Acceptable Means of Compliance and Guidance Material to the Annex to Regulation (EU) 2019/947 — Issue 1, Amendment 2

'AMC and GM to the Annex to Regulation (EU) 2019/947 — Issue 1, Amendment 2'

This document shows deleted, new or amended text as follows:

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue;

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

Note to the reader

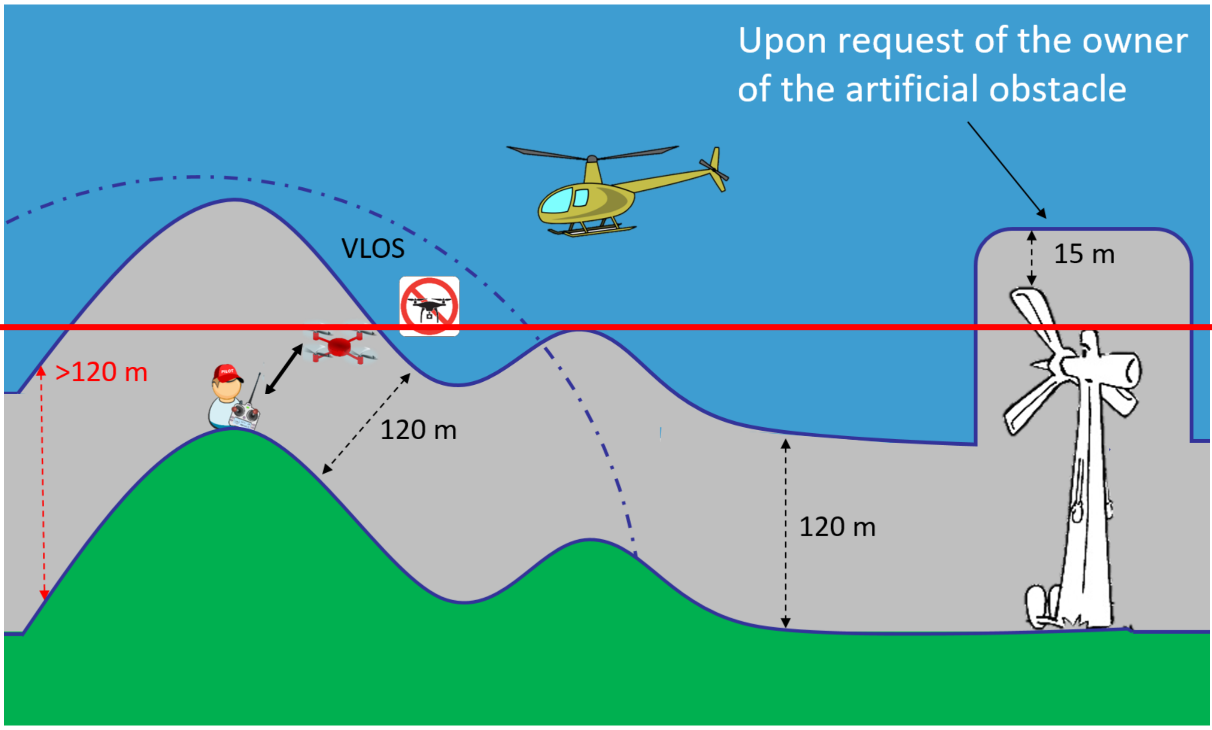
In amended, and in particular in existing (that is, unchanged) text, 'Agency' *is used interchangeably with* 'EASA'*. The interchangeable use of these two terms is more apparent in the consolidated versions. Therefore, please note that both terms refer to the* 'European Union Aviation Safety Agency (EASA)'*.*

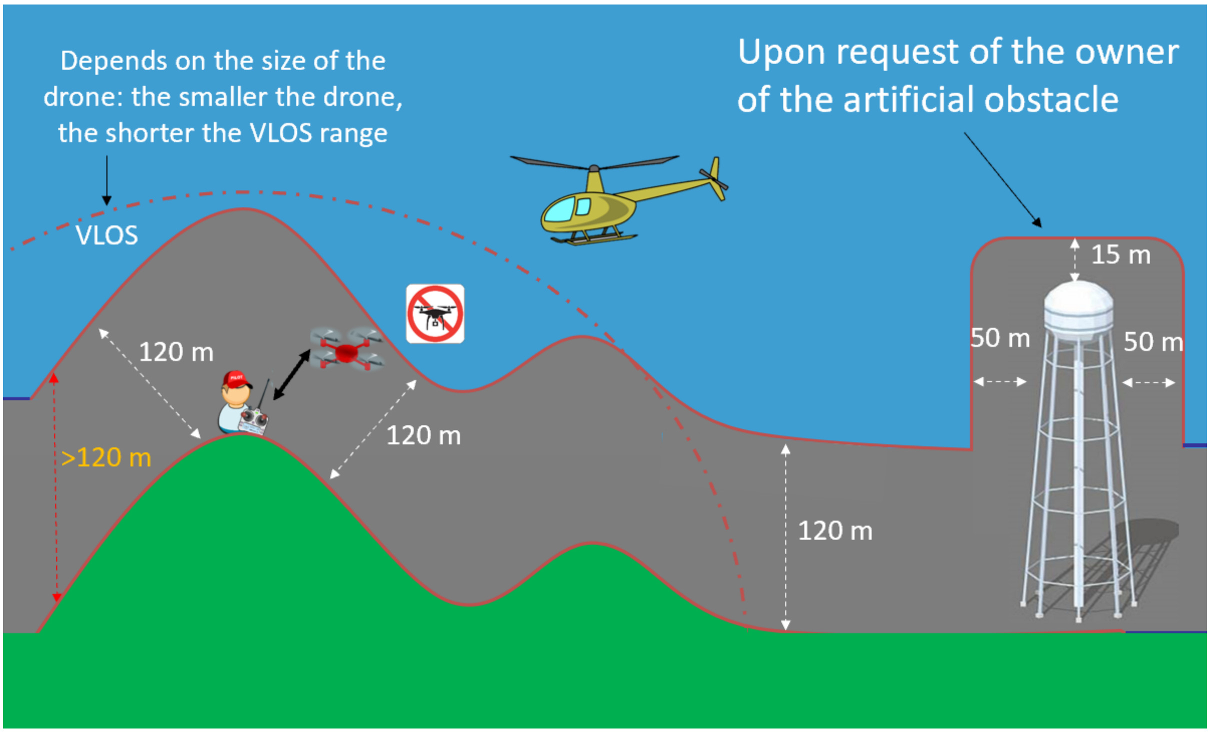
Annex II to ED Decision 2019/021/R of the Executive Director of the Agency of 9 October 2019 is amended as follows:

GM1 UAS.OPEN.010 General provisions

MAXIMUM HEIGHT

[...]





AMC1 UAS.OPEN.020(4)(b) and UAS.OPEN.040(3) UAS operations in subcategories A1 and A3

THEORETICAL KNOWLEDGE SUBJECTS FOR BASIC ONLINE THEORETICAL KNOWLEGDE TRAINING COURSES AND THEORETICAL KNOWLEGDE EXAMINATIONS FOR SUBCATEGORIES A1 AND A3

The acquisition of theoretical knowledge by theeach remote pilot should cover at least the following elementstheoretical knowledge subjects:

~~The acquisition of theoretical knowledge by theeach remote pilot should cover the following elements:~~

(a) Air safety:

(1) non-reckless behaviour, safety precautions for UAS operations and basic requirements regarding dangerous goods;

(2) starting or stopping the operations taking into account environmental factors, UAS conditions and limitations, remote pilot limitations and human factors;

(3) operation in visual line of sight (VLOS) and in very low level (VLL), which entails:

[…]

(b) Airspace restrictions:

(1) obtain and observe updated information about any flight restrictions or conditions published by the MS according to Article 15 of the UAS Regulation[1];

(2) describe the types of geographical zones and the procedures for receiving a flight authorisation; and

(3) upload the geographical zones onto the geo-awareness system;

[…]

(e) Operational procedures:

(1) pre-flight:

(i) assessment of the area of operation and the surrounding area, including the terrain and potential obstacles and obstructions for keeping VLOS of the UA, potential overflight aboveof uninvolved persons, and the potential overflight aboveof critical infrastructure;

(ii) identification of a safe area where the remote pilot can perform a practice flight;

(iii) environmental and weather conditions (e.g. factors that can affect the performance of the UAS such as electromagnetic interference, wind, temperature, etc.); methods of obtaining weather forecasts; and

(iv) checking the conditions of the UAS;

(2) in-flight:

[1] Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft (OJ L 152, 11.6.2019, p. 45).

(i) normal procedures; and

(ii) determine the UA's attitude, altitude, and direction of flight;

(iii) observe the airspace for other air traffic or hazards;

(iv) determine that the UA does not pose a danger for the life or property of other people; and

(iiv) contingency and emergency procedures for abnormal situations: (e.g. for lost-data-link connections);

(a) managing the UAS flight path in abnormal situations;

(b) managing the situation when the UAS positioning equipment is impaired;

(c) managing the situation of incursion of a person into the area of operation, and taking appropriate measures to maintain safety;

(d) managing the exit from the area of operation as defined during the flight preparation;

(e) managing the situation when a manned aircraft flies near the area of operation;

(f) managing the incursion of another UAS into the area of operation;

(g) dealing with a situation of a loss of attitude or position control caused by external phenomena; and

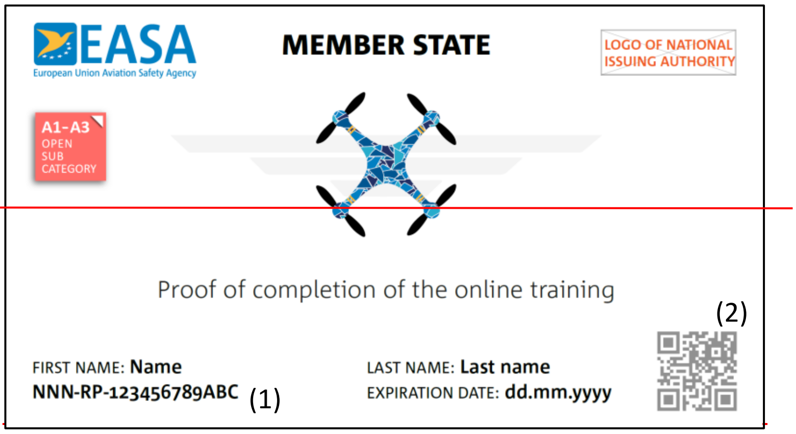
(h) following the C2 loss-of-link procedure;

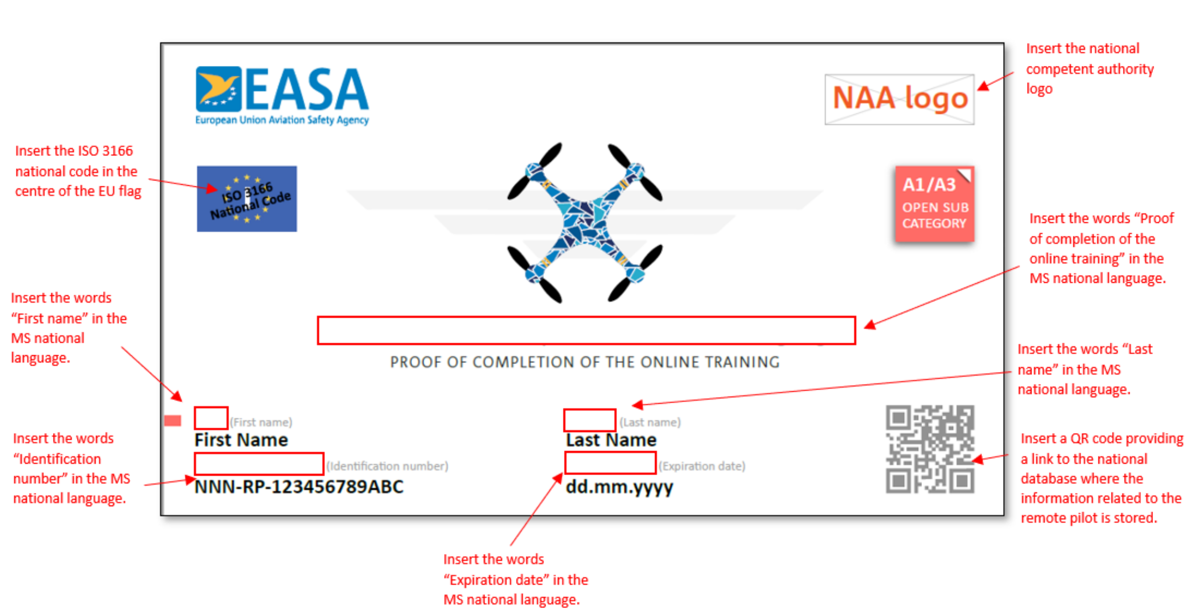
[…]

AMC2 UAS.OPEN.020(4)(b) and UAS.OPEN.040(3) UAS operations in subcategories A1 and A3

PROOF OF COMPLETION OF THE ONLINE THEORETICAL KNOWLEGDE TRAINING COURSE AND SUCCESSFUL COMPLETION OF THE ONLINE THEORETICAL KNOWLEGDE EXAMINATION

Upon receipt of the proof that of a remote pilot has successfully completed the online theoretical knowledge training course andpassing the online theoretical knowledge examination, the MScompetent authority should provide athe following proof of completion to the remote pilot in the format that is depicted in the figure below. An entity that is designated by the competent authority may issue the certificate on behalf of the competent authority. The proof may be provided in electronic form.





~~(1) Insert the identifier~~The remote pilot identification number that is provided by the competent authority, or the entity that is designated by the competent authority ~~releasing~~ that issues the proof of completion,~~. The reference~~ should have the following format:

NNN-RP-xxxxxxxxxxxx

Where:

— 'NNN' is the ISO 3166 Alpha-3 code of the MS ~~releasing~~that issues the proof of completion;

— 'RP' is a fixed field meaning~~:~~ 'remote pilot'; and

— ~~X~~'xxxxxxxxxxxx' are 12 alphanumeric characters (lower-case only) defined by the ~~MS~~ competent authority or the entity that is designated by the competent authority that issues ~~releasing~~ the proof of completion.

~~As an e~~Example: (FIN-RP-123456789abc)

~~(2)~~ The QR code provides ~~providing~~ a link to the national database where the information related to the remote pilot is stored. Through the 'remote pilot ~~identifier',~~ identification number', ~~(1)~~ all information related to the training of the remote pilot can be retrieved~~.~~ by authorised bodies (e.g. competent authorities, law enforcement authorities, etc.) and authorised personnel.

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

MODIFICATION OF A UAS WITH A ~~CE~~ CLASS IDENTIFICATION LABEL ~~MARK~~

When placing UASs with a class identification label on the market, manufacturers should ensure the compliance of those UASs with the applicable regulatory requirements. It is the responsibility of UAS operators to ensure that those UASs remain compliant throughout their lifetime. UAS operators should, therefore, not make any modifications to a UAS in class C0, C1, C2 C3, C5, or C6 that breach compliance with the product requirements, unless the modification is foreseen by the manufacturer and documented in the manufacturer's instructions.

The replacement of a part by a similar one for maintenance purposes is not considered a modification, provided the operator uses an original part or a part that complies with the characteristics defined by the manufacturer in the list of replaceable parts provided in the manufacturer's instructions.

The affixation of payload is not considered a modification provided that affixing a payload is not forbidden by the manufacturer and the payload complies with the characteristics provided in the manufacturer's instructions. Affixing a payload when it is forbidden by the manufacturer or affixing a payload that does not comply with the characteristics provided in the manufacturer's instructions is strictly forbidden.

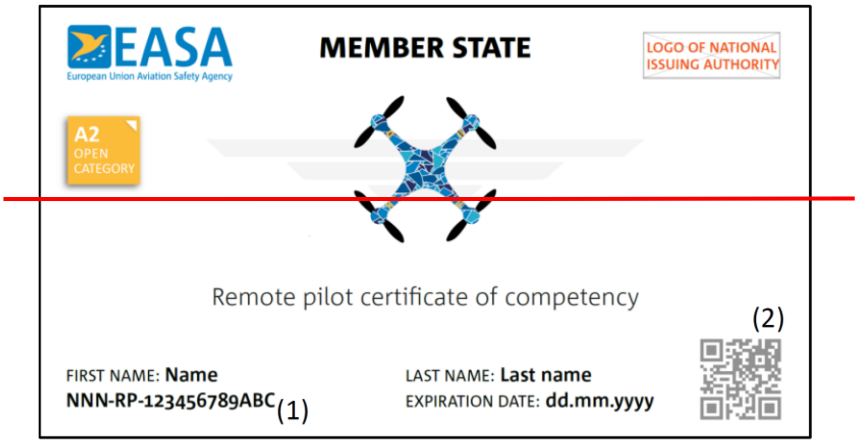
If the payload does not comply with the characteristics of the allowed payloads or if maintenance is not performed according to the manufacturer's instructions, it is then considered a modification that invalidates the class conformity. The class identification label must be removed from the UAS ~~If the UAS operator carries out such a modification on a UAS, that UAS is no longer considered to have a CE Class~~ identification label ~~mark~~ and the modified UAS may only be operated ~~in Subcategory A3, or~~ in the 'specific' category in accordance with Subpart B of Annex ~~I~~ to the UAS Regulation.

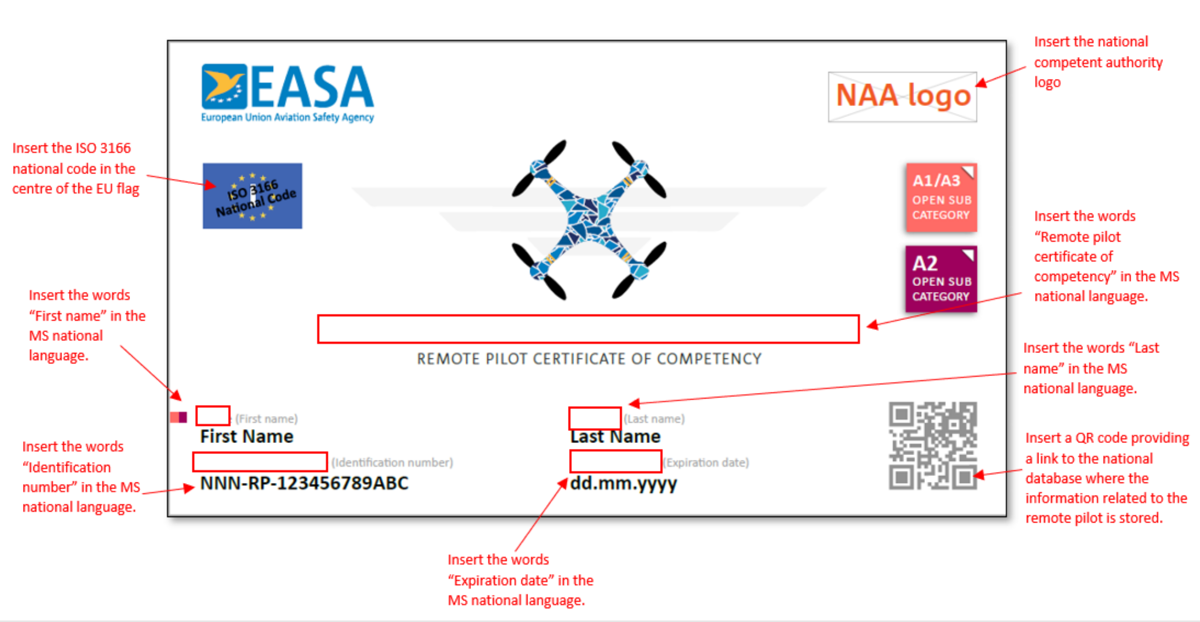
Changes to UASs with a class identification label C4 are allowed, and such UASs can be considered 'privately built' UASs and continue to be operated in subcategory A3 of the 'open' category.

AMC1 UAS.OPEN.030(2) UAS operations in subcategory A2

REMOTE PILOT CERTIFICATE OF COMPETENCY

After the verification that the applicant has passed the online theoretical knowledge examination, has completed and declared the ~~self-~~practical-skills self-training, and has passed the additional theoretical knowledge examination provided by the competent authority or by an entity recognised by the competent authority, the ~~MS~~competent authority should provide a~~the following~~ certificate of competency to the remote pilot in the format depicted in the figure below. An entity that is designated by the competent authority may issue the certificate on behalf of the competent authority. The certificate may be provided in electronic form.





~~(1)~~ ~~Insert the identifier~~The remote pilot identification number that is provided by the competent authority or the entity that is designated by the competent authority that issues ~~releasing~~ the certificate of remote pilot competency~~. The reference~~ should have the following format:

NNN-RP-xxxxxxxxxxxx

Where:

— 'NNN' is the ISO 3166 Alpha-3 code of the MS that issues ~~releasing~~ the proof of completion;

— 'RP' is a fixed field meaning~~:~~ 'remote pilot'; and

— 'xxxxxxxxxxxx' are 12 alphanumeric characters (lower-case only) defined by the ~~MS~~competent authority or the entity that is designated by the competent authority that issues ~~releasing~~ the proof of completion.

~~As an e~~Example: (FIN-RP-123456789abc)

~~(2)~~ The QR code provides ~~providing~~ a link to the national database where the information related to the remote pilot is stored. Through the 'remote pilot ~~identifier',~~ identification number', ~~(1)~~

all information related to the training of the remote pilot can be retrieved. by authorised bodies (e.g. competent authorities, law enforcement authorities, etc.) and authorised personnel.

AMC1 UAS.OPEN.030(2)(b) UAS operations in subcategory A2

PRACTICAL-SKILLS SELF-TRAINING

(a) The aim of the practical-skills self-training is to ensure that the remote pilot ~~should be able to~~ demonstrate at all times the ability to:

(1) operate a class C2 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 never seriously in doubt.

(b) The remote pilot should complete the practical-skills self-training with a UAS that features the same flight characteristics (e.g. fixed wing, rotorcraft), control scheme (manual or automated, human–machine interface) and a similar weight as the UAS intended for use in the UAS operation. This implies the use of a UA with an MTOM of less than 4 kg and bearing the Class 2 identification label.~~CE marking after the transition period relative to CE marking is closed.~~

(c) If a UAS with both manual and automated control schemes is used, the practical-skills self-training should be done~~performed~~ with both control schemes. If a~~this~~ UAS has multiple automated features, the remote pilot should demonstrate proficiency with each automated feature.

(d) The practical-skills self-training should contain at least flying exercises regarding 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 remote pilot should ~~exercise~~follow the contingency procedures for abnormal situations (e.g. a return-to-home function, if available), as stipulated in the user's manual provided by the manufacturer. However, the remote pilot should only follow those contingency procedures that do not require the deactivation of the UAS functions that may reduce its safety level.

AMC2 UAS.OPEN.030(2)(b) UAS operations in subcategory A2

PRACTICAL COMPETENCIES FOR THE PRACTICAL-SKILLS SELF-TRAINING

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

[...]

(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 on the remote pilot station (RPS) is the latest published by the UAS manufacturer;

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

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

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

(7) ~~update~~activate the geo-awareness system and ensure that the geographical information is up to date; ~~and~~

(8) set the height limitation system, if needed;

(9) set the low-speed mode, if available; and

(10) check the correct functioning of the C2 link.

(c) Flight under normal conditions:

(1) following~~using~~ the procedures provided by the manufacturer in the user's manual, familiarise themselves with how to:

(i) take off (or launch);

(ii) make a stable flight:

(A) hover in case of multirotor UA;

(B) perform coordinated large turns;

(C) perform coordinated tight turns;

(D) perform straight flight at constant altitude;

(E) change direction, height and speed;

(F) follow a path;

(G) return of the UA towards the remote pilot after the UA has been placed at a distance that no longer allows its orientation to be distinguished, in case of multirotor UA;

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

(iii) keep the UA outside no-fly zones or restricted zones, unless holding an authorisation;

(iv) use some external references to assess the distance and height of the UA;

(v) perform ~~return to home~~ a return-to-home (RTH) procedure — automatic or manual;

(vi) land (or recover);~~ and~~

(vii) perform a landing procedure and a missed approach in case of fixed-wing UA; and

(viii) perform real-time monitoring of the status and endurance limitations of the UAS; and

(2) maintain ~~a~~ sufficient separation from obstacles.~~;~~

(d) Flight under abnormal conditions:

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

(ii) manage the~~a~~ situation when the UAS positioning equipment is impaired (if the UAS used allows the deactivation of that equipment);

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

(iv) manage the exit from the operation zone as defined during the flight preparation;

(v) ~~manage~~ simulate the incursion of a manned aircraft near the area of operation;

(vi) ~~manage~~ simulate the incursion of another UAS in the area of operation;

(vii) select the safeguard mechanism relevant to the~~a~~ situation;

~~(viii) deal with a situation of a loss of attitude or position control generated by external phenomena;~~

(~~vii~~viii~~ix~~) resume manual control of the UAS when the use of automatic systems renders the situation dangerous; and

(ix) apply the recovery method following a deliberate (simulated) loss of the C2 link~~carry out the loss of link procedure~~.

(e) Briefing, debriefing and feedback:

(i) shut down the UAS and secure it;

(ii) carry out a post-flight inspection and record any relevant data on the general condition of the UAS (its systems, components, and power sources);

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

(~~i~~iv) identify situations where~~n~~ an occurrence report is necessary, and produce the occurrence report.

AMC2 UAS.OPEN.030(2)(c) UAS operations in subcategory A2 and Attachment A to Chapter I of Appendix 1 'Remote pilot theoretical knowledge and practical-skills examination for STS-01~~REMOTE PILOT THEORETICAL KNOWLEDGE AND PRACTICAL-SKILLS EXAMINATION FOR STS-01~~'

THEORETICAL KNOWLEDGE EXAMINATION FOR THE CERTIFICATE OF REMOTE PILOT COMPETENCY AND OF THE REMOTE PILOT THEORETICAL KNOWLEDGE FOR STSs

The theoretical knowledge examination to obtain a 'certificate of remote pilot competency' in subcategory A2 of the 'open' category (according to point UAS.OPEN.030(2)(c)) and the 'certificate of remote pilot theoretical knowledge' for STSs (as per Attachment A to Chapter I of Appendix 1 of the UAS Regulation) should be conducted:

(1) as a face-to-face examination at the facilities of the competent authority, or of the entity that is designated by the competent authority (if that entity issues the certificate), or of the entity recognised by the competent authority (if the certificate is issued by the competent authority); or

(2) through an online-proctored examination provided by the competent authority, or the entity that is designated by the competent authority (if that entity issues the certificate), or the entity recognised by the competent authority (if the certificate is issued by the competent authority). The examination provider should provide the participants in the exam with a clear procedure on how to conduct such an examination as well as with a system that:

   (a) allows the adequate verification of the identity of the person that takes the examination;

   (b) provides a method to verify that the person that takes the examination does not use during the examination support other than that specified in the examination procedure (e.g. computer traffic data lock and monitoring to prevent screen sharing, mirroring and remote desktop, video and room sound analysis).

GM1 UAS.OPEN.030(2)(c) UAS operations in subcategory A2

REMOTE PILOT COMPETENCIES REQUIRED TO OBTAIN A CERTIFICATE OF REMOTE PILOT COMPETENCY

A remote pilot may obtain the additional theoretical knowledge that is needed to pass the additional theoretical examination for a certificate of remote pilot competency ~~in one of the following two ways:~~

~~(a) Competency-based training~~

   ~~(1)~~ via ~~C~~competency-based training that covers aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated with UAS operations.

   ~~(2)~~ Competency-based training should be developed using the analysis, design, development, implementation, and evaluation (ADDIE) principles.

The competency may be acquired by one of the following two ways:

(~~b~~a) Self-study, such as:

~~(1) A remote pilot may undertake self-study in many ways in order to obtain a certificate of competency. The purpose of this self-study is to acquire some basic competency and familiarise themselves with the UA, as well as with the UAS operations they want to conduct.~~

~~(2) Examples of self-study:~~

(~~i~~1) reading the manual or leaflet provided by the UA manufacturer;

(~~ii~~2) reading related information or watching instructional films; and

(~~iii~~3) obtaining information from others who have already experience in flying a UA.

(b) Study in a training facility.

~~The~~A remote pilot may also undertake this study as classroom training, e-learning or similar training at a training facility. Since this training is not mandated by the UAS Regulation~~MSs~~, the national aviation authorities (NAAs) are not required to approve the training syllabi~~uses~~.

GM1~~GM2~~ UAS.OPEN.040(4) UAS operations in subcategory A3

USE OF UASs WITH A CLASS C0 OR C1 CLASS IDENTIFICATION LABEL IN SUBCATEGORY A3

Since subcategory A3 UAS operations are conducted at a 150-m distance from residential, commercial, and industrial areas, where no uninvolved persons are endangered, subcategory A3 encompass subcategory A1 (operations that are not conducted over assemblies of people and over uninvolved people). Therefore, UAS operations in subcategory A3 may also be conducted with an UA with:

(a) a class C0 class identification label that complies with the requirements of Part 1 of the Annex to Regulation (EU) 2019/945; or

(b) a class C1 class identification label that complies with the requirements of Part 1 of the Annex to Regulation (EU) 2019/945, as well as with an active and updated direct remote identification system and a geo-awareness function.

AMC1 UAS.OPEN.050(1) Responsibilities of the UAS operator

OPERATIONAL PROCEDURES

The UAS operator should develop procedures adapted to the type of operations they intend to perform and to the risks involved. Therefore, written procedures should not be necessary if the UAS operator is also the remote pilot, and the remote pilot may use the procedures defined ~~by~~in the manufacturer's instructions~~ in the operations manual (OM)~~.

[…]

GM1 UAS.OPEN.050(3) Responsibilities of the UAS operator

OPERATIONAL PROCEDURES

The UAS operator must identify a remote pilot for each flight. For UAS operations in the 'open' category, it is forbidden to hand the control of the UA over to another command unit during the flight.

AMC1 UAS.SPEC.030(2) Application for an operational authorisation

APPLICATION FORM FOR AN~~THE~~ OPERATIONAL AUTHORISATION

The UAS operator should submit an application for an operational authorisation according to the following form. The application and all the documentation referred to or attached to the application should be stored for at least 2~~two~~ years after the expiry of the related operational authorisation or submission of application in case of refusal. The UAS operator should ~~in a manner that~~ ensure~~s~~ the~~ir~~ protection of the stored data ~~protection~~ from unauthorised access, damage, alteration, and theft. The declaration may be complemented by the description of the procedures to ensure that all operations are in compliance with Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, as required by point UAS.SPEC.050(1)(a)(iv) of the UAS Regulation.

Application for an operational authorisation for the 'specific' category

Data protection: Personal data included in this application is processed by the competent authority pursuant to Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). Personal data will be processed for the purpose of the performance, management and follow-up of the application by the competent authority in accordance with Article 12 of Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft.

If the applicant requires further information concerning the processing of their personal data or exercising their rights (e.g. to access or rectify any inaccurate or incomplete data), they should refer to the point of contact of their competent authority.

The applicant has the right to file a complaint regarding the processing of their personal data at any time to the national data protection supervisory authority.

☐ New application	☐ Amendment to operational authorisation NNN-OAT-xxxxx/yyy		
1. UAS operator data			
1.1 UAS operator registration number			
1.2 UAS operator name			
1.3 Name of the accountable manager			
1.4 Operational point of contact Name Telephone Email			
2. Details of the UAS operation			
2.1 Expected date of start of the operation	DD/MM/YYYY	**2.2 Expected end date**	DD/MM/YYYY
2.3 Intended location(s) of the operation			
2.4 Risk assessment reference and revision	☐ SORA version __ ☐ PDRA # __-__ ☐ other __________		
2.5 Level of assurance and integrity			
2.6 Type of operation	☐ VLOS ☐ BVLOS		

2.7 Transport of dangerous goods		☐ Yes ☐ No
2.8 Ground risk characterisation	**2.8.1 Operational area**	
	2.8.2 Adjacent area	
2.9 Upper limit of the operational volume		
2.10 Airspace volume of the intended operation		☐A ☐B ☐ C ☐D ☐ E ☐F ☐G ☐U-space ☐Other, specify ____________
2.11 Residual air risk level	**2.12.1 Operational volume**	☐ARC-a ☐ARC-b ☐ARC-c ☐ARC-d
	2.11.2. Adjacent volume	☐ARC-a ☐ARC-b ☐ARC-c ☐ARC-d
2.12 Operations manual reference		
2.13 Compliance evidence file reference		

3. UAS data

3.1 Manufacturer		**3.2 Model**	
3.3 Type of UAS	☐Aeroplane ☐Helicopter ☐Multirotor ☐Hybrid/VTOL ☐Lighter than air / other	**3.4 Max characteristic dimensions**	______ m
3.5 Take-off mass	______ kg	**3.6 Maximum speed**	______ m/s (______ kt)
3.7 Serial number or, if applicable, UA registration mark			
3.8 Type certificate (TC) or design verification report, if applicable			
3.9 Number of the certificate of airworthiness (CofA), if applicable			
3.10 Number of the noise certificate, if applicable			
3.11 Mitigation of effects of ground impact		☐No ☐Yes, low ☐ Yes, medium ☐Yes, high	
3.12 Technical requirements for containment		☐Basic ☐ Enhanced	

4. Remarks

5. Declaration of compliance

I, the undersigned, hereby declare that the UAS operation will comply with:

- *any applicable Union and national regulations related to privacy, data protection, liability, insurance, security, and environmental protection;*
- *the applicable requirements of Regulation (EU) 2019/947; and*
- *the limitations and conditions defined in the operational authorisation provided by the competent authority.*

Moreover, I declare that the related insurance coverage, if appliable, will be in place at the start date of the UAS operation.

Date DD/MM/YYYY	**Signature and stamp**

~~Application for operational authorisation~~

~~**Data protection:** Personal data included in this application is processed by the competent authority pursuant to Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). It will be processed for the purposes of the performance, management and follow-up of the application by the competent authority in accordance with Article 12 of Regulation (EU) 2019/947.~~

~~If you require further information concerning the processing of your personal data or exercising your rights (e.g. to access or rectify any inaccurate or incomplete data), please refer to the contact point of the competent authority.~~

~~The applicant has the right to make a complaint regarding the processing of the personal data at any time to the national Data Protection Supervisor Authority.~~

~~**UAS operator data**~~	
~~**1.1 UAS operator registration number**~~	
~~**1.2 UAS operator name**~~	
~~**UAS data**~~	
~~**2.1 Manufacturer**~~	
~~**2.2 Model**~~	
~~**2.3 Type certificate (if required)**~~	
~~**2.4 Serial number or UA registration mark (if applicable)**~~	
~~**2.5 Certificate of airworthiness (CofA) (if required)**~~	
~~**2.6 Noise certificate (if required)**~~	
~~**2.7 Configuration**~~	~~☐Aeroplane ☐Helicopter ☐Multirotor ☐Hybrid/VTOL ☐Lighter than air/other~~
~~**2.8 MTOM**~~	
~~**2.9 Maximum airspeed**~~	
~~**2.10 Maximum characteristic dimensions**~~	
~~**Operation**~~	
~~**3.1 ConOps**~~	
~~**3.2 Operation manual available**~~	~~☐ **yes** ☐ **no**~~
~~**3.3 Predefined risk assessment (PDRA) (if applicable)**~~	
~~**3.4 If the operation complies with a PDRA published by EASA, provide all the information and documentation identified in it.**~~	
~~**3.5 If the operation does not comply with a PDRA published by EASA, provide the operational risk assessment in accordance with Article 11 of Regulation (EU) 2019/947**~~	
~~**3.6 Mitigations and operational safety objectives (OSOs)**~~	
~~**3.7 Insurance cover will be in place at the start of the UAS operations**~~	~~☐ yes ☐ no~~

~~*I, the undersigned, hereby declare that the UAS operation will comply with:*~~ ~~— *any applicable Union and national rules related to privacy, data protection, liability, insurance, security and environmental protection;*~~ ~~— *the applicable requirement of Regulation (EU) 2019/947; and*~~ ~~— *the limitations and conditions defined in the authorisation provided by the competent authority.*~~	
~~**Date**~~	~~**Signature**~~

Instructions for filling in the application form

If the application relates to an amendment to an existing operational authorisation, indicate the number of the operational authorisation and fill out in red the fields that are amended compared to the last operational authorisation.

1.1 ~~The~~ UAS operator registration number in accordance with Article 14 of the UAS Regulation.

1.2 UAS operator's name as declared during the registration process.

1.~~2~~3 Name of the accountable manager or, in the case of a natural person, the name of the UAS operator ~~in the case of a natural person~~.

1.4 Contact details of the person responsible for the operation, in charge to answer possible operational questions raised by the competent authority.

2.1 Date on which the UAS operator expects to start the operation.

2.2 Date on which the UAS operator expects to end the operation. The UAS operator may ask for an unlimited duration; in this case, indicate 'Unlimited'.

2.3 Location(s) where the UAS operator intends to conduct the UAS operation. The identification of the location(s) should contain the full operational volume and ground risk buffer (the red line in Figure 1). Depending on the initial ground and air risk and on the application of mitigation measures, the location(s) may be 'generic' or 'precise' (refer to GM2 UAS.SPEC.030(2)).

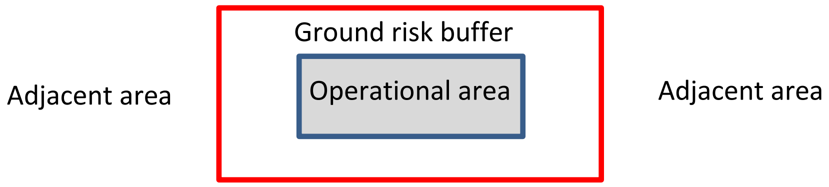


Figure 1 — Operational area and ground risk buffer

2.4 Select one of the three options. If the SORA is used, indicate the version. In case a PDRA is used, indicate the number and its revision. In case a risk assessment methodology is used other than the SORA, provide its reference. In this last case, the UAS operator should demonstrate that the methodology complies with Article 11 of the UAS Regulation.

2.5 If the risk methodology used is the SORA, indicate the final SAIL of the operation, otherwise the equivalent information provided by the risk assessment methodology used.

2.6 Select one of the two options.

2.7 Select one of the two options.

2.8 Characterise the ground risk (i.e. density of overflown population density, expressed in persons per km^2, if available, or 'controlled ground area', 'sparsely populated area', 'populated area', 'gatherings of people') for both the operational and the adjacent area.

2.9 Insert the maximum flight altitude, expressed in metres and feet in parentheses, of the operational volume (adding the air risk buffer, if applicable) using the AGL reference when the upper limit is below 150 m (492 ft), or use the MSL reference when the upper limit is above 150 m (492 ft).

2.10 Select one or more of the nine options. Select 'Other' in case none of the previous applies (i.e. military areas).

2.11 Select one of the four options.

2.12 Indicate the OM's identification and revision number. This document should be attached to the application.

2.13 Indicate the compliance evidence file identification and revision number. This document should be attached to the application.

~~2~~3.1 Name of the manufacturer of the UAS.

~~2~~3.2 Model of the UAS as defined by the manufacturer.

3.3 Select one of the five options.

3.4 Indicate the maximum dimensions of the UA in metres (e.g. for aeroplanes: the length of the wingspan; for helicopters: the diameter of the propellers; for multirotors: the maximum distance between the tips of two opposite propellers) as used in the risk assessment to identify the ground risk.

3.5 Indicate the maximum value, expressed in kg, of the UA take-off mass (TOM), at which the UAS operation may be operated. All flights should then be operated not exceeding that TOM. The TOM may be~~maybe be~~ different from (however, not higher than) the MTOM defined by the UAS manufacturer.

3.6 Maximum cruise airspeed, expressed in m/s and kt in parentheses, as defined in the manufacturer's instructions.

3.7 Unique serial number (SN) of the UA defined by the manufacturer according to standard ANSI/CTA-2063-A-2019, *Small Unmanned Aerial Systems Serial Numbers*, 2019, or UA registration mark if the UA is registered. In case of privately built UAS or UAS not bearing a unique SN, insert the unique SN of the remote identification system.

~~2.3~~

3.8 Include the EASA TC number, or the UAS design verification report number issued by EASA, if applicable ~~available~~.

~~2.4 Serial number of the UA defined by the manufacturer, or the UA registration mark if the competent authority requires the use of a UAS with an EASA TC.~~

~~2.5~~3.9 If a UAS with an EASA TC is required by the competent authority, the UAS should have a certificate of airworthiness (CofA).

~~2.6~~3.10 If a UAS with an EASA TC is required by the competent authority, the UAS should have a noise certificate.

3.11 Select one of the four options.

3.12 Select one of the two options.

4 Free-text field for the addition of any relevant remark.

~~2.7 Configuration of the UA.~~

~~2.8 Maximum take-off mass for which the UA is designed, expressed in kg.~~

~~2.9 Maximum cruise air speed expressed in m/s and knots in parenthesis.~~

~~2.10 State the maximum dimensions of the UA in metres (e.g. for aeroplanes: the length of the wingspan; for helicopters: the diameter of the propellers; for multirotors: the maximum distance between the tips of 2 opposite propellers).~~

~~NOTE~~Note 1: Section ~~2~~3 may include more than one UAS. In that case, it should be filled in with the data of all the UASs intended to be operated. If needed, fields may be duplicated.

~~3.1 The description of the intended operation characterising the area where it will take place (i.e. urban, sparsely populated, industrial, etc.) and the airspace.~~

~~3.3 The number of the PDRA, if applicable.~~

~~3.6 A list of the mitigation measures and the OSOs put in place, as required by the PDRA or proposed by the UAS operator if no PDRA is available. Sufficient information should be provided to the competent authority to assess the robustness of the measures.~~

~~3.8 A short description of the procedures established by the UAS operator to ensure that all operations are in compliance with Regulation (EU) 2016/679 on the protection on personal data as required by point UAS.SPEC.050(1)(a)iv.~~

Note 2: The signature and stamp may be provided in electronic form.

GM1 UAS.SPEC.030(2) Application for an operational authorisation

APPLICATION FORM FOR AN~~THE~~ OPERATIONAL AUTHORISATION

[…]

(4) CONTROL AND/OR POSITIONING SYSTEM

As a general instruction for this section, in addition to the description and information deemed necessary to define these systems, provide any certification and rating for the systems, such as those related to electromagnetic compatibility or any other European ~~D~~directive satisfied by the equipment installed on the aircraft, for consideration during the specific risk assessment conducted using the specific operations risk assessment (SORA) or any other risk assessment~~SMS~~ methodology that~~this~~ is followed to evaluate and authorise operations.

[…]

(6) FLIGHT TERMINATION SYSTEM

Describe and include the technical characteristics of the system, its modes of operation, system activation and any certification and rating for the components, as well as proof of its electromagnetic compatibility for consideration during the SORA or any other risk assessment~~SMS~~ methodology that is followed to evaluate and authorise operations.

[…]

GM2 UAS.SPEC.030(2) Application for an operational authorisation

‘GENERIC’ VERSUS ‘PRECISE’ OPERATIONAL AUTHORISATION

According to Article 12 of the UAS Regulation, a competent authority may decide to grant a ‘generic’ operational authorisation, i.e. an operational authorisation that is applicable to an indefinite number of flights taking place in locations generically identified, during the period of validity of the operational authorisation. (Contrary to the 'generic' operational authorisation, an operational authorisation that is limited to the number of flights and/or to known locations identified by geographical coordinates will be called 'precise' operational authorisation.)

CONDITIONS FOR ISSUING A 'GENERIC' OPERATIONAL AUTHORISATION

A 'generic' operational authorisation does not contain any precise location (geographical coordinates) but applies to all locations that meet the approved conditions/limitations (e.g. density of population of the operational and adjacent area, class of airspace of the operational and adjacent area, maximum height, etc.). The UAS operator is responsible for checking that each flight they conduct:

— meets the mitigations and operational safety objectives derived from the SORA and the requirements listed in the operational authorisation; and

— takes place in an area whose characteristics and local conditions are consistent with the GRC and ARC classification of the SORA as approved by the NAA.

The UAS operator should anyhow check whether their MS has published a geographical zone in the area of operation according to Article 15 of the UAS Regulation, requiring a flight authorisation (e.g. this may be the case for the areas covered by U-Space). A flight authorisation should not be confused with an operational authorisation.

The criteria to determine whether a UAS operator is eligible for a 'generic' operational authorisation are the following:

1. The limitations regarding the operational scenario, the operational volume and the buffers defined by the operational authorisation are expressed in such a way that it is simple for the UAS operator to ensure compliance with those limitations.

   It will usually be easier for the UAS operator to ensure compliance when the conditions are unambiguous and not open to interpretation. This is the case, for instance, when:

   — a controlled ground area is required, or the density of population is very low;

   — the operation takes place in segregated airspace.

   In this regard, 'generic' operational authorisations may be relevant for operations conducted according to PDRA-Sxx, since the conditions are similar to the ones of the declarative STS and it is relatively easy for the UAS operator to ensure compliance with those conditions.

   As a rule of thumb, a 'precise' operational authorisation rather than a 'generic' one may be more appropriate when the iGRC ≥ 4 or the iARC ≥ ARC-c.

2. The strategic mitigation measures, if any, are not open to interpretation or difficult to implement.

   The use of some strategic measure mitigation (M1 for GRC or Step 5 for ARC) often prompt debate between the UAS operator and the NAA regarding the relevance/validity of the data sources (density of population, density/type of traffic in given airspace, etc.), and the efficiency of the proposed strategic mitigation measures. Furthermore, some of these measures are difficult to implement and it is not always possible for the NAA to simply trust the capacity of the UAS operator to do so.

For instance, the following examples show measures that are difficult to implement / open to interpretation:

— achieving a local reduction of the density of population;

— ensuring the absence of uninvolved persons in very large, controlled ground areas, or reserving large, controlled ground areas in densely populated environments;

— starting an operation in airspace that requires a new protocol with the ANSP/ATSP, etc.

Note: In the future, qualified service for strategic deconfliction (U-space) may be a valid mitigation measure for a 'generic' operational authorisation.

3. The NAA has assessed the capacity of the UAS operator to identify/assess the local conditions

The UAS operator should have a diligent and documented process to identify/assess the local conditions and their compliance to the limitations given by the authorisation (in the operations manual (OM)). The UAS operator should train its personnel to assess the operational volume, buffers and mitigations in order to prepare for the next operations. The UAS operator should also document and record the assessment of locations (e.g. in mission files), so that adherence to this process can be verified by the NAA on a regular basis.

For simple operations where Criteria 1 and 2 are met, the NAA may decide to issue the 'generic' operational authorisation first and assess the robustness of the procedures through continuous oversight.

For complex operations where Criteria 1 and 2 are not met, then the third criterion is paramount. While the NAA may be confident enough to directly issue a 'generic' operational authorisation, it may also decide to add some restrictions for the locations that are valid for the first one (or more) operations. The UAS operator should provide evidence to the NAA that the process defined in Criterion 3 has been followed, and the area and local conditions identified by the UAS operator comply with the authorisation. The NAA will review the evidence (as for a 'precise' authorisation) and confirm in written to the operator that their analysis is satisfactory.

Once the NAA has enough evidence or confidence that the UAS operator is able to complete the assessments on its own, the restrictions on the location may be withdrawn.

Eventually, a LUC may be appropriate to demonstrate this capacity (see below).

DIFFERENCES BETWEEN A 'GENERIC' OPERATIONAL AUTHORISATION AND A LUC

An operational authorisation where the locations are generically identified may to some extent be traced to some privileges granted to a LUC holder: the UAS operator can schedule new flights without receiving a new operational authorisation for each of them. However, a LUC offers more flexibility than a generic operational authorisation by allowing a UAS operator to have different level of privileges, including the possibility to start new types of operations or use previously non-validated types of UASs.

On the other hand, a 'generic' operational authorisation does not require the UAS operator to formally implement a management system. Such a management system would be disproportionate for low-risk operations (such as PDRA-Sxx) (see Criterion 2). However, the more requirements are derived from the SORA and the conditions of the operational authorisations are difficult to check and to comply with, the more robust and reliable the processes and the organisation of the UAS operator need to be to ensure the absence of deviation.

Eventually, a LUC becomes necessary when the risk of deviation from these procedures is high and when deviating from the validated conditions greatly increases the risk of the operation. The LUC management system will be needed to ensure compliance with the procedures of the UAS operator through an independent process.

In this regard, a LUC may be more relevant than a 'generic' operational authorisation in the following cases:

— for SAIL ≥ 4 operations (due to OSO#1 'Ensure the UAS operator is competent and/or proven' with a 'high' level of robustness); or

— for SAIL ≥ 3 operations, when strategic ground risk mitigation (M1) or strategic air risk mitigation (Step 5) is applied, to make sure that the applicant exhibits~~exibits~~ the right safety culture to perform a location risk assessment.

AMC2 UAS.SPEC.030(3)(e) Application for an operational authorisation

OPERATIONAL PROCEDURES WITH 'MEDIUM' AND 'HIGH' LEVEL OF ROBUSTNESS

1. Scope of this AMC

1.1. This AMC addresses the criteria for the medium and high level of robustness of the operational procedures that are required under the following OSOs:

(a) OSO #08: *Technical issue with the UAS — Operational procedures are defined, validated and adhered to*;

(b) OSO #11: *Deterioration of the external systems that support the UAS operations — Procedures are in place to handle the deterioration of the external systems that support the UAS operations*;

(c) OSO #14: *Human error — Operational procedures are defined, validated and adhered to*; and

(d) OSO #21: *Adverse operating conditions — Operational procedures are defined, validated and adhered to.*

These criteria may be used to also address the criteria for the medium and high levels of robustness of the operational procedures required under the mitigation means, which are defined in Annex B to AMC1 Article 11.

2. Criteria for the level of integrity

2.1. <u>Criterion #1: Procedure definition</u>

2.1.1. Annex E to AMC1 Article 11 provides the minimum elements that the operational procedures need to appropriately cover for the intended operations.

2.1.2. AMC1 UAS.SPEC.030(3)(e) on the OM template[2] for the operational authorisation of UAS operations in the 'specific' category and the corresponding guidance in GM1 UAS.SPEC.030(3)(e) should be followed to define the procedures, as they provide more details on the elements that are referred to in point 2.1.1.

2.2. Criterion #2: Procedure complexity

2.2.1. Based on the SORA criterion of 'procedure complexity' for a low level of integrity, procedures with a higher level of integrity should not be complex. This implies that the workload and/or the interactions with other entities (e.g. air traffic management (ATM), etc.) of remote pilots and/or other personnel in charge of duties essential to the UAS operation should be limited to a level that may not jeopardise their ability to adequately follow the procedures.

2.2.2. Procedures should be validated in accordance with point 3.5.

2.3. Criterion #3: Consideration of potential human error

Operational procedures should be developed to minimise human errors:

(a) each of the tasks and the complete sequence of the tasks of a procedure should be intuitive, unambiguous, and clearly defined;

(b) the tasks should be clearly assigned to the relevant roles and persons, ensuring a balanced workload (see point 2.2); and

(c) the procedures should adequately address fatigue and stress, considering, among other aspects, the following: duty times, regular breaks, rest periods, the applicable health and safety requirements in the operational environment, handover/takeover procedures, responsibilities, and workload.

3. Criteria for the level of assurance

3.1. The purpose of the validation process described in this AMC is to confirm whether the proposed operational procedures are complete and adequate to ensure the safe conduct of the intended UAS operations.

3.2. The validation process should include the following:

(a) a review of the completeness of the procedures to ensure that:

(1) all elements that are indicated in points 2.1.1 and 2.1.2 have been addressed; and

(2) all relevant references have been considered, including but not limited to:

(i) the applicable regulations;

[2] EASA is working within JARUS to amend Annex A to the SORA. When this activity will be completed (planned for 2022/Q2) the title of Annex A will be changed to 'Operations manual' and it will describe how the UAS operator should develop an operations manual with a content proportionate to SAIL of its operation. Annex A to the SORA will also replace AMC1 UAS.SPEC.030(3)(e) and GM1 UAS.SPEC.030(3)(e).

(ii) the requirements from the competent authority and/or other relevant authorities or entities;

(iii) the local requirements and conditions;

(iv) the available recommended practices for the intended type of UAS operations;

(v) the instructions from the UAS manufacturer and of any other UAS equipment manufacturer, if applicable;

(vi) the instructions and requirements from externally provided services that support the UAS operations, if applicable;

(vii) the results from previous experience, including tests and/or simulations as those indicated in point (c) and (d); and

(viii) consensus-based voluntary industry standards;

(b) an expert judgement to assess the adequacy of the procedures based on:

(1) the objective(s) of each procedure;

(2) relevant key performance parameters/indicators and/or benchmarking of options, if applicable;

(3) an assessment of the procedures' complexity in accordance with point 2.2; and

(4) an assessment of the effect of human factors on procedures in accordance with point 2.3;

(c) a proof of the adequacy of the procedures through tests or practical exercise for phases of the UAS operation other than the UA flight, which involve the UAS and/or any external system that supports the operation;

(d) a proof of the adequacy of the contingency and emergency procedures through:

(1) dedicated flight tests conducted in an area with reduced air and ground risk and/or representative subsystems tests; or

(2) simulation, provided it is proven valid for the intended purpose with positive results; or

(3) any other means acceptable to the competent authority that issues the authorisation;

(e) if the option in point (d)(3) is selected, a substantiation of the suitability of those means for proving the adequacy of the procedures;

(f) a record of proof of the adequacy of the procedures, including at least:

(1) the UAS operator's name and registration number;

(2) the date(s) and place(s) of tests or simulations;

(3) identification of the means used, e.g. for tests or simulations that use actual UASs: the type category, the name of the manufacturer, and the model and serial number of each UA used;

(4) a description of tests or simulations conducted, including their purpose, the expected results (including key performance parameters/indicators, where relevant), how they were conducted, the results obtained, and conclusions; and

(5) the signature of the person that is appointed by the UAS operator to conduct the tests or simulations;

(g) for UAS operations that require a high level of assurance, the procedures and the dedicated flight tests, simulations, or other means acceptable to the competent authority, which are indicated in point 3.2, validated by the competent authority that issues the authorisation or by an entity that is recognised by that competent authority.

3.3. The following conditions apply to the dedicated flight tests that are indicated in point 3.2(d)(1):

(a) the configuration of the UAS hardware and software should be identified;

(b) the UAS operator should conduct the dedicated flight tests;

(c) if no simulations as the ones indicated in point 3.2(d)(2) are conducted, the dedicated flight tests should cover all the relevant aspects of the contingency and emergency procedures;

(d) for UAS operations that require a high level of assurance, the dedicated flight tests that are performed to validate the procedures and checklists should cover the complete flight envelope or prove to be conservative;

(e) the UAS operator should conduct as many flight tests as agreed with the competent authority to prove the adequacy of the proposed procedures;

(f) the dedicated flight tests should be conducted in a safe environment (reducing the ground and air risks to the greatest extent possible), while ensuring the representativeness of the tests' results for the intended UAS operations; and

(g) the UAS operator should record the flight tests as part of the information to be recorded as per point UAS.SPEC.050(1)(g), e.g. in a logbook, as indicated in AMC1 UAS.SPEC.050(1)(g); such a record should include any potential issues identified.

3.4. To ensure that the integrity criterion of point 2.2 is met, the complexity of the procedures should be validated.

3.4.1. This validation should include:

(a) an expert judgement, as indicated in point 3.3(b); and

(b) a proof of the adequacy of the procedures, as indicated in point 3.3(c) and (d).

3.4.2. The UAS operator should adopt a method for the evaluation of the complexity of the procedures by the relevant personnel, i.e. the remote pilot and/or other personnel in charge of duties essential to the UAS operation. That method should be adequate for the evaluation of the workload that is required by the task(s) of each procedure.

For example, a suitable method for evaluating the workload of the remote pilot and/or other personnel in charge of duties essential to the UAS operation may be the 'Bedford Workload Scale', which was conceived as a qualitative and relatively simple methodology for rating the pilots' workload that is associated with the design of an aircraft's human–machine interface (HMI). However, this methodology is deemed to be adequately generic to be also applicable to the tasks associated with the operational procedures to be conducted by remote pilots and/or other personnel in charge of duties essential to the UAS operation.

Figure 1 depicts the Bedford Workload Scale adapted to operational procedures for UAS operations: 'pilot' is replaced by 'remote crew member' (i.e. the remote pilot or other personnel in charge of duties essential to the UAS operation), and 'pilot decision' is replaced by 'remote crew member performs a procedure task'. A procedure may include one or more tasks.

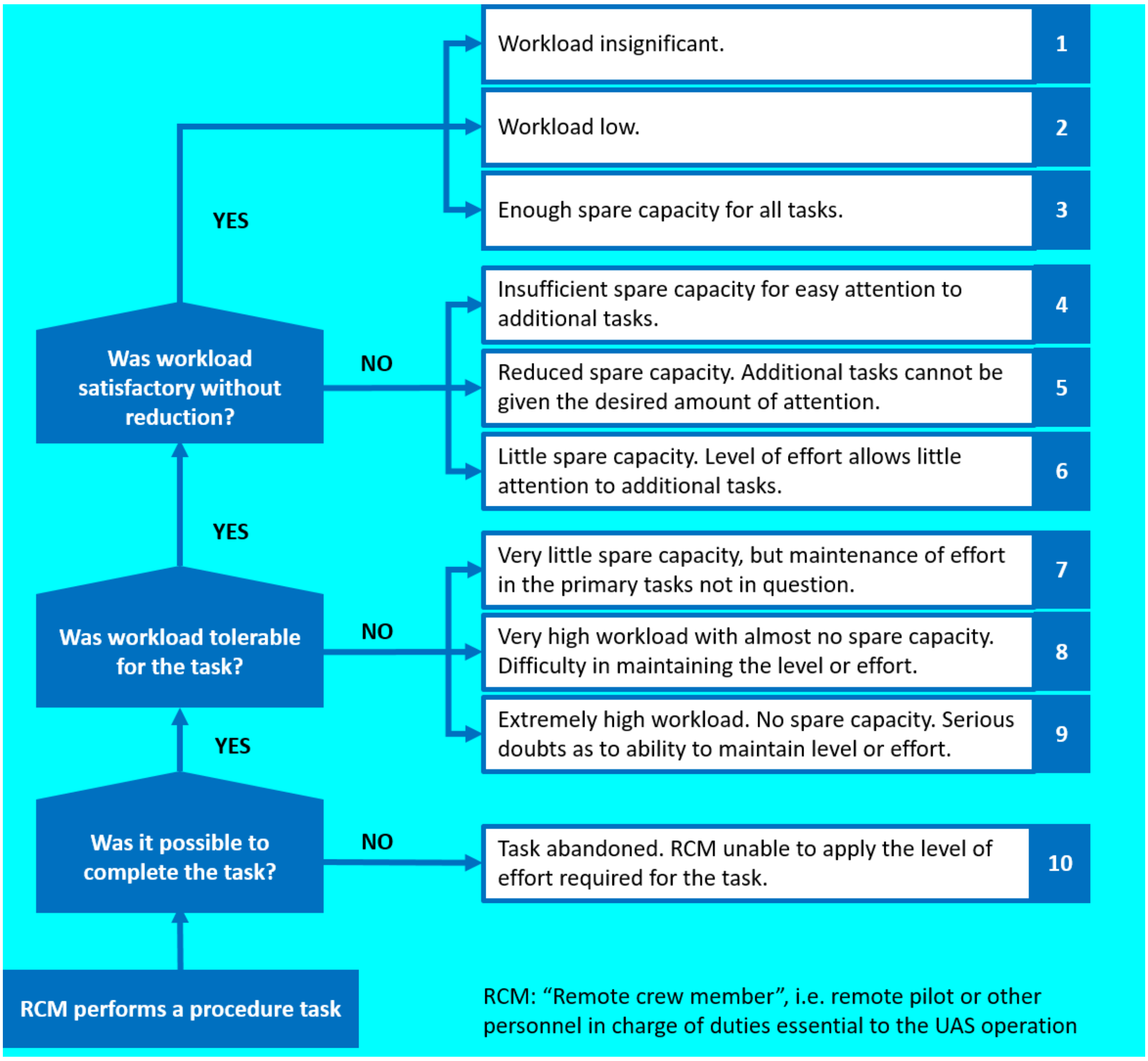


Figure 1 — Bedford Workload Scale adapted to operational procedures for UAS operations

AMC3 UAS.SPEC.030(3)(e) Application for an operational authorisation

EMERGENCY RESPONSE PLAN (ERP) WITH 'MEDIUM' AND 'HIGH' LEVEL OF ROBUSTNESS

1. Scope of this AMC

1.1. This AMC defines the content of an ERP as well as the methodology for its validation. It may be used to meet Criterion #1 (Procedures) of Mitigation M3 — *An ERP is in place, UAS operator validated and effective* of Annex B to AMC1 Article 11 for medium and high level of robustness.

1.2. The risk assessment, as required by Article 11 of the UAS Regulation, should address the safety risks that are associated with the loss of control of a UAS operation, which may result in:

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

(b) injuries to third parties in the air; or

(c) damage to critical infrastructure.

Note: As per point B.4 of Annex B to AMC1 Article 11, the loss of control of a UAS operation corresponds to situations where the emergency procedures would not have provided the desired effect, the UAS operation is in an unrecoverable state, and:

— the outcome of the situation relies highly on providence; or

— the situation could not be handled via a contingency procedure; or

— there is a grave and imminent danger of fatalities.

1.3. Therefore, in line with the risk assessment, the scope of this AMC is limited to addressing the response to emergency situations that are caused by the UAS operation, as well as the potential consequences that are indicated in point 1.2. However, the response to such emergency situations should not be limited to the potential risk/harm only to third parties but also to the UAS operator's personnel.

1.4. This AMC does not address emergency situations other than those referred to in point 1.3. However, the UAS operator may be required to address such situations as part of the operational authorisation[3].

2. Purpose of the ERP

2.1. The UAS operator should, in cooperation with other stakeholders, if applicable, develop, coordinate, and maintain an ERP that ensures orderly and safe transition from normal operation to emergency and return to normal operation. The ERP should include the actions to be taken by the UAS operator or specified individuals in an emergency, and

[3] Chapter 2 *Events which may activate the Emergency Response Plan* of the European Helicopter Safety Team (EHEST) *Safety Management Toolkit for Non-Complex Operators — Emergency Response Plan — A Template for Industry* (2nd edition, October 2014) provides examples of emergency situations that are outside the scope of this AMC but may be required to be addressed by the UAS operator as part of the operational authorisation (https://www.easa.europa.eu/document-library/general-publications/ehest-safety-management-toolkit-non-complex-operators-2nd).

indicate the size, nature, and complexity of the activities to be performed by the UAS operator or the specified individuals.

2.2. As for emergency procedures, an ERP is implemented by the UAS operator to address emergency situations. However, an ERP is specifically developed to:

(a) limit any escalating effect of the emergency situation;

(b) meet the conditions to alert the relevant authorities and entities.

2.3. The ERP should contain all the necessary information about the role of the relevant personnel in an emergency and about their response to it.

3. Effectiveness of the ERP

3.1. For the ERP to be effective, it should:

(a) be appropriate to the size, nature, and complexity of the UAS operation;

(b) be readily accessible by all relevant personnel and by other entities, where applicable;

(c) include procedures and checklists relevant to different or specific emergency situations;

(d) clearly define the roles and responsibilities of the relevant personnel;

(e) have quick-reference contact details of the relevant personnel;

(f) be regularly tested through practical exercises involving the relevant personnel; and

(g) be periodically reviewed and updated, when necessary, to maintain its effectiveness.

4. Emergency situations, response activation, procedures, and checklists

4.1. The ERP should define the criteria for identifying emergency situations, and for identifying the main emergency situations that are likely to increase the level of harm (escalating effect) if no action is taken.

4.2. The identified emergency situations should at least include those where one or more UA are operated by the UAS operator and have the potential to:

(a) harm one or more persons;

(b) hit a ground vehicle, building, or facility where there are one or more persons who might be injured as a consequence of the UA impact;

(c) harm critical infrastructure;

(d) start a fire that might propagate;

(e) release dangerous substances;

(f) hit an aircraft that carries people and/or whose crash might lead to one or more of the situations listed in (a) to (e); and

(g) cause the UA to leave the operational volume and fly beyond the limits of:

(1) the ground risk buffer; and/or

(2) the air risk buffer (if existing), or enter adjacent airspace where there is a risk of collision with manned aircraft.

4.3. The ERP should establish the criteria for the activation of the respective emergency response procedures to address the identified emergency situations.

4.4. The ERP should consider the following principles for prioritising the actions to respond to an emergency situation:

(a) alert the relevant personnel and entities;

(b) protect the life of those affected or in danger;

(c) give first aid while awaiting the arrival of the emergency services, provided the personnel employed by the UAS operator is qualified for that purpose;

(d) ensure the safety of the emergency responders;

(e) address secondary effects and put in place actions to reduce them (e.g. if the UA crashes on a road, warn the other drivers in the traffic or redirect them accordingly in order to avoid having cars colliding with the crashed UAS);

(f) keep the emergency situation under control or contained;

(g) protect property;

(h) restore the normal situation as soon as practicable;

(i) record the emergency situation and the response to it, and preserve evidence for further investigation;

(j) remove damaged items, unless needed untouched for investigation purposes, and restore the location of the emergency;

(k) debrief the relevant personnel;

(l) prepare any required post-emergency report or notification; and

(m) evaluate the effectiveness of the ERP and update it, if required.

4.5. As a minimum, the ERP should include procedures for:

(a) an orderly transition from the normal phase to the emergency response phase;

(b) the assignment of emergency responsibilities and roles (see point 5);

(c) coordinated action and interaction with other entities to respond to the emergency situation; and

(d) return to normal operation as soon as practicable.

4.6. The ERP should include a procedure for recording the information on the emergency situation and on the subsequent response. That procedure should also cover how to gather information from a third party that reports an emergency situation caused by a UA of the UAS operator.

4.7. The ERP should include procedures for handling hazardous materials in an emergency situation, if applicable.

4.8. The ERP should include checklists that:

(a) are suitable for the identified emergency situations, as per point 4.1;

(b) clearly indicate the sequence of actions and the personnel responsible to carry out those actions; and

(c) provide the contact details of key stakeholders, as per point 5.4.

4.9. The content of the ERP should be kept up to date and reflect all organisational or operational changes that may affect it.

5. Roles, responsibilities, and key points of contact

5.1. The UAS operator should nominate an emergency response manager (ERM) who has the overall responsibility for the emergency response.

5.2. If the UAS operator is not a one-person entity and/or manages external personnel in an emergency response, the UAS operator should establish an emergency response team (ERT) that:

(a) is led by the ERM;

(b) includes a core ERT that comprises persons with a role that implies being directly involved in responding to an emergency situation; and

(c) includes, if applicable, a support ERT that comprises ERT members who support the core ERT in responding to the emergency situation.

5.3. The ERP should provide a clear delineation of the responsibilities in an emergency response, including the duties of the remote pilot(s) and of any other personnel in charge of duties essential to the UAS operation.

5.4. The ERP should establish a contact list(s) of key staff, relevant authorities, and entities involved in an emergency response, including:

(a) the full names, roles, responsibilities, and contact details of the ERM and, if applicable, of the ERT members, including their replacement if the nominated persons are unavailable; and

(b) the full names, roles, responsibilities, and contact details of the relevant authorities and entities outside the UAS operator to be contacted in case of emergency; in addition, the single European emergency call number '112' should be indicated as an emergency contact number for UAS operations that are conducted in any of the EASA Member States and in any other State where that number is used[4].

[4] Chapter 5 *Reaction to an emergency call* of the European Helicopter Safety Team (EHEST) *Safety Management Toolkit for Non-Complex Operators — Emergency Response Plan — A Template for Industry* (2nd edition, October 2014) (https://www.easa.europa.eu/document-library/general-publications/ehest-safety-management-toolkit-non-complex-operators-2nd), and the 'primary accident information sheet' in its Section 5.1 may be a suitable reference for developing a procedure to indicate how to gather information from a third party on an emergency involving a UA of the UAS

5.5. The ERP should indicate the person(s) responsible for the emergency response means (refer to point 6.2) and their contact details. The responsible person(s) should ensure that those means are available and usable when needed.

5.6. To ensure a prompt response, the ERM and other ERT members, if applicable, should have direct access to:

(a) the emergency response checklists that are indicated in point 4.8; and

(b) if not included in the checklists referred to in (a), the contact list(s) indicated in point 5.4.

6. Emergency response means

6.1. The ERP should indicate the means to be used by the UAS operator to respond to an emergency, which may include one or more of the following:

(a) facilities, infrastructure, and equipment;

(b) extinguishing means, e.g. fire extinguishers, fireproof portable electronic device (PED) bags;

(c) personal protective equipment, e.g. protective clothing, high-visibility clothing, helmets, goggles, gloves;

(d) medical means, including first-aid kits;

(e) communication means, e.g. phones (landline and mobile), walkie-talkies, aviation radios, internet; and

(f) others.

6.2. The person(s) in charge of the emergency response means should have an updated record of the available means that are indicated in point 6.1, including their number and status (e.g. expiry date of perishable means).

7. ERP validation

7.1. If the UAS operator is a one-person entity and does not manage external personnel in an emergency response, the UAS operator should at least ensure that:

(a) the procedures that are indicated in point 4 cover all the identified emergency situations and that the necessary actions are reflected in the corresponding checklist(s);

(b) the contact details in the list(s) indicated in point 5.4 are up to date; and

(c) the availability of the emergency response means that are indicated in point 6 is checked before conducting any UAS operation, in particular that the communication means to alert the relevant contacts (see point (b)) are operational.

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operator. Section 6.5 *Crisis Log* provides an example of a 'crisis log' that might be useful for developing a template to record the emergency situation and the response to it.

7.2. If the UAS operator is not a one-person entity and/or manages external personnel in an emergency response, in addition to complying with point 7.1, the UAS operator should conduct a tabletop exercise[5] that:

(a) is established in accordance with the criteria that are indicated in the ERP to be considered representative;

(b) is consistent with the ERP training syllabus;

(c) includes sessions where one or more scenarios of the identified emergency situations are discussed by the exercise participants, which should include the relevant ERT members for each of the sessions; all aspects of the ERP should be covered once all sessions of the tabletop exercise have been completed;

(d) is guided by the ERM or any other person designated by the UAS operator to act as a facilitator;

(e) may include the participation of third parties that are identified in the ERP; the participation conditions for those third parties should be indicated in the ERP; and

(f) is performed with the periodicity that is indicated in the ERP.

However, if the UAS operator is a one-person entity and does not manage external personnel in an emergency response, a tabletop exercise may not be appropriate as the participation of third parties is not required. In such case, the conditions of point 7.1 are deemed sufficient and proportionate to the level of simplicity of the operator and, in principle, of the UAS operations.

For UAS operators with a more complex structure as well as for complex UAS operations, the tabletop exercises may need to be complemented with partial emergency exercises and/or full-scale exercises, including the corresponding drills. If the level of robustness that is required or claimed for the ERP is high, such exercises and drills are needed.

7.3. If the level of robustness of the ERP is high:

(a) the ERP and its effectiveness with respect to limiting the number of people at risk should be validated by the competent authority itself or by an entity designated by the competent authority;

(b) the UAS operator should coordinate and agree on the ERP with all third parties that are identified in the plan; and

(c) the representativeness of the tabletop exercise is validated by the competent authority that issues the authorisation or by an entity that is designated by that competent authority.

[5] Please refer to GM2 ADR.OPS.B.005(c) *Aerodrome emergency planning* (see AMC and GM to Authority, Organisation and Operations Requirements for Aerodromes), which defines the following three categories of exercises for emergency planning:
(a) full-scale exercises;
(b) partial emergency exercises; and
(c) tabletop exercises.

7.4. After following the procedures that are described in the ERP in a real emergency situation, the UAS operator should conduct an analysis of the way the emergency was managed and verify the effectiveness of the ERP.

8. ERP training

8.1. The UAS operator should provide relevant personnel, and in particular ERT members, with ERP training.

8.2. The UAS operator should develop a training syllabus that covers all the elements of the ERP.

8.3. The UAS operator should compile and keep up to date a record of the ERP training that is completed by the relevant personnel.

8.4. The competent authority that issues the authorisation or an entity that is designated by that competent authority should verify the competencies of the relevant personnel if the level of assurance that is required or claimed for the ERP is high.

GM1 UAS.SPEC.030(3)(e) Application for an operational authorisation

OPERATIONS MANUAL — TEMPLATE

[…]

'7. Emergency response plan (ERP)'

See AMC3 UAS.SPEC.030(3)(e).~~When the UAS operator develops an ERP, the following should be considered:~~

~~(a) it is expected to cover:~~

~~(1) the plan to limit crash-escalating effects (e.g. notify the emergency services and other relevant authorities); and~~

~~(2) the conditions to alert ATM.~~

~~(b) it is suitable for the situation;~~

~~(c) it limits the escalating effects;~~

~~(d) it defines criteria to identify an emergency situation;~~

~~(e) it is practical to use;~~

~~(f) it clearly delineates the responsibilities of the personnel in charge of duties essential to the UAS operation;~~

~~(g) it is developed to standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority; and~~

~~(h) when considered appropriate by the competent authority, to be validated through a representative tabletop exercise1 consistent with the ERP training syllabus.~~

AMC1 UAS.SPEC.040(1) Operational authorisation

OPERATIONAL AUTHORISATION TEMPLATE

The competent authority should produce the operational authorisation according to the following form:

	Operational authorisation for the 'specific' category	NAA Logo
1. Authority that issues the authorisation		
1.1 Issuing authority		
1.2 Point of contact **Name** **Telephone** **Email**		
2. UAS operator data		
2.1 UAS operator registration number		
2.2 UAS operator name		
2.3 Operational point of contact **Name** **Telephone** **Email**		
3. Authorised operation		
3.1 Authorised location(s)		
3.2 Extent of the adjacent area		____ km
3.3 Risk assessment reference and revision		☐ SORA version __ ☐ PDRA # __-__ ☐ other ___________
3.4 Level of assurance and integrity		
3.5 Type of operation		☐ VLOS ☐ BVLOS
3.6 Transport of dangerous goods		☐ Yes ☐ No
3.7 Ground risk characterisation	**3.7.1 Operational area**	
	3.7.2 Adjacent area	
3.8 Ground risk mitigations	**3.8.1 Strategic mitigations**	☐No ☐Yes, low ☐ Yes, medium ☐ Yes, high
	3.8.2 ERP	☐No ☐Yes, low ☐ Yes, medium ☐ Yes, high
3.9 Height limit of the operational volume		_____ m (_______ ft)
3.10 Residual air risk level	**3.10.1 Operational volume**	☐ARC-a ☐ARC-b ☐ARC-c ☐ARC-d
	3.10.2. Adjacent volume	☐ARC-a ☐ARC-b ☐ARC-c ☐ARC-d
3.11 Air risk mitigations	**3.11.1 Strategic mitigations**	☐No ☐Yes If yes, please describe _________________
	3.11.2 Tactical mitigation methods	
3.12 Achieved level of containment		☐ Basic ☐ Enhanced

3.13 Remote pilot competency	
3.14 Competency of staff, other than the remote pilot, essential for the safety of the operation	
3.15 Type of events to be reported to the competent authority (in addition to those required by Regulation (EU) No 376/2014)	
3.16 Insurance	☐No ☐Yes
3.17 Operations manual reference	
3.18 Compliance evidence file reference	
3.19 Remarks / additional limitations	

4. Data of authorised UAS

4.1 Manufacturer		**4.2 Model**	
4.3 Type of UAS	☐Aeroplane ☐Helicopter ☐Multirotor ☐Hybrid/VTOL ☐Lighter than air / other	**4.4 Maximum characteristic dimensions**	_____ m
4.5 Take-off mass	_____ kg	**4.6 Maximum speed**	_____ m/s (_____ kt)

4.7 Additional technical requirements	
4.8 Serial number or, if applicable, UA registration mark	
4.9 Number of type certificate (TC) or design verification report, if required	
4.10 Number of the certificate of airworthiness (CofA), if required	
4.11 Number of the noise certificate, if required	
4.12 Mitigation to reduce effect of ground impact	☐No ☐Yes, low ☐ Yes, medium ☐ Yes, high Required to reduce the ground risk ☐Yes ☐No
4.13 Technical requirements for containment	☐ Basic ☐ Enhanced

5. Remarks

6. Operational authorisation

____________ (UAS operator name) is authorised to conduct UAS operations with the UAS(s) defined in Section 4 and according to the conditions and limitations defined in Section 3, for as long as it complies with this operational authorisation, with Regulation (EU) 2019/947, and with any applicable Union and national regulations related to privacy, data protection, liability, insurance, security, and environmental protection.

6.1 Operational authorisation number	
6.2 Expiry date	DD/MM/YYYY

Date DD/MM/YYYY	Signature and stamp

Operational authorisation

NAA Log

1. AUTHORITY RELEASING THE AUTHORISATION			
1.1 State of the UAS operator			
1.2 Issuing authority			
1.3 Contact person Name Telephone Email			
2. UAS operator data			
2.1 UAS operator registration number			
2.2 UAS operator name			
2.3 Operational point of contact Name Telephone Fax Email			
2.4 Authorisation number			
3. Data of authorised UAS			
3.1 Brand		3.2 Model	
3.3 3.3 Type certificate (TC) (if required)			
3.4 Serial number or UA registration mark (for certified UAS)			
3.5 Certificate of airworthiness (CofA) (if required)			
3.6 Noise certificate (if required)			

3.7 Requirements for continuing airworthiness	
4. Limitations and conditions for the UAS operation	
4.1 Authorised location(s)	
4.2 Authorised airspace risk level	
4.3 Operational limitations	
4.4 Mitigation measures	
4.5 Remote pilot competency	
4.6 Competency of other staff essential for the safety of the operation	
4.7 Records to be kept	
4.8 Type of events to be reported to the competent authority according to Regulation (EU) No 376/2014	
4.9 Expiry date	
The…………………… (2.2) is authorised to conduct UAS operations with the UAs defined in Section 3 and according to the conditions and limitations defined in Section 4, if it complies with this authorisation, as well as with Annex IX to Regulation (EU) 2018/1139 and its implementing rules.	
Date, signature and stamp	

Instructions for filling in the operational authorisation form

1.1 Name of the competent authority that issues the operational authorisation, including the name of the State of the UAS operator.

1.2 Identification of the issuing competent authority.

1.32 Contact details of the competent authority staff person of responsible for issuing the authorisation the file.

2.1 Registration information of the UAS operator registration number in accordance with Article 14 of the UAS Regulation.

2.2 UAS operator's registered first name, as registered in the UAS operator registration database. and surname or, in the case of a legal entity, the business name.

2.3 The cContact details of the person responsible for the UAS operation, in charge to answer possible operational questions raised by the competent authority. details include the telephone and fax numbers, including the country code, and the email address at which the accountable manager and the safety manager can be contacted.

2.4 Reference number, as issued by the competent authority.

3.1 Location(s) where the UAS operator is authorised to operate. The identification of the location(s) should contain the full operational volume and ground risk buffer (the red line in Figure 2). Depending on the initial ground and air risk and on the application of mitigation measures, the location(s) may be 'generic' or 'precise' (refer to GM2 UAS.SPEC.030(2)). When the UAS operation is conducted in a MS other than the State of registration, the competent authority of the MS of registration should specify the location(s) only after receiving confirmation from the State of operation, according to Article 13 of the UAS Regulation.

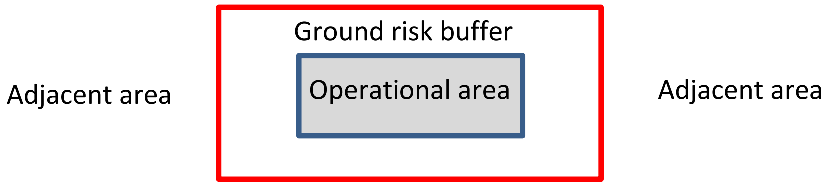


Figure 2 — Operational area and ground risk buffer

3.2 Provide the maximum distance in km to be considered for the adjacent area, starting from the limits of the ground risk buffer.

3.3 Select one of the three options. If the SORA is used, indicate the version. In case a PDRA is used, indicate the number and its revision. In case a risk assessment methodology is used other than the SORA, provide its reference. In this last case, the UAS operator should demonstrate that the methodology complies with Article 11 of the UAS Regulation.

3.4 If the risk methodology used is the SORA, indicate the final SAIL of the operation, otherwise the equivalent information provided by the risk assessment methodology used.

3.5 Select one of the two options.

3.6 Select one of the two options.

3.7 Characterise the ground risk (i.e. density of overflown population density, expressed in persons per km^2, if available, or 'controlled ground area', 'sparsely populated area', 'populated area', 'gatherings of people') for both the operational and the adjacent area.

3.8.1 Select one of the four options. In case the risk assessment is based on the SORA, this consists in M1 mitigation.

3.8.2 Select one of the four options. In case the risk assessment is based on the SORA, this consists in M3 mitigation.

3.9. Insert the maximum flight altitude, expressed in metres and feet in parentheses, of the approved operational volume (adding the air risk buffer, if applicable) using the AGL reference when the upper limit is below 150 m (492 ft), or use the MSL reference when the upper limit is above 150 m (492 ft).

3.10 Select one of the four options.

3.11.1 Select one of the two options.

3.11.2 Describe the tactical mitigation methods to be applied by the UAS operator.

3.12 Select one of the two options.

3.13 Specify the type of the remote pilot certificate, if required; otherwise, indicate 'Declared'.

3.14 Specify the type of the certificate for the staff, other than the remote pilot, essential for the safety of the operation, if required; otherwise, indicate 'Declared'.

3.15 List the type of events that the UAS operator should report to the competent authority, in addition to those required by Regulation (EU) No 376/2014, if applicable.

3.16 Select one of the two options.

3.17 Indicate the OM's identification and revision number.

3.18 Indicate the compliance evidence file identification and revision number.

3.19 Additional limitations defined by the competent authority.

4. Only the UAS features/characteristics required to be used for the operation should be identified in the form (e.g. in case the UAS qualifies for enhanced containment but the operation requires a basic containment, and the operator developed consistent procedures, then the basic containment should be ticked).

~~3~~4.1 Name of the manufacturer of the UAS.

~~3~~4.2 Model of the UAS as defined by the manufacturer.

4.3 Select one of the five options.

4.4 Indicate the maximum dimensions of the UA in metres (e.g. for aeroplanes: the length of the wingspan; for helicopters: the diameter of the propellers; for multirotors: the maximum distance between the tips of two opposite propellers) as used in the risk assessment to identify the ground risk.

4.5 Indicate the maximum value, expressed in kg, of the UA take-off mass (TOM), at which the UAS operation may be operated. All flights should then be operated not exceeding that TOM. The TOM maybe be different from (however, not higher than) the MTOM defined by the UAS manufacturer.

4.6 Maximum cruise airspeed, expressed in m/s and kt in parentheses, as defined in the manufacturer's instructions.

4.7 List any additional technical requirements established by the competent authority.

4.8 Unique serial number (SN) of the UA defined by the manufacturer according to standard ANSI/CTA-2063-A-2019, *Small Unmanned Aerial Systems Serial Numbers*, 2019, or the UA registration mark if the UA is registered. In case of privately built UAS or UAS not equipped with a unique SN, insert the unique SN of the remote identification system.

~~3.3~~4.9 Include the EASA TC number, or the UAS design verification report number issued by EASA, as required by the competent authority ~~requires the use of a UAS with an EASA TC~~.

~~3.4 Serial number of the UA defined by the manufacturer or UA registration mark if the competent authority requires the use of a UAS with an EASA TC.~~

~~3.5~~4.10 If a UAS with an EASA ~~type certificate (~~TC~~)~~ is required, the UAS should have a certificate of airworthiness (CofA) ~~and a noise certificate,~~ and the competent authority should require compliance with the continuing airworthiness ~~continuing airworthiness~~ rules.

4.11 If a UAS with an EASA TC is required, the UAS should have a noise certificate.

4.12 Select one of the four options of the first row. In case the risk assessment is based on the SORA, this consists in M2 mitigation. Even if the UAS may be equipped with such system, this mitigation may not be required in the operation to reduce the ground risk. In this case, in the second row select 'NO'. If the mitigation is instead used to reduce the ground risk, select 'YES' and the operator is required to include in the OM the related procedures.

4.13 Select one of the two options.

5 Free-text field for the addition of any relevant remark.

6.1 Reference number of the operational authorisation, as issued by the competent authority. The number should have the following format:

NNN-OAT-xxxxx/yyy

Where:

— 'NNN' is the ISO 3166 Alpha-3 code of the Member State that issues the operational authorisation;

— 'OAT' is a fixed field meaning 'operational authorisation';

— 'xxxxx' are up to 12 alphanumeric characters defining the operational authorisation number; and

— 'yyy' are 3 alphanumeric characters defining the revision number of the operational authorisation; each amendment of the operational authorisation will determine a new revision number.

6.2 The duration of the operational authorisation may be unlimited; in this case, indicate 'Unlimited'. The authorisation will be valid for as long as the UAS operator complies with the relevant requirements of the UAS Regulation and with the conditions defined in the operational authorisation.

~~4.1 Locations where the UAS operation has been authorised.~~

~~4.2 Characterisation of the authorised airspace (i.e. low risk — ARC a, medium risk — ARC b, high risk — ARC C).~~

~~4.3 List the operational limitations, including at least:~~

~~1.the maximum height;~~

~~2.limitations on the payload;~~

~~3.limitations on the operations (i.e. the possibility to hand over to another remote pilot during the flight);~~

~~4.the minimum contents of the OM;~~

~~5.the methodology to verify the operational procedures;~~

~~6.the need for an emergency response plan (ERP);~~

~~7.the maintenance requirements; and~~

~~8.the record-keeping requirements.~~

~~4.4 List the mitigation measures (including the definition of a specific authorised flight path, if applicable)[6].~~

~~4.5 The minimum competency required for the remote pilot and the methodology to assess it.~~

~~4.6 The minimum competency required for the staff essential for the operation (i.e. maintenance staff, the launch and recovery assistant, UA AO, etc.) and the methodology to assess it.~~

Note 1: In section 4, more than one UAS may be listed. If needed, the fields may be duplicated.

Note 2: The signature and stamp may be provided in electronic form. The quick response (QR) code should provide the link to the national database where the operational authorisation is stored.

~~[6] In case of cross-border UAS operations, this information will be revised by the NAA of the Member State of operation.~~

~~GM~~AMC1 UAS.SPEC.050(1)(d) and UAS.SPEC.050(1)(e) Responsibilities of the UAS operator

THEORETICAL KNOWLEDGE SUBJECTS FOR THE TRAINING OF THE REMOTE PILOT AND ALL PERSONNEL IN CHARGE OF DUTIES ESSENTIAL TO THE UAS OPERATION~~TRAINING FOR~~ IN THE 'SPECIFIC' CATEGORY

(a) The 'specific' category may cover a wide range of UAS operations with different levels of risk and a wide range of UAS designs, in particular in terms of level of automation. The following guidelines may, therefore, have to be adapted considering the level of automation and the level of involvement of the remote pilot in the management of the flight. The UAS operator is, therefore, required to identify the competency required for the remote pilot ~~and all the personnel in charge of duties essential to the UAS operation,~~ according to the outcome of the risk assessment. This AMC covers the theoretical knowledge subjects while AMC2 UAS.SPEC.050(1)(d) covers the practical knowledge subjects applicable to all UAS operations in the 'specific' category. In addition, for both theoretical and practical knowledge subjects, the UAS operator should select the relevant additional modules from AMC3 UAS.SPEC.050(1)(d), as applicable to the type of the intended UAS operation. The UAS operator should achieve a level of robustness consistent with the assurance integrity level (e.g. SAIL) of the intended UAS operation.

(b) Additional topics to cover areas under national competence, such as national regulations for security, privacy and data protection, may be added by the national competent authority. In case of operations conducted in a MS other the State of registration, these additional topics may be defined as local conditions required by the MS of operation.

(~~b~~c) When the UAS operation is conducted according to ~~a~~one of the STSs that are listed in Appendix 1 to the Annex of the UAS Regulation, the UAS operator ~~must~~should ensure that the remote pilot has the competency that is defined in the STSs. In all other cases, the UAS operator ~~may~~should propose to the competent authority~~NAA~~, as part of the application, a theoretical knowledge training course for the remote pilot based on the elements that are listed in AMC1 UAS.OPEN.020(4)(b), ~~and~~ in UAS.OPEN.0~~3~~40(3~~2~~), in AMC1 UAS.OPEN.030(2)(c) and in Attachment A to the Annex of the UAS Regulation, which are relevant for the intended operation, complemented by the ~~following~~ elements listed below~~subjects~~. The UAS operator may use the same listed topics to propose also for the personnel in charge of duties essential to the UAS operation a theoretical knowledge training course with competency-based theoretical training specific to the duties of that personnel.

(1) ~~air~~Aviation safety:

(i) remote pilot records;

(ii) logbooks and associated documentation;

(iii) good airmanship principles;

(iv) aeronautical decision-making;

(v) ground safety;

(vi) ~~aviation~~air safety;

(vii) air proximity reporting; and

(viii) advanced airmanship:

(A) manoeuvres and emergency procedures; and

(B) general information on unusual conditions (e.g. stalls, spins, vertical lift limitations, autorotation, vortex ring states);.

(2) aAviation regulations:

(i) introduction to the UAS Regulation with focus on the 'specific' category;

(ii) risk assessment, introduction to the SORA; and

(iii) overview of the STSs and the PDRA;.

(3) nNavigation:

(i) navigational aids (e.g. GNSS) and their limitations (e.g. GNSS);

(ii) reading maps and aeronautical charts (e.g. 1:500 000 and 1:250 000, interpretation, specialised charts, helicopter routes, U-space service areas, and understanding of basic terms); and

(iii) vertical navigation (e.g. reference altitudes and heights, altimetry);.

(4) hHuman performance limitations:

(i) perception (situational awareness in BVLOS operations); and

(ii) fatigue:

(A) flight durations within work hours;

(B) circadian rhythms;

(C) work stress; and

(D) vision problems; and

(ED) commercial pressures; and

(iii) attentiveness:

(A) eliminating distractions; and

(B) scan techniques;

(iv) medical fitness (health precautions, alcohol, drugs, medication, etc.); and

(v) environmental factors such as vision changes from orientation to the sun.;

(5) Airspace operating principlesoperational procedures:

(i) airspace classifications and operating principles;

(ii) U-space;

(iii) procedures for airspace reservation;

(ivii) aeronautical information publications (AIPs); and

(~~i~~v) NOTAMs.~~; and~~

~~(v) mission planning, airspace considerations and site risk-assessment:~~

~~(A) measures to comply with the limitations and conditions applicable to the operational volume and the ground risk buffer for the intended operation; and~~

~~(B) BVLOS operations. Use of UA VOs;~~

(6) General knowledge of UASs and external systems that support the operation of UASs ~~general knowledge~~:

(i) differences between autonomy levels (e.g. automatic versus autonomous operations);

(ii) loss of signal and system failure protocols — understanding the condition and planning for programmed responses such as returning to home, loiter, landing immediately;

(iii) equipment to mitigate air and ground risks (e.g. flight termination systems);~~ and~~

(iv~~ii~~) flight control modes;

(v) the means to monitor the UA (its position, height, speed, C2 link, systems status, etc.);

(vi) the means of communication with the VOs; and

(vii) the means to support air traffic awareness.

(7) ~~m~~Meteorology:

(i) obtaining and interpreting advanced weather information:

(A) weather reporting resources;

(B) reports;

(C) forecasts and meteorological conventions appropriate for typical UAS flight operations;

(D) local weather assessments (including sea breeze, sea breeze front, and urban heat island);

(E) low-level charts; and

(F) METAR, SPECI, TAF;

(ii) regional weather effects — standard weather patterns in coastal, mountain or desert terrains; and

(iii) weather effects on the UA (wind, storms, mist, variation of wind with altitude, wind shear, etc.).~~; and~~

(8) Technical and operational mitigation measures for air risks:~~emergency response plan (ERP) —~~

(i) operations for which airspace observers (AOs) are employed; and

(ii) principles of detect and avoid (DAA).

(9) Operational procedures:

(i) mission planning, airspace considerations, and site risk assessment:

(A) measures to comply with the limitations and conditions applicable to the operational volume and to the ground risk buffer for the intended UAS operation;

(B) UAS operations over a controlled ground area;

(C) BVLOS operations;

(D) use of UA VOs;

(E) importance of on-site inspections, operation planning, pre-flight and operating procedures;

(ii) multi-crew cooperation (MCC):

(A) coordination between the remote pilot and other personnel (e.g. AOs) in charge of duties essential to the UAS operation;

(B) crew resource management (CRM):

(a) effective leadership;

(b) working with others.

(10) Managing data sources regarding:

(i) where to obtain the data from;

(ii) the security of the data;

(iii) the quantity of the data needed; and

(iv) the impact on the storage of data.

(~~8~~c) emergency response plan (ERP) —~~-~~ the UAS operator should provide its personnel with competency-based theoretical training covering the ERP that includes the related proficiency requirements and recurrent training.

(d) Both the training and the assessment should be appropriate to the level of automation of the intended UAS operation.

~~(c) The UAS operator may define additional aspects from the subjects mentioned in point (b) based on the UAS operations intended to be conducted:~~

~~(1) operational procedures;~~

~~(i) mission planning, airspace considerations and site risk assessment — operations over a controlled ground area;~~

~~(ii) multi crew cooperation (MCC):~~

~~(A) coordination between the remote pilot and other personnel in charge of duties essential to the UAS operation (i.e. VO);~~

~~(B) crew resource management (CRM):~~

~~(a) effective leadership; and~~

~~(b) working with others;~~

~~(2) UAS general knowledge — the means supporting BVLOS operations:~~

~~(i) the means to monitor the UA (its position, height, speed, C2 Link, systems status, etc.);~~

~~(ii) the means of communication with VOs; and~~

~~(iii) the means to support air traffic awareness.~~

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

PRACTICAL-SKILLS TRAINING FOR THE REMOTE PILOT AND ALL PERSONNEL IN CHARGE OF DUTIES ESSENTIAL TO THE UAS OPERATION IN THE 'SPECIFIC' CATEGORY

(a) Regarding the practical-skills training and assessment for the remote pilot, the UAS operator should consider the competencies that are defined in AMC2 UAS.OPEN.030(2)(b), complemented by the items listed below. The UAS operator should adapt the practical-skills training to the characteristics of the intended UAS operation and the functions available on the UAS. The UAS operator may use the same listed topics and may provide a practical training course also for all other personnel in charge of duties essential to the UAS operation. Appropriate simulators may be used to conduct some or all the tasks.

(1) Preparation of the UAS operation:

(i) implement the necessary measures to comply with the limitations and conditions applicable to the operational volume and to the ground risk buffer for the intended UAS operation in accordance with the OM procedures;

(ii) follow the necessary procedures for UAS operations in controlled airspace, including a protocol to communicate with the ATC and obtain clearance and instructions, if necessary;

(iii) confirm that all necessary documents for the intended UAS operation are on-site;

(iv) brief all participants on the planned UAS operation;

(v) perform visual airspace scanning; and

(vi) if AOs are employed, place them appropriately and brief them on the deconfliction scheme that includes phraseology.

(2) Preparation for the flight:

(i) ensure that all safety systems and functions, if installed on the UAS, including its height and speed limitation systems, flight termination system, and triggering system, are operational; and

(ii) know the basic actions to be taken in the event of an emergency, including issues with the UAS, or a mid-air collision hazard arising during the flight.

(3) Flight under abnormal conditions:

(i) manage a partial or a complete power shortage of the UA propulsion system, while ensuring the safety of third parties on the ground;

(ii) manage a situation of a non-involved person entering the operational volume or the controlled ground area, and take appropriate measures to maintain safety; and

(iii) react to, and take the appropriate corrective actions for, a situation where the UA is likely to exceed the limits of both the flight geography (contingency procedures) and of the operational volume (emergency procedures) as they were defined during the flight preparation.

(4) In general, emphasis should be placed on the following:

(i) normal, contingency, and emergency procedures;

(ii) skill tests combined with periodic proficiency checks;

(iii) operational experience (with on-the-job training counting towards proficiency);

(iv) pre-flight and post-flight procedures and documentation;

(v) recurrent training (UAS / flight training device (FTD)); and

(vi) remote pilot incapacitation.

(b) The practical-skills training may be conducted with the UAS or on an FTD. Scenario-based training (SBT) with highly structured, real-world experience scripts for the intended UAS operation should be used to fortify personnel's learning in an operational environment and improve situational awareness. SBT should include realistic normal, abnormal, and emergency scenarios that are drafted considering specific learning objectives.

(c) The practical-skills training is checked during the assessment and can be provided using the actual UAS or an FTD appropriate to the intended UAS operation.

(d) Initial and recurrent training

(1) The UAS operator should ensure that specified minimum requirements regarding the time of the initial and recurrent training (e.g. duration and number of flight hours) are provided for in a manner that is acceptable and approved by the competent authority.

(2) Depending on the training course, each of the topics shown in Table 1 below may require only overview training or in-depth training. In-depth training should be interactive and should include discussions, case-study reviews, and role play, as deemed necessary to enhance learning. In case of change or update of the SW/HW of the UAS, depending on the size of the changes, the UAS operator should define the level of training.

Topic	Initial training	Change of UAS	Change of remote pilot/crew	Recurrent training
Situational awareness and error management	In-depth	In-depth	Overview	Overview
Organisational safety culture, operational procedures, and organisational structure	In-depth	Not required	In-depth	Overview
Stress management, fatigue, and vigilance	In-depth	Not required	Not required	Overview
Decision-making	In-depth	Overview	Not required	Overview
Automation and philosophy of the use of automation	As required	In-depth	In-depth	As required
Specific UAS type-related differences	As required	In-depth	Not required for the same UAS type)	As required
Case-based studies	In-depth	In-depth	In-depth	As required

Table 1 — Level of the practical-skills training in several topics depending on initial training, recurrent training, or change of UAS / remote pilot / remote crew

AMC3 UAS.SPEC.050(1)(d) Responsibilities of the UAS operator

UAS OPERATION-SPECIFIC ENDORSEMENT MODULES

Depending on the type and risk of the intended UAS operation, the UAS operator may propose, as part of the application for an operational authorisation, additional theoretical knowledge training in combination with the practical-skills training that is specific to the intended UAS operation as described in the OM.

The practical-skills training should at least contain the practical competencies that are described in AMC2 UAS.OPEN.030(2)(b) 'UAS operations in subcategory A2', which may include relevant emergency and contingency procedures. However, the UAS operator may adapt that training to the level of automation of the UAS.

During the practical-skills training, the remote pilot should list the relevant emergency and contingency procedures, which are defined in the OM and are peculiar to flight over known populated areas or over assemblies of people or increased air risk, in a given area of operation, and should describe the basic conditions for each kind of emergency as well as the related recovery techniques to be applied during flight for the emergencies that are defined in the OM. Depending on the criticality of the situation and on the available time to react, the remote pilot should memorise some procedures, while for other procedures, they may consult a checklist. The emergency and contingency procedures may involve also other personnel; in that case, the UAS operator should define the practical-skills training needed for them.

The remote pilot only needs to complete the relevant operation-specific endorsement modules that reflect the intended UAS operation. For example, in case of transport of cargo, the remote pilot should complete the related training module 'Transport and/or dropping of cargo'; however, if the cargo contains dangerous goods, then the remote pilot should also complete the training module 'Transport of dangerous goods'.

The assurance level of the operation-specific endorsement modules is determined by the related assurance integrity level (e.g. SAIL) according to the respective specific operational risk assessment.

Relevant UAS operation-specific endorsement modules should be reflected in the documentation of the remote pilot's competencies.

The following UAS operation-specific endorsement modules and the areas to be covered are recommended:

(a) night operations;

(b) overflight (flight over known populated areas or over assemblies of people);

(c) BVLOS operations;

(d) low-altitude (below 500 ft) operations;

(e) flights in non-segregated airspace;

(f) transport and/or dropping of cargo;

(g) transport of dangerous goods;

(h) operations with multiple UASs and swarms;

(i) UA launch and recovery using special equipment;

(j) flying over mountainous terrain.

Note: The 'Rationale' in grey-font italics under the 'Learning objectives' column is provided for explanatory purposes and does not form part of the proposed rule text.

Operation-specific endorsement modules	**Areas to be covered**	**Learning objectives**
Night operations	General	Recognise the meaning of the definition of 'night' or other similar wording that is used for night flight. *Rationale: In Regulation (EU) No 1178/2011 (the 'Aircrew Regulation'), 'night' for manned aviation 'means the period between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise as may be prescribed by the appropriate authority'.* *Some national laws use the sunset and sunrise times for the definition of a night flight. 'Sunset' is defined as the daily disappearance of the upper limb of the sun below the horizon. This time depends on the latitude and longitude of the viewpoint. There are*

Operation-specific endorsement modules	Areas to be covered	Learning objectives
		many websites and apps to find out the sunset and sunrise times at a specific location. Recognise the benefits of illuminating the operational area, especially during the critical phases of take-off and landing. Recognise that during night flight it is hard to estimate the distance between the UA and other obstacles if visibility is only ensured by the lights of the UA. Recognise that a visual obstacle avoidance system may be less accurate in night-time operations. Understand that if the sight of the UA is lost at night, return-to-home (RTH) should be immediately followed. *Rationale: During daytime, it is sometimes difficult to see the position of the UA, which is even more difficult at night.* Recognise that an infrared radiation (IR) camera allows one to see enough at night. Turning off the front green flashing light~~lights~~ might improve the view because there will be no reflection in the on-board camera. Recognise that the IR camera does not help in case of rain/humidity, and that the IR visibility significantly decreases. Explain the use of the green flashing light at night. Explain the use of navigation lights, position lights, anti-collision lights, and other lights for UA controllability. Explain the use of lights (e.g. navigation, position, or anti-collision lights) for recognising the presence of manned aircraft. *Rationale: Those lights show where the UA is positioned and the direction in which the UA is aligned.* *For manned aircraft, a red navigation light is located on the leading edge of the left-wing tip and a green navigation light on the leading edge of the right-wing tip (for helicopters, on the left and right sides of the cockpit). A white navigation light is positioned on the tail as far aft as possible. High-intensity strobe lights are also located in those positions. They are used as anti-collision lights and flash twice after a short break. A red rotating beacon is also part of the anti-collision lights.*

Operation-specific endorsement modules	Areas to be covered	Learning objectives
	Degradation of visual acuity	Recognise that flying the UA at night degrades visual perception. Recognise night myopia, caused by the increasing pupil size. At low-light levels, without distant objects to focus on, the focusing mechanism of the eye may go to a resting myopic position. If night-vision goggles are used, know how they function.
	Night illusions	Define the term 'night illusion'. Recognise and overcome visual illusions that are caused by darkness, and understand the physiological conditions that may degrade night vision. State the limitations of night vision techniques at night and by day.
	Altered visual-scanning techniques	State the limitations of the different visual-scanning techniques at night and by day. *Rationale: Despite the value of electronic means of conflict detection, physical lookout remains an important defence against the loss of visual separation for all types of aircraft.* *To avoid collisions, the remote pilot should visually scan effectively from the moment the UA starts moving until it comes to a stop at the end of the flight. Collision threats are present everywhere.* *Before take-off, the remote pilot should visually check the take-off area to ensure that there are no other objects. After take-off, the remote pilot should continue to visually scan to ensure a safe departure of the UA with no obstacles.*
	Altered identification of obstacles	Explain the effect of obstacles on the take-off distance that is required at night. *Rationale: The remote pilot should know the flight area where the UA will fly at night. Objects look different and power lines are nearly invisible at night. It is, therefore, advisable that the remote pilot conduct a test flight during the daytime.*
Overflight (flight over known populated	Identification of populated areas and assemblies of people	Explain the definition of 'populated area' and 'assemblies of people'.

Operation-specific endorsement modules	Areas to be covered	Learning objectives
areas or over assemblies of people)	Optimising flight paths to reduce risk of exposure	Explain the effects of the following variables on the flight path and take-off distances: — take-off procedure; — obstacle clearances both laterally and vertically; — understand the lethality of a UAS including debris area through flying parts after a crash; and — recognise the importance of a defined emergency landing area.
	Likely operating sites and alternative sites	Recognise the different operating sites and alternative sites on the route of the overflight.
	Adequate clearance for wind effects, especially in urban environment	Explain how the wind changes at very low height due to its interaction with orography and buildings.
	Obstructions (wires, masts, buildings, etc.)	Explain the effect of obstacles on the required take-off distance. Interpret all available procedures, data, and information regarding obstructions that could be encountered during overflight.
	Avoiding third-party interference with the UA	Explain how to avoid third-party interference with the UA.
	Minimum separation distances from persons, vessels, vehicles, and structures	Explain the importance of minimum separation distances from persons, vessels, vehicles, and structures.
	Impact of electromagnetic interference, i.e. high-intensity radio transmissions	Describe the physical phenomenon ‘interference’. Explain in which situations electromagnetic interference could occur, particularly with regard to electromagnetic emissions and signal reflections peculiar to an urban environment. Explain their impact on the UAS system (i.e. C2 link GNSS quality, etc.)
	Crowd control strategies and public access	Explain the importance of ensuring that no one is endangered within the take-off and landing area. Describe the different crowd control strategies. Explain the importance of having knowledge of public access.
BVLOS operations	Operation planning: airspace, terrain, obstacles,	Explain the operation planning for BVLOS operations:

Operation-specific endorsement modules	**Areas to be covered**	**Learning objectives**
	expected air traffic, and restricted areas	— check the flying conditions (e.g. geographical zone, NOTAM) and obstacles along the planned route; — secure the necessary documentation before the BVLOS operation; — know and comply with the local conditions in the area where the BVLOS operation takes place; — ensure communication with the air traffic controller (ATCO), depending on the type of airspace within which the BVLOS operation is planned to be conducted; — plan the BVLOS operation including flight route and response to contingency and emergency events; — in uncontrolled airspace, check the actual traffic level of manned traffic along the planned route, including low-level traffic such as paragliders, hang gliders, helicopters, model aircraft, seaplanes and other possible traffic; — in uncontrolled airspace, verify that the UAS operation has been notified to manned aviation using, e.g. NOTAM, or other means used by manned aviation; — how to employ airspace observers (AOs), when needed; — consider the C2 link limitations (e.g. maximum range and presence of obstacles); and — use of conspicuity devices or traffic information / detection of incoming aircraft / deconfliction and emergency manoeuvres.
	Sensor systems and their limitations	State the limitations of the different sensor systems. *Rationale: UASs that are used for BVLOS operations should maintain precise positioning to avoid traffic conflict and to successfully carry out their mission. Environmental features, such as tunnels and urban canyons, can weaken GNSS signals or even cause them to be lost completely. To maintain accuracy in GNSS-denied environments, UA may use real-time kinematic (RTK) capable inertial navigation systems (INSs) that provide information from accelerometers and gyroscopes to accurately estimate position, velocity, heading, and attitude.*
	Cooperative and non-cooperative aircraft (airspace surveillance)	Identify the cooperative and non-cooperative detect-and-avoid (DAA) sensor/system capabilities for UA, if applicable.

Operation-specific endorsement modules	Areas to be covered	Learning objectives
		Rationale: Cooperative and non-cooperative DSAA capabilities are key enablers for UA to safely and routinely access all airspace classes.
	Roles and responsibilities of the remote pilot to remain clear of collision	Explain the traffic alert system and traffic collision avoidance system (TCAS) phraseologies, and how these systems work. Identify the roles and responsibilities of the remote pilot to remain clear of collision. Explain the collision avoidance methodology that is used in the operation to keep the UA clear of other traffic. *Rationale: Collision avoidance is emerging as a key enabler for UAS operations in civil airspace. The operational and technical challenges of UAS collision avoidance are complicated by the wide variety of UA, of their associated missions, and of their ground control capabilities. Numerous technological solutions for collision avoidance are being explored in the UAS community.*
	Command, control and communication (C3) link performance and limitations	Know the definition of 'C3'. Understand the relation between communications and effective command and control (C2). Understand the basic C3 structure. Understand the use of true and relative motion displays. Understand the problems inherent in C3. *Rationale: C3 cannot be accomplished without two-way communications. C3 would be impossible unless the remote pilot can collect feedback in some form. Basic to any C3 system is the incorporation of a reliable communications network.*
	Signal or communications latency for the C2 link	Understand the impact of signal or communications latency on the C2 link. Explain what can cause, and how to detect, a signal or communications latency. Describe the actions that are required following a signal or communications latency. *Rationale: BVLOS control may require a satellite communications link that implies a level of signal delay, or signal latency, which may impact on the accuracy of the BVLOS operation.*
	Planning for the loss of C2 link or for system failure	Understand the impact of a loss of C2 link.

Operation-specific endorsement modules	**Areas to be covered**	**Learning objectives**
		Explain what can cause, and how to detect, a system failure. Describe the actions that are required following a loss of C2 link. Describe how to plan the contingency routes in case of a loss of the C2 link. *Rationale: It is of utmost importance to keep track of the UASs in civil airspace, and to know what happens if the C2 link between the remote pilot's ground control station and the UAS is disrupted. In such a loss-of-the-C2-link situation, the UA usually flies on a pre-programmed contingency route based on its flight altitude, orientation, and bearing. The absence of situational awareness and direct communication from the UA makes it difficult or impossible for the ATCOs to discover the real position of the UA and identify if the pre-programmed contingency route is properly followed impairing the possibility to clear the traffic along its intended route.*
	Interpreting separate data sources	Interpret different data sources to identify whether during flight the UA follows the planned route.
	Crew resource management (CRM)	Explain the importance of CRM for BVLOS operations.
Low-altitude (below 500 ft) operations	Air traffic management (ATM) procedures	Describe the ATM procedures for low-altitude operations.
	Radio communications and phraseology	Define the meaning of 'standard words and phrases'. Recognise, describe, and use the correct standard phraseology for each phase of a visual flight rules (VFR) flight. Explain the selective calling (SelCal) system and aircraft communications addressing and reporting system (ACARS) phraseologies. Explain the traffic alert and collision avoidance system (TCAS) phraseologies.
	Situational awareness	Keep situational awareness, especially with low-level manned aircraft and, if necessary, employ airspace observers (AOs).
	Advanced aviation terminology	Explain the meaning of low-altitude operations related terminology.
Flight in non-segregated airspace	Clear roles and responsibilities	Describe the relationship between the initiating causes (or threats), the hazard (top (main) event), the risk mitigations (the controls and barriers), and

Operation-specific endorsement modules	Areas to be covered	Learning objectives
		the potential consequential results (loss states) when conducting a flight in a non-segregated airspace.
	Wake turbulence	State the wake turbulence categories for UA. State the wake turbulence separation minima.
Transport and/or dropping of cargo	Weight and balance	Describe the relationship between UA mass and structural stress. Describe why mass should be limited to ensure adequate margins of strength. Describe the relationship between UA mass and aircraft performance. Describe why UA mass should be limited to ensure adequate aircraft performance. Depending on the type of operation, describe the relationship between centre-of-gravity (CG) position and stability/controllability of the UA. Describe the consequences if the CG is in front of the forward limit. Describe the consequences if the CG is behind the aft limit. Describe the relationship between CG position and aircraft performance. Describe the effects of the CG position on the performance parameters (speed, altitude, endurance, and range). Be familiar with the abbreviations regarding mass and balance, e.g. (maximum) take-off mass ((M)TOM), (maximum) landing mass ((M)LM), basic empty mass (BEM), dry operating mass (DOM), operating mass (OM), and zero-fuel mass (ZFM). Describe the effects of changes in the load when dropping an object. Describe the effects of an unintended loss of the load. *Rationale: Mass and balance are extremely important for a UA. A UA that is not in balance may become difficult to control. Therefore, the overall balance should be considered when adding payloads, attaching gimbals, etc.*
	Load securing and awareness of dangerous goods	Calculate the MTOM and the MLM. Explain the reasons for restraining or securing cargo loads.

Operation-specific endorsement modules	Areas to be covered	Learning objectives
		Describe the basic methods of restraining or securing loads. Explain why the transport of dangerous goods by air is subject to an additional training module. State that certain articles and substances, which would otherwise be classified as dangerous goods, may be exempted if they are part of the UA equipment. *Rationale: The safe operation of the UAS requires to weigh all cargo in the UA (or provide an accurate estimate of weight using 'standard' values), load it correctly, and secure it to prevent loss or movement of the cargo during the flight.* *Loading should be performed in accordance with the applicable regulations and limitations. The UAS operator's loading procedures should be in accordance with the instructions given by the person that has the overall responsibility for the loading process for a particular UA flight. These loading instructions should match the requirements for cargo distribution that are included in the UA load and trim sheet.*
Transport of dangerous goods	Safe transport of dangerous goods	Explain the terminology relevant to dangerous goods. Be able to recognise dangerous goods and understand their labelling. Be able to interpret the documentation related to dangerous goods. Recognise dangerous goods by using 'safety data sheets' and the consumer labelling of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). Explain that the provisions for the transport of dangerous goods by air are included in ICAO Doc 9284 'Technical Instructions for the Safe Transport of Dangerous Goods by Air'. State the emergency/reporting procedures in case of an event with dangerous goods, including that in the event of a dangerous-goods-related emergency regarding the UA, the remote pilot should inform the ATC organisation of the transport of dangerous goods. Explain the principles of compatibility and segregation of dangerous goods. Explain the special requirements for loading radioactive materials.

Operation-specific endorsement modules	**Areas to be covered**	**Learning objectives**
		Explain the use of the dangerous goods list. Explain the procedures for collecting safety data, e.g. reporting accidents, incidents, and occurrences with dangerous goods. *Note: The learning objectives should be derived from the* Technical Instructions *and should be commensurate with the personnel responsibilities.*
Operations with multiple UASs and swarms	Limitations related to human factors	Understand the human performance limitations in an operation with multiple UASs, including UAS swarms. List the vital actions that the remote pilot and the persons who assist the remote pilot should perform in case of an emergency descent of the multiple/swarming UASs.
	CRM	Explain the importance of CRM for operations with multiple UASs and swarms.
	Navigating multiple platforms	Describe how to navigate multiple platforms.
	Recognising system failures	Describe the different failures that may potentially occur during multiple/swarming UAS operations. Explain what to do in the event of a failure. Recognise that the remote pilot can override the system in the event of a failure.
	Emergency containment procedures	List the different emergency containment procedures and describe the basic conditions for each kind of emergency. Describe the recovery techniques in the event of engine or battery failure during multiple/swarming UAS operations.
UAS launch and recovery using special equipment	Operating procedures	Explain the specific procedures for launch and recovery operations. Explain the impact on the UA’s behaviour when the systems for launch and recovery are operated from a moving vehicle, including ships.
	Recognising failures	Describe the different failures that may occur during launch and recovery operations. Explain what to do in the event of a failure. Describe the cases where the remote pilot can override the system in the event of a failure.

<table>
<tr><th>Operation-specific endorsement modules</th><th>Areas to be covered</th><th>Learning objectives</th></tr>
<tr><td rowspan="3">Flying over hilly environment</td><td>Temperature inversions</td><td>Describe the following:
— the effect of thermic-induced turbulence near the Earth's surface;
— surface effects;
— diurnal and seasonal variations;
— the effect of clouds; and
— the effect of wind.
Rationale: The temperature can affect the density altitude. If the UA flies on a hot and humid day, the remote pilot will experience poor UA performance: as the temperature increases, the air molecules spread out. As a result, the propellers or motors of the UA do not have much air to grab on to.</td></tr>
<tr><td>Orographic lifting</td><td>Describe the effect of exploiting orographic lifting (i.e. slope or ridge) and the actions required.
Describe the vertical movements, wind shear, and turbulence, which are typical of hilly environment.
Rationale: Orographic lifting occurs when an air mass is forced from a low elevation to a higher elevation as it moves over rising terrain. As the air mass gains altitude, it quickly cools down adiabatically, which can raise the relative humidity to 100 %, create clouds and, under the right conditions, cause precipitation[7].</td></tr>
<tr><td>Higher winds through passes</td><td>Describe the effects of wind shear and the actions required when wind shear is encountered at take-off and approach.
Describe the precautions to be taken when wind shear is suspected at take-off and approach.
Describe the effects of wind shear and the actions required following entry into strong downdraught wind shear.
Describe the influence of a mountainous area on a frontal passage.
Rationale: In mountainous environment, the wind blows smoothly on the windward side of the mountain. On the leeward side, the wind follows the contours of the terrain and can be quite turbulent: this is called a katabatic wind. The stronger the wind, the higher the downward pressure. Such a wind will push the UA down towards the surface of the mountain. If the remote pilot does not know how to</td></tr>
</table>

[7] For examples of such service providers, see the footnote in E.6 'OSOs related to the deterioration of external systems supporting UAS operations' of Annex E to AMC1 Article 11 of the UAS Regulation.

Operation-specific endorsement modules	Areas to be covered	Learning objectives
		recognise a downdraft, which is downward moving air, the situation can become quite challenging.
	Mountain waves	Explain the origin and formation of mountain waves. State the conditions necessary for the formation of mountain waves. Describe the structure and properties of mountain waves. Explain how mountain waves may be identified through their associated meteorological phenomena. Explain that mountain wave effects may exceed the performance or structural capability of the UA. Explain that mountain wave effects may be propagated from low to high levels. Indicate the turbulent zones (mountain waves, rotors) on a drawing of a mountain chain.
	High- and low-pressure patterns	Describe the movements of fronts and pressure systems, and the life cycle of a midlatitude depression. State the rules for predicting the direction and the speed of movement of fronts. State the difference in the speed of cold and warm fronts. State the rules for predicting the direction and the speed of frontal depressions.
	Density altitude effects	Define pressure altitude and air density altitude. Explain the effects of all-up mass (AUM), pressure, temperature, density altitude, and humidity. Explain the influence of density altitude on the equilibrium of forces and moments in a stable hover, if applicable. *Rationale: Higher-density altitude means thinner air, and thinner air means that the remote pilot will experience poor UA performance. The propellers or motors of the UA do not have much air to grab on to. Lower-density altitude means thicker, denser air, and higher UA performance.* *This knowledge is very important when the remote pilot flies in a mountainous or other high-elevation environment.*

~~AMC1 UAS.SPEC.050(1)(e)(ii) Responsibilities of the UAS operator~~

~~INFORMATION ABOUT THE UAS OPERATOR'S MANUAL~~

~~The UAS operator should ensure that the personnel in charge of duties essential to the UAS operation apply the procedures contained in the operator's manual.~~

GM1 UAS.SPEC.050(1)(d)(iii) Responsibilities of the UAS operator

COORDINATION OF THE UAS OPERATOR WITH THE DESIGNATED ENTITY(IES)

For UAS operations that require an operational authorisation, the training of the remote pilots must be provided in coordination with the entity(ies) that is (are) designated by the competent authority, only if the competent authority has nominated entities that meet the applicable criteria to provide the required training. If the competent authority has not designated any entity, then such coordination is not required.

GM~~2~~1 UAS.LUC.030(2)(g)(vi) Safety management system

[…]

GM~~2~~1 UAS.LUC.030(2)(g)(viii) Safety management system

[…]

AMC1 UAS.LUC.030(2)(g)(v) Safety management system

COMPLIANCE MONITORING

[…]

(b) The compliance monitoring manager should:

[…]

(3) not be one of the other persons referred to in UAS.LUC.030(2)(~~c~~d).

AMC1 UAS.LUC.030(2)(g)(vi) Safety management system

SAFETY RISK MANAGEMENT

[…]

(h) respond to emergencies using an ERP that reflects the size, nature, and complexity of the activities performed by the organisation, considering AMC3 UAS.SPEC.030(3)(e). The ERP should:

(1) contain the action to be taken by the UAS operator or the specified individuals in an emergency;

(2) provide for a safe transition from normal to emergency operations and vice versa;

(3) ensure coordination with the ERPs of other organisations, where appropriate; and

(4) describe emergency training/drills, as appropriate.

AMC2~~AMC21~~ UAS.LUC.040 LUC manual

GENERAL

The LUC manual may contain references to the OM, where an OM is compiled in accordance with ~~GM~~AMC1 UAS.SPEC.030(3)(e).

[…]

LUC MANUAL TEMPLATE

Operator's name

Table of contents

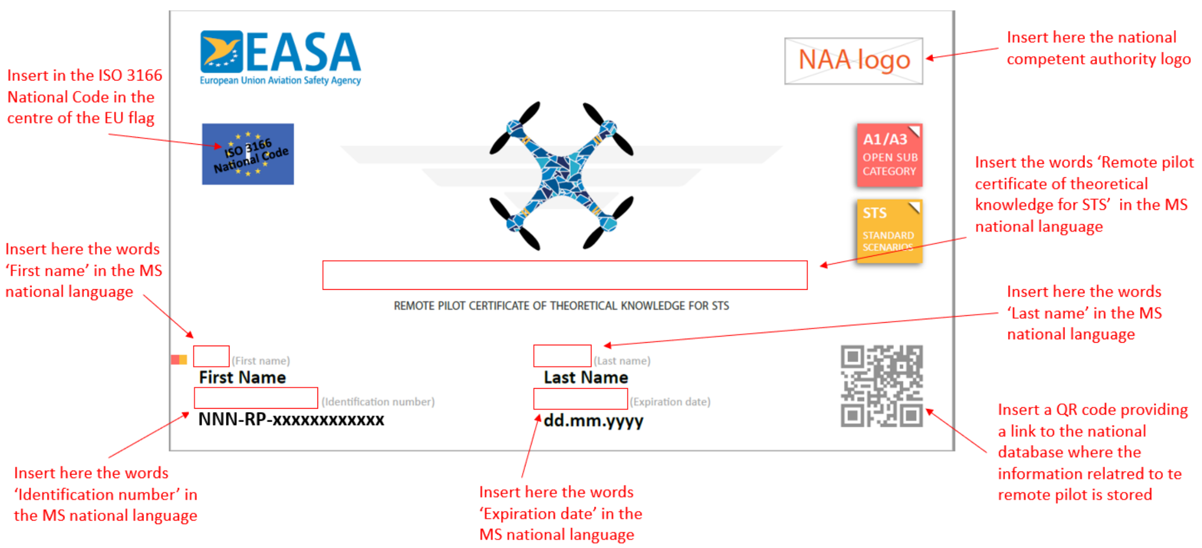
1. Introduction (*the information under Chapter 1~~0, points 1-6~~ of the OM may be duplicated here or simply referenced in~~to~~ the OM*)

[…]

AMC1 UAS.STS-01.020(1)(e)(i) UAS operations in STS-01 and UAS.STS-02.020(7)(a) UAS operations in STS-02

CERTIFICATE OF REMOTE PILOT THEORETICAL KNOWLEDGE

Upon receipt of proof that the remote pilot has successfully completed the theoretical knowledge examination, the competent authority or the entity that is designated by the competent authority should provide the remote pilot with a certificate of remote pilot theoretical knowledge in the format that is depicted in the figure below. The certificate may be provided in electronic form.



The remote pilot identification number that is provided by the competent authority, or the entity that is designated by the competent authority, which issues the certificate of remote pilot theoretical knowledge should have the following format:

NNN-RP-xxxxxxxxxxxx

Where:

— 'NNN' is the ISO 3166 Alpha-3 code of the competent authority that issues the proof of completion;

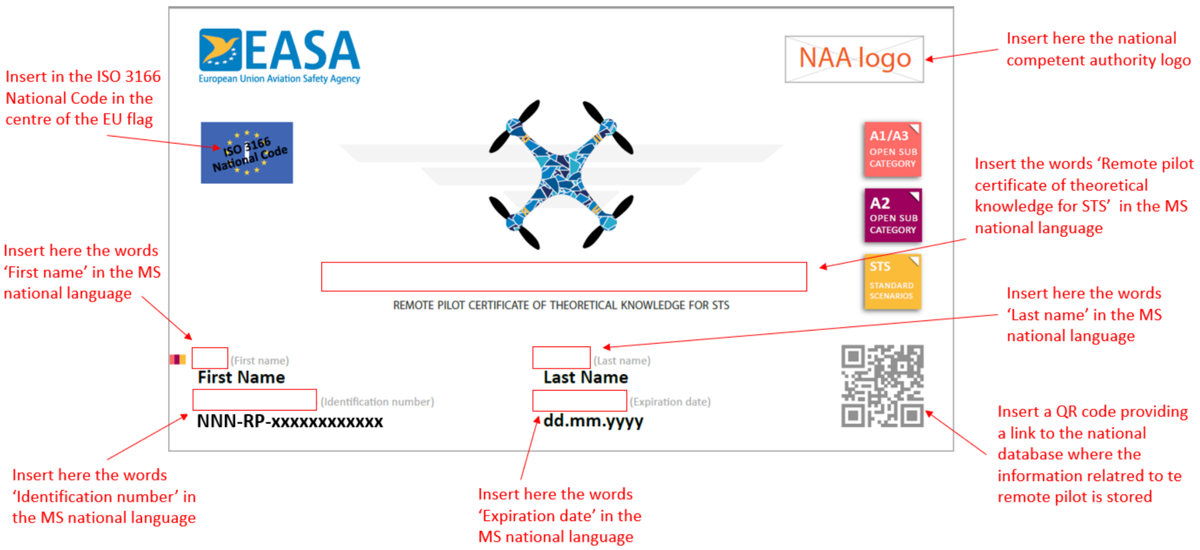
— 'RP' is a fixed field meaning 'remote pilot'; and

— 'xxxxxxxxxxxx' are 12 alphanumeric characters (lower-case only) defined by the competent authority that issues the proof of completion.

Example: (FIN-RP-123456789abc)

The QR code provides a link to the national database where the information related to the remote pilot is stored. Through the 'remote pilot identification number', all information related to the training of the remote pilot can be retrieved by authorised bodies (e.g. competent authorities, law enforcement authorities, etc.) and authorised personnel.

If the remote pilot provides the declaration of the practical-skills self-training as defined in point UAS.OPEN.030(2)(c), before passing the theoretical knowledge examination, the competent authority may include in the certificate also 'subcategory A2'.



AMC1 UAS.STS-01.020(1)(e)(ii) UAS operations in STS-01 and UAS.STS-02.020(7)(b) UAS operations in STS-02

REMOTE PILOT PRACTICAL TRAINING FOR STSs

The instructor should gradually compile a 'progress booklet' to allow the monitoring of the training and the continuous evaluation of the practical skills of the student remote pilot.

The progress booklet should be signed by the student remote pilot at the end of each practical training cycle. A record of the booklet should be kept for 5 years.

When the student remote pilot reaches the desired level of competence, the organisation that provides the practical training issues an attestation of practical training.

GM1 UAS.STS-01.020(1)(e)(ii) UAS operations in STS-01 and UAS.STS-02.020(7)(b) UAS operations in STS-02

REMOTE PILOT PRACTICAL TRAINING FOR STSs

Practical training for STSs is provided as a 'continuous evaluation' of the student remote pilot by:

(1) either a UAS operator that has declared compliance with:

(a) the relevant STS(s) (the one(s) for which training and assessment are provided); and

(b) the requirements of Appendix 3 to the Annex to the UAS Regulation; or

(2) an entity that has declared compliance with the requirements of Appendix 3 to the Annex to the UAS Regulation.

GM1 UAS.STS-01.020(1)(c) UAS operations in STS-01

GROUND RISK BUFFER

The values for determining the size of the ground risk buffer that are indicated in the table of point UAS.STS-01.020(1)(c)(i)(C) should be considered as minimum values. However, additional margins should be considered depending on factors that may increase the distance travelled by the UA, e.g. UA flight characteristics, such as autorotation capability, wind, remote pilot's reaction time, etc.

AMC1 UAS.STS-01.030(1)&(3) and UAS.STS-02.030(1)&(3) Responsibilities of the UAS operator

OPERATIONAL PROCEDURES

The UAS operator should comply with the conditions for a 'medium' level of robustness of AMC2 UAS.SPEC.030(3)(e) as regards:

— the operational procedures contained in the OM, indicated in UAS.STS-01.030(1) and UAS.STS-02.030(1); and

— the contingency and emergency procedures, indicated in UAS.STS-01.030(3) and UAS.STS-02.030(3).

The flight test to verify the adequacy of the contingency and emergency procedures may be conducted in subcategory A3 of the 'open' category. In that case, the UAS operator should ensure that the UAS operation complies with the 'open' category requirements.

AMC1 UAS.STS-01.030(4) and UAS.STS-02.030(4) Responsibilities of the UAS operator

EMERGENCY RESPONSE PLAN (ERP)

The UAS operator should develop an ERP in compliance with the conditions for a 'medium' level of robustness as per AMC3 UAS.SPEC.030(3)(e).

GM1 UAS.STS-01.030(5)&(6) and UAS.STS-02.030(5)&(6) Responsibilities of the UAS operator

EXTERNALLY PROVIDED SERVICES

'External service' should be understood as any service that is provided by an external service provider to the UAS operator and which is:

— necessary to ensure the safety of a UAS operation; and

— provided by a service provider other than the UAS operator[8].

GM1 UAS.STS-02.020(3) UAS operations in STS-02

FLIGHT VISIBILITY

Point UAS.STS-02.020(3) requires a minimum flight visibility of 5 km to ensure that the remote pilot and/or the AO(s) can adequately visually scan the operational volume and surrounding airspace to detect well in advance any incoming manned aircraft and identify any risk of collision with that aircraft.

'Flight visibility' should be understood as the shortest distance from the remote pilot's position, or from the position of each of the AOs (if employed), at which unlighted objects may be seen and identified at day and prominently lighted objects may be seen and identified at night. It should be considered in all directions.

Before starting the intended UAS operation, the UAS operator should gather all relevant information that may affect the UAS flight visibility.

Other aspects that should be considered are, for example, the light conditions (including the sun or other intense lights that may blind the remote pilot and/or the AO(s)), the presence of natural or artificial obstacles, the cloud ceiling level, the presence of smoke, etc.

AMC1 UAS.STS-02.050(2) Responsibilities of the airspace observer

MAINTAINING AWARENESS OF THE UA

The airspace observer should be provided with clear and concise information on the geographical position of the UA, its speed, and its height above the surface or take-off point.

The airspace observer may use the same system provided to the remote pilot to comply with the requirement in Part 17 point (3) of the UAS Regulation.

GM1 Appendix 2 Operational declaration

~~GM1 Appendix 2 Operational declaration~~

OPERATIONAL DECLARATION FORM: UAS MANUFACTURER, UAS MODEL AND UAS SERIAL NUMBER

If the UAS operator intends to conduct UAS operations that are covered by the STS that uses different UASs (not used at the same time in the same location and all bearing the appropriate class identification label), the UAS operator is not required to submit a separate operational declaration form for each UAS.

In such a case, the information on the 'UAS manufacturer', the 'UAS model', and the 'UAS serial number' for each UAS should be provided in the corresponding fields of the operational declaration form. For example, for two different UASs from different manufacturers:

	UAS manufacturer	UAS model	UAS serial number
UAS #1			
UAS #2			

If the UAS operator intends to provide practical-skills training and conduct practical-skills assessments of remote pilots that operate in an STS, information on the manufacturer, the model, and the serial number of the UAS that is used for such training and assessment should also be included in the operational declaration form even if the UAS is used only for training and assessment purposes.