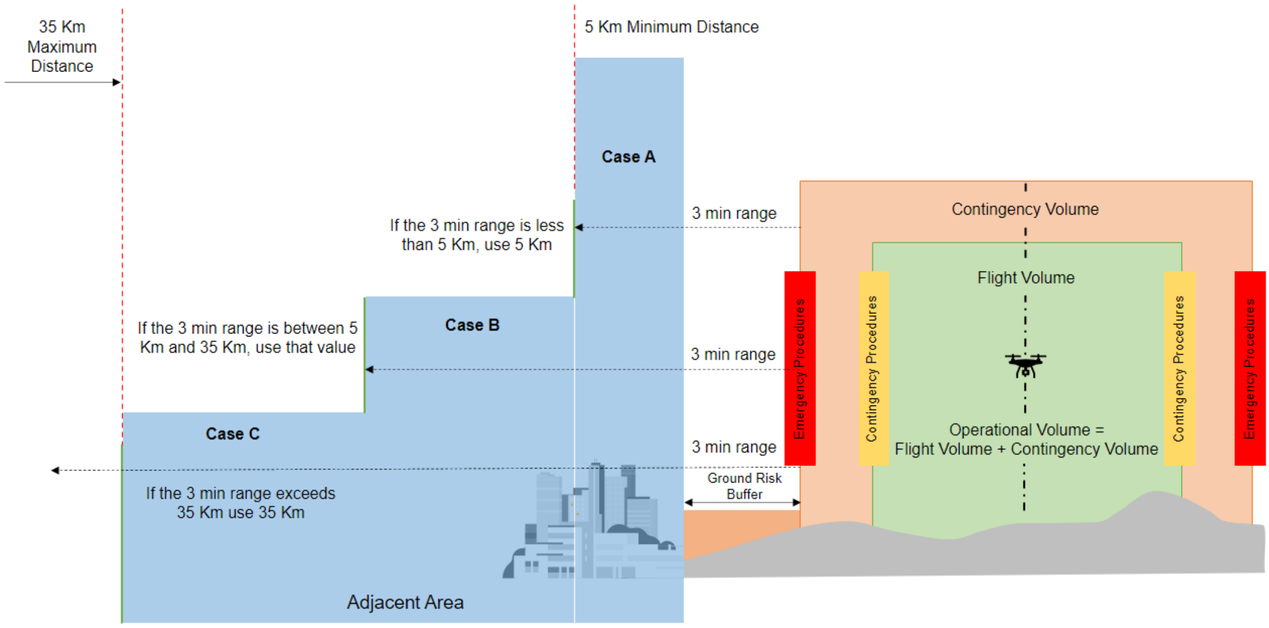
1.149 There are three possible levels of robustness for containment: Low, Medium, and High; each with a set of safety requirements described in Annex E.

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

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

1.152 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



1.153 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.

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

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

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

1.157 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.

1.158 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/km²**~~	~~**< 5,000 ppl/km²**~~
~~**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~~8 - Containment requirements 3m UA (< 35 m/s) ~~applicant does not claim sheltering as a mitigation~~

Average population density allowed	**No Upper Limit**	**< 50,000 ppl/km²**	**< 5,000 ppl/km²**	**< 500 ppl/km²**
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~~9 - 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/km²	< 5,000 ppl/km²	< 500 ppl/km²	< 50 ppl/km²
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~~10 - 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/km²	< 5,000 ppl/km²	< 500 ppl/km²	< 50 ppl/km²
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

Average population density allowed	No Upper Limit	< 50,000 ppl/km²	< 5,000 ppl/km²	< 500 ppl/km²	< 50 ppl/km²
Assemblies allowed within 1km of the operational volume	**> 400k**	**Assemblies of 40k to 400k**	**Assemblies < 40k**	**Assemblies < 40k**	**Assemblies < 40k**
SAIL 5	Out of scope	Medium	Low	Low	Low
SAIL 6	Medium	Low	Low	Low	Low

Table ~~12~~11 - 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/km²	< 5,000 ppl/km²	< 500 ppl/km²	< 50 ppl/km²
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 scope	Out of scope	Out of scope	Medium	Low
SAIL 5	Out of scope	Out of scope	Medium	Low	Low
SAIL 6	Out of scope	Medium	Low	Low	Low

Adjacent area

1.159 The ~~ground~~ area adjacent to the ~~ground risk buffer is defined as the adjacent area~~ outer edge of the ground risk buffer where a UA after a loss of control may crash only under extraordinary scenarios.

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

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

Adjacent area containment requirements

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

Adjacent area operational limitations

1.163 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.

1.164 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.

1.165 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

1.166 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.

1.167 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

1.168 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. The CAA may apply containment requirements at a higher robustness level for some adjacent airspaces proportional to the risk.

Step 11 - Operational Safety Objectives (OSO)

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

1.170 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.).

1.171 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.

1.172 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	L	M	H	H	H	H

OSO ID	OSO Description	SAIL 1	SAIL 2	SAIL 3	SAIL 4	SAIL 5	SAIL 6
	operation, human errors or critical environmental conditions						
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

1.173 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.

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

VLOS Operations

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

1.176 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

1.177 Identify the applicable Tactical mitigations for the residual ARC.

Step 13 - Phase 2 Assessment

1.178 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.

1.179 The applicant should then:

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

1.180 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.

1.181 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.

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

Step 14 - Compliance Evidence Decision

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

1.184 If the application is approved, the CAA will grant an Operational Authorisation to the applicant.

1.185 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.

1.186 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.

AMC2 Article 11(1)(c) Rules for Conducting an Operational Risk Assessment

SPECIFIC RISK ASSESSMENT AND EMERGENCY RESPONSE PLAN FOR THE CARRIAGE OF DANGEROUS GOODS

(1) The specific risk assessment for the carriage of dangerous goods, should at a minimum, include the following aspects:

i. the extent to which third parties, property or the environment, could be endangered by dangerous goods being carried, in case of an incident or accident;

ii. identification of the hazards associated with the dangerous goods to persons directly involved in the handling of such articles and substances;

iii. type of operation and geographical area where the operation will be carried out;

iv. containment characteristics of the UAS and the crash-protected container, when required;

v. the effects of the intrinsic hazard of the dangerous goods, considering the capabilities of the UAS to respond to the hazards, should an incident occur during flight;

vi. the packing and packaging being used for the transport of dangerous goods.

vii. the quantity and type of dangerous goods to be carried;

viii. the level of competence of those handling the dangerous goods;

ix. the level of confidence in the supply chain.

(2) Operators should document and implement an Emergency Response Plan (ERP), which include procedures and actions to be taken in the event of an incident or an accident when dangerous goods are being carried.

(a) When establishing emergency response procedures, a contingency checklist should be developed, which details the response to an incident or accident involving dangerous goods carried on board the UAS, with the objective of providing adequate information to all of the operator's staff involved in the response. As a minimum the following aspects should be included in the ERP:

i. identification of emergency scenarios that may result from the Classes of dangerous goods being carried on board;

ii. contingency procedures for dealing with an emergency involving dangerous goods for UAS cargo compartments which do not have fire detection or suppression systems;

iii. identification of entities which are trained and competent to adequately respond to the incident or accident on the ground and their contacts;

iv. when dangerous goods are being carried, operators should identify entities which may, at short notice, search for and secure an accident site before the arrival of the operator's emergency responders;

v. procedures for communicating the ERP to local entities which may be involved in the emergency response to incidents and accidents involving dangerous goods;

vi. where emergency response kits are used, the operator should ensure that these are deployable and available to their emergency response staff, at the location where the incident or accident has occurred;

vii. the ERP should include a contact list for all entities that may be involved in any action related to the operator's ERP to ensure expeditious and effective communications during any accident or incident involving DG or any emergency that may occur when an aircraft is carrying DG.

Operators should periodically review the risk assessment and the ERP to ensure that they remain relevant, up to date and that no further hazards to the operation, introduced either internally or by external factors and entities have arisen, which may need to be further assessed and mitigated.

GM3 Article 11(1)(c) Rules for Conducting an Operational Risk Assessment

OPERATIONAL RISK ASSESSMENT FOR THE CARRIAGE OF DANGEROUS GOODS

To the extent possible, the full scope of Technical Instructions should be complied with. However, considering the differences in the type of operations carried out by UAS and the type/s of aircraft involved, there may be circumstances when the full provisions of the

Technical Instructions are not appropriate or necessary. Where the operator identifies such circumstances, justification to support why the operator believes that the provisions should not apply must be included in the risk assessment and must demonstrate that appropriate alternative mitigating measures will achieve an equivalent level of safety to those provided by the Technical Instructions.

There may be hazards unique to UAS operations that are not addressed in the Technical Instructions. The Operator should also consider such hazards in the risk assessment and include appropriate mitigating measures.

Dangerous goods may have two or more associated hazards (primary and subsidiary hazards). Correct identification and classification of DG is the first step towards safely transporting DG by air. Whilst the safety risks posed may be reduced through appropriate training, proper packaging, communication, handling, and stowage, the scope of DG carried onboard an UAS in the specific category may be limited to specific items and classes depending on the hazard posed by the article or substance to health, safety, property or the environment. Information on classification criteria and hazards and may be found in Parts 2; and 3; of the Technical Instructions.

The table below provides general guidance on intrinsic hazards related to the various Classes or Divisions of DG which may be transported in the Specific Category, which the operator should take into consideration when conducting the specific risk assessment. It is not intended to cover all associated hazardous properties and additional hazards may apply.

	Class / Division including Sub-hazards							
HAZARDOUS PROPERTIES	**2.1**	**2.2**	**3**	**4.1**	**5.1**	**6.1**	**8**	**9**
Flammability	√		√	√				√
Chemical Explosion	√		√	√				
Physical explosion	√	√						
Physical and Chemical Explosion	√			√	√			√
Explosive atmosphere	√		√					
Toxic by inhalation						√		
Toxic by skin or eye contact						√	√	
Toxic by ingestion						√		
Asphyxiation risk		√						√
Corrosivity							√	

High Reactivity				√	√			
Cryogenic burns		√						
Chemical instability *					√			
Hazardous decomposition *					√	√	√	
Environmental Pollutant	√		√	√	√	√	√	√

AMC2 Article 11(2)(d) Rules for Conducting an Operational Risk Assessment

THE CARRIAGE OF DANGEROUS GOODS – EXCEPTED ITEMS

Articles and substances which are classified as dangerous goods, but are required to be on board the unmanned aircraft for the purpose of supplying energy to its propulsion system or for the operation of its equipment in accordance with operating regulations, (e.g. fuel, batteries and other items required to be used during flight), are excepted from the provisions of the Technical Instructions and not required to be transported in accordance with the provisions of the Technical Instructions.

The safety of these articles and substances should be assessed during the design and manufacturing of the UAS.

AMC3 Article 11(6) Rules for Conducting an Operational Risk Assessment

THE CARRIAGE OF DANGEROUS GOODS

Any risk to third parties must be sufficiently mitigated. This may be achieved with the use of a crash protected container and following the provisions of the Technical Instructions, or by adjusting the scope/location/nature of the operation, or by a combination of all such mitigations.

GM3 Article 16 UAS Operations in the Framework of Model Aircraft Clubs and Associations

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~~ Far from People (A3), in which the following categories of UAS are allowed to fly according to the limitations and conditions defined in UAS.OPEN.040:
  - UAS that meet the requirements defined in Article 20(b); and
  - 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 19(2) Safety Information

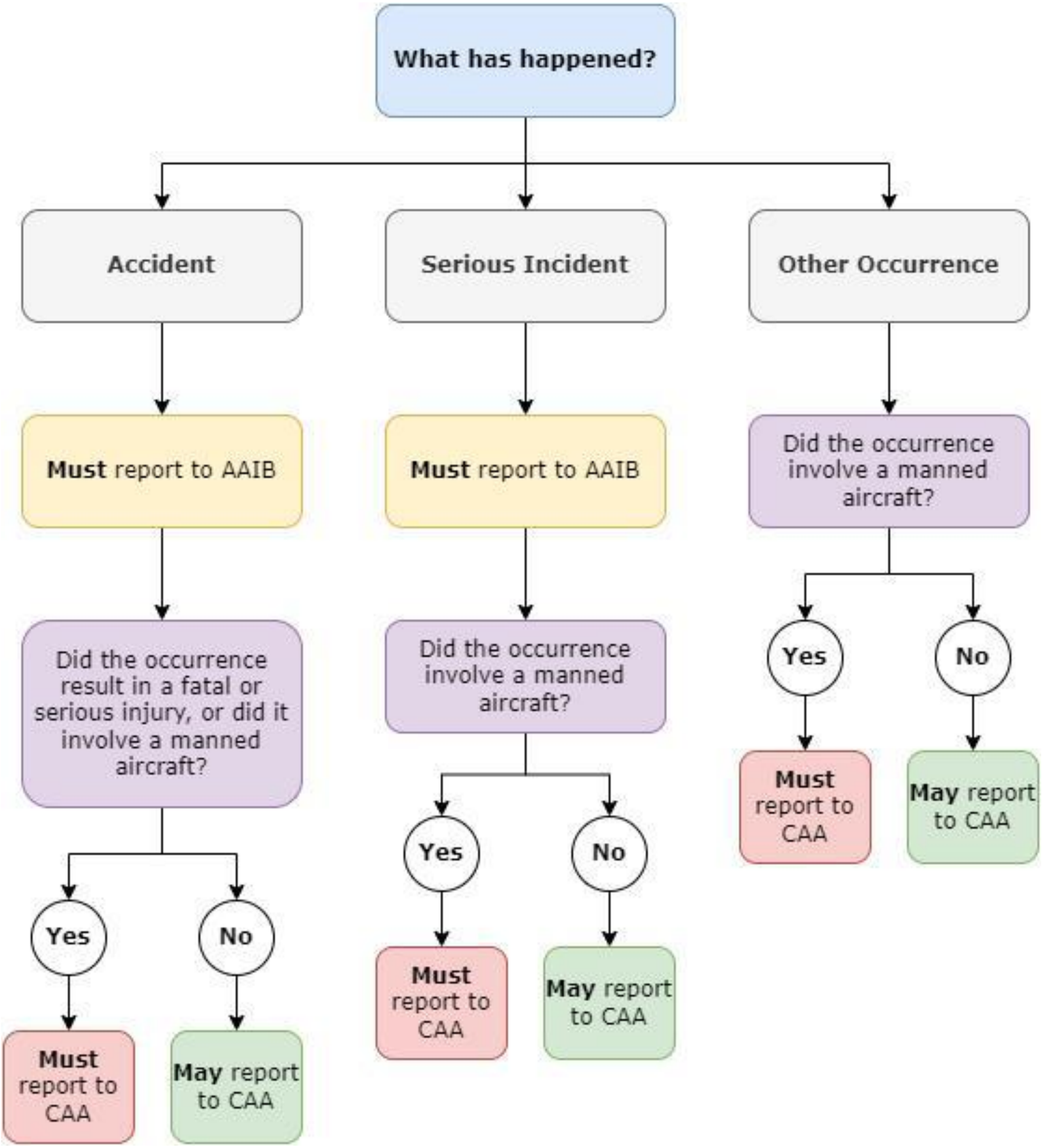
OCCURENCE REPORTING - CAA

Occurrence reports must be submitted through the Mandatory Occurrence Reporting (MOR) process, using the ECCAIRS 2 portal, which can be found here ~~(https://aviationreporting.eu).~~ (https://eccairs.icao.int/reporting). 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.

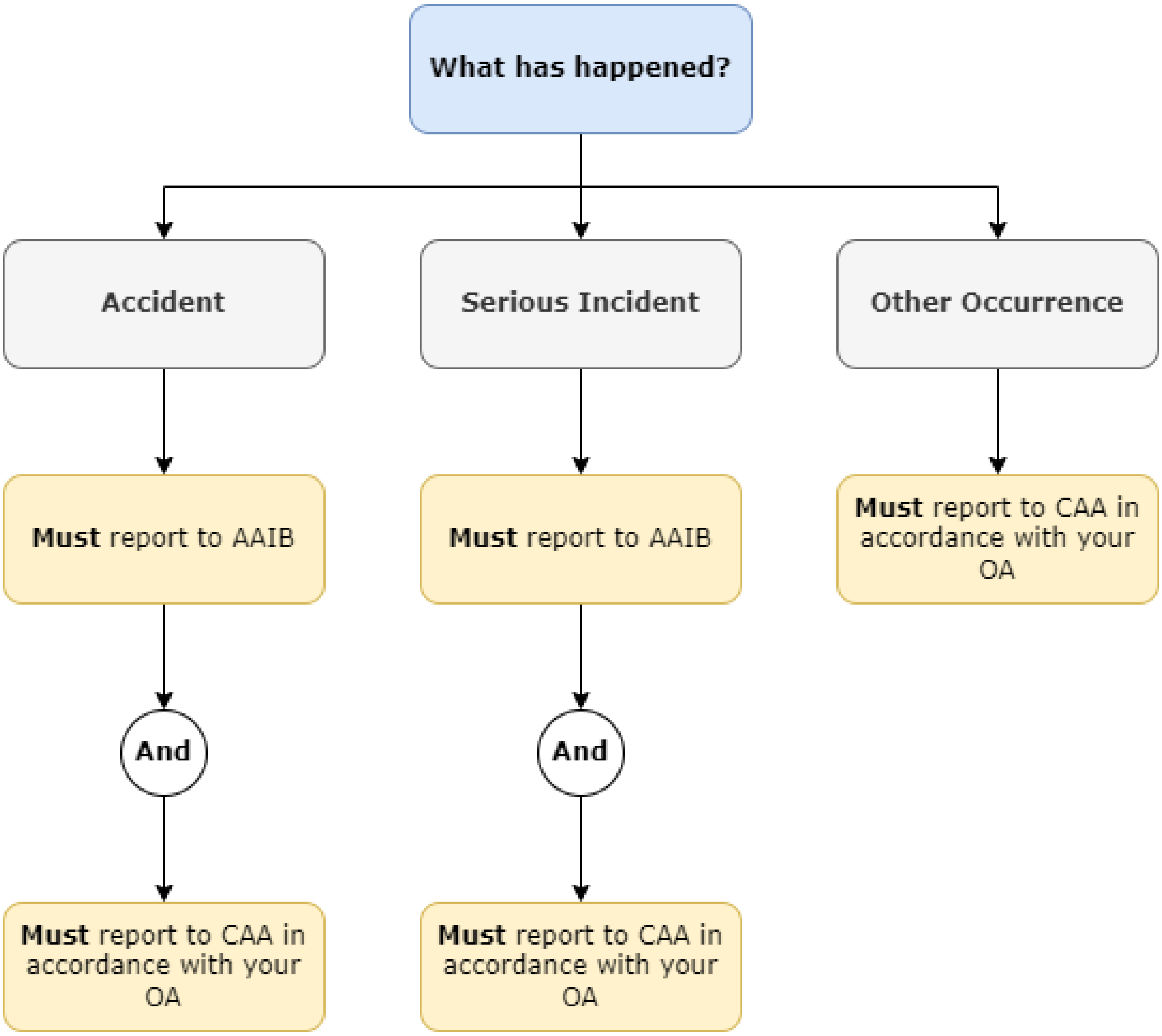
Consideration should also be given to supplementary safety reporting channels, for example:

- 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

USE OF THE ECCAIRS 2 PORTAL

Reporting to the CAA should take place via the ECCAIRS 2 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.

AMC1 Article 20(a) Particular provisions concerning the use of EU class-marked UAS in the UK

USE OF EU CLASS-MARKED UAS IN THE UK

To allow products class-marked in the European Union but not class-marked in the UK to be continuously operated in the UK, European Union class labels are accepted for UAS operating in the Open category for a limited time period until 1 January 2028. UAS that are class-marked according to the European Union and that comply with the requirements of EU Regulation 2019/945, Annex Part 1-5 and bearing a class label C0, C1, C2, C3, or C4 can be used in the UK under the following conditions before 1 January 2028:

- In the Open category, subcategory ‘Over People (A1)’, following the requirements of UK Regulation 2019/947 Part A, point UAS.OPEN.020, if the UAS is marked with a C0 or C1 class label.
- In the Open category, subcategory ‘Near People (A2)’, following the requirements of UK Regulation 2019/947 Part A, point UAS.OPEN.030, if the UAS is marked with a C2 class label.
- In the Open category, subcategory ‘Far from People (A3)’, following the requirements of UK Regulation 2019/947 Part A, point UAS.OPEN.040, if the UAS is marked with a C2, C3 or C4 class label.

On and after 1 January 2028, these UAS will be treated as “legacy” UAS if not retrofitted with a UK class label. This means that UAS Operators and RP carrying out operations with such UAS should comply with the requirements of Article 20A.

Annex to UK Regulation (EU) 2019/947

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

Part A UAS OPERATIONS IN THE 'OPEN' CATEGORY

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

OPERATIONAL LIMITATIONS IN SUBCATEGORY ~~A1~~ OVER PEOPLE 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 250g~~

> ~~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 250g: 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,~~ Over People A1 ~~A2~~ Near People A2 and ~~A3~~ Far from People A3

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 100~~250~~g or more, i.e. operating in the Open category.

~~- 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,~~ Over People A1 ~~A2~~ Near People A2 and ~~A3~~ Far from People A3

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,~~ Over People A1 ~~A2~~ Near People A2 and ~~A3~~ Far from People A3

MODIFICATION OF A UAS WITH A CLASS MARK

See GM1 Article 2(16).

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

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.

Legacy UA weighing between 250g and 2kg can only be used Near People (A2) or Far from people (A3) while maintaining a minimum horizontal distance from uninvolved people of 50m.

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

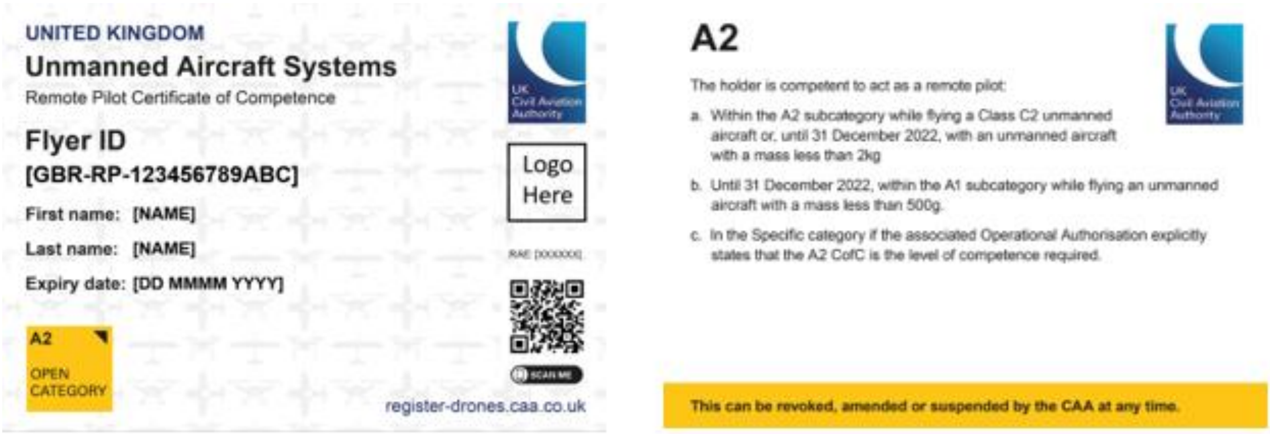
AMC1 UAS.OPEN.030(2)(b) and (c) UAS Operations in Subcategory ~~A2~~ Near People A2

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~~ Near People A2

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 a UK2 class-marking.

(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~~ Over People (A1) or ~~A3~~ Far from People (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 (CU) is the latest version published by the UAS manufacturer;

(4) calibrate the instruments on board the UA, if required by the manufacturer's procedure or prompted by the CU;

(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 lowspeed), 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 takeappropriate 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 externalphenomena such as Electromagnetic Interference (EMI);

(8) resume manual control if fitted on the UAS, when automatic systems render the situationdangerous; 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~~ Near People A2 Online Test

DECLARATION OF COMPLETION OF SELF-PRACTICAL TRAINING

The applicant shall declare that they have completed the self-practical training, described in AMC1 and AMC2 UAS.OPEN.030(2)(b). 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~~ Near People A2 Online Test

PASS AN ADDITIONAL THEORY TEST

The additional theory test should 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~~ Near People 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 - 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~~ Near People A2

OPERATIONS IN SUBCATGORY ~~A2~~ NEAR PEOPLE A2

Subcategory ~~A2~~ Near People 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~~ Near People A2 CofC) in order to fly in sub-category ~~A2~~ Near People A2.

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

COMPLETION OF ~~A1~~ OVER PEOPLE(A1)/~~A3~~ FAR FROM PEOPLE (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~~ Over People (A1), ~~A2~~ Near People (A2) and ~~A3~~ Far from People (A3).

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

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~~ Near people A2

MODIFICATION OF A UAS WITH A CLASS MARK

See GM1 Article 2(16) Definitions.

AMC1 UAS.OPEN.040(1) Operations in Subcategory ~~A3~~ Far from People A3

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.

Always maintain a minimum horizontal distance from uninvolved people of 50m. This minimum distance may need to be increased based on other factors, such as kinetic energy, controllability, height and other such factors.

GM1 UAS.OPEN.040(1) Operations in Subcategory ~~A3~~ Far from People A3

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.~~

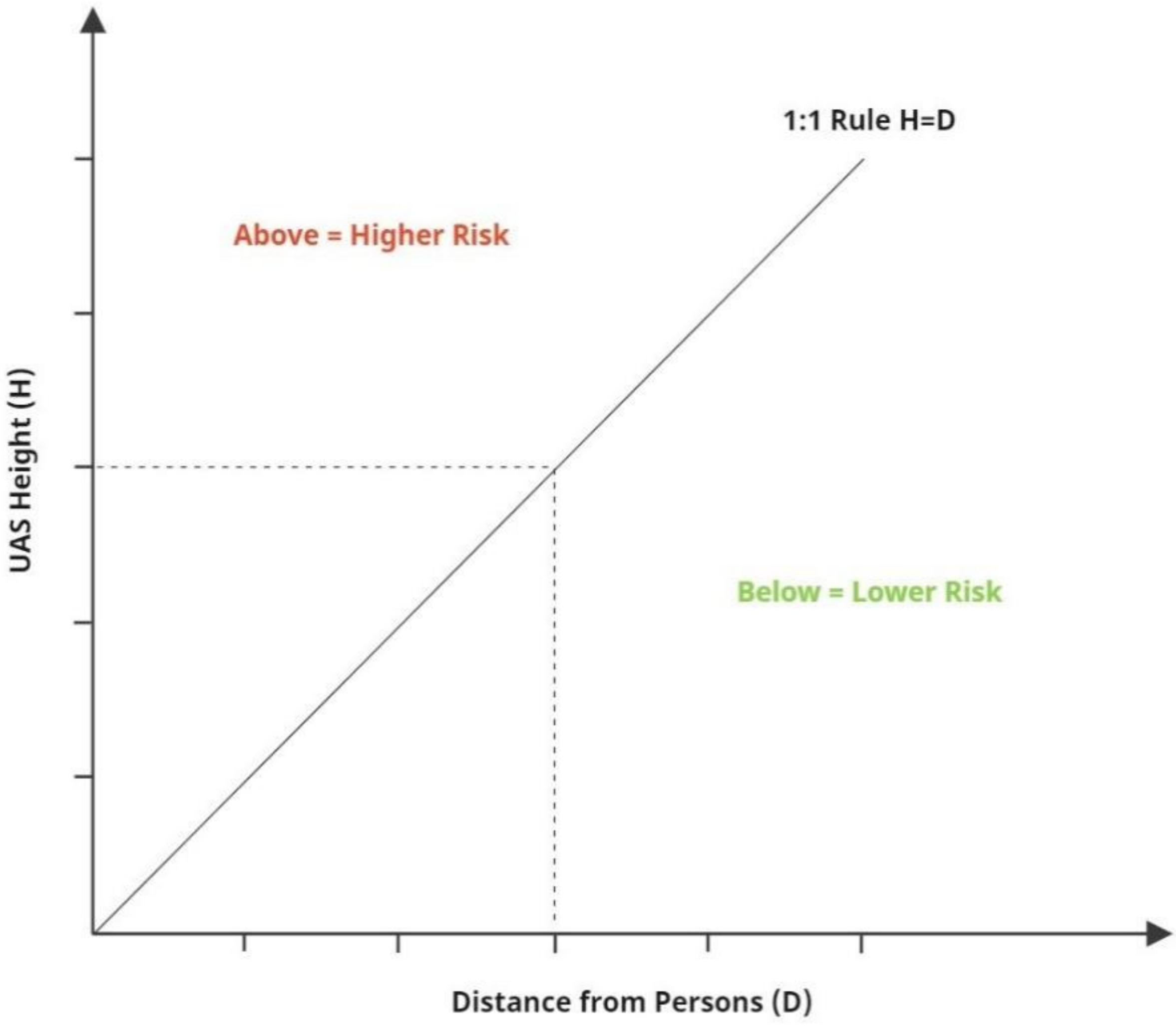
~~When flying above uninvolved people, some horizontal separation should be maintained. The necessary horizontal separation depends on factors, such as wind direction, trajectory of the UA and height of the UA.~~

The RP must be aware of their responsibilities as set out in UAS.OPEN.060(2)(d), ~~Responsibilities of the remote pilot" on page 120 (2)(d)~~ and in GM1 UAS.OPEN.060(2)(d) ~~Responsibilities of the Remote Pilot" on page 127~~, 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~~ Far from People

RESIDENTIAL, COMMERCIAL, INDUSTRIAL AND RECREATIONAL AREAS

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

The minimum horizontal distance to residential, commercial, industrial, and recreational areas should be 150m. Individual buildings separated by at least 50m from other buildings are not considered to be an area. The minimum horizontal distance to individual buildings shall be at least 50m.

GM1 UAS.OPEN.040(3) UAS Operations in Subcategory ~~A3~~ Far from People

COMPLETION OF ~~A1~~OVER PEOPLE (A1)/~~A3~~FAR FROM PEOPLE (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~~ Over People (A1), ~~A2~~ Near People (A2) and ~~A3~~ Far from People (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~~ Far from People A3

MODIFICATION OF A UAS WITH A CLASS MARK

See GM1 Article 2(16) Definitions.

AMC1 UAS.OPEN.050(1) Operations in Subcategory ~~A3~~ Far from People A3

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.

AMC1 UAS.OPEN.060(1)(d) Responsibilities of the Remote Pilot

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.

  o Ensure any lighting or remote identification systems (if applicable) are functioning correctly.

UAS Operators and RPs should use direct remote identification systems to broadcast relevant information as set out in the Remote ID requirements.

Operators should ensure their drone or model aircraft is equipped with Remote ID by the relevant deadlines, either 1 January 2026 or 1 January 2028 depending on its class and category of use. From 1 January 2028, Remote ID will be mandatory for all operations unless an exemption is granted.

We recommend switching on Remote ID even if it does not become mandatory for your operations until 1 January 2028.

Summary of Remote ID Open Category Requirements

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

GM1 UAS.OPEN.060(2)(g) Green Flashing Light

UAS Operated in the Open category must be equipped with a green flashing light when operated at night. UK Class marked UAS will comply with this requirement as part of the class mark design requirements. Non class marked UAS will need to be retrofitted with a green flashing light. If adding an add-on light to a UA, the UAS Operator must ensure it does not cause the UA to exceed the maximum mass, if one is defined. When working out which category to operate within, the total mass of the UA (including an add-on light) must be taken into account. For example, a 249g UA with a 5g light added, would not be able to operate in the <250g part of the Open category.

Part B UAS OPERATIONS IN THE 'SPECIFIC' CATEGORY

GM1 UAS.SPEC.050(1)(L) Responsibilities of the UAS Operator)

~~**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.~~)

UAS.SPEC.050(1)(l)(i) GREEN FLASHING LIGHT

A green flashing light is required under UAS.SPEC.050(1)(l) for all Specific Category operations, however the CAA has the ability to exempt from this requirement via the Operational Authorisation process, where suitable.

If a UAS Operator has an operational need to not carry a green flashing light, then they should request this exemption as part of the OA application process. Such circumstances may include operations where the UA is equipped with standard aircraft lighting in accordance with the rules of the air.

Unless exempted via this mechanism, UAS operated in the Specific Category not already equipped with a green flashing light, will need to be fitted with one.

UAS.SPEC.050(1)(l)(ii) 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.~~

According to Article 40 of UK Regulation (EU) 2019/945 and UAS.SPEC.050 of UK Regulation (EU) 2019/947, operations in the Specific category shall take place only with a function, active and up-to-date direct remote ID system from 1st January 2026 onwards. However, the CAA can issue an exemption via an Operational Authorisation enabling flights without direct remote identification in the Specific category. To ensure harmonisation across the Open and Specific categories and across different operations, the CAA intends to provide automatic exemption from direct remote identification in the Specific Category until 1st January 2028, unless using a UK Class Maked UAS, in which case RiD requirements will not be routinely exempted from. During this transition phase a UAS Operator may have an operational need to not use RiD when using a class marked UAS. The UAS Operator should outline this requirement as part of their application, with suitable rationale.

After the transition period ends in 2028, RiD will be required for any Specific Category Operation. Any operational requirement to be exempted from this, will need to be made during the application process.

AMC2 UAS.SPEC.050(1)(a)(i) Responsibilities of the UAS Operator

DANGEROUS GOODS PROCEDURES MANUAL

Operators intending to carry dangerous goods must develop, implement and maintain operational procedures specific to the carriage of dangerous goods. These procedures should be documented in a Dangerous Goods Procedures Manual, which includes the following information:

(a) a policy statement for the safe carriage of DG;

(b) identify the person responsible for the DG approval and for continued compliance with the applicable regulations.

(c) detailed assignments to personnel, of responsibilities associated with the carriage of dangerous goods;

(d) instructions defined by the operator in accordance with the operator’s responsibilities detailed in Part 7; of the Technical Instructions;

(e) instructions for communicating to relevant persons, information related to the dangerous goods being transported, in case of an accident or incident;

(f) instructions for the collection and reporting of safety data related to dangerous goods accidents, dangerous goods incidents or the finding of undeclared or mis declared dangerous goods in cargo in accordance with UK Regulation (EU) 376/2014;

(g) identification of training needs for the operator’s staff and/or staff of other entities carrying out responsibilities of the operator, which are involved with activities related to the transport of DG;

(h) training policy for all relevant staff, commensurate with their responsibilities and in accordance with Part 1;4 of the Technical Instructions and the ICAO Guidance on a Competency-based Approach to Dangerous Goods Training and Assessment (Doc-10147). This policy should include the level of competency achieved once training is complete;
(i) retention policy for Operational documentation related to the transport of dangerous goods.

GM2 UAS.SPEC.050(1)(a)(i) Responsibilities of the UAS Operator

DANGEROUS GOODS PROCEDURES MANUAL

When developing a Dangerous Goods Procedures Manual, the templates published on the CAA website may be used. These templates provide a recommended structure and content that the Manual should incorporate and are structured in a manner that enables the operator to describe its specific operation.

Operators without an approval to carry dangerous goods but intending to carry general cargo, should develop documented procedures to ensure that undeclared or mis declared dangerous goods are not carried and should provide training to staff handling and loading general cargo to be transported by the UAS, so as to enable them to identify hidden dangerous goods. Additionally, they should establish procedures for reporting instances where undeclared dangerous goods are found to have been loaded or have been offered to the operator for transport.

AMC2 UAS.SPEC.050(1)(d) and (e) Responsibilities of the UAS Operator

TRAINING AND COMPETENCY OF PERSONNEL PERFORMING FUNCTIONS FOR AND ON BEHALF OF AN OPERATOR AUTHORISED TO TRANSPORT DANGEROUS GOODS

(a) Operators transporting dangerous goods shall establish and maintain a dangerous goods training programme aimed at ensuring that personnel who perform functions related to the transport of dangerous goods, are trained and competent to perform such functions, in accordance with Part 1;4 of the Technical Instructions.

(b) The training programme shall include the following functions:

(i) a person responsible for the dangerous goods authorisation and for continued compliance with the applicable regulations.

(ii) remote pilot(s)

(iii) staff involved in, or with responsibilities in the operation of the flight.

(iv) ground staff of the operator (i.e., those conducting acceptance checks, handling of dangerous goods and the loading/unloading of aircraft).

(v) ground staff of external entities contracted by an operator to carry out any responsibilities of the operator detailed in Part 7 of the Technical Instructions.

(vi) operations staff responsible for communications with the Remote Pilot(s) during the flight or with any entity involved in the Emergency Response to an incident or accident.

(c) As a minimum, training shall include:

(i) general awareness/familiarization training — Personnel must be trained to be familiar with the general provisions;

(ii) function-specific training — Personnel must be trained to perform competently any function for which they are responsible;

(iii) safety training — Personnel must be trained on how to recognize the hazards presented by dangerous goods, on the safe handling of dangerous goods, and on emergency response procedures.

(d) The competency of personnel to perform any function which is assigned to them, shall be assessed prior to performing such a function and it shall be achieved through training and assessment commensurate with the assigned functions. Training courses may be developed and delivered by, or for the operator.

(e) Personnel shall receive recurrent training and assessment within 24 months of previous training and assessment to ensure that competency has been maintained.

(f) Training and assessment records shall be maintained by the operator in alignment with Part 1;4 of the Technical Instructions.

(g) The Operator's dangerous goods training programme shall be approved by the CAA.

Instructors shall demonstrate or be assessed as competent, in the training that they will instruct prior to the delivery of such training.

GM2 UAS.SPEC.050(1)(d) and (e) Responsibilities of the UAS Operator

TRAINING AND COMPETENCY OF PERSONNEL PERFORMING FUNCTIONS FOR AND ON BEHALF OF AN OPERATOR AUTHORISED TO TRANSPORT DANGEROUS GOODS

(1) Personnel must be trained commensurate with the functions for which they are responsible. These responsibilities are determined by the specific functions performed by personnel and not by their job titles. This will ensure that a person is competent to perform

the function in accordance with the Technical Instructions. The depth of training each person receives should be a propriate to the functions performed.

(2) When building the competency-based dangerous goods training programme, five main workflows should be considered:

(i) analysis of the training needs for functions and responsibilities;

(ii) designing of the competency-based training;

(iii) development of the training and assessment materials;

(iv) conduct the course;

(v) evaluate the course;

(3) To identify the dangerous training and assessment that personnel will require, the operator should consider the training syllabi for each function involved in the carriage of dangerous goods, which should include:

(i) an assessment plan;

(ii) a training plan;

(iii) a competency framework for personnel;

(iv) a dangerous goods task list;

(v) a task/knowledge matrix tool.

As a minimum, the operator should include the functions associated to personnel identified in paragraph a) of AMC2 UAS.SPEC.050 1(d) and (e).

Before developing the assessment and training plans, the operator should consider principles such as:

- The use of clear performance criteria,
- The demonstration of all competencies including interactions with one another,
- The use of multiple observations to determine if the trainee has achieved the interim or final competency standard required.
- The assessment of all the components of the competency framework.
- The assessment should be reliable to ensure that the same assessment conclusion be reached irrespective of who is conducting the assessment (if different assessors are being used).
- Practical assessments should formative whereby instructors provide feedback to trainees on their progress toward an interim or final competency standard, or

summative, whereby trainees demonstrate competence at defined points during the training which may include or be the end of training.

(4) Assessment Plan

The assessment plan will detail:

(i) the final standard to which the trainee will need demonstrate competency;

(ii) when the assessment should take place;

(iii) how the trainee will be assessed and;

(iv) what tools will be used in the assessment, such as observation of job performance, exams, tests, practical exercises, oral assessments, projects, or task simulation.

Additional guidance for what should be considered in the competency framework, the dangerous goods task list and a task/knowledge matrix tool mentioned in paragraph 3 of this GM, can be found in Chapters 4 and 5 of ICAO Guidance on a Competency-based Approach to Dangerous Goods Training and Assessment (Doc 10147).

Appendices

Annex A to Article 8

Remote Pilot Competence

Due to the size of the AMC and GM for Article 8, 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.

Remote pilots should comply with the competency requirements by obtaining a Remote Pilot Certificate (RPC) at the appropriate level for the intended operation.

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:

- “Air Risk Class” (ARC) is a classification of the risk of the air environment as defined in UK SORA.

- "Assessment of competence" means the demonstration of skills, knowledge, and attitudes for the initial issue, revalidation, or renewal of a remote pilot certificate.
- “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.
- “Credit” means the recognition of prior experience or qualifications.
- "Competency" means a combination of skills, knowledge and attitudes required to perform a task to the prescribed standard.
- “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.
- "**Must**" indicates:

(a) a condition a trainee is required to comply with to be assessed as competent to the relevant standard in accordance with this AMC or

(b) a condition an RAE(PC) is required to comply with to maintain approval under the RAE(PC) scheme.

- “OA Applicant” means applicant for an Operational Authorisation.
- “Operator Currency” means the minimum currency determined by the operator for the relevant UA type.
- “Practical Flight Assessor” (PFA) means an individual who is authorised by an RAE(PC) to conduct flight assessments and evaluations of remote pilots.
- “Practical Flight Instructor” (PFI) means an individual who is authorised by an RAE(PC) to conduct flight instruction of remote pilots.
- “RAE(PC)” means Recognised Assessment Entity (Pilot Competence).
- “RPC” means Remote Pilot Certificate.
- “Simulated flight hours” means flight undertaken in a CAA approved simulator.
- “Theoretical Knowledge Instructor” (TKI) means an individual who is authorised by an RAE(PC) to conduct theoretical training of remote pilots.
- “Trainee” means a remote pilot undergoing training at an RAE(PC)

- "Type" or "UA Type" means a categorisation of unmanned aircraft according to the specific manufacturer and model.
- "UA Category" or "Category of UA" means a categorisation of unmanned aircraft according to its basic characteristics. For this AMC that could mean and unmanned ~~aeroplane~~ fixed wing or unmanned rotorcraft.

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)~~ Fixed Wing

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)~~

The issuance of the GVC will be discontinued on 31 December 2026. From this date, all remote pilot training and assessment will be conducted under the RPC framework, including RPC-L1, RPC-L2 and RPC-L3.

The GVC will continue to be recognised as an AMC to article 8(2) until 31 December 2027. An RP who holds a valid GVC may undertake a bridging course at an RAE to obtain an RPC-L1.

CHANGE OF RAE(PC)

In cases where the applicant completes the training course (theoretical knowledge instruction or flight instruction) at a different RAE(PC) from the one where they have started the training course, the applicant should request from the RAE(PC) where they started a copy of the training records.

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) 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

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.
(h)

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) Theoretical instruction may be delivered through remote learning or distance learning materials.
(c) The course **must** include theoretical knowledge and flight instruction appropriate to the privileges of the RPC-L1.
(d) 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~~ Fixed Wing Instruction

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)~~ Fixed Wing flight instruction syllabus considers the principles of safe UA operations ~~including~~ and must include the following competency-based training:

(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. **Note:** ~~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.

RPC-L1~~(A) Aeroplane~~ Fixed Wing Assessment

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L1~~(A)~~ Fixed Wing 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.
(f) BVLOS VM operational procedures.

THEORETICAL KNOWLEDGE ASSESSMENT STANDARD

To demonstrate a level of knowledge to the required standard, a trainee must achieve a pass mark of at least 75% in all theoretical knowledge assessments.

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) A trainee for a practical flight assessment for the RPC-L1~~(A)~~ Fixed Wing **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)~~ FIXED WING

~~(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication~~.

Where the CAA has imposed conditions relating to the UAS to be used for practical flight assessments, for example in an operational authorisation issued to the RAE(PC), the UAS used in such assessments must comply with the relevant conditions.

The practical flight assessment must include an assessment of VLOS skills (Part A).

If the training included BVLOS VM operational procedures, the practical flight assessment must also include an assessment of those skills (Part B).

Every section of Parts A and B 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.

Part A VLOS:

~~(b)~~ The practical flight assessment **must** ~~comprise of~~ include a general handling assessment ~~in a range of flight modes including non-positioning mode~~ lasting a minimum of 30 minutes of which 15 minutes must be flown in a non-positioning made. The assessment may be shorter if the trainee has demonstrated they are competent in accordance with the assessment standard.

Part B BVLOS VM (Optional):

The practical flight assessment must include a minimum of 30 minutes of BVLOS VM. This may be conducted in conjunction with time spent in any positioning mode, provided the candidate demonstrates appropriate situational awareness and control of the UA.

~~(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)~~ FIXED WING PRACTICAL FLIGHT ASSESSMENT

RPC-L1~~(A)~~ FIXED WING 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~~ fixed wing 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~~
Section 5 - Oral Questions	
5.1	Asking oral questions at any point during the assessment to test the candidate’s competence. These may cover any aspect of UAS operations (e.g., emergency procedures, weather and environmental factors, flight planning).

RPC-L1~~(A)~~ FIXED WING PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of an RPC-L1~~(A)~~ Fixed Wing 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 and the remote pilot has passed the Part A assessment.

(4) The flight is being conducted BVLOS VM and the remote pilot has passed the Part B assessment

(5) The operational authorisation under which the flight is being conducted states the RPC-L1~~(A)~~ Fixed Wing 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 without VM prohibited.

RPC-L1~~(A)~~ FIXED WING EXPERIENCE REQUIREMENTS AND CREDITING

(a) An RPC-L1~~(A)~~ Fixed Wing trainee **must** have completed at least 2 hours of flight instruction at a CAA approved RAE(PC).

(b) An RPC-L1~~(A)~~ Fixed Wing trainee that holds a valid GVC are exempt from the theoretical assessment, **except** for the theoretical assessment covering BVLOS VM operational procedures.

RPC-L1~~(A)~~ FIXED WING VALIDITY, REVALIDATION, AND RENEWAL

(a) Validity. An RPC-L1~~(A)~~ Fixed Wing is valid for 5 years from the date notified on the certificate.

(b) Revalidation. An RPC-L1~~(A)~~ Fixed Wing 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)~~ Fixed Wing.

(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)~~ Fixed Wing before it expires **must not** exercise any RPC-L1~~(A)~~ Fixed Wing privileges unless they renew their RPC-L1~~(A)~~ Fixed Wing in accordance with the provisions below.

(i) **Renewal**. If an RPC-L1~~(A)~~ Fixed Wing 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)~~ Fixed Wing proficiency check.
(2) The remote pilot **must** pass an RPC-L1~~(A)~~ Fixed Wing proficiency check at an RAE(PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

RPC-L1~~(A)~~ FIXED WING 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 Instruction

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)~~ Rotorcraft flight instruction syllabus considers the principles of safe UA operations and must include the following competency-based training:

(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. **Note**: ~~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.

RPC-L1~~(R)~~ Rotorcraft Assessment

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L1~~(R)~~ Rotorcraft 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.
(f) BVLOS VM operational procedures.

THEORETICAL KNOWLEDGE ASSESSMENT STANDARD

To demonstrate a level of knowledge to the required standard, a trainee must achieve a pass mark of at least 75% in all theoretical knowledge assessments.

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) A trainee for a practical flight assessment for the RPC-L1~~(R)~~ Rotorcraft **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)~~ ROTORCRAFT

~~(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication~~.

Where the CAA has imposed conditions relating to the UAS to be used for practical flight assessments, for example in an operational authorisation issued to the RAE(PC), the UAS used in such assessments must comply with the relevant conditions.The practical flight assessment must include an assessment of VLOS skills (Part A).

If the training included BVLOS VM operational procedures, the practical flight assessment must also include an assessment of those skills (Part B).

Every section of Parts A and B 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.

Part A VLOS:

~~(b)~~ The practical flight assessment **must** ~~comprise of~~ include a general handling assessment ~~in a range of flight modes including non-positioning mode~~ lasting a minimum of 30 minutes of which 15 minutes must be flown in a non-positioning made. The assessment may be shorter if the trainee has demonstrated they are competent in accordance with the assessment standard.

Part B BVLOS VM (Optional):

~~(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.~~

The practical flight assessment must include a minimum of 30 minutes of BVLOS VM. This may be conducted in conjunction with time spent in any positioning mode, provided the candidate demonstrates appropriate situational awareness and control of the UA.

RPC-L1~~(R)~~ ROTORCRAFT PRACTICAL FLIGHT ASSESSMENT

RPC-L1~~(R)~~ ROTORCRAFT 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	Rotorcraft inspection and technical logbook
1.3	Take-off
1.4	Performance considerations
Section 2 - General Handling	

2.1	Control of the ~~aeroplane~~ rotorcraft 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~~
Section 5 - Oral Questions	
5.1	Asking oral questions at any point during the assessment to test the candidate's competence. These may cover any aspect of UAS operations (e.g., emergency procedures, weather and environmental factors, flight planning).

RPC-L1~~(R)~~ ROTORCRAFT PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of an RPC-L1~~(R)~~ Rotorcraft 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 and the remote pilot has passed the Part A assessment.

The flight is being conducted BVLOS VM and the remote pilot has passed the Part B assessment.

(4) The operational authorisation under which the flight is being conducted states the RPC-L1~~(R)~~ Rotorcraft 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 without VM flight is prohibited.

RPC-L1~~(R)~~ ROTORCRAFT EXPERIENCE REQUIREMENTS AND CREDITING

(a) An RPC-L1~~(R)~~ Rotorcraft trainee **must** have completed a minimum of 2 hours of instruction at a CAA approved RAE(PC).

(b) An RPC-L1~~(R)~~ Rotorcraft trainee that holds a valid GVC are exempt from the theoretical assessment, **except** for the theoretical assessment covering BVLOS VM operational procedures.

RPC-L1~~(R)~~ ROTORCRAFT VALIDITY, REVALIDATION, AND RENEWAL

(a) **Validity.** An RPC-L1~~(R)~~ Rotorcraft is valid for 5 years from the date notified on the certificate.

(b) **Revalidation.** An RPC-L1~~(R)~~ Rotorcraft 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)~~ Rotorcraft.

(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)~~ Rotorcraft before it expires **must not** exercise any RPC-L1~~(R)~~ Rotorcraft privileges unless they renew their RPC-L1~~(R)~~ Rotorcraft in accordance with the provisions below.

(i) **Renewal**. If an RPC-L1~~(R)~~ Rotorcraft 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)~~ Rotorcraft proficiency check.

(2) The remote pilot **must** pass an RPC-L1~~(R)~~ Rotorcraft 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)~~ Rotorcraft 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)~~ Rotorcraft; and

(3) the complexity of the remote pilot's experience.

RPC-L1~~(R)~~ ROTORCRAFT 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) Theoretical instruction may be delivered through remote learning or distance learning materials.
(c) The course **must** include theoretical knowledge and flight instruction appropriate to the privileges of the RPC-L2.
(d) 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~~ Instruction

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 and must include the following competency-based training:

(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. **Note**: ~~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.

RPC-L2~~(A) Aeroplane~~ Assessment

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.
(b) UK SORA air risk class ARC-a
(c) Aeronautical communication procedures

THEORETICAL KNOWLEDGE ASSESSMENT STANDARD

To demonstrate a level of knowledge to the required standard, a trainee must achieve a pass mark of at least 75% in all theoretical knowledge assessments.

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.~~

(a) Where the CAA has imposed conditions relating to the UAS to be used for practical flight assessments, for example in an operational authorisation issued to the RAE(PC), the UAS used in such assessments must comply with the relevant conditions.

(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
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
3.2	Go-around TOLA blocked
3.3	Normal Landing
3.4	Post flight actions
Section 4 - Abnormal and Emergency Procedures	
4.1	Engine/motor failure
4.2	Equipment malfunctions
4.3	Forced landing
~~4.4~~	~~Oral questions~~
Section 5 - Oral Questions	
5.1	Asking oral questions at any point during the assessment to test the candidate's competence. These may cover any aspect of UAS operations (e.g., emergency procedures, weather and environmental factors, flight planning).

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).~~

(2) The maximum air risk class (ARC) of the flight is ARC-a.

(3) 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~~
~~3.2~~	~~Go-around TOLA blocked~~
~~3.3~~	~~Normal Landing~~
~~3.4~~	~~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) Theoretical instruction may be delivered through remote learning or distance learning materials.

(c) The course **must** include theoretical knowledge and flight instruction appropriate to the privileges of the RPC-L3.

(d) 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 an L2 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~~ Instruction

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 and must include the following competency-based training:

Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections).

(a) Ability to manage aeronautical communication.
(b) Manage the unmanned aircraft flight path and automation.
(c) Leadership, teamwork, and self-management.
(d) Problem solving and decision-making.
(e) Situational awareness.
(f) Workload management.
(g) 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. **Note:** ~~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.

RPC-L3~~(A) Aeroplane~~ Assessment

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.

THEORETICAL KNOWLEDGE ASSESSMENT STANDARD

To demonstrate a level of knowledge to the required standard, a trainee must achieve a pass mark of at least 75% in all theoretical knowledge assessments.

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.~~

(a) Where the CAA has imposed conditions relating to the UAS to be used for practical flight assessments, for example in an operational authorisation issued to the RAE(PC), the UAS used in such assessments must comply with the relevant conditions

(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:
   (i) The outbound leg is at least 10 nautical miles.
   (ii) The return leg is at least 10 nautical miles.
   (iii) 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.

(a) 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).~~
   (2) The maximum air risk class (ARC) of the flight is ARC-c.
   (3) 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:

(i) The outbound leg is at least 10 nautical miles.

(ii) The return leg is at least 10 nautical miles.

(iii) 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).
(a) The course **must** include theoretical knowledge and flight instruction appropriate to the privileges of the RPC-4 applied for.
(b) 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**~~

(e)a ~~**Validity.** An RPC-L4(R) is valid for 1 year from the date notified on the certificate~~

(e)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).~~

(e)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.~~

(e)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)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).~~

(e)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.~~

(e)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.~~

(e)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.~~

(e)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.~~

(e)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
		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	
		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	
		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~~**		
		~~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)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
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
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
LAW.SPEC.01.06	Describe the responsibilities of a ~~remote pilot~~ UAS operator in accordance with UAS.SPEC.050. **Source: UAS.SPEC.050**					X
LAW.SPEC.01.07	Describe the responsibilities of a ~~UAS operator~~ remote pilot in accordance with UAS.SPEC.060. **Source: UAS.SPEC.060**					X
LAW.SPEC.01.08	Explain key differences between these responsibilities.					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
LAW.SPEC.02.03	Describe how article 23 of the ANO limits the scope of the order in relation to UAS operations.					X
LAW.SPEC.02.04	Describe the residual articles of the ANO that remain in scope of the order.					X

Syllabus Reference	Syllabus Details and Associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
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
LAW.SPEC.05.00	**The Standard European Rules of the Air (SERA)**					
LAW.SPEC.05.01	Reserved - Rights of Way.					
LAW.SPEC.06.00	**Flightworthiness of UAS**					
LAW.SPEC.06.01	For use after the implementation of the UK SAIL mark for flightworthiness.					X

OPERATIONAL PROCEDURES

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
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 UAS operations.	X	X	X		
OPS.SPEC.02.00	**Beyond Visual Line of Sight Procedures**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
OPS.SPEC.02.01	Demonstrate an understanding of coordination procedures with air traffic control (ATC) for BVLOS flights.				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	
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	
OPS.SPEC.05.00	**Waypoint Planning**					
OPS.SPEC.05.01	Describe the process to determine the position of waypoints along the chosen route.				X	
OPS.SPEC.05.02	Explain the need for precision navigation, obstacle avoidance, and compliance with airspace restrictions.				X	

UA GENERAL KNOWLEDGE

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
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 magnitude: (a) static loads (b) dynamic loads (c) cyclic loads					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
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
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
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
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 (f) screwing					X
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
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

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1(A) Fixed Wing	L1(R) Rotorcraft	L2A	L3A
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
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
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
AGK.SPEC.08.00	**Structural Components**					
AGK.SPEC.08.01	Describe the function of a wing spar and other critical structural components.					X
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
AGK.SPEC.10.00	**Rotorcraft Structural Aspects of Fight Controls**					
AGK.SPEC.10.01	List the functions of flight controls.					X
AGK.SPEC.10.02	Explain why vertical and horizontal stabilisers may have different shapes and alignments.					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
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
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
AGK.SPEC.12.03	Describe the early indications and vibrations which are likely to be experienced					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
	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.					
AGK.SPEC.12.04	Explain how a vibration harmonic can be set up in other components which can lead to their early failure.					X
AGK.SPEC.12.05	State the three planes of vibration measurement, i.e. vertical, lateral, fore and aft.					X
AGK.SPEC.13.00	**Brakes**					
AGK.SPEC.13.01	Describe the basic operating principle of a disc brake.					X
AGK.SPEC.13.02	Explain the limitation of brake energy and describe the operational. consequences.					X
AGK.SPEC.13.03	Explain how brakes are actuated: hydraulically, electrically, or mechanically					X
AGK.SPEC.13.04	Describe the function of a parking brake.					X
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: (a) swash plate inputs (b) the function of the non-rotating swash plate (c) the function of the rotating swash plate (d) how swash plate tilt is achieved (e) swash plate pitch axis (f) swash plate roll axis (g) balancing of pitch/roll/collective inputs to the swash plate to equalise torsional loads on the blades					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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		
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
AGK.SPEC.16.02	State the main characteristics of these fuels and give typical values regarding their flash points, freezing points and density.					X
AGK.SPEC.17.00	**Design, Operation, System Components, Indications**					
AGK.SPEC.17.01	State the tasks of the fuel system.					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
AGK.SPEC.17.03	Describe a gravity fuel feed system and a pressure feed fuel system.					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
AGK.SPEC.17.05	Define the term ‘unusable fuel’.					X
AGK.SPEC.17.06	List the following parameters that maybe monitored for the fuel system: (a) fuel quantity (low-level warning) (b) fuel temperature					X
AGK.SPEC.18.00	**Turbine Engines**					
AGK.SPEC.18.01	State the types of fuel used by a gas turbine engine:					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
	(a) JET-A (b) JET-A1 (c) JET-B					
AGK.SPEC.18.02	State the main characteristics of these fuels and give typical values regarding their flash points, freezing points and density.					X
AGK.SPEC.18.03	State the existence of additives for freezing.					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
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
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
AGK.SPEC.20.03	Explain why an unmanned aircraft must first be grounded before refuelling/defueling.					X
AGK.SPEC.20.04	Explain the reason for electrical bonding.					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:					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
	(a) toggle switch (b) rocker switch (c) pushbutton switch (d) rotary switch					
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
AGK.SPEC.21.07	State that resistances can have a positive or a negative temperature coefficient (PTC/NTC) and state their use.					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
AGK.SPEC.22.02	Define the term 'phase', and explain the basic principle of single- phase and three-phase AC.					X
AGK.SPEC.22.03	State that unmanned aircraft can use single-phase or three-phase AC.					X
AGK.SPEC.22.04	Define frequency and state the unit of measurement.					X
AGK.SPEC.22.05	Define 'phase shift' in qualitative terms.					X
AGK.SPEC.23.00	**Electromagnetism**					
AGK.SPEC.23.01	State that an electrical current produces a magnetic field.					X
AGK.SPEC.23.02	Describe how the strength of the magnetic field changes with the magnitude of the current.					X
AGK.SPEC.23.03	Explain the purpose and the working principle of a solenoid.					X
AGK.SPEC.23.04	Explain the purpose and the working principle of a relay.					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
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
AGK.SPEC.24.03	Describe how circuit breakers may be used to reset unmanned aircraft systems/computers in the event of system failure.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
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 (c) risk of thermal runaway	X	X	X		
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
AGK.SPEC.27.02	Explain the principle of voltage control and why it is required.					X
AGK.SPEC.27.03	Describe the basic operating principle of a starter generator and state its purpose.					X
AGK.SPEC.28.00	**DC Distribution**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
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
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
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					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
	(h) cylinder head (i) valves (j) valve springs (k) push rod (l) camshaft (m) rocker arm (n) camshaft gear (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
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
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
AGK.SPEC.34.02	Name the type of fuel normally used for aviation diesel engines (JET-A1).					X
AGK.SPEC.34.03	Define the term 'octane rating'.					X
AGK.SPEC.34.04	Define the term 'detonation' and describe the causes and effects of detonation for both petrol and diesel engines.					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
AGK.SPEC.34.06	Identify the conditions and power settings that promote detonation for petrol engines.					X
AGK.SPEC.34.07	Describe how detonation in petrol engines is recognised.					X
AGK.SPEC.34.08	Describe the method and occasions for checking the fuel for water content.					X
AGK.SPEC.34.09	State the typical value of fuel density for aviation gasoline and diesel fuel.					X
AGK.SPEC.34.10	Explain volatility, viscosity and vapour locking in petrol and diesel fuels.					X
AGK.SPEC.35.00	**Engine Fuel Pumps**					
AGK.SPEC.35.01	Describe common fuel pumps used in unmanned aircraft.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1(A) Fixed Wing	L1(R) Rotorcraft	L2A	L3A
AGK.SPEC.36.00	**Carburettor/Injection System**					
AGK.SPEC.36.01	State the purpose of a carburettor.					X
AGK.SPEC.36.02	Explain the advantages and difference in operation of an injection system compared with a carburettor system.					X
AGK.SPEC.37.00	**Icing**					
AGK.SPEC.37.01	Describe the causes and effects of carburettor icing.					X
AGK.SPEC.37.02	Name the meteorological conditions under which carburettor icing may occur.					X
AGK.SPEC.37.03	Describe the indications of the presence of carburettor icing for a rotorcraft.					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
AGK.SPEC.37.05	Explain the reason for the use of alternate air on fuel injection systems and describe its operating principle.					X
AGK.SPEC.37.06	State the meteorological conditions under which induction system icing may occur.					X
AGK.SPEC.38.00	**Cooling Systems**					
AGK.SPEC.38.01	Specify the reasons for cooling a piston engine.					X
AGK.SPEC.38.02	Describe the design features to enhance cylinder air cooling for aeroplanes.					X
AGK.SPEC.38.03	Describe the design features to enhance cylinder air cooling for rotorcraft.					X
AGK.SPEC.38.04	Compare the differences between liquid- and air-cooling systems.					X
AGK.SPEC.39.00	**Lubrication Systems**					
AGK.SPEC.39.01	Describe the term ‘viscosity’ including the effect of temperature.					X
AGK.SPEC.39.02	Describe the viscosity grade numbering system used in aviation.					X
AGK.SPEC.39.03	Design, operation, indications, and warnings.					X
AGK.SPEC.39.04	State the functions of a piston-engine lubrication system.					X
AGK.SPEC.39.05	Describe the working principle of a dry-sump lubrication system and 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					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
	(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
AGK.SPEC.39.07	State the differences between a wet- and a dry-sump lubrication system and their advantages and disadvantages.					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
AGK.SPEC.39.09	Describe the interaction between oil pressure, oil temperature and oil quantity.					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 (h) high-tension (HT) cable					X
AGK.SPEC.40.02	State why piston engines maybe equipped with two electrically independent ignition systems.					X
AGK.SPEC.40.03	Explain how combustion is initiated in diesel engines.					X
AGK.SPEC.41.00	**Fuel and Air Mixture**					
AGK.SPEC.41.01	Define the term mixture.					X
AGK.SPEC.41.02	State the typical fuel-to-air ratio values or range of values for the above mixtures.					X
AGK.SPEC.41.03	Describe the advantages and disadvantages of weak and rich mixtures.					X
AGK.SPEC.41.04	Describe the relation between engine-specific fuel consumption and mixture ratio.					X
AGK.SPEC.42.00	**Aeroplane: Propellers**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
AGK.SPEC.44.00	**Engine Handling**					
AGK.SPEC.44.01	Define the following terms: (a) take-off power (b) maximum continuous power					X
AGK.SPEC.44.02	Describe the start problems associated with extreme cold weather.					X
AGK.SPEC.45.00	**Turbine Engines**					
AGK.SPEC.45.01	Describe how thrust is produced by a basic gas turbine engine.					X
AGK.SPEC.45.02	Describe how thrust is produced by a basic electric ducted fan (EDF) engine.					X
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
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
AGK.SPEC.46.02	List the different types of gas turbine engines: (a) straight jet (b) turboprop					X
AGK.SPEC.46.03	State that a gas turbine engine can have one or more spools.					X
AGK.SPEC.46.04	Describe how thrust is produced by turbojet engines.					X
AGK.SPEC.46.05	Describe how power is produced by turboprop engines.					X
AGK.SPEC.47.00	**Aeroplane: Air Intake**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1(A) Fixed Wing	L1(R) Rotorcraft	L2A	L3A
AGK.SPEC.47.01	State the functions of the engine air inlet/air intake.					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
AGK.SPEC.48.00	**Compressor and Diffuser**					
AGK.SPEC.48.01	State the purpose of the compressor.					X
AGK.SPEC.48.02	Describe the working principle of a centrifugal and an axial flow compressor.					X
AGK.SPEC.48.03	Name the following main components of a single stage and describe their function for a centrifugal compressor: (a) impeller (b) diffuser					X
AGK.SPEC.48.04	Name the following main components of a single stage and describe their function for an axial compressor: (a) rotor vanes (b) stator vanes					X
AGK.SPEC.48.05	Describe the gas-parameter changes in a compressor stage.					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
AGK.SPEC.48.07	State the advantages and disadvantages of increasing the number of stages in a centrifugal compressor.					X
AGK.SPEC.48.08	Explain the difference in sensitivity for FOD of a centrifugal compressor compared with an axial flow type.					X
AGK.SPEC.48.09	Explain the convergent air annulus through an axial flow compressor.					X
AGK.SPEC.48.10	Describe the reason for twisting the compressor blades.					X
AGK.SPEC.48.11	State the tasks of inlet guide vanes (IGVs).					X
AGK.SPEC.48.12	State the advantages of increasing the number of spools.					X
AGK.SPEC.48.13	Explain the implications of tip losses and describe the design features to minimise the problem.					X
AGK.SPEC.48.14	Explain the problems of blade bending and flapping and describe the design					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1(A) Fixed Wing	L1(R) Rotorcraft	L2A	L3A
	features to minimise the problem.					
AGK.SPEC.48.15	Explain the following terms: (a) compressor stall (b) engine surge					X
AGK.SPEC.48.16	State the conditions that are possible causes of stall and surge.					X
AGK.SPEC.48.17	Describe the indications of stall and surge.					X
AGK.SPEC.48.18	Describe the design features used to minimise the occurrence of stall and surge.					X
AGK.SPEC.48.19	Describe a compressor map (surge envelope) with rpm lines, stall limit, steady state line and acceleration line.					X
AGK.SPEC.48.20	Describe the function of the diffuser.					X
AGK.SPEC.49.00	**Combustion Chamber**					
AGK.SPEC.49.01	Define the purpose of the combustion chamber.					X
AGK.SPEC.49.02	List the requirements for combustion.					X
AGK.SPEC.49.03	Describe the working principle of a combustion chamber.					X
AGK.SPEC.49.04	Explain the reason for reducing the airflow axial velocity at the combustion chamber inlet (snout).					X
AGK.SPEC.49.05	State the function of the swirl vanes (swirler).					X
AGK.SPEC.49.06	State the function of the drain valves.					X
AGK.SPEC.49.07	Define the terms ‘primary airflow’ and ‘secondary airflow’ and explain their purpose.					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
AGK.SPEC.49.09	Describe the gas-parameter changes in the combustion chamber.					X
AGK.SPEC.49.10	State a typical maximum value of the outlet temperature of the combustion chamber.					X
AGK.SPEC.49.11	Describe the following types of combustion chambers and state the differences between them: (a) can type (b) can-annular, cannular or turbo-annular (c) annular (d) reverse-flow annular					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
AGK.SPEC.50.00	**Turbine**					
AGK.SPEC.50.01	Explain the purpose of a turbine in different types of gas turbine engines.					X
AGK.SPEC.50.02	Describe the principles of operation of impulse, reaction, and impulse-reaction axial flow turbines.					X
AGK.SPEC.50.03	Name the main components of a turbine stage and their function.					X
AGK.SPEC.50.04	Describe the working principle of a turbine.					X
AGK.SPEC.50.05	Describe the gas-parameter changes in a turbine stage.					X
AGK.SPEC.50.06	Describe the function and the working principle of active clearance control.					X
AGK.SPEC.50.07	Describe the implications of tip losses and the means to minimise them.					X
AGK.SPEC.50.08	Explain why the available engine thrust is limited by the turbine inlet temperature.					X
AGK.SPEC.50.09	Explain the divergent gas-flow annulus through an axial-flow turbine.					X
AGK.SPEC.50.10	Explain the high mechanical thermal stress in the turbine blades and wheels/discs.					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
AGK.SPEC.51.02	Describe the working principle of the exhaust unit.					X
AGK.SPEC.51.03	Describe the gas-parameter changes in the exhaust unit.					X
AGK.SPEC.51.04	Define the term ‘choked exhaust nozzle’ (not applicable to turboprops).					X
AGK.SPEC.51.05	Explain how jet exhaust noise can be reduced.					X
AGK.SPEC.52.00	**Rotorcraft: Air Intake**					
AGK.SPEC.52.01	Name and explain the main task of the engine air intake.					X
AGK.SPEC.52.02	Describe the use of a convergent air-intake ducting on rotorcrafts.					X
AGK.SPEC.52.03	Describe the reasons for and the dangers of the following operational problems concerning engine air intake: (a) airflow separations (b) intake icing (c) intake damage (d) FOD					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
AGK.SPEC.52.04	Describe the conditions and circumstances during ground operations when FOD is most likely to occur.					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
AGK.SPEC.52.06	Describe the function of the heated pads on some rotorcraft air intakes.					X
AGK.SPEC.53.00	**Rotorcraft: Exhaust**					
AGK.SPEC.53.01	Describe the working principle of the exhaust unit.					X
AGK.SPEC.53.02	Describe the gas-parameter changes in the exhaust unit.					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
AGK.SPEC.54.02	State the tasks of the fuel control unit.					X
AGK.SPEC.54.03	List the possible input parameters to a fuel control unit to achieve a given thrust/power setting.					X
AGK.SPEC.55.00	**Engine control system**					
AGK.SPEC.55.01	State the tasks of the engine control system.					X
AGK.SPEC.56.00	**Engine lubrication**					
AGK.SPEC.56.01	State the tasks of an engine lubrication system.					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
AGK.SPEC.57.00	**Engine Ignition**					
AGK.SPEC.57.01	State the task of the ignition system.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
AGK.SPEC.57.02	Name the following main components of the ignition system and state their function.					X
AGK.SPEC.58.00	**Engine Starter**					
AGK.SPEC.58.01	Name the main components of the starting system and state their function.					X
AGK.SPEC.58.02	Explain the principle of a turbine engine start.					X
AGK.SPEC.58.03	Define 'self-sustaining rpm'.					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
AGK.SPEC.59.02	List and describe the common rotorcraft lubrication systems.					X
AGK.SPEC.59.03	Name the following main components of a rotorcraft lubrication system.					X
AGK.SPEC.60.00	**Engine Operation and Monitoring**					
AGK.SPEC.60.01	Explain spool-up time.					X
AGK.SPEC.60.02	State the parameters that can be used for setting and monitoring the thrust/power.					X
AGK.SPEC.60.03	Explain how the exhaust gas temperature is used to monitor turbine stress.					X
AGK.SPEC.60.04	Describe the possible effects on engine components when EGT limits are exceeded.					X
AGK.SPEC.60.05	Explain why engine-limit exceedances must be reported.					X
AGK.SPEC.60.06	Explain the term 'engine seizure'.					X
AGK.SPEC.60.07	State the possible causes of engine seizure and explain their preventative measures.					X
AGK.SPEC.60.08	Explain oil-filter clogging (blockage) and the implications for the lubrication system.					X
AGK.SPEC.60.09	Give examples of monitoring instruments of an engine.					X
AGK.SPEC.60.10	Describe how to identify and assess engine damage based on instrument indications.					X
AGK.SPEC.61.00	**Relight Envelope**					
AGK.SPEC.61.01	Explain the relight envelope.					X
AGK.SPEC.62.00	**Rotorcraft: Rotor-Heads**					
AGK.SPEC.62.01	Describe the following rotor-head system.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
AGK.SPEC.62.02	Describe in basic terms the following configuration of rotor systems and their advantages and disadvantages.					X
AGK.SPEC.62.03	Explain how flapping, dragging and feathering is achieved in each rotor-head system.					X
AGK.SPEC.63.00	**Structural Components and Materials, Stresses, Structural Limitations**					
AGK.SPEC.63.01	Identify from a diagram the main structural components of the main types of rotor-head systems.					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
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
AGK.SPEC.66.00	**Tail Rotor Types**					
AGK.SPEC.66.01	Describe common tail-rotor systems used on UA.					X
AGK.SPEC.66.02	Identify from a diagram the main structural components of common tail-rotor systems used on UA.					X
AGK.SPEC.66.03	Explain pitch-input mechanisms.					
AGK.SPEC.66.04	Explain the relationship between tail-rotor thrust and engine power.					X
AGK.SPEC.66.05	Describe how the vertical fin on some types reduces the power demand of the tail rotor.					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
AGK.SPEC.68.00	**Rotorcraft: Transmission**					
AGK.SPEC.68.01	Describe the following main principles of rotorcraft transmission systems used in UA.					X
AGK.SPEC.69.00	**Rotor Brake**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
AGK.SPEC.69.01	Describe the main function of the disc type of rotor brake.					X
AGK.SPEC.69.02	Describe the different options for the location of the rotor brake.					X
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
AGK.SPEC.70.02	Describe the material and construction of the driveshaft.					X
AGK.SPEC.70.03	Explain the need for alignment between the engine and the main- rotor gearbox.					X
AGK.SPEC.70.04	Identify how temporary misalignment occurs between driving and driven components.					X
AGK.SPEC.70.05	Explain the relationship between driveshaft speed and torque.					X
AGK.SPEC.70.06	Describe the methods with which power is delivered to the tail rotor.					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
AGK.SPEC.72.00	**Clutches**					
AGK.SPEC.72.01	Explain the purpose of a clutch.					X
AGK.SPEC.72.02	Describe and explain the operation of a: (a) centrifugal clutch (b) actuated clutch					X
AGK.SPEC.72.03	List the typical components of the various clutches.					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
AGK.SPEC.73.02	Describe the fully articulated rotor with hinges and feathering hinges.					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
AGK.SPEC.74.02	List the main structural components of a main-rotor blade and their function.					X
AGK.SPEC.74.03	Describe the drag hinge of the fully articulated rotor and the lag flexure in the hinge-less rotor.					X
AGK.SPEC.75.00	**Forces and Stresses**					
AGK.SPEC.75.01	Describe main-rotor blade-loading on the ground and in flight.					X
AGK.SPEC.75.02	Describe where the most common stress areas are on rotor blades.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
AGK.SPEC.76.00	**Structural Limitations**					
AGK.SPEC.76.01	Explain the structural limitations in terms of bending and rotor rpm.					X
AGK.SPEC.77.00	**Adjustment**					
AGK.SPEC.77.01	Explain the use of trim tabs.					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
AGK.SPEC.79.00	**Lateral Vibrations**					
AGK.SPEC.79.01	Explain blade imbalances, causes, and effects.					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
AGK.SPEC.80.02	Describe the dangers to ground personnel and to the rotor blades, and how to minimise these dangers.					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
AGK.SPEC.81.02	Explain the sources of vibration of the tail rotor and the resulting high frequencies.					X
AGK.SPEC.81.03	Explain balancing and tracking of the tail rotor.					X
AGK.SPEC.82.00	**Structural Limitations**					
AGK.SPEC.82.01	Describe the structural limitations of the tail-rotor blades.					X
AGK.SPEC.82.02	Describe the method of checking the strike indicators placed on the tip of some tail-rotor blades.					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

HUMAN PERFORMANCE AND LIMITATIONS

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
HPL.SPEC.02.02	Explain and give examples of latent threats.					X
HPL.SPEC.02.03	Explain and give examples of environmental threats.					X
HPL.SPEC.02.04	Explain and give examples of organisational threats.					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
HPL.SPEC.02.06	Give examples of different countermeasures which may be used to manage threats, errors, and undesired unmanned aircraft states.					X
HPL.SPEC.02.07	Explain and give examples of procedural error, communication errors, and unmanned aircraft handling errors.					X
HPL.SPEC.02.08	Explain and give examples of ‘undesired unmanned aircraft states’.					X
HPL.SPEC.02.09	State the components of the SHELL model.					X
HPL.SPEC.02.10	State the relevance of the SHELL model to the work in the flightdeck					X
HPL.SPEC.03.00	**Safety Culture and Safety Management**					
HPL.SPEC.03.01	Distinguish between ‘open cultures’ and ‘closed cultures’.					X
HPL.SPEC.03.02	Illustrate how safety culture is reflected in national culture.					X
HPL.SPEC.03.03	Discuss the established expression ‘safety first’ in a commercial entity.					X
HPL.SPEC.03.04	Explain James Reason’s ‘Swiss Cheese Model’.					X
HPL.SPEC.03.05	State the important factors that promote a good safety culture.					X
HPL.SPEC.03.06	Distinguish between ‘just culture’ and ‘non-punitive culture’.					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
HPL.SPEC.03.08	Name the basic concepts of safety management system (SMS) (including hazard identification and risk management) and its relationship with safety culture.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
HPL.SPEC.05.02	Define the term 'sensitivity', especially in the context of vision.					X
HPL.SPEC.05.03	Give examples of sensory adaptation.					X
HPL.SPEC.05.04	Define the term 'habituation' and state its implication for flight safety.					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
HPL.SPEC.06.02	State the basic functions of the parts of the eye.	X	X	X		
HPL.SPEC.06.03	Define 'accommodation'.					X
HPL.SPEC.06.04	Distinguish between the functions of the rod and cone cells.					X
HPL.SPEC.06.05	Describe the distribution of rod and cone cells in the retina and explain their relevance to vision.					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
HPL.SPEC.06.07	List the factors that may degrade visual acuity and the importance of 'lookout'.					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
HPL.SPEC.06.10	Reserved.					
HPL.SPEC.06.11	Explain the nature of colour blindness.					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
HPL.SPEC.06.15	Explain long-sightedness, short-sightedness, and astigmatism.					X
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

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1(A) Fixed Wing	L1(R) Rotorcraft	L2A	L3A
HPL.SPEC.06.17	State the possible problems associated with contact lenses.					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
HPL.SPEC.07.04	Define the main causes of the following hearing defects/loss: — conductive deafness — noise-induced hearing loss — presbycusis					X
HPL.SPEC.07.05	Summarise the effects of environmental noise on hearing.					X
HPL.SPEC.07.06	State the decibel level of received noise that will cause NIHL.					X
HPL.SPEC.07.07	Identify the potential occupational risks that may cause hearing loss.					X
HPL.SPEC.07.08	List the main sources of hearing loss in the unmanned flying environment.					X
HPL.SPEC.07.09	List the precautions that may be taken to reduce the probability of onset of hearing loss.					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 important of which is body temperature.					X
HPL.SPEC.09.02	Explain the term ‘circadian rhythm’.					X
HPL.SPEC.09.03	State the approximate duration of a ‘free-running’ rhythm.					X
HPL.SPEC.09.04	Explain the significance of the ‘internal clock’ in regulating the normal circadian rhythm.					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
HPL.SPEC.09.06	List and describe the stages of a sleep cycle.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
HPL.SPEC.09.07	Differentiate between rapid eye movement (REM) and non-REM sleep.					X
HPL.SPEC.09.08	Explain the function of sleep and describe the effects of insufficient sleep on performance.					X
HPL.SPEC.09.09	Explain the simple calculations for the sleep/wake credit/debit situation.					X
HPL.SPEC.09.10	Explain how sleep debit can become cumulative.					X
HPL.SPEC.09.11	Describe the main effects of lack of sleep on an individual's performance.	X	X	X		R
HPL.SPEC.10.00	**Intoxication**					
HPL.SPEC.10.01	State the harmful effects of tobacco on: — the respiratory system — the cardiovascular system					X
HPL.SPEC.10.02	Indicate the level of caffeine dosage at which performance is degraded.					X
HPL.SPEC.10.03	Besides coffee, indicate other beverages containing caffeine.					X
HPL.SPEC.10.04	State the maximum acceptable limit of alcohol for flight crew according to the applicable regulations.	X	X	X		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
HPL.SPEC.10.06	State the effects alcohol may have if consumed together with other drugs.	X	X	X		
HPL.SPEC.10.07	List the signs and symptoms of alcoholism.					X
HPL.SPEC.10.08	List the factors that may be associated with the development of alcoholism.					X
HPL.SPEC.10.09	Define the 'unit' of alcohol and state the approximate elimination rate from the blood.					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
HPL.SPEC.10.11	Discuss the actions that might be taken if a crew member is suspected of being an alcoholic.					X
HPL.SPEC.10.12	State the dangers associated with the use of non-prescription drugs.	X	X	X		R

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
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
HPL.SPEC.10.17	List those unmanned aircraft component parts which if burnt may give off toxic fumes.					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
HPL.SPEC.11.02	List the major causes of remote pilot incapacitation.	X	X	X		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
HPL.SPEC.11.04	Explain methods and procedures to cope with incapacitation in flight.	X	X	X		R
HPL.SPEC.12.00	**Human Information Processing (HIP)**					
HPL.SPEC.12.01	Differentiate between ‘attention’ and ‘vigilance’.	X	X	X		R
HPL.SPEC.12.02	Differentiate between ‘selective’ and ‘divided’ attention.					X
HPL.SPEC.12.03	Define ‘hypovigilance’.					X
HPL.SPEC.12.04	Identify the factors that may affect the state of vigilance.					X
HPL.SPEC.12.05	List the factors that may forestall hypovigilance during flight.					X
HPL.SPEC.12.06	Indicate the signs of reduced vigilance.					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
HPL.SPEC.13.03	Illustrate why perception is subjective and state the relevant factors that influence interpretation of perceived information					X
HPL.SPEC.13.04	Describe some basic perceptual illusions.					X
HPL.SPEC.13.05	Illustrate some basic perceptual concepts.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
HPL.SPEC.13.06	Give examples where perception plays a decisive role in flight safety.					X
HPL.SPEC.13.07	Stress how persuasive and believable mistaken perception can manifest itself both for an individual and a group.					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
HPL.SPEC.14.02	Describe the differences between the types of memory in terms of capacity and retention time.					X
HPL.SPEC.14.03	Justify the importance of sensory-store memories in processing information.					X
HPL.SPEC.14.04	State the average maximum number of separate items that may be held in working memory (5 ± 2).					X
HPL.SPEC.14.05	Stress how interruption can affect short-term/working memory.					X
HPL.SPEC.14.06	Give examples of items that are important for pilots to hold in working memory during flight.					X
HPL.SPEC.14.07	Describe how the capacity of the working-memory store may be increased.					X
HPL.SPEC.14.08	State the subdivisions of long-term memory and give examples of their content.					X
HPL.SPEC.14.09	Explain that skills are kept primarily in the long-term memory.					X
HPL.SPEC.14.10	Describe amnesia and how it affects memory.					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
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
HPL.SPEC.15.02	Recognise pilot-related examples as behaviouristic, cognitive or modelling forms of learning.					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					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
	— vigilance — application in practical exercises					
HPL.SPEC.15.04	Explain ways to facilitate the memorisation of information with the following learning techniques: — mnemonics — mental training					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
HPL.SPEC.15.06	Explain the term ‘motor programme’ or ‘mental schema’.					X
HPL.SPEC.15.07	Describe the advantages and disadvantages of mental schemas.					X
HPL.SPEC.15.08	Explain the Rasmussen model which describes the guidance of a pilot’s behaviour in different situations.					X
HPL.SPEC.15.09	State the possible problems or risks associated with skill, rule and knowledge-based behaviour.					X
HPL.SPEC.15.10	Define ‘motivation’.					X
HPL.SPEC.15.11	Explain the relationship between motivation and learning.					X
HPL.SPEC.15.12	Explain the problems of over-motivation, especially in the context of the extreme need to achieve.					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	
HPL.SPEC.16.03	List the cues that indicate loss of situation awareness and name the steps to regain it.					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
HPL.SPEC.16.05	Define the term ‘mental model’ in relation to a surrounding complex situation.					X
HPL.SPEC.16.06	Describe the advantages/disadvantages of mental models.					X
HPL.SPEC.16.07	Explain the relationship between personal ‘mental models’ and the creation of cognitive illusions.					X
HPL.SPEC.16.08	Explain the concept of the ‘error chain’.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1(A) Fixed Wing	L1(R) Rotorcraft	L2A	L3A
HPL.SPEC.16.09	Differentiate between an isolated error and an error chain.					X
HPL.SPEC.16.10	Distinguish between the main forms/types of errors (i.e. slips, faults, omissions and violations).					X
HPL.SPEC.16.11	Discuss the above errors and their relevance in flight.					X
HPL.SPEC.16.12	Distinguish between an active and a latent error and give examples.					X
HPL.SPEC.16.13	Distinguish between internal and external factors in error generation.					X
HPL.SPEC.16.14	Identify possible sources of internal error generation.					X
HPL.SPEC.16.15	Define and discuss the two errors associated with motor programmes (action slip and environmental capture).					X
HPL.SPEC.16.16	List the three main sources of external error generation in the flight crew compartment.					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
HPL.SPEC.16.18	Name the major goals in the design of human-centred human– machine interfaces.					X
HPL.SPEC.16.19	Define the term ‘error tolerance’.					X
HPL.SPEC.16.20	List and describe the strategies that are used to reduce human error.					X
HPL.SPEC.16.21	Describe the advantage of planning and the anticipation of future actions.					X
HPL.SPEC.17.00	**Decision Making**					
HPL.SPEC.17.01	Define the terms ‘deciding’ and ‘decision-making’.					X
HPL.SPEC.17.02	Describe the major factors on which decision-making should be based during the course of a flight.					X
HPL.SPEC.17.03	Describe the main human attributes with regard to decision making.					X
HPL.SPEC.17.04	Discuss the nature of bias and its influence on the decision making process.					X
HPL.SPEC.17.05	Describe the main error sources and limits in an individual’s decision-making mechanism.					X
HPL.SPEC.17.06	State the factors upon which an individual’s risk assessment is based.	X	X	X		
HPL.SPEC.17.07	Explain the relationship between risk assessment, commitment, and pressure of time in decision-making strategies.	X	X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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
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	X	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
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
HPL.SPEC.19.00	**Coordination (Multi-Crew Concepts)**					
HPL.SPEC.19.01	Name the objectives of the multi-crew concept.					X
HPL.SPEC.19.02	State and explain the elements of multi-crew concepts.					X
HPL.SPEC.19.03	Describe the concepts of 'standard operating procedures' (SOPs), checklists and crew briefings.	X	X	X	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
HPL.SPEC.19.09	Explain potential threats of SOPs.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1(A) Fixed Wing	L1(R) Rotorcraft	L2A	L3A
HPL.SPEC.20.00	**Cooperation**					
HPL.SPEC.20.01	Distinguish between cooperation and coaction.					X
HPL.SPEC.20.02	Define the term ‘group’.					X
HPL.SPEC.20.03	Illustrate the influence of interdependence in a group.					X
HPL.SPEC.20.04	List the advantages and disadvantages of teamwork.					X
HPL.SPEC.20.05	Explain the term ‘synergy’.					X
HPL.SPEC.20.06	Define the term ‘cohesion’.					X
HPL.SPEC.20.07	Define the term ‘groupthink’.					X
HPL.SPEC.20.08	State the essential conditions for good teamwork.					X
HPL.SPEC.20.09	Explain the function of role and norm in a group.					X
HPL.SPEC.20.10	Name the different role patterns which occur in a group situation.					X
HPL.SPEC.20.11	Explain how behaviour can be affected by the following factors: — persuasion — conformity — compliance — obedience					X
HPL.SPEC.20.12	Distinguish between status and role.					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
HPL.SPEC.20.14	Explain the terms ‘leadership’ and ‘followership’.					X
HPL.SPEC.20.15	Describe the trans-flightdeck authority gradient and its affiliated leadership styles (i.e. autocratic, laissez-faire and synergistic).					X
HPL.SPEC.20.16	Name the most important attributes of a positive leadership style.					X
HPL.SPEC.21.00	**Communication**					
HPL.SPEC.21.01	Define the term ‘communication’.					X
HPL.SPEC.21.02	List the most basic components of interpersonal communication.					X
HPL.SPEC.21.03	Explain the advantages of in-person two-way communication as opposed to one-way communication.					X
HPL.SPEC.21.04	Name the importance of non-verbal communication.					X
HPL.SPEC.21.05	Describe the general aspects of non-verbal communication.					X
HPL.SPEC.21.06	Describe the advantages/disadvantages of implicit and explicit communication.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
HPL.SPEC.21.07	Describe the advantages and possible problems of using ‘social’ and ‘professional’ language in high- and low-workload situations.					X
HPL.SPEC.21.08	Name and explain the major obstacles to effective communication.					X
HPL.SPEC.21.09	Explain the difference between intrapersonal and interpersonal conflict.					X
HPL.SPEC.21.10	Describe the escalation process in human conflict.					X
HPL.SPEC.21.11	List the typical consequences of conflicts between crew members.					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 — advocacy — feedback — metacommunication — negotiation					X
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
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
HPL.SPEC.22.03	Define and distinguish between personality, attitude, and behaviour.					X
HPL.SPEC.22.04	State the origin of personality and attitude.					X
HPL.SPEC.22.05	State that with behaviour good and bad habits can be formed.					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
HPL.SPEC.22.07	State that personality differences and selfish attitude may have effects on flight crew performance.					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
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

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
HPL.SPEC.24.02	Explain how a self-concept of under confidence may lead to an outward show of aggression and self- assertiveness.					X
HPL.SPEC.25.00	**Self-Discipline**					
HPL.SPEC.25.01	Define ‘self-discipline’ and justify its importance for flight safety.					X
HPL.SPEC.26.00	**Identification of Hazardous Attitudes (error proneness)**					
HPL.SPEC.26.01	Explain dangerous attitudes in aviation: — Anti-authority — macho — impulsivity — invulnerability — complacency — resignation					X
HPL.SPEC.26.02	Describe the personality, attitude, and behaviour patterns of an ideal crew member.					X
HPL.SPEC.26.03	Summarise how a person’s attitude influences their work in an unmanned flightdeck					X
HPL.SPEC.27.00	**Human Overload and Underload**					
	Arousal					
HPL.SPEC.27.01	Explain the term ‘arousal’.					X
HPL.SPEC.27.02	Describe the relationship between arousal and performance.					X
HPL.SPEC.27.03	Explain the circumstances under which underload may occur and its possible dangers.					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
HPL.SPEC.28.03	Describe the function of the autonomic nervous system (ANS) in stress response.					X
HPL.SPEC.28.04	Explain the relationship between arousal and stress.					X
HPL.SPEC.28.05	State the relationship between stress and performance.					X
HPL.SPEC.28.06	State the basic categories of stressors.	X	X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
HPL.SPEC.28.07	List and discuss the major environmental sources of stress in the flight crew compartment.					X
HPL.SPEC.28.08	Discuss the concept of 'break point' with regard to stress, overload and performance.					X
HPL.SPEC.28.09	Name the principal causes of domestic stress.					X
HPL.SPEC.28.10	State that the stress experienced as a result of particular demands varies among individuals.					X
HPL.SPEC.28.11	Explain the factors that lead to differences in the levels of stress experienced by individuals.					X
HPL.SPEC.28.12	List the factors that influence the tolerance of stressors.					X
HPL.SPEC.28.13	State that stress is a result of perceived demands and perceived ability.					X
HPL.SPEC.28.14	Explain the relationship between stress and anxiety.					X
HPL.SPEC.28.15	Describe the effects of anxiety on human performance.					X
HPL.SPEC.28.16	State the general effect of acute stress on people.					X
HPL.SPEC.28.17	Describe the relationship between stress, arousal and vigilance.					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
HPL.SPEC.28.19	Explain the differences between psychological, psychosomatic, and somatic stress reactions.					X
HPL.SPEC.28.20	Name the typical common physiological and psychological symptoms of human overload.					X
HPL.SPEC.28.21	Describe the effects of stress on human behaviour.					X
HPL.SPEC.28.22	Explain how stress is cumulative and how stress from one situation can be transferred to a different situation.					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
HPL.SPEC.28.24	Describe the effect of human underload/overload on effectiveness in the flight crew compartment.					X
HPL.SPEC.28.25	List sources and symptoms of human underload.					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

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
HPL.SPEC.29.02	Name the causes of short-term and chronic fatigue.	X	X	X		R
HPL.SPEC.29.03	Identify the symptoms and describe the effects of fatigue.	X	X	X		R
HPL.SPEC.29.04	List the strategies that prevent or delay the onset of fatigue and hypovigilance.					X
HPL.SPEC.29.05	List and describe strategies for coping with stress factors and stress reactions.					X
HPL.SPEC.29.06	Distinguish between short-term and long-term methods of stress management.	X	X	X		R
HPL.SPEC.29.07	Give examples of short-term methods of stress management.	X	X	X		X
HPL.SPEC.29.08	Give examples of long-term methods of coping with stress.					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
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
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
HPL.SPEC.31.00	**Automation Complacency**					
HPL.SPEC.31.01	State the main weaknesses in the monitoring of automatic systems to be hypovigilance.					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
HPL.SPEC.31.03	Explain how the method of call-outs counteracts ineffective monitoring of automatic systems.					X
HPL.SPEC.31.04	Define ‘complacency’.					X
HPL.SPEC.32.00	**Working Concepts**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2~~A~~	L3~~A~~
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 comprehension, status of the unmanned aircraft and unmanned aircraft position.					X

METEOROLOGY

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
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
MET.SPEC.01.02	List the different layers and their main qualitative characteristics up to FL650					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
MET.SPEC.03.02	Mention the general causes of the cooling of the air in the troposphere with increasing altitude.					X
MET.SPEC.03.03	Calculate the temperature and temperature deviations (in relation to International Standard Atmosphere (ISA)) at specified levels.					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
MET.SPEC.04.02	Describe radiation.					X
MET.SPEC.04.03	Describe solar radiation reaching the Earth.					X
MET.SPEC.04.04	Describe the filtering effect of the atmosphere on solar radiation.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.04.05	Describe terrestrial radiation.					X
MET.SPEC.04.06	Explain how terrestrial radiation is absorbed by some components of the atmosphere.					X
MET.SPEC.04.07	Explain the effect of absorption and radiation in connection with clouds.					X
MET.SPEC.04.08	Explain the process of conduction.					X
MET.SPEC.04.09	Explain the role of conduction in the cooling and warming of the atmosphere.					X
MET.SPEC.04.10	Explain the process of convection.					X
MET.SPEC.04.11	Name the situations in which convection occurs.					X
MET.SPEC.04.12	Explain the process of advection.					X
MET.SPEC.04.13	Name the situations in which advection occurs.					X
MET.SPEC.04.14	Describe the transfer of heat by turbulence.					X
MET.SPEC.04.15	Describe the transfer of latent heat.					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
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
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
MET.SPEC.05.04	Explain the influence of the wind on the cooling and warming of the air near the surfaces.					X
MET.SPEC.06.00	**Atmospheric Pressure**					
	Barometric Pressure, Isobars					
MET.SPEC.06.01	Define 'atmospheric pressure'.					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
MET.SPEC.06.03	Describe the principle of the barometers (mercury barometer, aneroid barometer).					X
MET.SPEC.06.04	Define isobars and identify them on surface weather charts.					X
MET.SPEC.06.05	Define 'high', 'low', 'trough', 'ridge', 'col'.					X
MET.SPEC.07.00	**Pressure Variation with Height, Contours (Isotypes)**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.07.01	Explain the pressure variation with height.					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
	Reduction of Pressure to QFF (MSL)					
MET.SPEC.07.03	Define ‘QFF’.					X
MET.SPEC.07.04	Explain the reduction of measured pressure (QFE) to QFF (MSL).					X
MET.SPEC.07.05	Mention the use of QFF for surface weather charts.					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
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
MET.SPEC.08.0	Describe the vertical variation of the air density in the atmosphere.					X
MET.SPEC.09.00	**International Standard Atmosphere (ISA)**					
MET.SPEC.09.01	Explain the use of standardised values for the atmosphere.					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
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
MET.SPEC.10.02	Describe the terms ‘transition altitude’, ‘transition level’,‘transition layer’, ‘terrain clearance’, ‘lowest usable flight level’.					X
	Altimeter settings					
MET.SPEC.10.03	Name the altimeter settings associated to height, altitude, pressure altitude and FL.					X
MET.SPEC.10.04	Describe the altimeter-setting procedures.					X
	Calculations					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.10.05	Calculate the different readings on the altimeter when a remote pilot uses different settings (QNH, 1013.25, QFE).					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
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
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
MET.SPEC.10.09	Explain the influence of pressure areas on true altitude.					X
MET.SPEC.10.10	Determine the true altitude/height for a given altitude/height and a given ISA temperature deviation.					X
MET.SPEC.10.11	Calculate the terrain clearance and the lowest usable FL for given atmospheric temperature and pressure conditions.					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.* *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.*					X
	Effect of Accelerated Airflow Due to Topography					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.10.13	Describe qualitatively how the effect of accelerated airflow due to topography (the Bernoulli effect) affects altimetry.					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
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
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
MET.SPEC.14.00	**Local Winds**					
MET.SPEC.14.01	Describe and explain anabatic and katabatic winds.	X	X	X		
MET.SEPC.14.02	Describe mountain and valley winds.	X	X	X		
MET.SPEC.14.03	Describe the Venturi effect, convergence in valleys and mountain areas.	X	X	X		
MET.SPEC.14.04	Describe land and sea breezes, and sea-breeze front.	X	X	X		
MET.SPEC.14.05	Describe that local, low-level jet streams can develop in the evening.					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
MET.SPEC.15.02	State the conditions necessary for the formation of mountain waves.					X
MET.SPEC.15.03	Describe the structure and properties of mountain waves.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.15.04	Explain how mountain waves may be identified by their associated meteorological phenomena.					X
MET.SPEC.15.05	Describe that mountain wave effects can exceed the performance or structural capability of unmanned aircraft.					X
MET.SPEC.15.06	Describe that mountain wave effects can propagate from low to high level, e.g. over Greenland and elsewhere.					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
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
MET.SPEC.17.03	Describe and indicate the areas of worst wind shear and CAT.					X
MET.SPEC.18.00	**Clouds and Fog**					
MET.SPEC.18.01	Explain cloud formation by adiabatic cooling, conduction, advection and radiation.					X
MET.SPEC.18.02	Describe cloud formation based on the following lifting processes: unorganised lifting in thin layers and turbulent mixing; forced lifting at fronts or over mountains; free convection.					X
MET.SPEC.18.03	List cloud types typical for stable and unstable air conditions.					X
MET.SPEC.18.04	Summarise the conditions for the dissipation of clouds.					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
MET.SPEC.21.00	**Fog, Mist, Faze**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.21.01	Define ‘fog’, ‘mist’ and ‘haze’ with reference to the WMO standards of visibility range.					X
MET.SPEC.21.02	Explain briefly the formation of fog, mist and haze.					X
MET.SPEC.21.03	Name the factors that generally contribute to the formation of fog and mist.					X
MET.SPEC.21.04	Name the factors that contribute to the formation of haze.					X
MET.SPEC.21.05	Describe freezing fog and ice fog.					X
MET.SPEC.22.00	**Radiation Fog**					
MET.SPEC.22.01	Explain the formation of radiation fog.					X
MET.SPEC.22.02	Describe the significant characteristics of radiation fog, and its vertical extent.					X
MET.SPEC.22.03	Summarise the conditions for the dissipation of radiation fog.					X
MET.SPEC.23.00	**Advection Fog**					
MET.SPEC.23.01	Explain the formation of advection fog.					X
MET.SPEC.23.02	Describe the different possibilities of advection-fog formation (over land, sea and coastal regions).					X
MET.SPEC.23.03	Describe the significant characteristics of advection fog.					X
MET.SPEC.23.04	Summarise the conditions for the dissipation of advection fog.					X
MET.SPEC.24.00	**Sea Smoke**					
MET.SPEC.24.01	Explain the formation of sea smoke.					X
MET.SPEC.24.02	Explain the conditions for the development of sea smoke.					X
MET.SPEC.24.03	Summarise the conditions for the dissipation of sea smoke.					X
MET.SPEC.24.04	Explain the formation of frontal fog.					X
MET.SPEC.24.05	Describe the significant characteristics of frontal fog.					X
MET.SPEC.24.06	Summarise the conditions for the dissipation of frontal fog.					X
MET.SPEC.24.07	Summarise the features of orographic fog.					X
MET.SPEC.24.08	Describe the significant characteristics of orographic fog.					X
MET.SPEC.24.09	Summarise the conditions for the dissipation of orographic fog.					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

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.25.02	Summarise the outlines of the ice-crystal process (The Wegener– Bergeron–Findeisen process).					X
MET.SPEC.25.03	Summarise the outlines of the coalescence process.					X
MET.SPEC.25.04	Explain the development of snow, rain, drizzle and hail.					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
MET.SPEC.26.02	State the ICAO/WMO approximate diameters for cloud, drizzle and rain drops.					X
MET.SPEC.26.03	State that, because of their size, hail stones can cause significant damage to unmanned aircraft.					X
MET.SPEC.26.04	Explain the mechanism for the formation of freezing precipitation.					X
MET.SPEC.26.05	Describe the weather conditions that give rise to freezing precipitation.					X
MET.SPEC.26.06	Distinguish between the types of precipitation generated in convective and stratiform clouds.					X
MET.SPEC.26.07	Assign typical precipitation types and intensities to different cloud types.					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
MET.SPEC.27.00	**Air Masses and Fronts**					
	Air Masses					
MET.SPEC.27.01	Define the term ‘air mass’.					X
MET.SPEC.27.02	Describe the properties of the source regions.					X
MET.SPEC.27.03	Summarise the classification of air masses by source regions.					X
MET.SPEC.27.04	State the classifications of air masses by temperature and humidity at source.					X
MET.SPEC.27.05	State the characteristic weather in each of the air masses.					X
MET.SPEC.27.06	Name the three main air masses that affect Europe.					X
MET.SPEC.27.07	Classify air masses on a surface weather chart.					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*					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
	— *arctic (A)* — *polar (P)* — *tropical (T)* — *equatorial (E)* — *third letter: temperature* — *cold (c)* — *warm (w)*					
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
MET.SPEC.28.02	Explain how maritime and continental tracks modify air masses.					X
MET.SPEC.28.03	Explain the effect of passage over cold or warm surfaces.					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
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
MET.SPEC.29.00	**Fronts**					
MET.SPEC.29.01	Describe the boundaries between air masses (fronts).					X
MET.SPEC.29.02	Define 'front' and 'frontal zone'.					X
MET.SPEC.29.03	Name the global frontal systems (polar front, arctic front).					X
MET.SPEC.29.04	State the approximate seasonal latitudes and geographic positions of the polar front and the arctic front.					X
MET.SPEC.30.00	**Warm Front, Associated Clouds and Weather**					
MET.SPEC.30.01	Define a 'warm front'.					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
MET.SPEC.30.03	Explain the seasonal differences in the weather at warm fronts.					X
MET.SPEC.30.04	Describe the structure, slope and dimensions of a warm front.					X
MET.SPEC.30.05	Sketch a cross section of a warm front showing weather, cloud and aviation hazards.					X
MET.SPEC.31.00	**Cold Front, Associated Clouds and Weather**					
MET.SPEC.31.01	Define a 'cold front'.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
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
MET.SPEC.31.03	Explain the seasonal differences in the weather at cold fronts.					X
MET.SPEC.31.04	Describe the structure, slope and dimensions of a cold front.					X
MET.SPEC.31.05	Sketch a cross section of a cold front showing weather, cloud and aviation hazards.					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
MET.SPEC.32.02	Describe the cloud, weather, ground visibility and aviation hazards in a warm sector.					X
MET.SPEC.32.03	Explain the seasonal differences in the weather in the warm sector.					X
MET.SPEC.32.04	Sketch a cross section of a warm sector showing weather, cloud and aviation hazards.					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
MET.SPEC.33.02	Explain the seasonal differences in the weather behind the cold front.					X
MET.SPEC.34.00	**Occlusions, Associated Clouds and Weather**					
MET.SPEC.34.01	Define the term ‘occlusion’ and ‘occluded front’.					X
MET.SPEC.34.02	Describe the cloud, weather, ground visibility and aviation hazards in a cold occlusion.					X
MET.SPEC.34.03	Describe the cloud, weather, ground visibility and aviation hazards in a warm occlusion.					X
MET.SPEC.34.04	Explain the seasonal differences in the weather at occlusions.					X
MET.SPEC.34.05	Sketch a cross section of occlusions showing weather, cloud and aviation hazards.					X
MET.SPEC.34.06	On a sketch illustrate the development of an occlusion and the movement of the occlusion point.					X
MET.SPEC.35.00	**Stationary Front, Associated Clouds and Weather**					
MET.SPEC.35.01	Define a ‘stationary front’.					X
MET.SPEC.35.02	Describe the cloud, weather, ground visibility and aviation hazards in a stationary front.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
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
MET.SPEC.36.02	State the rules for predicting the direction and the speed of movement of fronts.					X
MET.SPEC.36.03	State the difference in the speed of movement between cold and warm fronts.					X
MET.SPEC.36.04	State the rules for predicting the direction and the speed of movement of frontal depressions.					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
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 the vertical axis.					X
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
MET.SPEC.38.02	Explain how these pressure areas are formed.					X
MET.SPEC.38.03	Explain how the pressure areas move with the seasons.					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
MET.SPEC.39.02	Explain the general weather conditions under which ice accretion occurs in a venturi carburettor.					X
MET.SPEC.39.03	Explain the general weather conditions under which ice accretion occurs on airframe.					X
MET.SPEC.39.04	Explain the formation of supercooled water in clouds, rain and drizzle.					X
MET.SPEC.39.05	Explain qualitatively the relationship between the air temperature and the amount of supercooled water.					X
MET.SPEC.39.06	Explain qualitatively the relationship between the type of cloud and the size					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
	and number of the droplets in cumuliform and stratiform clouds.					
MET.SPEC.39.07	Indicate in which circumstances ice can form on an unmanned aircraft on the ground: air temperature, humidity, precipitation.					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
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
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 air, speed of the unmanned aircraft, shape (thickness) of the airframe parts (wings, antennas, etc.).					X
MET.SPEC.39.11	Explain the effects of topography on icing.					X
MET.SPEC.39.12	Explain the higher concentration of water drops in stratiform orographic clouds.					X
MET.SPEC.40.00	**Types of Ice Accretion**					
MET.SPEC.40.01	Define ‘clear ice’.					X
MET.SPEC.40.02	Describe the conditions for the formation of clear ice.					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
MET.SPEC.40.04	Describe the aspects of clear ice: appearance, weight, solidity.					X
MET.SPEC.40.05	Define ‘rime ice’.					X
MET.SPEC.40.06	Describe the conditions for the formation of rime ice.					X
MET.SPEC.40.07	Describe the aspects of rime ice: appearance, weight, solidity.					X
MET.SPEC.40.08	Define ‘mixed ice’.					X
MET.SPEC.40.09	Describe the conditions for the formation of mixed ice.					X
MET.SPEC.40.10	Describe the aspects of mixed ice: appearance, weight, solidity.					X
MET.SPEC.40.11	Describe the possible process of ice formation in snow conditions.					X
MET.SPEC.40.12	Define ‘hoar frost’.					X
MET.SPEC.40.13	Describe the conditions for the formation of hoar frost.					X
MET.SPEC.40.14	Describe the aspects of hoar frost: appearance, solidity.					X
MET.SPEC.41.00	**Hazards of Ice Accretion, Avoidance**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.41.01	State the ICAO qualifying terms for the intensity of icing.					X
MET.SPEC.41.02	Describe, in general, the hazards of icing.					X
MET.SPEC.41.03	Assess the dangers of the different types of ice accretion.					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
MET.SPEC.41.05	Indicate the possibilities of avoiding dangerous zones of icing: — in the flight planning: weather briefing, selection of track and altitude; — during flight: recognition of the dangerous zones, selection of appropriate track and altitude.					X
MET.SPEC.42.00	**Ice Crystal Icing**					
MET.SPEC.42.01	Describe ice crystal icing.					X
MET.SPEC.42.02	Describe the atmospheric processes leading to high ice crystal concentration. Define the variable ice water content (IWC).					X
MET.SPEC.42.03	Identify weather situations and their relevant areas where high concentrations of ice crystals are likely to occur.					X
MET.SPEC.42.04	Name, in general, the flight hazards associated with high concentrations of ice crystals.					X
MET.SPEC.42.05	Explain how a pilot may possibly avoid areas with a high concentration of ice crystals.					X
MET.SPEC.43.00	**Turbulence**					
MET.SPEC.43.01	Describe the effects of turbulence on an unmanned aircraft in flight.					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
MET.SPEC.43.03	Describe atmospheric turbulence and distinguish between turbulence, gustiness and wind shear.					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
MET.SPEC.44.00	**Wind Shear**					
MET.SPEC.44.01	Define 'wind shear' (vertical and horizontal).					X
MET.SPEC.44.02	Define 'low-level wind shear'.					X
MET.SPEC.45.00	**Weather Conditions for Wind Shear**					

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
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
MET.SPEC.46.00	**Effects on Flight, Avoidance**					
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
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
MET.SPEC.48.02	Describe a supercell storm: initial, supercell, tornado and dissipating stage.					X
MET.SPEC.48.03	Summarise the flight hazards associated with a fully developed thunderstorm.					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
MET.SPEC.49.00	**Electrical Discharges**					
MET.SPEC.49.01	Describe the basic outline of the electric field in the atmosphere.					X
MET.SPEC.49.02	Describe types of lightning, i.e. ground stroke, intra-cloud lightning, cloud-to-cloud lightning, upward lightning.					
MET.SPEC.49.03	Reserved					
MET.SPEC.49.04	Describe the development of lightning discharges.					X
MET.SPEC.49.05	Describe the effect of lightning strike on unmanned aircraft and flight execution.					X
MET.SPEC.50.00	**Development and Effects of Downbursts**					
MET.SPEC.50.01	Define the term ‘downburst’.					X
MET.SPEC.50.02	Distinguish between macroburst and microburst.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.50.03	State the weather situations leading to the formation of downbursts.					X
MET.SPEC.50.04	Describe the process of development of a downburst.					X
MET.SPEC.50.05	Give the typical duration of a downburst.					X
MET.SPEC.50.06	Describe the effects of downbursts.					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
MET.SPEC.51.02	Describe practical examples of flight techniques used to avoid the hazards of thunderstorms.					X
MET.SPEC.52.00	**Tornadoes**					
MET.SPEC.52.01	Define ‘tornado’.					X
MET.SPEC.52.02	Describe the formation of a tornado.					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
MET.SPEC.52.04	Compare the dimensions and properties of tornadoes and dust devils.					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
MET.SPEC.54.00	**Hazards in Mountainous Areas**					
MET.SPEC.54.01	Describe the influence of mountainous area on a frontal passage.					X
MET.SPEC.54.02	Describe the vertical movements, wind shear and turbulence that are typical of mountain areas.					X
MET.SPEC.54.03	Indicate on a sketch of a chain of mountains the turbulent zones (mountain waves, rotors).					X
MET.SPEC.54.04	Explain the influence of relief on ice accretion.					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
MET.SPEC.55.02	Describe the valley inversion formed by warm winds aloft.					X
MET.SPEC.55.03	Describe the effects of a valley inversion for an unmanned aircraft in flight.					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.56.00	**Meteorological Information**					
MET.SPEC.56.01	Demonstrate ability to obtain, interpret and apply meteorological reports and forecasts for operations.	X	X	X		
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
MET.SPEC.56.04	Define 'visibility'.					X
MET.SPEC.56.05	Describe the meteorological measurement of visibility.					X
MET.SPEC.56.06	Define 'prevailing visibility'.					X
MET.SPEC.56.07	Define 'ground visibility'.					X
MET.SPEC.56.08	List the units used for visibility (m, km, statute mile).					X
MET.SPEC.56.09	Define 'runway visual range'.					X
MET.SPEC.56.11	Describe the meteorological measurement of runway visual range.					X
MET.SPEC.56.12	Indicate where the transmissometers/forward-scatter meters are placed on the aerodrome.					X
MET.SPEC.56.13	List the units used for runway visual range (m, ft).					X
MET.SPEC.56.14	List the different possibilities to transmit information to pilots about runway visual range.					X
MET.SPEC.56.15	Compare ground visibility, prevailing visibility, and runway visual range.					X
MET.SPEC.56.16	Indicate the means of observation of present weather.					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
MET.SPEC.56.18	State the clouds which are indicated in METAR, TAF and SIGMET.					X
MET.SPEC.56.19	Define 'oktas'.					X
MET.SPEC.56.20	Define 'cloud base'.					X
MET.SPEC.56.21	Define 'ceiling'.					X
MET.SPEC.56.22	Name the unit and the reference level used for information about cloud base (ft).					X
MET.SPEC.56.23	Define 'vertical visibility'.					X
MET.SPEC.56.24	Explain briefly how and when vertical visibility is measured.					X
MET.SPEC.56.25	Name the units used for vertical visibility (ft, m).					X

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.56.26	Indicate the means of observation of air temperature (thermometer).					X
MET.SPEC.56.27	Name the units of relative humidity (%) and dew-point temperature (Celsius, Fahrenheit).					X
MET.SPEC.57.00	**Satellite Observations**					
MET.SPEC.57.01	Describe the basic outlines of satellite observations.					X
MET.SPEC.57.02	Name the main uses of satellite pictures in aviation meteorology.					X
MET.SPEC.57.03	Describe the different types of satellite imagery.					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
MET.SPEC.57.06	Interpret qualitatively the satellite pictures in order to get useful information for flights: — location of fronts.					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
MET.SPEC.58.01	Interpret ground weather radar images.					X
MET.SPEC.58.01	Describe the basic principle and the type of information given by airborne weather radar.					X
MET.SPEC.58.01	Describe the limits and the errors of airborne weather radar information.					X
MET.SPEC.58.01	Interpret typical airborne weather radar images.					X
MET.SPEC.59.00	**Unmanned Aircraft Observations and Reporting**					
MET.SPEC.59.01	Describe routine air-report and special air-report (ARS).					X
MET.SPEC.59.02	State the obligation of a pilot to prepare air-reports.					X
MET.SPEC.59.03	Name the weather phenomena to be stated in an ARS.					X
MET.SPEC.60.00	**Weather Charts**					
MET.SPEC.60.01	Decode and interpret significant weather charts (low, medium and high level).					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
MET.SPEC.61.00	**Surface Charts**					
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

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1~~(A)~~ Fixed Wing	L1~~(R)~~ Rotorcraft	L2 ~~A~~	L3 ~~A~~
MET.SPEC.61.02	Determine from surface weather charts the wind direction and speed.					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
MET.SPEC.62.02	Describe the general meaning of MET REPORT and SPECIAL REPORT.					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	Monitors UAS systems status
6	Complies with applicable regulations

7	Applies relevant procedural knowledge

MANAGE AERONAUTICAL 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~~ MANAGE UA FLIGHT PATH MANAGEMENT AND AUTOMATION

UA Flight Path Management, Automation (FPM)	
Description: Controls the ~~RPA~~ UA flight path through automation, including appropriate use of flight management system(s) and guidance.	
Observable Behaviours	
1	Controls the UA through automation with accuracy and smoothness as appropriate to the situation
2	Contains the UA 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 UA 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 UA safely in degraded automation using only the relationship between UA 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

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
5	Keeps track of time and energy
6	Validates the accuracy of information and checks for gross errors
7	Maintains awareness of the people involved in or affected by the operation and their capacity to perform as expected
8	Anticipates accurately what could happen, plans, and stays ahead of the situation
9	Develops effective contingency plans based upon potential threats
10	Recognizes and effectively responds to indications of reduced situational awareness

WORKLOAD MANAGEMENT

Workload Management (WLM)	
Description: Manages available resources efficiently to prioritize and perform tasks in a timely manner under all circumstances.	
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

COORDINATION AND HANDOVER (WHERE APPLICABLE)

Coordination and Handover (CAH)
Description: Demonstrates effective coordination and handover practices to ensure operational continuity.
Observable Behaviours

1	Conducts handovers clearly and completely, ensuring continuity
2	Shares relevant information with receiving personnel.
3	Confirms understanding and readiness of the receiving party
4	Coordinates actions with other operators or units as required
5	Uses standard phraseology appropriately

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

Introduction

A.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.

A.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?

A.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?

A.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.

A.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 extracted and 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

A.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.

A.7 When submitting your compliance evidence, you should provide a separate, clearly referenced document for each individual requirement or finding. Duplicate documents should not be uploaded.

A.8 If the information is contained within manuals or higher-level documentation, you should only submit the specific pages or annexes that directly address the relevant requirement.

A.9 Compliance evidence must be stored for a minimum of 3 years ~~the duration of the authorisation~~ and be available to CAA assessors upon request. Where compliance evidence contains personal data, it is recommended to follow UK Government advice on General Data Protection Regulation (GDPR).

A.10 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:

A.11 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%).”

A.12 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.”

A.13 Provide compliance evidence: the physical report(s) that evidence the compliance statement has been achieved. For example:

(i) Parachute deployment analysis report no.XYZ.pdf
(ii) Parachute deployment flight test report no.ABC.pdf

How to document and present an operational volume

A.14 The applicant should provide a 3-dimensional flight area in the format of a .kml file or a similar format for example, .kmz suitable for visualisation, accompanied by a document that includes all relevant flight area details.

A.15 Applicants should provide geographical location data using latitude and longitude coordinates. This may be submitted as a central point with a specified radius, or as a defined multi-point polygon.

A.16 The provided graphical representation of the iGRC Footprint below should contain as a minimum:

- An area: Flight Volume in transparent green colour
- An area: Contingency Volume in transparent yellow colour
- An area: Ground Risk Buffer in transparent red colour
- A position: Remote Pilot Position (for VLOS operation)
- A position: Take Off / Landing Position

A.17 The applicant should decide between the following methods to determine the ground area at risk for the specific operation:

(i) The **‘Inside out’** method is used for applications where the flight volume is the constraining factor. The required contingency volume and ground risk buffer are added to the flight volume to define the total iGRC Footprint.
(ii) The **‘Reverse’** approach should be used when your operation is constrained by a defined boundary – for example, when operating within a controlled ground area. By subtracting the ground risk buffer and contingency volume will determine the maximum available flight volume.

Figure A.1 - Inside Out vs Reverse computation of the flight area

Inside out **Reverse**

A.18 Areas within the flight volume that need to be excluded for any reason (e.g. higher ground risk) should be addressed in the same way as to surround them with a contingency volume and a ground risk buffer.

A.19 The applicant should provide a graphical representation of the flight area, accompanied by a concise description, all input values, and the calculations for the flight volume, contingency volume and ground risk buffer should be documented.

A.20 The content should be presented in a manner that is easily comprehensible to all parties involved in the operation, enabling swift access to all pertinent data during routine operations. It is also crucial for the CAA to understand the calculation process.

Calculating the Flight Volume, Contingency Volume and Ground Risk Buffer

A.21 Tables A.2, A.3 and A.4 provide sample calculations for determining the minimum dimensions of the flight volume, contingency volume and the ground risk buffer. These examples are intended solely as illustrative calculations. Operator specific values should be used in place of these assumptions and will need to be evidenced.

A.22 The applicant should use the volume calculation method defined in the tables below. Where an applicant elects to use an alternative method, suitable calculation tools may be sourced and applied to support their assessment.

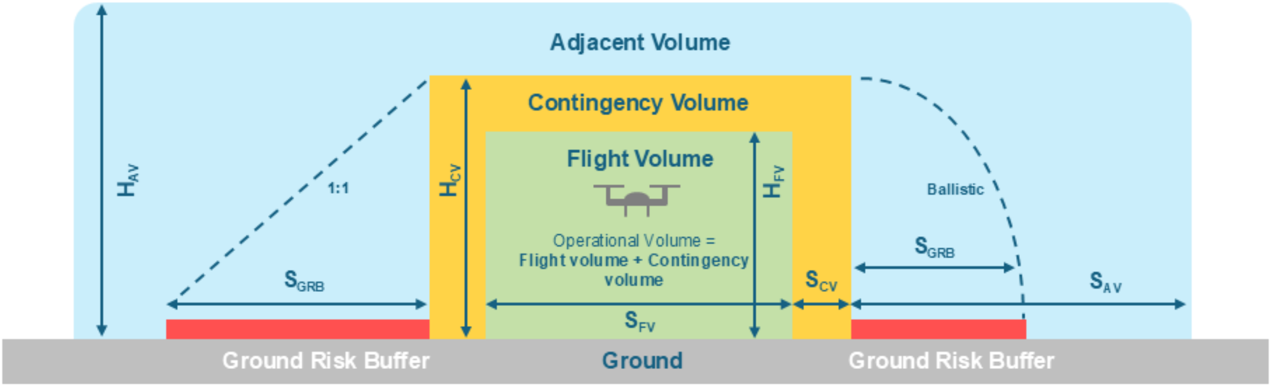
Table A.1 - Information required for calculations

Abbreviation	Meaning
a	Acceleration
ALOS	Attitude Line Of Sight
baro	Barometric
CL	Lift Coefficient
CD	The "Maximum UA characteristic dimension" or "CD" is the maximum possible length of a straight line that can be spanned from one point on the UA geometry to another point. Propellers and rotors are part of the geometry, whereby their most unfavourable position is considered. Note: Commonly used values for: **Fixed-wing aircraft** • Wingspan or • Fuselage length **Multirotor** • Diagonal distance from rotor tip to rotor tip, rotors in unfavourable position
CM	Contingency Manoeuvre
CV	Contingency Volume
C_D	Drag coefficient
DLOS	Detection Line of Sight
FV	Flight Volume
g	Gravitational Acceleration
GNSS	GNSS accuracy
GRB	Ground Risk Buffer
GV	Ground Visibility
H	Height
K	Map error
m	UAS mass

Pos	Position
RZ	Reaction time
S	Horizontal distance
t	Time
t_p	Time to open parachute
V_0	Maximum operational speed
V_{Stall_clean}	Stall speed in clean configuration
V_Z	Rate of decent with parachute open
Z	Vertical direction
ε	Glide angle
Φ	Roll angle
Θ	Pitch angle
Ψ	Yaw angle

Figure A.2 – Schematic diagram of the Flight Volume, Contingency Volume and Ground Risk Buffer

Side View



Top View

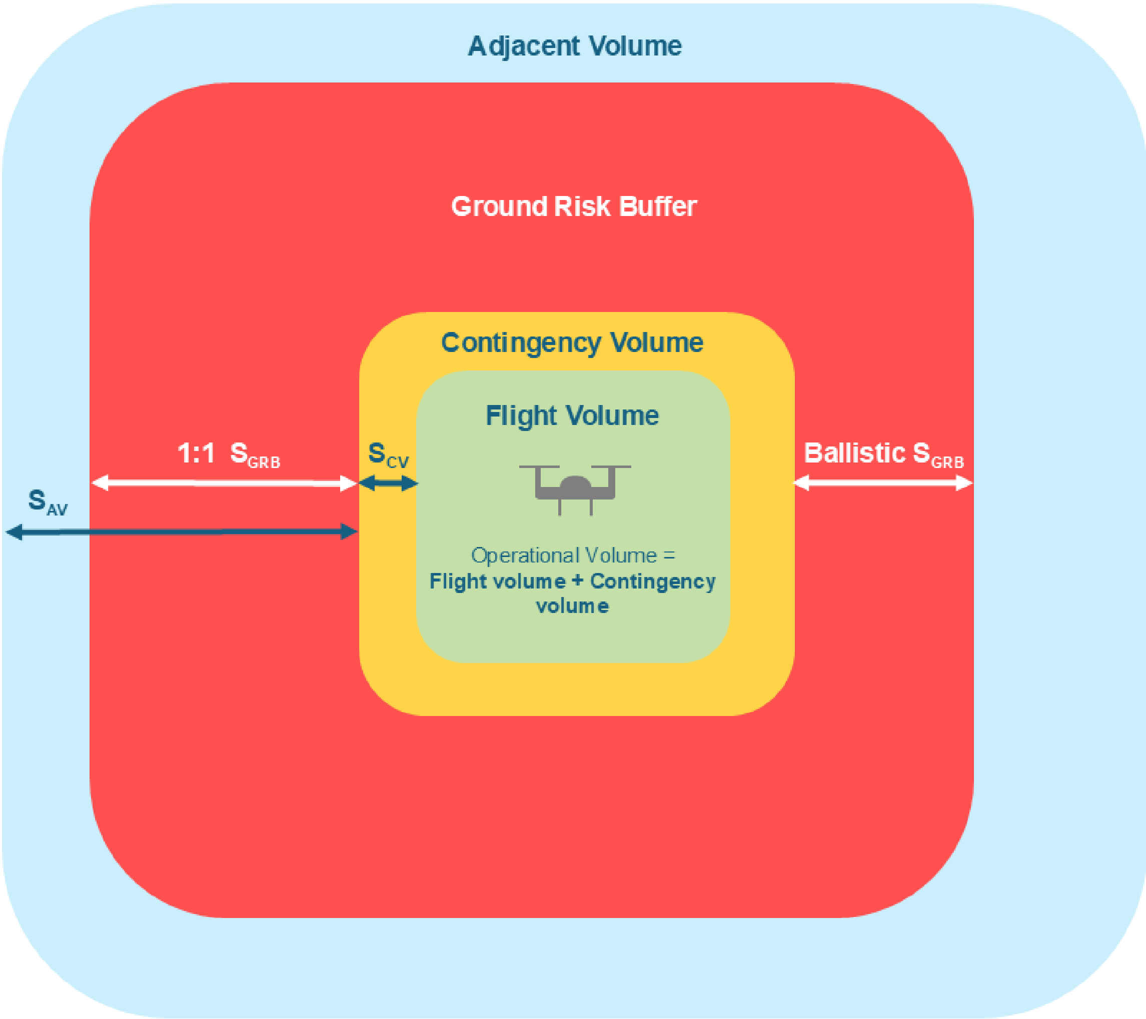


Table A.2 - Flight Volume Calculation

FG horizontal	
Width flight geography: S_{FV}	$S_{FV} \geq 3\ CD$
FG vertical	
Height flight geography: H_{FV}	$H_{FV} \geq 3\ CD$

Table A.3 – Contingency Volume Calculation

CV horizontal	
GNSS accuracy: S_{GNSS}	$S_{GNSS} = 3$ m
Position holding error: S_{POS}	$S_{POS} = 3$ m
Map error: S_K	$S_K = 1$ m
Reaction distance: S_R	**Manual initiation of measures** Reaction time: $t_R = 1s$, with V_0 results in $S_R = V_0\ t_R$ *Note: t_R can also be smaller in fully automatic systems (e.g. geofence).*
Contingency manoeuvres: S_{CM}	**Multirotor - stopping** Based on $S_{CM} = \frac{1}{2} a\ t_{R^2} + V_0\ t_R$ follows for a thrust to weight ratio of at least 2 $thrust \geq 2\ m\ g$ and a maximum pitch angle of less than 45 degrees $\Theta max \leq 45°$ The minimum distance for stopping to hovering mode is: $S_{CM} = \frac{1}{2} \frac{V_{0^2}}{g \tan(\Theta)}$

	Fixed-wing aircraft - 180° turn: Assumption: roll angle $\Phi_{max} \leq 30°$ The radius for the turn is: $$S_{CM} = \frac{V_0{}^2}{g\ tan(\Phi)}$$
Alternative contingency manoeuvre parachute: S_{CM} S_{CM}	Flight terminated with parachute triggered when leaving the FG t_P = Time to open the parachute $$S_{CM} = V_0\ t_P$$
Horizontal extension of the contingency volume: S_{CV}	$$S_{CV} = S_{GPS} + S_{POS} + S_K + S_R + S_{CM}$$
Examples	
Example multirotors: $V_0 = 10\frac{m}{s}, \Theta = 45°, [tan(45°) = 1]$	$$S_{CV} = 3m + 3m + 1m + 10m + \frac{1}{2} \cdot \frac{\left(10\frac{m}{s}\right)^2}{9.81\frac{m}{s^2} \cdot 1} = 22.1m$$
Example fixed-wing aircraft: $V_0 = 30\frac{m}{s}, \Phi = 30°$	$$S_{CV} = 3m + 3m + 1m + 30m + \frac{\left(30\frac{m}{s}\right)^2}{9.81\frac{m}{s^2} \cdot tan(30°)} = 195.9m$$
CV vertical	
Altitude measurement error: H_{AM}	$H_{AM} = H_{Baro} = 1$m for barometric altitude measurement, or $H_{AM} = H_{GNSS} = 4$m for GNSS-based altitude measurement.
Reaction distance: H_R	**Manual initiation of measures** Reaction time: $t_R = 1s$, with 45° pitch angle results $$H_R = V_0 \cdot 0.7 \cdot t_R$$ *Note: t_R can also be smaller in fully automatic systems (e.g. geofence).*

Contingency manoeuvres: HCM	For multirotor The forward kinetic energy is completely converted into potential energy. This results in $$H_{CM} = \frac{1}{2}\frac{V_0{}^2}{g}$$ For fixed-wing aircraft Exit the FG upwards with a 45° pitch angle, then fly on a constant circular path with V0 and radius r until level flight is achieved. With $$r = \frac{V_0{}^2}{g}$$ results in the contingency manoeuvre height being approximately $$H_{CM} = \frac{V_0{}^2}{g} \cdot 0.3$$
Alternate contingency manoeuvre parachute: H_{CM}	Flight terminated with parachute triggered when leaving the FG Exit FV with a 45° pitch angle t_P = Time to open the parachute $$H_{CM} = V_0 \cdot t_p \cdot 0.7$$
Contingency volume: H_{CV}	$$H_{CV} = H_{FV} + H_{AM} + H_R + H_{CM}$$
Examples	
Height of flight volume	$$H_{FV} = 100\text{m}$$
Example multirotor: $V_0 = 10\frac{m}{s}$	$$H_{CV} = 100m + 1m + 7m + \frac{1}{2} \cdot \frac{\left(10\frac{m}{s}\right)^2}{9.81\frac{m}{s^2}} = 113.1m$$
Example fixed-wing a/c: $V_0 = 30\frac{m}{s}$	$$H_{CV} = 100m + 1m + 21m + \frac{\left(30\frac{m}{s}\right)^2}{9{,}81\frac{m}{s^2}} \cdot 0.3$$ $$= 149.52m$$

Table A.4 - Ground Risk Buffer Calculations

GRB horizontal	
Simplified approach: 1:1 rule: S_{GRB}	$$S_{GRB} = H_{CV} + \frac{1}{2}CD$$
Ballistic approach: S_{GRB} Note: Only permitted for rotorcraft and multirotor.	$$S_{GRB} = V_0\sqrt{\frac{2H_{CV}}{g}} + \frac{1}{2}CD$$
Termination with parachute: SGRB Note: Values below $V_{Wind} = 3\frac{m}{s}$ are not considered realistic for this computation.	t_{P} = Time to open the parachute From the rate of descent with the parachute open (Vz) and the maximum permissible wind speed for operation (V_{Wind}) results. $$S_{GRB} = V_0 t_P + V_{Wind}\frac{H_{CV}}{V_Z}$$
Termination with fixed-wing aircraft: S_{GRB}	Power is switched off: A glide ratio of $E = \frac{1}{\varepsilon} = \frac{C_L}{C_D}$ results in $$S_{GRB} = E\ H_{CV}$$ Power is switched off and the flight control surfaces are permanently set in a way that no gliding is possible: The simplified approach can be chosen (1:1 rule).
Examples	
Simplified approach: Multirotor: $V_0 = 10\frac{m}{s}, CD = 1.5m$, $H_{CV} = 113.1m$	$$S_{GRB} = 113.1m + \frac{1}{2}\cdot 1.5m = 113.85m$$
Ballistic approach: Multirotor: $V_0 = 30\frac{m}{s}, CD =$ $1.5m, H_{CV} = 113.1m$	$$S_{GRB} = 10\frac{m}{s}\sqrt{\frac{2\cdot 113.1m}{9.81\frac{m}{s^2}}} + \frac{1}{2}\cdot 1.5m = 48.77$$
Fixed-wing aircraft only power is s witched off:	$$E = 20$$ $$S_{GRB} = 149.52m \cdot 20 = 2990.4m$$

$V_0 = 30\frac{m}{s}, CD = 3m\ H_{CV} = 149.52m$	
Fixed-wing aircraft power is switched off and flight control surfaces set so that no gliding is possible: $V_0 = 30\frac{m}{s}, CD = 3m\ H_{CV} = 149.52m$	$S_{GRB} = 149.52m + \frac{1}{2} \cdot 3m = 151.02m$
GRB vertical – not applicable	

Determining the maximum VLOS and BVLOS distances

A.23 When determining the operating range for Visual Line of Sight (VLOS) operations, the remote pilot must be able to maintain continuous unaided visual contact with the UA, and be able to detect its position, orientation, and intended flight path. This is to ensure effective situational awareness and control of the UA, including the ability to take action in response to any potential air or ground risk.

A.24 The maximum VLOS distance is dependent on environmental conditions, UA size, and visibility limitations and must be determined during flight planning and verified prior to the operation taking place.

A.25 The operator must determine if the operation is VLOS or BVLOS using the following calculations.

A.26 When an applicant claims VLOS as a tactical mitigation, it must deliver the mitigation performance required.

Table A.5 - Definitions for calculating distances

Definitions	
VLOS limit	The maximum possible VLOS distance between remote pilot or observer and UA results from the smaller value of ALOS and DLOS. Anything beyond that is considered BVLOS.
ALOS	**Attitude Line of Sight** The attitude line of sight defines the maximum distance up to which a remote pilot can detect the position and orientation of the UA. Up to this limit, the remote pilot is able to control the

	flight path of the UA and is able to determine the attitude and position of the UA. Note: ALOS is only dependant on UA size and not the weather.
DLOS	**Detection Line of Sight** The detection line of sight defines the distance up to which other aircraft can be visually detected, and sufficient time is available for an avoidance manoeuvre. The ground visibility is crucial for this. Note: The detection range may not be the same in all directions due to possible visual obstructions.
GV	**Ground Visibility** The ground visibility depends on the operational area and the meteorological conditions and should be determined at the time of operation. The procedure for precisely determining ground visibility should be described in the operations manual. The use of ground references or the use of a transmissometer or similar device are possible. The maximum ground visibility to be assumed is 5km, analogue to the visibility according to the VFR rules in Class G airspace.

ALOS limit	**For rotorcraft and multirotor:** $ALOS_{max} = 327 \cdot CD + 20m$ **For fixed-wing aircraft:** $ALOS_{max} = 490 \cdot CD + 30m$
DLOS limit	$DLOS_{max} = 0{,}3 \cdot GV$ GV depends on the actual ground visibility at site and time of operation. However, it always applies: $GV_{max} = 5km$

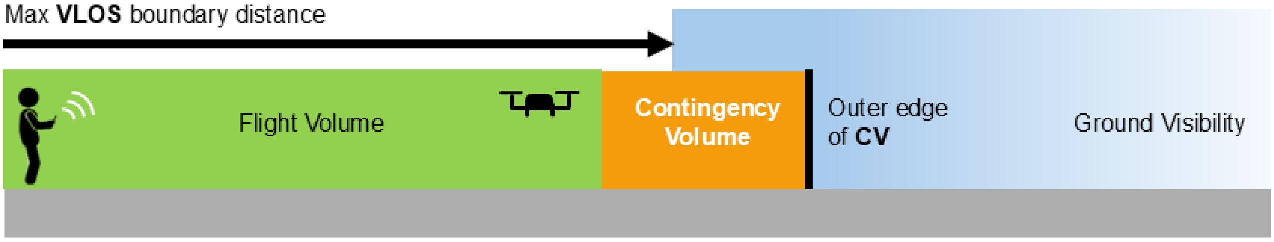
A.27 To ensure compliance with VLOS requirements;

(i) the operator must verify that the outer limit of the planned operation is within the VLOS boundary;

(ii) the remote pilot must maintain VLOS at all times during the flights.

A.28 Figure A.3 below illustrates the maximum VLOS boundary distance falls short of the outer edge of the contingency volume. The operation must take place in BVLOS.

Figure A.3 – Example VLOS operation cannot take place



A.29 The following table is valid for a ground visibility of 5km or more.

Table A.6 - Example maximum VLOS distances

Maximum VLOS distance calculations		
Maximum UA Characteristic Dimension (CD)	**Maximum VLOS distance**	
	Multi-rotor	**Fixed-wing**
<=1m	347m	520m
<=2m	674m	1010m
<=3m	1000m	1500m
<=3.5m	1164.5m	1500m
<=4 m	1328m	1500m
<=4.53m	1500m	1500m
> 4.53m	1500m	1500m

A.30 Figure A.4 and A.5 illustrate how VLOS operational distances for Rotorcraft and Fixed-wing UA are affected by ground visibility, UA size, and the RP's ability to detect and maintain visual contact with the UA. The illustrations are divided into three scenarios, each showing different visibility conditions and the resulting VLOS range.

A.31 For a Rotorcraft UA with a ground visibility of only 100m, the VLOS boundary is reduced to 30m with a maximum DLOS capability of 60m. ALOS at 200m is not achievable due to ground visibility.

Figure A.4 – Rotorcraft & Multi-rotor VLOS range

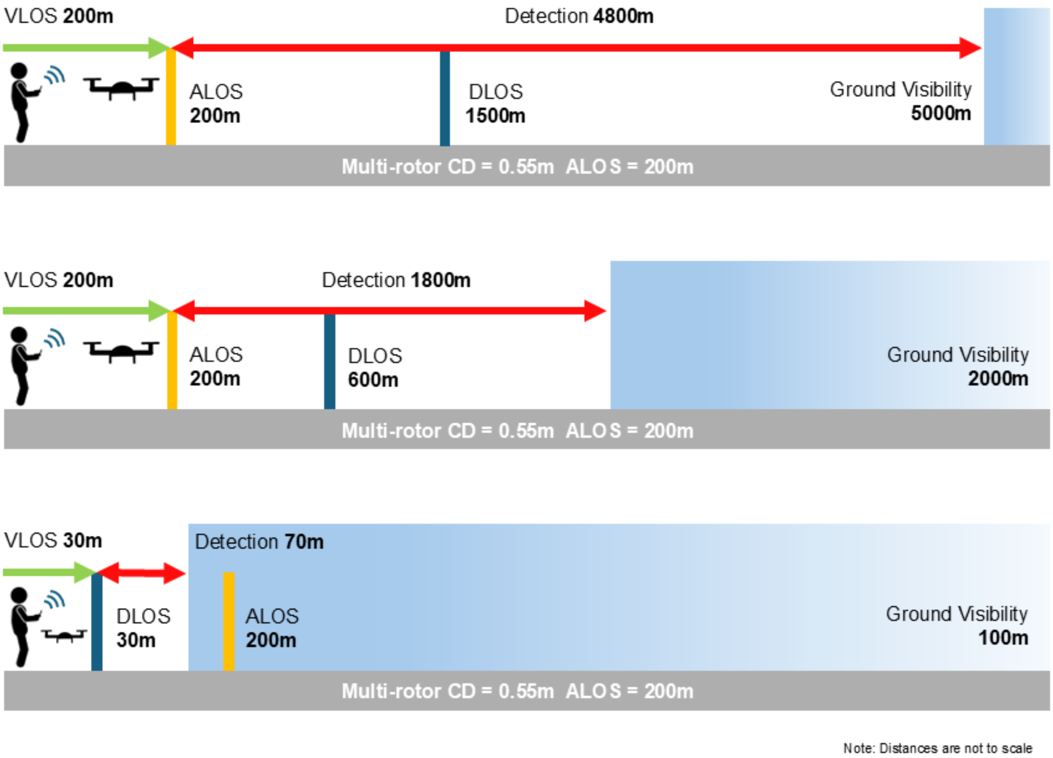
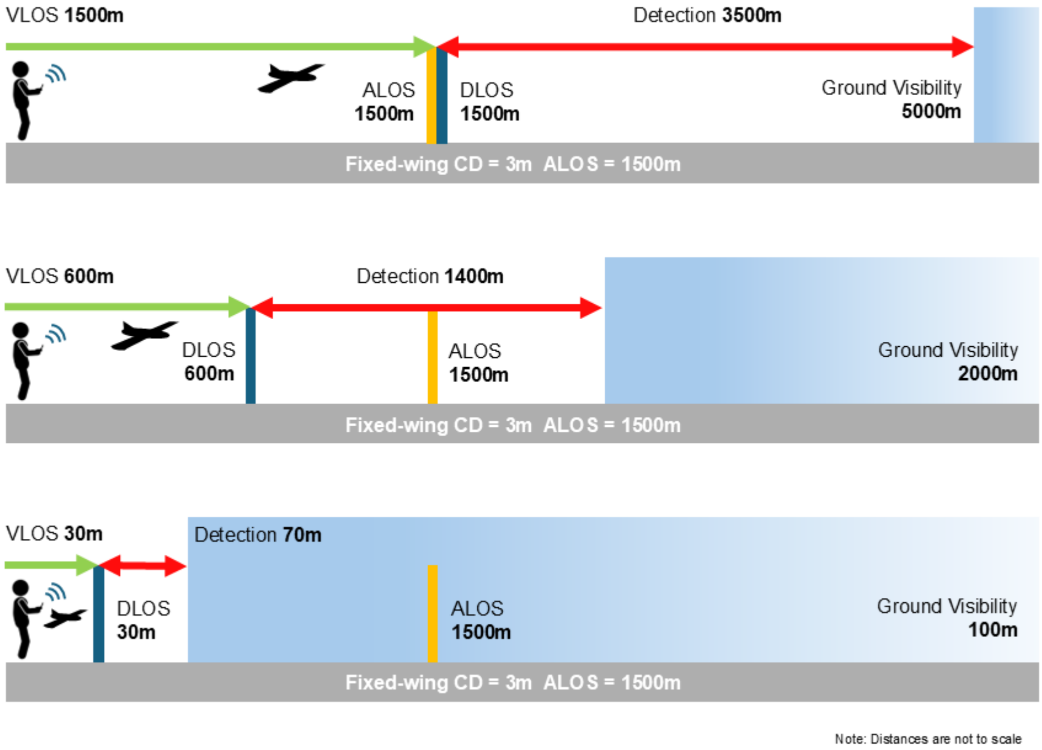


Figure A.5 – Fixed-wing VLOS range



Operations with reduced maximum speed

A.32 UK SORA defines **Maximum Speed** as the maximum possible airspeed the UA may achieve, as specified by its Designer.

A.33 An applicant may propose an operational maximum speed to reduce the intrinsic Ground Risk Class (iGRC) using software-enforced speed limitations or by mechanical restriction.

A.34 The UAS designer should specify the maximum achievable airspeeds of the UA and be described in the designer's technical documentation.

A.35 The operator may claim a lower operational speed limitation provided that the following process is followed:

(i) the configuration and procedure to select a reduced maximum speed is clearly stated in the designer's technical manuals and documentation;

(ii) the operator has a documented procedure for configuring and verifying the UA's maximum speed limitation for the specific operation;

(iii) the configuration or mode associated with the lower speed is selected, and controlled prior to take-off;

(iv) the UA will maintain the selected speed in the relevant configuration throughout the operation.

(v) the operator has developed relevant procedures in their operations manual in case of failure of the reduced maximum speed restriction.

A.36 Applicants should note that the CAA may request further compliance evidence to verify the robustness of the system and procedures used to limit the UA's operational speed.

Using the UK SORA annexes

A.37 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 A.7 - 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

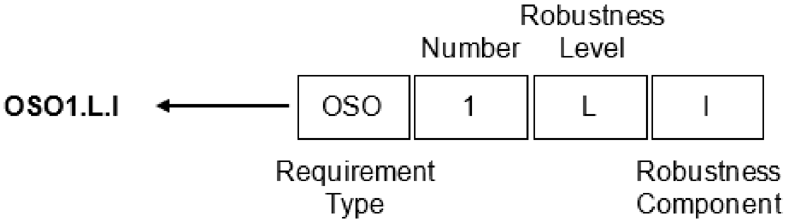
Level of assurance

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

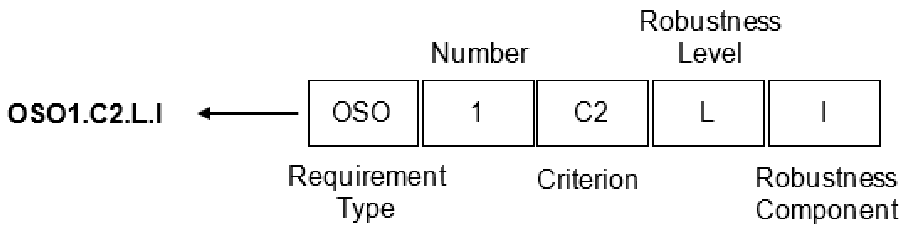
A.38 All UK SORA requirements have a requirement code, which may be used to find AMC and GM. Figure 7 shows an example of a requirement code for SAIL 2 at low integrity with a single criterion.

Figure A.5 - Requirement codes single criterion



A.39 Some requirements have several criteria, this is displayed after the requirement number, prefixed by the letter C for example C2 shown below in figure A.6.

Figure A.6 - Requirement codes multiple criterion



Using the reference system

Integrity requirements

A.40 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

A.41 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

A.42 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

A.43 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

A.44 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

A.45 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**

A.46 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

Introduction

B.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.

B.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".

B.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.

B.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.

B.5 Annex B mitigations are primarily applied to the operational volume and ground risk buffer.

B.6 The GRC may not be lowered to a value less than the corresponding value for a controlled ground area.

B.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.

B.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

M1A Sheltering – Level of integrity

Criterion	Low	Medium	1. 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	2. 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~~ should 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

(a) The applicant **must** use a UA that is not expected to penetrate structures and ~~fatally~~ significantly injure people under the shelter.

(b) The applicant must conduct a penetration analysis.

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.~~

The applicant must submit a declaration of compliance that the UA has a kinetic energy at terminal velocity and max operating weight of less than or equal to 175 J.

OR

For a UA with a kinetic energy at terminal velocity and max operating weight above 175J, the applicant must provide compliance evidence that the required level of integrity is achieved.

For a UA over 175J and below 7000J:

a. Compliance evidence is a penetration analysis report.

For a UA equal to or greater than 7000J:

a. Compliance evidence is a penetration analysis report.

Additional evidence to show compliance with the integrity requirements.

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**

To avoid double counting, M1(A) medium robustness mitigations may not be combined with any M1(B) mitigations.

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, compared to the low level of robustness.

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.

AMC.M1A.C2.L.I

An applicant using a UA with a kinetic energy at terminal velocity of less than or equal to 175 J will be deemed to meet the penetration hazard requirement.

OR

For a UA with a kinetic energy at terminal velocity and max operating weight above 175J.

(a) For a UA over 175J and below 7000J, a penetration analysis must be conducted.

(b) For UA equal to or greater than 7000J a penetration analysis must be conducted, and additional evidence must be provided. The additional evidence must take into consideration secondary fires due to leakage of propulsion fuel. It should evaluate the sheltering provided by automotive vehicles in the operating volume. For battery powered UA, the battery must be designed to a standard acceptable to the CAA. The battery design should take into consideration the effects of collision and the risk of a secondary fire due to battery disintegration from its packaging or assembly should be minimised.

The method to conduct a penetration analysis is described below.

Calculation of the UA Kinetic energy

To determine the UA's kinetic energy, the applicant should take into consideration the terminal velocity of the UA. The frontal area of a UA is the cross-sectional area projected on a plane perpendicular to the direction of travel of the UA. The applicant may use table B1 and interpolate where necessary to calculate the frontal area or the applicant may provide the frontal area using CAD data.

The terminal velocity of a UA maybe computed in two ways.

(a) The applicant may determine the terminal velocity using a drop test. A drop test should be conducted from at least 80m from the measurement point and a high-speed camera capable of recording 250 frames per second should be used. The measurement setup should be appropriate with a reference of time and distance. The UA should be configured to its maximum operating weight.

(b) The applicant may calculate the terminal velocity using equation B1.

$$V_{termUA} = \sqrt[2]{\frac{2mg}{C_d \rho A_f}} \qquad (B1)$$

Where

V_{termUA} = Terminal velocity of the UA (m/s)

m = Maximum operating weight of UA (kg)

A_f = frontal area of UA (m^2) (refer to table B1)

ρ = Density of air at sea level (kg/m^3) (assumed to be 1.225 kg/m^3)

C_d = Drag coefficient (assumed to be 0.8)

g = acceleration due to gravity (assumed to be 9.8 m/s^2)

To calculate the kinetic energy of the UA at its terminal velocity, the equation B2 should be used.

$$KE_{UA_{term}} = \frac{mV_{termUA}^2}{2} \qquad (B2)$$

Penetration analysis: **UA with $KE_{UA_{term}}$ <= 175 J**

No penetration analysis is required for UA with $KE_{UA_{term}}$ **<= 175 J**. It will be assumed that the UA cannot penetrate any shelter.

Penetration analysis: UA with 175 J < $KE_{UA_{term}}$ < 7000 J

The applicant should determine the net kinetic energy of a UA impact into a structure. Each structure has an absorption energy which is listed in the table B4. The resulting kinetic energy is calculated using equation B3. If the net kinetic energy (KE_{net}) is negative, the applicant should conclude that the UA will not penetrate that structure. The applicant should conduct the penetration analysis for all the types of structures in their operational volume. The analysis should be conducted for both rooftop and side wall penetration. For structures not included in the table, reasonable assumptions for their absorption KE can be made using the existing data.

$$KE_{net} = KE_{UA_{term}} - KE_{absorbed} \qquad (B3)$$

$$KE_{absorbed} = \frac{A_{UA\,frontal}}{A_{scalar\,constant}} * \Delta KE_{struct_{abs}} \qquad (B4)$$

$$A_{scalar\,constant} = 0.005\,m^2$$

Wingspan (m)	1	3	8	20	40

Frontal area (m^2) $A_{UA\ frontal}$	0.1	0.5	2.5	12.5	25

Table B 1

Roof type	**KE absorbed by roof (J)** $\Delta KE_{struct_{abs}}$
4 inch Reinforced concrete	13550
14 inch reinforced concrete	271000
Plywood/Wood Joist (2x10 at 16 inch)	68
Gypsum/Steel Joist	34
Plywood Panelized (2x6 at 24 inch)	68
2 inch Lightweight Concrete/Steel Deck and Joists	2710
Medium steel panel (18 gauge)	2033
Light steel panel (22 gauge)	1355
Steel (automobile)	271
No roof	0

Table B 2

Wall Type	**KE absorbed by wall (J)**
Steel sliding (22 gauge)	1355
8inch Unreinforced CMU (concrete masonry unit)	678
8 inch Reinforced CMU	678
8 inch Reinforced Concrete	67750
14 inch Reinforced Concrete	271000
6 inch Reinforced Concrete Tilt up	50813
1/2 in Plywood siding	136
8 inch Unreinforced brick	13550

Steel (automotive doors)	1355
No walls	0

Table B 3

Type of building	Representative Wall	Representative roof
UK residential home clay or slate tiled roof, non-flat	8 inch unreinforced brick	Plywood Panelised
UK residential home (built pre 1950 but post 1900)	8 inch CMU	Steel Joist
Caravan/Trailer/Temporary office trailer	½ inch Plywood siding	Steel Joist
Small commercial buildings and public buildings like hospitals, council buildings	6inch reinforced concrete	2 inch light weight concrete or steel deck
Large apartment complex / large commercial buildings	8inch reinforced concrete	22 gauge steel roof with 3 inch to 14 inch concrete
Warehouses	Steel sliding	Light steel panel
Village houses constructed before 19th century	½ inch plywood sliding	Gypsum
Wooden houses	½ inch plywood sliding	Plywood Panelized
Festival and/or concert tents (indoor)	No walls	Gypsum or lower
Glass roofing (conservatories)	½ inch plywood sliding or lower	Gypsum or lower

Table B 4

Penetration analysis: UA with a $KE_{UA_{term}}$ >= 7000 J

The applicant should conduct the penetration analysis that is applicable for UA with 175 J < $KE_{UA_{term}}$ < 7000 J

In addition to the penetration analysis, the applicant should ensure the following additional criteria when evaluating the penetration hazard:

(i) The penetration analysis report considers sheltering due to vehicles in the operational volume.

(ii) A simulation study (example via FEA (Finite Element Analysis) or dynamic modelling) of an impact on the highest KE_{net} structure.

(iii) If the UA is powered by propulsion fuel (other than batteries), an analysis showing that any impact on a structure does not create secondary fires due to the propulsion fuel.

(iv) If the UA is powered by a battery, evidence showing that the battery pack is designed to a recognised industry standard (such as IEC62133 or UL1642 or UN 38.3). The applicant should provide evidence to ensure that the battery pack is integrated into the UA in a way that minimises battery fires due to impact on a structure (An example can be that the battery and payload are surrounded by energy absorbing material).

(v) Any impact on a structure should not result in any additional hazards such as disintegration of battery or payload from UA.

(vi) If any UA results in penetration of a structure, it should have a maximum probability of 30% of causing an injury of greater than or equal to AIS 3 to uninvolved people.

GM1 Article 11 Annex B. M1A Strategic mitigation – sheltering

~~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%.

(b) 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.

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).~~

A structure is anything which can enclose people partially or completely. Structures include but are not limited to concrete or glass buildings, tents, caravans, steel warehouses and automotive vehicles. A structure is penetrated by a UA if the UA interacts with the structure in a way results in immediate danger to uninvolved people in or under the structure.

The objective of the sheltering mitigation is to ensure that any uninvolved people are protected from the operation by being present inside a structure that the UA cannot penetrate. The ASSURE UAS Ground collision severity Evaluation A4 report extensively covers the various methods by which penetration could occur in a structure. It also discusses the potential secondary effects of an impact of a UA on a structure. A significant amount of AMC.M1A.C2.L.I utilises the work done by the A4 and A14 ASSURE report while making assumptions where applicable.

For UA with 175 J < $KE_{UA_{term}}$ < 7000 J, a simple penetration analysis report is deemed suitable to claim the penetration hazard requirement of sheltering. To perform the penetration analysis, the applicant should identify the structures in their operational volume, take best match values from the tables provided and calculate the resultant kinetic energy due to an impact. If this resultant kinetic energy is negative, then there is a low probability for that UA to penetrate that structure. To identify the various structures in their operational volume, the applicant may use sources such as google street maps and/or satellite imaging to identify the type of structures in their operational volume. If the applicant determines that a structure in their operational volume is not represented by table B4, they may provide alternate representative values to the structure's $KE_{absorbed}$.

For UA with $KE_{UA_{term}}$ >= 7000 J, additional risks are presented due to the kinetic energy impact of the UA which have a higher probability of penetrating some structures and therefore secondary considerations are added to ensure that any penetration does not result in significant injuries to uninvolved people. For these UA, the applicant needs to demonstrate that their battery is designed to a recognised standard that also tests impact condition of the battery pack. If the UA is using a propulsion fuel other than batteries, then its impact is also to be considered in the penetration analysis.

In addition, any debris from the penetration injuring uninvolved people is also to be considered. A significant injury is when a UA impact has more than 30% probability of causing an AIS 3 (Abbreviated Injury Scale) and above injury. The ASSURE UAS Ground collision severity Evaluation A4 report defines AIS 3 injuries are defined as any injury that requires hospitalisation or causes loss of consciousness. Below table from ASSURE UAS Ground collision severity Evaluation A4 (https://assureuas.com/wp-content/uploads/2021/06/A4-Final-Report.pdf) report provides a rough guideline of various human injuries and their equivalent AIS rating. The AIS method of defining an injury is taken from the automotive industry, which uses the study AIS 2005: a contemporary injury scale (https://pubmed.ncbi.nlm.nih.gov/17092503/) as its reference.

Body Part	Injury	AIS Rating
Head	Penetrating Injury - Superficial; ≤ 2cm beneath the entrance	AIS 2
	Laceration resulting in blood loss of > 20% by volume	AIS 3
	Total scalp loss or blood loss of > 20% by volume	AIS 3
	Severing of the Optic Nerve	AIS 2
	Severing of the Facial Nerve	AIS 3
Brain	Superficial cerebellum contusions ≤ 15cc; 1-3 cm	< AIS 3
	Concussive Injury Loss of Consciousness 1-6 hours	AIS 3
	All other concussions	AIS 2
Face	Penetrating Injury; with blood loss > 25 cm^2	AIS 2
	Penetrating Injury with blood loss 20% by volume	AIS 3
	Massive destruction of whole face including both eyes	AIS 4
	Complete separation of the facial bones from their cranial attachments or any injury resulting in blood loss > 20% by volume	AIS 3
Neck	Penetrating Injury with blood loss 20% by volume	AIS 3
	Bilateral laceration of the Carotid Artery	AIS 3
Upper Limbs	Single amputation at the shoulder	AIS 4
	Amputation of a single hand, partial of complete	AIS 2
	Amputation of the thumb	AIS 2
	Amputation of other fingers, single or multiple	AIS 1

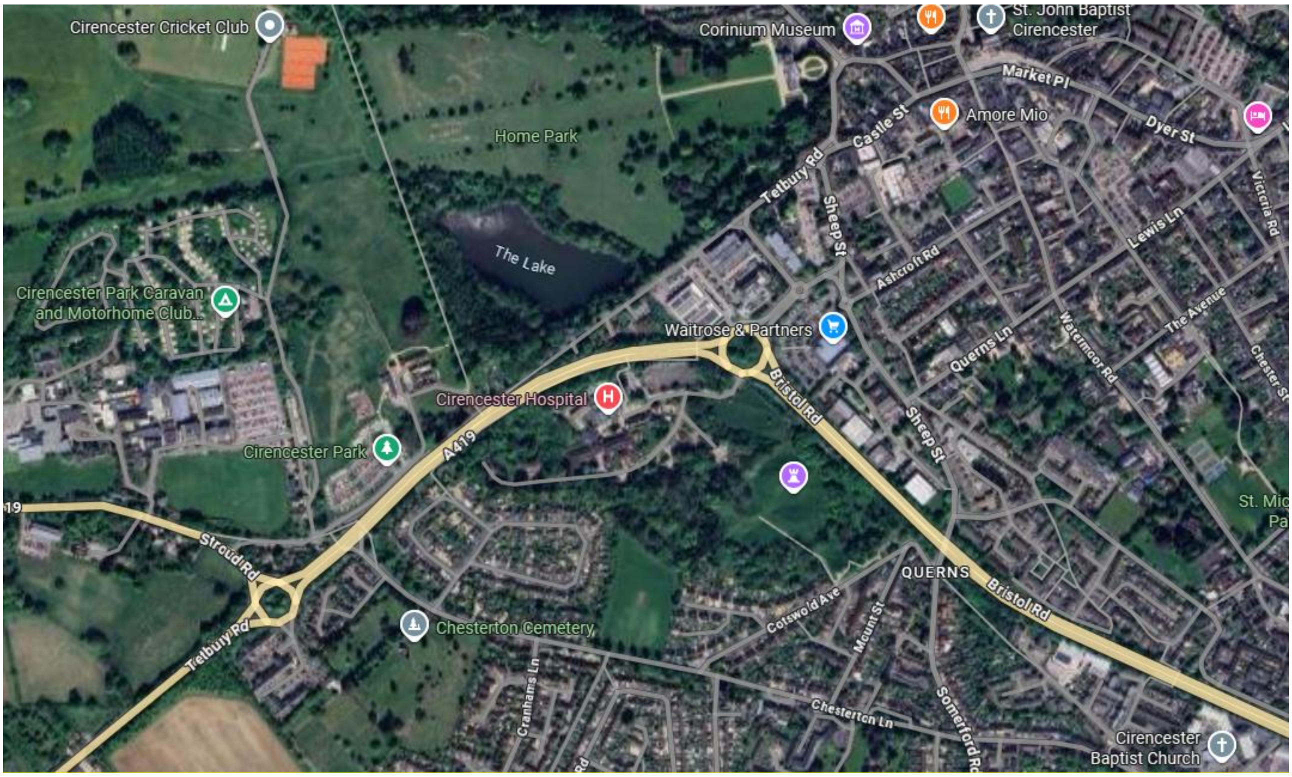
Table B 5

Example of a penetration analysis

An applicant has chosen a multi-rotor UA with frontal area of 0.76m^2 with an operating weight of 16kg. They choose their operational environment to be around Cirencester in the Cotswolds.

They calculate their kinetic energy at terminal velocity to be approximately 20 m/s and kinetic energy of the UA as 3368J. They should meet the requirement of a UA < 7000J.

By using a satellite image of Cirencester, they identify that the town has some new residential buildings, some listed heritage buildings, supermarkets, caravan park, sports leisure clubs, churches and a hospital.



They proceed to list the type of unique structures in their operational volume. For each unique structure, they identify from table B4 and approximate to the best matched roof and wall for such structures. The applicant calculates the $\Delta KE_{struct_{abs}}$ for each structure in their operational volume. Using the $\Delta KE_{struct_{abs}}$ for each structure, the applicant proceeds to calculate the KE_{net} for each structure. If the KE_{net} for any structure identified in the Cirencester operational volume is positive, then the applicant cannot claim sheltering for this operation.

Below is a non-exhaustive list of buildings in the operational volume and the values used for the KE absorbed by the wall and roof and the net KE for their UA. The penetration analysis in this case demonstrates that the UA cannot penetrate any structures in this operational volume.

Type of building in OV	$\Delta KE_{struct_{abs}}$ absorbed by roof (J)	$\Delta KE_{struct_{abs}}$ absorbed by wall (J)	KE_{net} (J) roof	KE_{net} (J) wall

UK residential home clay tiled roof, non-flat	68	13550	-6968	-2056232
Caravan park	34	136	-1800	-17304
UK residential home (built pre 1950)	34	678	-1800	-99688
Supermarket, restaurants	2710	50813	-408552	-7720208
Small commercial buildings including hospitals	2710	50813	-408552	-7720208
Church	34	136	-1800	-17304

~~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

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.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

Criterion	Low	Medium	High
Criterion 2 (Impact on at risk population)	Not applicable	M1B.C2.M.A	M1B.C2.M.A

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 on 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.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 at risk 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 at risk population

No additional requirements

GM1 Article 11 Annex B. M1B Strategic mitigation using operational restrictions

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

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.

AMC1.M1C.C2.L.I

If ground observation is achieved using a camera or any other optical image sensor onboard the UA, then such a device should be able to detect people with a certain level of accuracy (example of 25 PPM (pixels per meter)) . The applicant may choose a camera designed using principles of BS EN 62676-4:2015 or ISO/TS 19159-4:2022, although the camera does not require to be certified to that standard. The applicant should ensure that the camera is able to detect people at the level of accuracy required from their operating height with suitable safety margin. If any additional algorithms are used to process the data from a camera to perform ground observation, testing evidence of those algorithms should be provided.

If ground observation is achieved using a LiDAR sensor onboard the UA, then the LiDAR sensor should be designed using the principles of ISO/TS 19159-4:2022 or IEC 61496-1 or any other equivalent standard. An automotive qualified LiDAR sensor may be used if its resolution is suitable to detect people on the ground from the operating height. If any additional algorithms are used to process the data from a camera to perform ground observation, testing evidence of those algorithms should be provided.

If ground observation is achieved using any other technology, appropriate industry standards for such technology should be used by the applicant,

If the applicant claims a M1A or M1B mitigation where they restrict operating hours, they should ensure that the sensor device used is suitable to operate at the required accuracy in those operating hours.

AMC1.M1C.C2.LA

The applicant should also provide contingency measures to perform ground observation in case of failure or malfunction of a sensor where it is no longer able to detect people at the required level of detail or accuracy. Some reasons for malfunction could be dirt, rain, wind or low light environments. The applicant should also provide any maintenance (such as but not limited to re-calibration, checking of functioning, cleaning) and operational requirements for the sensors used. The applicant should check functioning of the sensor prior to each flight and confirm its working. Any steps that are required to check such functioning should be added to the flight manual.

GM1 Article 11 Annex B. M1C Tactical Mitigations – Ground observation

GM.M1C

M1(C) mitigation is a tactical mitigation where the remote crew, UAS, or external 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.

The remote crew or system may use a variety of devices or sensors to detect uninvolved people in the operational volume. Such devices or sensors may be designed to an industry standard with a certain level of accuracy to detect people. If there is any post processing of data and any algorithms used in the detection of people, it is important that such algorithms are shown to be accurate and developed with suitable software development processes in place. Applicants may refer to ASTM F3201-24 for more guidance on organisational requirements for developing software.

Environmental conditions play a major role in the efficiency of technical solutions to detect people. Various studies have shown that LiDAR sensors are sensitive to environmental effects such as rain, hail, humidity and dust. Laser signals from LiDAR sensors get absorbed by rain, dust and cause inaccuracies. Applicants are advised to take these into consideration when integrating LiDAR sensors onto the UA. Similar considerations are to be made when using a camera or other optical image sensors.

M2 – Effects of UA impact dynamics are reduced

AMC1 Article 11 Annex B. M2 Effects of UA impact dynamics are reduced

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	Low	Medium	High
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 applicable	M2.C3.M.A	M2.C3.M.A

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.

(d) In case of crash of the UA, the probability of an uninvolved person suffering an injury equal to or greater than AIS 3 (Abbreviated Injury Scale) must be below 30%.

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 suitably qualified. ~~for the task~~

(c) The applicant must have developed a training syllabus which must be competency based.

(d) The operator must provide competency-based, theoretical, and practical training for the remote crew.

(e) Personnel responsible for installation and maintenance of the mitigation measures must have completed relevant training.

M2.C1.M.A

Criterion 1 – Technical design

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements including suitable evidence of measures that reduce the impact dynamics of a UA crash and measures that reduce the post impact hazards of a UA crash.

(b) If compliance evidence is provided through simulation, both the simulation and assumptions made must be representative of a real operational scenario.

~~(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 maintenance and/or operational procedures **must** be demonstrated as relevant and sufficient through either flight testing, ground testing or simulation methods: ~~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

Criterion 3 – Training

~~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.~~

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements.

AMC.M2.C1.M.I

Criterion 1 – Technical design

(a) A UA with a Kinetic energy at terminal velocity ($KE_{UA_{term}}$) or maximum operational velocity (whichever higher) of less than or equal to 175 J will be deemed to comply with M2.C1.M.I.

(b) Any M2 mitigation used to reduce the impact dynamics or post impact hazards should ensure (via simulation and/or testing or operational experience) that it achieves a 90% reduction in lethality when compared to a UAS operation without medium M2 mitigation. (i.e. probability of a fatality should be 10% of the original probability after applying M2 medium).

(c) To comply with M2.C1.M.I (a), the applicant should use one or many of the following methods below to show compliance:

(i) If a parachute is used to reduce UA impact dynamics via the reduction of critical area and/or post impact hazards, it should be designed to *ASTM F3322-22: Standard Specification for Small Unmanned Aircraft System (sUAS) Parachutes* or any other equivalent industry standard. For UA <=25kg and < 3m wingspan, a parachute designed and tested under ASTM F3322-22, with a net velocity (parachute descent rate velocity minus wind velocity) of < 10 m/s will be deemed to show compliance.

(ii) If reduction of critical area of UA is used to show compliance, the critical area after applying M2 mitigation should be calculated using the method below. If the calculated critical area is less than or equal to the column left of the nominal critical area allowed for a particular UA wingspan length as per table B6, it is deemed to show compliance. If the applicant wishes to propose an alternate method to calculate critical area, they should provide suitable evidence to ensure its accuracy and relevance. For a UA with a wingspan <= 1m, the critical area limit is $0.8m^2$.

Examples: For a UA with WS of 3.5m, the applicant should ensure that the critical area after M2 mitigation is less than or equal to $80m^2$. For a UA with WS of 1m, the applicant should ensure that the critical area after M2 mitigation is less than or equal to $0.8m^2$.

UA Wingspan (WS) (m)	WS <=1m	1<WS<=3	3<WS<=8	8<WS<=20	20<WS<=40
Nominal Critical Area (m^2)	8	80	800	8000	80000

Table B 6

The critical area of a UA should be calculated using the following method.

For UA wingspan dimension (WS) WS<=1m

$$A_c = 2r_D\left(d_{glide}\right) + \pi r_D^2$$

$$v_{non\_lethal} = \sqrt[2]{\frac{2KE_{non-lethal}}{m}}$$

$$t_{safe} = \frac{v_{non\_lethal} - ev_{horizontal}}{-C_g g}$$

$$v_{horizontal} = \mathrm{v}\cos\theta$$

$$r_D = r_{person} + \frac{w}{2}$$

For UA wingspan dimension (WS) 1m<WS<=8m

$$A_c = 2r_D\left(d_{glide} + d_{slide\_reduced}\right) + \pi r_D^2$$

$$v_{non\_lethal} = \sqrt[2]{\frac{2KE_{non-lethal}}{m}}$$

$$t_{safe} = \frac{v_{non\_lethal} - ev_{horizontal}}{-C_g g}$$

$$d_{slide\_reduced} = ev_{horizontal}t_{safe} - \frac{1}{2}C_g g t_{safe}^2$$

$$v_{horizontal} = \mathrm{v}\cos\theta$$

$$r_D = r_{person} + \frac{w}{2}$$

Parameters used in the calculation of Critical area

r_{person}	Radius of a person	0.3 m
h_{person}	Height of a person	1.8 m
e	Coefficient of restitution	0.65
θ	Angle of impact	35
C_g	Coefficient of friction	0.75
g	Gravitational acceleration	9.8 m/s^2
	Non-lethal kinetic energy limit	175 J
π	Pi	3.1415
d_{glide}	Glide distance	2.57 m
v	Max velocity of UA	m/s
m	Maximum take off weight of UA	kg
g	Gravitational acceleration	9.8 m/s2

Table B 7

1. The parameters in table B7 are standard values used in the computation of critical area for a UA. The applicant may propose different values to those parameters but should substantiate with suitable evidence. For example, the applicant may have a stall feature enabled to satisfy M2 mitigation which may create a higher impact angle. They should be able to ensure it by testing and/or simulation. They may then be able to use that impact angle in their critical area calculation.
2. If the UA contains a propulsion fuel other than batteries, the critical area should consider secondary effects due to the fuel (example: explosion, deflagration).
3. An applicant may claim a reduced critical area if they are able to demonstrate any valid reason (such as but not limited to sheltering). In case of reduced critical area claims, the applicant should ensure it in their operating environment with the help of testing and/or simulation. If the applicant has claimed applicable M1A mitigation, they may apply a sheltering factor of 0.6 to their critical area calculation.

(iii) Reduction of post impact hazards may be ensured for a UA <= 25kg MTOW using a solution (example frangible UA) designed and tested to ASTM F3389/F3389M − 21 Standard Test Method for Assessing the Safety of Small Unmanned Aircraft Impacts or any other equivalent industry standard. Method A of ASTM FF3389M-21 is not applicable.

(d) To comply with M2.C1.M.I (b), the applicant should use the following methods below to show compliance.

(i) If a flight termination system (FTS) is used, the applicant should ensure that it is designed to an appropriate industry standard and its reliability to meet the M2 mitigation probability ensured. Applicants may use BS EN 4709-006 (currently in draft stage) or any other equivalent industry standard to design a FTS. A FTS designed to meet low robustness containment COR.L is deemed to show compliance.

(ii) If any other system is used in the UAS as part of a M2 mitigation, the applicant should ensure that it is designed to an appropriate industry standard and its reliability to meet the M2 mitigation probability ensured.

(e) The applicant should use the following methods below to show compliance with M2.C1.M.I (c).

(i) Mitigated SAIL I compliance is assumed met without further evidence required.

(ii) For mitigated SAIL II and above:

1. A safety assessment of the mitigation and its impact on the UAS should be conducted using an appropriate industry standard. The applicant may use *F3309/F3309M − 24a Standard Practice for Simplified Safety Assessment of Systems and Equipment in Small Aircraft and/or ED-280 Guidelines for UAS Safety Analysis for the Specific Category.*. In addition, the applicant may also use *ED-279 Generic Functional Hazard Assessment (FHA) for UAS* to identify hazards that lead to UAS loss of control in case of failure of M2 mitigation.

2. The applicant should ensure that any failure of the M2 mitigation does not reduce the reliability of the UAS ensured in other requirements and OSOs.

(f) The applicant should use any of the following methods below to show compliance with M2.C1.M.I (d).

(i) The maximum transferred energy to an uninvolved person upon impact should be <= 80 J or the kinetic energy of the UA prior to impact should be equal to or lower than 175 J after applying M2 mitigation.

(ii) By using methods in AMC.M2.C1.M.I (a) (iv), the applicant should ensure that post impact hazard is <30% of causing an AIS3+ injury to an uninvolved person.

AMC.M2.C1.M.A

(a) If the applicant meets the integrity requirements by using a UA with a kinetic energy at max velocity or terminal velocity (whichever higher) of <=175J, they should submit a declaration stating that their UA is within the kinetic energy requirements. If the applicant meets the integrity requirements by using a parachute, they should submit a declaration that the parachute is designed to an appropriate industry standard and provide the associated evidence which will be evaluated by the CAA.

(b) If the applicant meets the integrity requirements by reduction of critical area, they should provide the associated evidence for the claim of reduction, which will be evaluated by the CAA

(c) If the applicant meets the integrity requirements by crashworthiness testing of the UA and demonstrating its reduction in post impact hazards, they should submit a declaration that such testing is conducted to an appropriate industry standard and provide the associated evidence which will be evaluated by the CAA.

(d) If an FTS is used as part of the M2 mitigation, the applicant should provide a declaration that it is designed and tested to an appropriate industry standard and provide the associated evidence which will be evaluated by the CAA.

(e) The applicant should submit a report of their safety assessment and/or functional hazard analysis conducted for the M2 mitigation which will be evaluated by the CAA.

~~(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.I

Criterion 2 – Procedures

The applicant should develop steps in the appropriate operations manual and/or flight manual and maintenance manual for the proposed M2 mitigation.

~~AMC.M2.C2.M.A~~

~~Criterion 2 – Procedures~~

~~(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 316 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.

(c) No single failure should lead simultaneously to the loss of control of the operation and loss of the effectiveness of the M2 mitigation.

M2.C2.H.I

Criterion 2 – Procedures

~~No additional requirements.~~

The flight tests performed to validate the procedures **must** cover the entire flight envelope or be ensured to be conservative.

M2.C3.H.I

Criterion 3 – Training

No additional requirements.

M2.C1.H.A

Criterion 1 – Technical design

The Applicant **must** provide evidence of compliance with the Integrity requirements. ~~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~~

(a) If 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

Criterion 3 – Training

No additional requirement.

AMC.M2.C1.H.I

(a) To show compliance with M2.C1.H.I (a), the applicant should ensure the following:

(i) The applicant may use methods similar to AMC.M2.C1.M.I but should ensure a 99% reduction in risk to uninvolved persons using those methods.

(ii) If using the reduction of critical area method, the applicant should ensure that the calculated critical area after applying M2 mitigation is below the column left of the nominal critical area in table B8.

Example: The critical area limit for a UA with WS of 2.5m is 6.5m. For a UA with a wingspan <1m, the critical area limit is 0.8m^2

UA Wingspan (WS) (m)	WS <=1m	1<WS<=3	3<WS<=8	8<WS<=20	20<WS<=40
Nominal Critical Area (m^2)	6.5	65	650	6500	65000

Table B 8

(iii) If post impact hazards are reduced using crash testing, the applicant should use method D in ASTM F3389/F3389M-21. The maximum transferred energy to an uninvolved person upon impact should be <= 80 J or the kinetic energy of the UA prior to impact should be less than or equal to 175 J after applying M2 mitigation.

(b) To show compliance with M2.C1.H.I (c), the applicant should conduct a safety assessment and ensure that no single failure causes loss of control to the UA and reduces effectiveness of the M2 mitigation.

~~**AMC.M2.C1.H.A**~~

~~Criterion 1 – Technical design~~

~~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

GM.M2

(a) M2 mitigation reduces the effect of ground impact in case of a loss of control (LOC) leading to an impact on uninvolved and unsheltered people. M2 mitigation does not consider the probability of an occurrence of a loss of control event. M2 mitigation aims to:

(1) Lower the probability of significant injuries by reducing the effect of the UA's ground impact (example via lowering the impact energy, lowering the energy transfer dynamics) and/or,

(2) Lower the probability of significant injuries by reducing the size of the expected critical area. (Examples include but not limited to the use of parachutes, autorotation, frangibility, stalling the UA)

The applicant can choose both options to arrive at an overall reduction in the probability of fatality. The probability to demonstrate is a below 30% likelihood of an injury greater than AIS 3.

If option 2 (reduction of critical area) is used by the applicant to achieve M2, they should demonstrate that the critical area of all their UA is below the critical area limit defined in AMC.M2.C1.M.I. If the applicant has already used a feature to demonstrate reduced critical area in determining their iGRC, they cannot use the same feature to claim any M2 mitigation.

Operational experience may be used to meet the M2 mitigation requirement as an alternative to testing. The applicant should demonstrate that the UAS configuration during operational experience has no differences (that would affect the validity of any of the M2 mitigation requirements) to the one used for satisfying the M2 medium mitigation. This is valid if the applicant has already been operating with the M2 mitigation in other countries. It will be at the discretion of the CAA to accept any relevance of operational experience.

Mitigated SAIL is the SAIL after applying all mitigations to reduce the initial SAIL.

~~(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 UK 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 UK 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

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 E to article 11

Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)

Introduction

E.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.

E.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.

E.3 A number of OSOs propose an alternative Functional Test Based (FTB) approach to complying with the OSO criteria.

E.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).

E.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.

E.6 The CAA has introduced two new policy concepts; CAP 722J - Recognised Assessment Entity for Flightworthiness (RAE(F)) and CAP 722K - SAIL Mark Policy.

E.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 should use the services of an RAE(F) to demonstrate compliance with several UK SORA requirements. Full details of which UK SORA requirements should be met using an RAE(F) can be found in Using a RAE(F) under UK SORA | UK Civil Aviation Authority and CAP 722J.

E.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.

COR – Containment requirements

AMC1 Article 11 Annex E. Containment requirements

COR – Containment requirements

Level of integrity

Criterion	Low	Medium	High
Criterion 1 (Operational volume containment)	COR.C1.L.I	COR.C1.L.I	COR.C1.H.I

Criterion	Low	Medium	High
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	Medium	High
Criterion 1 (Operational volume containment)	COR.C1.L.A	COR.C1.L.A COR.C1.M.A	COR.C1.L.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.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.L.A COR.C3.M.A COR.C3.H.A
Criterion 4 (Ground risk buffer containment)	Not applicable	COR.C4.M.A	COR.C4.M.A

Containment probability targets: Integrity & Assurance summarised

For SAIL I and SAIL II

Containment level	Adjacent area GRC	M1 Mitigation	M2 Mitigation	$P(OV_{exit})$ / FH	$P(GRB_{exit})$ / FH	Type of Assurance
Low	<=3	No	No	10^{-2}	NA	Declaration
Low	<=3	Yes	Yes	10^{-2}	NA	Declaration
Low	>3	No	No	10^{-3}	NA	Evidence
Low	>3	Yes	Yes	10^{-3}	NA	Evidence
Medium	<=3	No	No	10^{-2}	10^{-4}	Evidence
Medium	<=3	Yes	Yes	10^{-2}	10^{-3}	Evidence
Medium	>3	No	No	10^{-3}	10^{-5}	Evidence

Medium	>3	Yes	Yes	10^{-3}	10^{-4}	Evidence
High	<=3	No	No	10^{-3}	10^{-5}	Evidence
High	<=3	Yes	Yes	10^{-3}	10^{-4}	Evidence
High	>3	No	No	10^{-4}	10^{-6}	Evidence
High	>3	Yes	Yes	10^{-4}	10^{-5}	Evidence

Table E 1

For SAIL III and above

Containment level	**Adjacent area GRC**	**M1 mitigation**	**M2 mitigation**	**P(OV$_{exit}$) / FH**	**P(GRB$_{exit}$) / FH**	**Type of Assurance**
Low	Any	Any	Any	10^{-S-1}	NA	Evidence
Medium	Any	Any	Any	10^{-S-1}	10^{-S-3}	Evidence
High	No containment requirements				NA	

Table E 2

S = mitigated SAIL score (calculated at Step #9 of UK SORA)

P(OV$_{exit}$) /FH = Probability target of the UA exiting the Operational Volume (OV) per flight hour

P(GRB$_{exit}$) / FH = Probability target of the UA exiting the ground risk buffer (GRB) per flight hour

M1 mitigation = No -> no M1 mitigations or no relevant M1 mitigations (refer to AMC.COR)

M2 mitigation = No -> no M2 mitigations or no relevant M2 mitigations (refer to AMC.COR)

NA for P(GRB$_{exit}$) = Not required to meet this requirement

Any for adjacent area GRC = Any value of adjacent area GRC (upto and including GRC 8)

>3 for adjacent area GRC = any value of adjacent area GRC upto and including GRC 8

Any for mitigations = Mitigations maybe present or absent

Type of submission

Declaration = applicant must submit a declaration that they comply with integrity requirements

Evidence = applicant must submit evidence that they comply with integrity requirements

Low level of robustness

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) Depending on the mitigated SAIL, the applicant must refer to table E1 or table E2 for determining the probability target of the failure condition "UA leaving the operational volume'' ($P(OV_{exit})$). ~~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 ensure the applicability of a smaller buffer.

COR.C1.L.A

Criterion 1 – Operational volume containment

(a) Where applicable, the Applicant **must** provide declaration of compliance with the Integrity requirements, which may be assessed by the CAA.

(b) Where applicable, the applicant must provide evidence of compliance with the integrity requirements, which will be assessed by the CAA.

(c) For a qualitative analysis, the compliance evidence **must** include the following: ~~at least include a design and installation appraisal which shows that:~~

(1) The design and installation features, including independence claims, ~~comply with~~ demonstrate the probability of achieving the low integrity requirements.

(2) A report must be prepared listing all probable failures of the UAS compiled and their impact on loss of control assessed. A declaration (wherever applicable) that such a report is developed using any relevant industry standards must be provided to the CAA. ~~Particular risks relevant to the intended operation have been addressed and do not violate any independence claim.~~

(3) The report must contain the impact of Environmental conditions, human factors and other external risks which could result in the UA leaving the operational volume and demonstrate that there is no impact of these risks on the independence claims or on the probable failures.

(4) If M1 or M2 mitigations applied, the applicant must include the relevance of them in the report and submit a declaration (wherever applicable) to the CAA that the mitigations are relevant for meeting the containment requirements.

(d) For a quantitative analysis:

~~If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.~~

(1) A declaration (wherever applicable) must be submitted stating that a report of quantitative functional hazard analysis is developed for all probable failures.

(2) A declaration (wherever applicable) must be submitted stating that testing evidence to demonstrate achieving the probability requirements of leaving the Operational Volume has been collected.

(e) 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.~~ Environmental conditions, human factors and other risks.

~~(e) 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) Where applicable, the Applicant **must** provide declaration of compliance with the Integrity requirements, which may be assessed by the CAA.

(b) Where applicable, the applicant must provide evidence of compliance with the integrity requirements, which will be assessed by the CAA.

(c) The adequacy of the procedures to initiate an immediate end of the flight **must** be tested and documented in a report.

(d) If technical means are used to initiate an immediate end of flight, then such means must be tested and a test report must be submitted (wherever applicable).

(e) The applicant must demonstrate that any factors that prevent the end of flight if exited the operational volume are considered and mitigated as part of an analysis report which must be submitted to the CAA (wherever applicable).

(f) If (c), (d), (e) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the procedures developed by the Designer are followed by the Operator.

~~(a) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.~~

(c) ~~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) Where applicable, the Applicant **must** provide declaration of compliance with the Integrity requirements, which may be assessed by the CAA.

(b) Where applicable, the applicant must provide evidence of compliance with the integrity requirements, which will be assessed by the CAA.~~The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA~~.

(c) A report demonstrating the calculation of the final ground risk buffer and adjacent area must be submitted (wherever applicable).

~~(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

The applicant should use Table E1 and E2 in the following way:

(1) They should determine their mitigated SAIL score in Step #9 of UK SORA.

(2) They should then pick table E1 or E2 depending on their mitigated SAIL score.
(3) They should identify their level of containment (Low/Medium/high) using the containment tables in Step #10 of UK SORA.
(4) They should calculate the average GRC of the adjacent area.
(5) They should determine if their M1 and M2 mitigations are applicable in the adjacent area.
(6) They should determine their probability target of the UA exiting operational volume.
(7) They should then determine their probability target of the UA exiting the ground risk buffer (if applicable).
(8) They should then determine the type of assurance for demonstrating compliance with integrity requirements.

AMC.COR.C1.L.I

The applicant should identify all probable failures of the UAS and any other external systems used in their operation. They should then determine whether any such failure leads to UA operation outside of the operational volume. If they determine such a failure, then appropriate mitigation measures should be presented. Applicants may refer to ASTM F3230-21a Standard Practice for Safety Assessment of Systems and Equipment in Small Aircraft, ED-279 Generic functional hazard assessment (FHA) for UAS to conduct such an analysis. Operational volume containment may also be met using a geocaging function. Such a function should be designed to an industry standard such as ED-270 Minimum Operational performance standard for geocaging. The applicant may also use some principles from BS EN 4709-005 (currently in draft stage) when developing a geocaging system. Operational volume containment may also be met using other functions as Return to Home (RTH). The applicant should ensure meeting the probability requirements of leaving the operational volume using any such functions. Failure of any systems that prevent the functioning of RTH should also be accounted for in the probable failures of the UAS.

AMC.COR.C2.L.I

An end of flight maybe initiated using a flight termination system (FTS). This FTS may be designed and tested following the principles of an industry standard such as BS EN 4709-006 (currently in draft stage). The applicant should still ensure reliability of the FTS designed to the above standard by conducting appropriate ground and/or flight testing as per BS EN 4709-006.

Any FTS should be segregated from the UAS flight control system architecture. It maybe manually and/or automatically activated. Any maintenance and operational procedures for the FTS should be defined in the appropriate manuals. Independence of the FTS from all other UAS systems should be ensured. (examples: Use of different sensors for FTS activation, use of different radio frequencies for FTS activation).

Any other means to end flight upon exit of operational volume should be ensured in the same manner as a FTS.

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 ensured by the Applicant for a rotary wing UA using a ballistic methodology approach.

For a fixed wing UA, an alternate approach such as using the glide ratio method may be ensured by the Applicant

AMC.COR.C1.L.A

Criterion 1 – Operational volume containment

The design and installation appraisal ~~may~~ should consist of a written justification which includes functional diagrams, describes how the system works and explains how the Integrity requirement is met.

If an industry standard is used to conduct a failure analysis, then a declaration (wherever applicable) should be made by the applicant that the analysis has been conducted following such standard should be provided.

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.C2.L.A**
- **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.

In case of crash of the UA in the adjacent area, the probability of an uninvolved person suffering an injury greater than or equal to AIS 3 (Abbreviated Injury Scale) must be equal to or below 30%.

COR.C4.M.I

Criterion 4 – Ground risk buffer containment

(a) Depending on the mitigated SAIL, The applicant must refer to table E1 or table E2 for determining the probability target of the failure condition “UA leaving the ground risk buffer ($P(GRB_{exit})$)’’

(b) No single failure of the UAS or any external system supporting the operation **must** lead to operation outside of the ground risk buffer.

(c) 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

(a) Where applicable, the Applicant **must** provide declaration of compliance with the Integrity requirements, which may be assessed by the CAA.

(b) Where applicable, the applicant must provide evidence of compliance with the integrity requirements, which will be assessed by the CAA.

~~The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.~~

COR.C2.M.A

<u>Criterion 2 – End of flight upon exit of the operational volume</u>

(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) Where applicable, the Applicant **must** provide declaration of compliance with the Integrity requirements, which may be assessed by the CAA.

~~(c) The Applicant must provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.~~

(d) Where applicable, 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

<u>Criterion 3 – Definition of the final ground risk buffer</u>

(a) Where applicable, the Applicant **must** provide declaration of compliance with the Integrity requirements, which may be assessed by the CAA.

(b) Where applicable, the applicant must provide evidence of compliance with the integrity requirements, which will be assessed by the CAA.

(c) To demonstrate that a UA crash in the adjacent area does not have a probability of more than 30% to cause an AIS3+ injury to an uninvolved person, the applicant must show compliance through simulation and/or testing.

~~The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.~~

COR.C4.M.A

<u>Criterion 4 – Ground risk buffer containment</u>

(a) The compliance evidence **must** ~~at least~~ include a design and installation appraisal which shows that sufficient measures are implemented to meet the probability of UA not exiting the ground risk buffer (GRB).~~The design and~~

~~installation features, including independence claims, comply with the low integrity requirements.~~

(b) In case of UA entering GRB, a report showing evidence of simulation and/or testing to demonstrate that it is contained within the GRB.

(c) A report must be presented showing any failure modes which may affect containment of the UA within the ground risk buffer identified and suitable mitigations. ~~Particular risks relevant to the intended operation have been addressed and do not violate any independence claim.~~

(d) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(e) If ~~(a),~~ (b), (c), (d) 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.C3.M.I

(a) A 1:1 ground risk buffer may not be applicable when considering other factors as described in COR.C3.M.I. The applicant should ensure that their ground risk buffer calculation method considers all failures that may require a bigger ground risk buffer.

(b) The applicant should ensure that the maximum glide distance of the UA (at all its possible glide angles) upon activation of FTS should be less than the ground risk buffer. The wind velocity and any other environmental conditions that may increase the glide distance should be considered when defining the ground risk buffer.

(c) If the applicant identifies that projection of high energy parts such as rotors or propellors is a probable failure, the ground risk buffer should be determined based on the projection distance of such parts. The applicant may ensure this using testing and/or simulation.

(d) If the activation of a FTS or any other termination system used in COR.C2 may result in the UA having a larger glide distance, then the ground risk buffer should take that into account.

(e) Any performance degradation or malfunction of the UA should be taken into account in computing the ground risk buffer.

(f) If any other propulsion fuel is used other than batteries, then the applicant should ensure that the ground risk buffer considers secondary effects of an impact in the ground risk buffer such as detonation and/or deflagration.

(g) To ensure the probability of an AIS3+ injury to an uninvolved person in the adjacent area is <=30%, the applicant may use the approaches (such as critical area reduction, post impact hazards reduction, impact dynamics reduction) set out in M2 Effects of UA impact dynamics are reduced. However, the probability of a 90% reduction as set out in M2 does not need to be met. If the applicant is already using a relevant M2 mitigation, then this is deemed to be compliant with COR.C3.M.I (ii).

AMC.COR.C4.M.I

Criterion 4 – Ground risk buffer containment

(a) One of the following methods may be used to ensure compliance with the requirement:

(1) An independent flight termination system (FTS) which initiates the end of the flight when exiting the operational volume. Compliance with **COR.C2.L.I** is deemed acceptable. In addition, the applicant should ensure that the FTS prevents the UA from leaving the ground risk buffer.

(2) A secondary independent emergency flight control system which ends the flight in a controlled manner.

(3) A geocaged system designed using the principles of an industry standard such as BS EN 4709-006

~~(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).

(5) Any other procedural methods which the CAA will determines if appropriate.

(6) The applicant may use consensus industry standards in development of software and hardware whose failure may lead to the UA exiting the

ground risk buffer. Principles from standards such as ASTM F3201-24 *Ensure dependability of software used in UAS,* RTCA DO-254 *Design Assurance Guidance for Airborne Electronic Hardware*, RTCA DO-178C *Software considerations in Airborne systems and Equipment Certification* (Design assurance levels (DAL) are dependent on P(OV_{exit}) /FH) maybe used. The applicant should have configuration control and management of software and hardware. In case of software provided by the manufacturer, the applicant should verify that any software updates do not affect the validity of their containment measures. This maybe verified by the means of flight testing and/or simulation or theoretical analysis of the software update.

~~(b) Annex E 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.~~

For ground risk buffer containment designed using technical means, the evidence may consist of a report demonstrating compliance to a relevant industry standard.

High level of robustness

Lower robustness level requirements to be complied with:

- **COR.C1.M.A**
- **COR.C1.L.A**
- **COR.C2.L.I**
- **COR.C2.M.A**
- **COR.C3.M.I**
- **COR.C3.L.A**
- **COR.C3.M.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,

Depending on the mitigated SAIL, the applicant must refer to table E1 or E2 for determining the probability target of the failure condition “UA leaving the operational volume ($P(OV_{exit})$). ~~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

Depending on the mitigated SAIL, the applicant must refer to table E1 or E2 for determining the probability target of the failure condition “UA leaving the ground risk buffer” ($P(GRB_{exit})$) ~~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

GM.COR

Table E1 and E2 compile the various scenarios in low/medium/high containment an applicant may need to comply.

Calculating probabilities of UA exiting operational volume and/or ground risk buffer

The applicant should demonstrate qualitatively and/or quantitatively achieving $P(OV_{exit})$ and $P(GRB_{exit})$ (if applicable).

$P(OV_{exit})$ is the probability target that the UA will exit the operational volume. If $P(OV_{exit})$ is 10^{-2}/FH, this means that only 1 in every 100 flight hours, the UA may exit the operational volume

$P(GRB_{exit})$ is the probability target that the UA will exit the ground risk buffer. If $P(GRB_{exit})$ is 10^{-2}/FH, this means that only 1 in every 100 flight hours, the UA may exit the ground risk buffer.

Validity of mitigations

If mitigations are applied in the operational volume and the applicant can demonstrate that both their M1 and M2 mitigations are applicable in the adjacent area, they may be used in containment. M1 mitigations that are inapplicable are any space-based mitigations (such as specific route planning). Such measures are invalid in a loss of control scenario. M2 mitigations that are inapplicable are any mitigations whose failure may cause the UA to leave the operational volume. As an example, if a parachute failure causes the UA to leave the OV, then such a mitigation cannot be claimed as M2 for containment purposes.

Applicants should note that both M1 mitigation and M2 mitigation should be applicable in the adjacent area.

For SAIL III and above

For SAIL III and above, the probability of leaving the operational volume and/or ground risk buffer (GRB) is dependent on the SAIL level of the operation. As an example, for a SAIL IV operation with M2 mitigation high and M1 mitigation medium for an adjacent area GRC < 3, the probability requirement of exiting operational volume is 10^{-S-1} which is 10^{-5}.

Calculating adjacent area GRC

To calculate the ground risk of the adjacent area, the applicant should use the population density of the adjacent area determined as part of containment. For a given population density, the adjacent area GRC should be determined using the iGRC in Table 3 of UK SORA.

Declaration vs Presenting evidence

As per table E1 and E2, some scenarios in containment only require the applicant to submit a declaration stating compliance with the integrity requirements.

The objective of containment is to ensure that the probability of significant injuries outside the operational volume is suitably addressed. The probability of significant injuries inside the operational volume and ground risk buffer is addressed by the Operational Safety Objectives (OSOs) and mitigations. Containment ensures that in case the UA leaves the operational volume and the ground risk buffer, then the probability of significant injuries are minimised. 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.

For containment to become relevant, the following conditions need to occur:

(1) The UA should exit the operational volume (OV)
(2) The UA should exit the ground risk buffer (GRB)
(3) The UA enters the Adjacent area
(4) The UA has an event that causes a crash in the adjacent ground area

Using the principles of JARUS Annex F, the probability of significant injuries is defined by the equation below (equation number to be mentioned)

$$E_{i,Adj} = P(ADJ)\,P(GI|ADJ)D_{pop,adj}A_c 10^{M_{1adj}+M_{2adj}} \quad (15)$$

Where

$E_{i,Adj}$ = Expected significant injury rate in adjacent area

$P(ADJ)$ = Probability that UAS enters adjacent area

$P(GI|ADJ) =$ Probability of a ground impact when UAS already entered the adjacent area

$D_{pop,adj}$ = Population density in adjacent area (people per m^2)

A_c = Unmitigated critical area of UA (m^2)

M_{1adj} = Validity of any M1A, M1B mitigation in adjacent area (1 if true, 0 if false)

M_{2adj} = Validity of any M2 mitigation in adjacent area (1 if true, 0 if false)

The containment requirements summary table (Table E1 and E2) is developed taking the equation 15 into consideration. Applicants who apply M1 and M2 mitigations which are applicable in the adjacent area can meet a higher probability target requirement to leave the operational volume.

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.

$P(OV_{exit})$ is defined as the probability that the UA will exit its operational volume. A higher $P(OV_{exit})$ implies a greater probability that the UA will exit its operational volume. As per table E1 or E2, when the applicant applies mitigations which are also applicable in the adjacent area, they have to only demonstrate a higher probability target of leaving the operational volume (vs a scenario without mitigations). This is because if the UA leaves the OV, it has mitigation employed to reduce its impact to uninvolved persons in the adjacent area. For Low containment, a higher probability target of leaving operational volume is not given because low containment also considers adjacent airspace containment requirements.

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.

GM.COR.C1.L.I

A probable failure, also termed as a minor failure as per JARUS AMC RPAS.1309 is a failure that would not significantly reduce UAS safety and involve remote crew actions that are within their capabilities. It may include a slight reduction in safety margin and crew workload. A quantitative analysis is not a mandatory requirement for a probable failure scenario. A probable failure is anticipated to occur one or more times in the entire operational life of the UAS.

The applicant may use multiple methods to ensure UA is contained within the operational volume in case of a loss of control. The probability of exiting the operational volume may be complied with by using multiple methods.

A template of FHA is provided in ED-279 or ASTM F3230-21a, either of which maybe used by the applicant in their FHA report. It is important that the applicant considers all external systems whose failure may result in the UA exiting the operational volume.

The BS EN 4709-005 is currently in draft stage and expected to be finalised in 2026. Once finalised the applicant should use the published version. Until that time, the applicant may use the latest draft version.

GM.COR.C1.L.A

Some of the environmental conditions that affect the probability of leaving the operational volume are temperature, high intensity radiation field, density of air, wind velocity and wind gusts, rain, night time operation. Some of the human factors conditions are pilot error, operational errors, maintenance errors and design of systems related to human factors (such as haptic touch, positioning of buttons/levers). Some of the external risks are GNSS failure, loss of communication, cyber security breaches.

GM.COR.C2.L.I

The BS EN 4709-006 is currently in draft stage and expected to be finalised in 2026. Once finalised the applicant should use the published version. Until that time, the applicant may use the latest draft version.

GM.COR.C2.M.A

To demonstrate the end of flight upon exit of operational volume using a flight test for a FTS solution, the applicant may refer to BS EB 4709-006 which lists testing requirements for FTS.

GM.COR.C3.L.I

To calculate the ground risk buffer, applicants may refer to Annex A Table A.4.

GM.COR.C3.M.I

(a) Some of the meteorological conditions that may affect the ground risk buffer are wind velocity, wind gusts, rain, light (day or night) and radiation.

(b) UA behaviour when activating a technical containment measure means any changes to UA system functions that increase its probability of a loss of control event or invalidates the existing ground risk buffer calculation methods. In these cases, the ground risk buffer may need to be larger than the 1:1 method. An example may be where a deployment of a containment feature may vary the glide ratio for a fixed wing UA, which may increase the GRB from the calculated value.

(c) UA performance may mean any degradation in any of UA systems performance during operation or over a prolonged period that may require a larger ground risk buffer.

(d) Designer data is found on the SAIL mark certificate.

GM.COR.C4.M.I

(a) The objective of COR.C4 is to ensure that the UA does not leave the ground risk buffer. Tables E1, E2 provide the probability targets that the applicant would need to meet for leaving the ground risk buffer. This is to ensure that for medium and high containment operations, the UA is contained within the ground risk buffer.

(b) The applicant may use ASTM F3201-24 to help develop organisational requirements when developing software and/or electronic hardware for medium and high containment applications. The may also refer to low DAL levels in RTCA DO-254 and RTCA DO-178 for some guidance on processes, configuration control, independency in development and testing and other areas.

(c) Designer data is found on the SAIL mark certificate.

GM.COR.C1.H.I

(a) 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 several UAS of that type. A remote failure is also sometimes referred to as a major failure. As per JARUS 1309, a major failure would reduce the capability of the UAS or the ability of the remote crew to cope with adverse operating conditions to the extent that there would a significant reduction in safety margins, functional capabilities. In addition, the failure condition has a significant increase in remote crew workload or impairs remote crew efficiency.

(b) Designer data is found on the SAIL mark certificate.

~~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.~~