Acceptable Means of Compliance and Guidance Material to Regulation (EU) 2019/947, Issue 1, Amendment 3

'AMC and GM to Regulation (EU) 2019/947— Issue 1, Amendment 3'

This document shows deleted text, 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.

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

LIST OF ABBREVIATIONS

[…]

DVR	design verification report

[…]

GDOP	geometric dilution of precision

[…]

PDOP	position dilution of precision

GM1 AMC1 Article 11 Rules for conducting an operational risk assessment

GENERAL

The operational risk assessment required by Article 11 of the UAS Regulation may be conducted using the methodology described in AMC1 Article 11. This methodology is basically the specific operations risk assessment (SORA) developed by JARUS. Other methodologies might be used by the UAS operator as alternative means of compliance.

Unmanned free balloons are unmanned aircraft and shall thus comply with Regulation (EU) 2019/947. For this type of aircraft, compliance with Appendix 2 to Regulation (EU) No 923/2012 is considered an acceptable means of compliance with Article 11.

[…]

AMC1 Article 11 Rules for conducting an operational risk assessment

SPECIFIC OPERATIONS RISK ASSESSMENT (SORA) (SOURCE JARUS SORA V2.0)

[…]

1.5 Roles and responsibilities

[…]

(b) UAS operator — The UAS operator is responsible for the safe operation of the UAS, and hence the safety risk analysis. In accordance with Article 5 of the UAS Regulation, the UAS operator must substantiate the safety of the operation by performing the specific operational and risk assessment, except for the cases defined by the same Article 5. Supporting material for the assessment may be provided by third parties (e.g. the manufacturer of the UAS or equipment, U-space service providers, etc.). The UAS operator obtains an operational authorisation from the competent authority/ANSP. A UAS operator having a LUC cannot be

granted the privilege to assess compliance with the design requirements when a UAS with a design verification report[1] (DVR) or a (restricted) type certificate ((R)TC) is required.

[…]

(f) Competent authority — The competent authority that is referred to throughout this AMC is the authority designated by the Member State in accordance with Article 17 of the UAS Regulation to assess the safety case of UAS operations and to issue the operational authorisation in accordance with Article 12 of the UAS Regulation. The competent authority may accept an applicant's SORA submission in whole or in part. Through the SORA process, the applicant may need to consult with the competent authority to ensure the consistent application or interpretation of individual steps. The competent authority must perform oversight of the UAS operator in accordance with paragraphs (i) and (j) of Article 18 of the UAS Regulation. According to Regulation (EU) 2018/1139[2] (the EASA 'Basic Regulation'), EASA is the competent authority ~~competent~~ in the European Union to verify compliance of the UAS design and its components with the applicable rules, while the authority that is designated by the Member State is the competent authority to verify compliance with the operational requirements and compliance of the personnel's competency with those rules. The following elements are related to the UAS design:

— OSOs #02 (limited to design criteria), #04, #05, #06, #10, #12, #18, #19 (limited to criterion #3), #20, #23 (limited to criterion #1) and #24;

— ~~M1 mitigation (tethered operations): criterion #1 and~~ M2 mitigation for ground risk~~:~~ (criterion #1);

— Verification of the system to contain the UAS ~~within the operational volume~~ to avoid an infringement of the adjacent areas on the ground and/or adjacent airspace, in accordance with step #9 of the SORA process.

~~When according to the SAIL or to the claimed mitigation means, the level of assurance of the above OSOs and/or mitigation means is 'high' (i.e. SAIL V and VI), a verification by EASA is required according to~~ If the UAS operation is classified as SAIL V and VI, compliance with the design provisions defined by SORA (i.e. design-related OSOs, mitigation means linked with the design and containment function) should be demonstrated through a type certificate (TC) issued by EASA according to Annex I (Part 21) to Regulation (EU) No 748/2012[3] as defined in Article 40(1)(d)

[1] https://www.easa.europa.eu/sites/default/files/dfu/guidelines_design_verification_uas_medium_risk.pdf

[2] Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L 212, 22.8.2018, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018R1139).

[3] Commission Regulation (EU) No 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification

of Regulation (EU) 2019/945[4]. For the other OSOs and mitigation means, the competent authority may verify compliance or may define~~s~~ which entity ~~third party~~ is able to verify compliance with them as a third party.

(1) ~~If the level of robustness of the design-related OSOs and/or mitigation means is 'lower than 'high', the competent authority may still require a verification by EASA of the compliance of the UAS and/or its components with the design-related OSOs and/or mitigation means according to point Article 40(1)(d) of Regulation (EU) 2019/945. Similarly, also for UAS operators to which the competent authority granted a light UAS operator certificate (LUC), the terms of the approval may require to use a UAS that is verified by EASA when conducting operations for which the level of robustness of the design-related OSOs and/or mitigation means is lower than 'high'. In those cases, EASA will verify that the achievement of the design integrity level is appropriate to the related SAIL and to the mitigation means, when those means are applicable, and will issue a type certificate (TC) (or a restricted type certificate (RTC)) to the UAS manufacturer, which will cover all design-related OSOs, the design-related mitigation means, and the enhanced containment verification in accordance with Step #9, if that verification is applicable. Alternatively, the competent authority that issues the operational authorisation may accept a declaration by the UAS operator, who is responsible for compliance of the UAS with the design-related OSOs.~~ If the UAS operation is classified as SAIL IV, compliance with the design-related SORA provisions (i.e. design-related OSOs, mitigation means linked with the design and containment function) should be demonstrated through a DVR issued by EASA. Evidence of compliance with the other OSOs and mitigations (not related to design) will be provided to the competent authority according to the level of robustness of the OSOs, that will assess them as part of the application for the operational authorisation.

(2) If the UAS operation is classified as SAIL I, II or III, the competent authority may accept a declaration submitted by the UAS operator for the compliance with all OSOs and mitigations related to design. The competent authority may check the statements of the UAS operator, in particular with regard to the claimed level of integrity and robustness of the UAS for the considered SAIL.

(3) Despite the SAIL, when the claimed level of robustness of the mitigation means M2 is high, the competent authority should require the operator to

of design and production organisations (OJ L 224, 21.8.2012, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012R0748&qid=1622557691925).

[4] Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems (OJ L 152, 11.6.2019, p. 1) (https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:32019R0945).

use a UAS with a DVR issued by EASA limited to compliance with those mitigation means[5].

[…]

2.3.1 Step #2 – Determination of the intrinsic UAS ground risk class (GRC)

[…]

(k) When evaluating the typical kinetic energy expected for a given operation, the applicant should generally use the airspeed, in particular V_{cruise} for fixed-wing aircraft and the terminal velocity for other aircraft. Specific designs (e.g. gyrocopters) might need additional considerations. Guidance useful in determining the terminal velocity can be found at ~~https://www.grc.nasa.gov/WWW/K-12/airplane/termv.html~~ https://www1.grc.nasa.gov/beginners-guide-to-aeronautics/termvel/.

[…]

2.5.2 Step #8 — Identification of the operational safety objectives (OSOs)

[…]

OSO number (in line with Annex E)		SAIL					
		I	II	III	IV	V	VI
	Technical issue with the UAS						
OSO#01	Ensure the UAS operator is competent and/or proven	O	L	M	H	H	H
OSO#02	UAS manufactured by competent and/or proven entity	O	O	L	M	H	H
OSO#03	UAS maintained by competent and/or proven entity	L	L	M	M	H	H
OSO#04	UAS developed to authority recognised design standards[6]	O	O	~~L~~O	L	M	H
OSO#05	UAS is designed considering system safety and reliability	O	O	L	M	H	H
OSO#06	C3 link performance is appropriate for the operation	O	L	L	M	H	H
OSO#07	Inspection of the UAS (product inspection) to ensure consistency with the ConOps	L	L	M	M	H	H
OSO#08	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#09	Remote crew trained and current and able to control the abnormal situation	L	L	M	M	H	H
OSO#10	Safe recovery from a technical issue	L	L	M	M	H	H
	Deterioration of external systems supporting UAS operations						
OSO#11	Procedures are in-place to handle the deterioration of external systems supporting UAS operations	L	M	H	H	H	H

[5] If the UAS has a DVR covering the full design, this may cover also the mitigation means.

[6] In the case of experimental flights that investigate new technical solutions, the competent authority may accept that recognised standards are not met.

OSO number (in line with Annex E)		SAIL					
		I	II	III	IV	V	VI
OSO#12	The UAS is designed to manage the deterioration of external systems supporting UAS operations	L	L	M	M	H	H
OSO#13	External services supporting UAS operations are adequate for the operation	L	L	M	H	H	H
	Human error						
OSO#14	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#15	Remote crew trained and current and able to control the abnormal situation	L	L	M	M	H	H
OSO#16	Multi-crew coordination	L	L	M	M	H	H
OSO#17	Remote crew is fit to operate	L	L	M	M	H	H
OSO#18	Automatic protection of the flight envelope from human error	O	O	L	M	H	H
OSO#19	Safe recovery from human error	O	O	L	M	M	H
OSO#20	A human factors evaluation has been performed and the human machine interface (HMI) found appropriate for the mission	O	L	L	M	M	H
	Adverse operating conditions						
OSO#21	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#22	The remote crew is trained to identify critical environmental conditions and to avoid them	L	L	M	M	M	H
OSO#23	Environmental conditions for safe operations are defined, measurable and adhered to	L	L	M	M	H	H
OSO#24	UAS is designed and qualified for adverse environmental conditions	O	O	M	H	H	H

[…]

2.5.3 Step #9 – Adjacent area/airspace considerations

(a) The objective of this section is to address the risk posed by a loss of control of the operation, resulting in an infringement of the adjacent areas on the ground and/or adjacent airspace. These areas may vary with different flight phases.

(b) Safety requirements for 'basic containment' are:

~~1.~~ No probable[7] failure[8] of the UAS or any external system supporting the operation should lead to operation outside the operational volume.

[7] The term 'probable' needs to be understood in its qualitative interpretation, i.e. 'Anticipated to occur one or more times during the entire system/operational life of an item.'

[8] The term 'failure' needs to be understood as an occurrence that affects the operation of a component, part, or element such that it can no longer function as intended. Errors may cause failures~~,~~ but are not considered to be failures. Some structural or mechanical failures may be excluded from the criterion if it can be shown that these mechanical parts were designed according to aviation industry best practices.

Compliance with the requirement above should~~shall~~ be substantiated by a design and installation appraisal and ~~shall~~should include at least:

— *the design and installation features (independence, separation and redundancy);*

Note: Independence, separation and redundancy are not necessarily required, but they may be useful to substantiate the robustness of the containment system.

— *any relevant particular risk (e.g. hail, ice, snow, electromagnetic ~~electro-magnetic~~ interference, etc.) associated with the ConOps.*

The competent authority may accept a declaration for the claimed integrity. The applicant declares that the required level of integrity has been achieved and supporting evidence is available.

(c) The enhanced containment~~, which consists in the following three safety requirements,~~ applies to operations conducted:

(1) either where the adjacent areas:

(i) contain assemblies of people[9] unless the UAS is already approved for operations over assemblies of people; or

(ii) are ARC-d unless the residual ARC of the airspace area intended to be flown within the operational volume is already ARC-d;

(2) Or where the operational volume is in a populated area where:

(i) M1 mitigation has been applied to lower the GRC; or

(ii) operating in a controlled ground area.

(d) The enhanced containment consists in the following safety requirements:

(a) The UAS is designed to standards that are considered adequate by the competent authority and/or in accordance with a means of compliance that is acceptable to that authority such that:

(1) the probability of the UA leaving the operational volume should be less than 10^{-4}/FH; and

(2) no single failure* of the UAS or any external system supporting the operation should lead to its operation outside the ground risk buffer.

Compliance with the requirements above should be substantiated by analysis and/or test data with supporting evidence.

[9] See the definition in Article 2(3) of the UAS Regulation.

* The term 'failure' needs to be understood as an occurrence that affects the operation of a component, part, or element such that it can no longer function as intended. Errors may cause failures, but are not considered to be failures. Some structural or mechanical failures may be excluded from the criterion if it can be shown that these mechanical parts were designed according to aviation industry best practices.

(b)	Software (SW) and airborne electronic hardware (AEH) whose development error(s) could **directly** (refer to Note 2) lead to operations outside the ground risk buffer should be developed to an industry standard or methodology that is recognised as being adequate by ~~the competent authority~~EASA.

For UA with maximum characteristic dimensions not greater than 3 m, operated up to SAIL II operations, the competent authority may accept a declaration from the applicant for the compliance with the MoC to Light-UAS.2511[10]. For UAS configurations exceeding the applicability of such MoC[11], the competent authority may decide to still accept declarations based on such MoC with evidence available, or to accept appropriate MoC proposed by the applicant. Otherwise, the competent authority may request the applicant to use a UAS for which EASA has verified the claimed integrity.

[…]

[10] Final Means of Compliance with Light-UAS.2511 MOC Light-UAS.2511-01 - Issue 01 | EASA (europa.eu)

[11] EASA is developing MoC applicable to different UAS configurations. Until these are available, the competent authority may define means of compliance for special configurations (e.g. tethered drones) where a DVR may not be appropriate.

Annex B to AMC1 to Article 11

INTEGRITY AND ASSURANCE LEVELS FOR THE MITIGATIONS USED TO REDUCE THE INTRINSIC GROUND RISK CLASS (GRC)

[…]

B.2 M1 — Strategic mitigations for ground risk

[…]

		Level of assurance		
		Low	**Medium**	**High**
M1 — Strategic mitigations for ground risk	Criterion #1 (Definition of the ground risk buffer)	The applicant declares that the required level of integrity is achieved1.	The applicant has supporting evidence to claim that the required level of integrity has been achieved. This is typically done by means of testing, analysis, simulation[2], inspection, design review or through operational experience.	The claimed level of integrity is validated by the competent authority of the MS or by an entity that is designated by the ~~a~~ competent authority~~third party~~.
	Comments	*[1] Supporting evidence may or may not be available.*	*[2] When simulation is used, the validity of the targeted environment used in the simulation needs to be justified.*	*N/A*
	Criterion #2 (Evaluation of people at risk)	The applicant declares that the required level of integrity has been achieved[3].	The density data used for the claim of risk reduction is an average density map for the date/time of the operation from a static sourcing (e.g. census data for night time ops). In addition, for localised operations (e.g. intra-city delivery or infrastructure inspection), the applicant submits the proposed route/area of operation to the applicable authority (e.g. city police, office of civil protection, infrastructure owner, etc.) to verify the claim of a reduced number of people at risk.	Same as medium; however, the density data used for the claim of risk reduction is a near-real time density map from a dynamic sourcing (e.g. cellular user data) and applicable for the date/time of the operation.
	Comments	*[3] Supporting evidence may or may not be available*	*N/A*	*N/A*

Table B.3 — Level of assurance assessment criteria for ground risk of non-tethered M1 mitigations

[…]

		Level of assurance		
		Low	**Medium**	**High**
M1 — Tethered operation	Criterion #1 (Technical design)	Does not meet the 'medium' level criteria	The applicant has supporting evidence (including the specifications of the tether material) to claim that the required level of integrity is achieved. (a) This is typically achieved through testing or operational experience. (b) Tests can be based on simulations; however, the validity of the target environment used in the simulation needs to be justified.	The claimed level of integrity is validated by ~~EASA~~ the competent authority of the MS or by an entity that is designated by the competent authority.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Procedures)	(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority of the MS. (b) The adequacy of the procedures and checklists is declared.	(a) Procedures are validated against standards considered adequate by the competent authority of the MS and/or in accordance with the ~~a~~ means of compliance acceptable to that authority[1]. (b) The ~~A~~adequacy of the procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided that the representativeness of the simulation means is proven to be valid for the intended purpose with positive results; or (3) any other means acceptable to the competent authority of the MS.	Same as medium. In addition: (a) Flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative. (b) The procedures, flight tests and simulations are validated by the competent authority of the MS or by an entity that is designated by the ~~a~~ competent authority~~third party~~.
	Comments	*N/A*	~~N/A~~[1] *AMC2 UAS.SPEC.030(3)(e) (Operational procedures for medium and high levels of*	*N/A*

			robustness) is considered an acceptable means of compliance.	

Table B.5 — Level of assurance assessment criteria for ground risk tethered M1 mitigations

B.3 M2 — Effects of ground impact are reduced

[…]

		~~LEVEL of ASSURANCE~~ Level of assurance		
		Low/None	**Medium**	**High**
M2 — Effects of UA impact dynamics are reduced (e.g. parachute)	Criterion #1 (Technical design)	The applicant declares that the required level of integrity has been achieved[1].	The applicant has supporting evidence to claim that the required level of integrity is achieved. This is typically[2] done by means of testing, analysis, simulation[3], inspection, design review or through operational experience. The applicant may declare compliance with MoC to Light-UAS.2512[4] providing the supporting evidence defined in it.	~~The claimed level of integrity is validated by EASA against a standard considered adequate by EASA and/or in accordance with means of compliance acceptable to EASA (when applicable).~~ The competent authority should request the applicant to use a UAS for which EASA has verified the claimed integrity through a DVR.
	Comments	*[1] Supporting evidence may or may not be available.*	*[2] The use of industry standards is encouraged when developing mitigations used to reduce the effect of ground impact.* *[3] When simulation is used, the validity of the targeted environment used in the simulation needs to be justified.* *[4] https://www.easa.europa.eu/en/document-library/product-certification-consultations/means-compliance-mitigation-means-m2-ref-amc*	
	Criterion #2 (Procedures, if applicable)	(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the	(a) Procedures are validated against standards considered adequate by the competent authority of the MS and/or in accordance with the means of compliance acceptable to that authority[1].	Same as medium. In addition: (a) Flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative. (b) The procedures, flight tests and simulations are validated by the competent authority of

		competent authority of the MS. (b) The adequacy of the procedures and checklists is declared.	(b) The adequacy of the procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided that the representativeness of the simulation means is proven to be valid for the intended purpose with positive results; or (3) any other means acceptable to the competent authority of the MS.	the MS or by an entity that is designated by the ~~a~~ competent authority~~third party~~.
	Comments	*N/A*	~~N/A~~[1] *AMC2 UAS.SPEC.030(3)(e) (Operational procedures for medium and high levels of robustness) is considered an acceptable means of compliance.*	*N/A*
	Criterion #3 (Training, if applicable)	Training is self-declared (with evidence available)	(a) Training syllabus is available. (b) The UAS operator provides competency-based, theoretical and practical training.	(a) Training syllabus is validated by the competent authority of the MS or by an entity that is designated by the ~~a~~ competent authority~~third party~~. (b) Remote crew competencies are verified by the competent authority of the MS or by an entity that is designated by the ~~a~~ competent authority~~third party~~.
	Comments	*N/A*	*N/A*	*N/A*

Table B.7 ~~-~~— Level of assurance assessment criteria for M2 mitigations

B.4 M3 — An ERP is in place, UAS operator validated and effective

[…]

		Level of assurance		
		Low/None	**Medium**	**High**
M3 — An ERP is in place, UAS operator validated and effective	Criterion #1 (Procedures)	(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority of the MS. (b) The adequacy of the procedures and checklists is declared.	(a) The ERP is developed to standards considered adequate by the competent authority of the MS and/or in accordance with means of compliance acceptable to that authority[1]. (b) The ERP is validated through a representative tabletop exercise~~[1]~~[2] consistent with the ERP training syllabus.	(a) Same as medium. In addition: (b) The ERP and the effectiveness of the plan with respect to limiting the number of people at risk are validated by the ~~a~~ competent ~~third party~~ authority of the MS or by an entity that is designated by the competent authority. (c) The applicant has coordinated and agreed the ERP with all third parties identified in the plan. (d) The representativeness of the tabletop exercise is validated by the ~~a~~ competent ~~third party~~ authority of the MS or by an entity that is designated by the competent authority.
	Comments	*N/A*	*[1] AMC3 UAS.SPEC.030(3)(e) (ERP for medium and high level of robustness) is considered an acceptable means of compliance.* *~~[1]~~[2] The tabletop exercise may or may not involve all third parties that are identified in the ERP.*	*N/A*
	Criterion #2 (Training)	Does not meet the 'medium' level criterion	(a) An ERP training syllabus is available. (b) A record of the ERP training completed by the relevant staff is established and kept up to date.	Same as medium. In addition, the competencies of the relevant staff are verified by the ~~a~~ competent ~~third party~~ authority of the MS or by an entity that is designated by the competent authority.
	Comments	*N/A*	*N/A*	*N/A*

Table B.9 — Level of assurance assessment criteria for M3 mitigations

Annex C to AMC1 ~~to~~ Article 11

STRATEGIC MITIGATION — COLLISION RISK ASSESSMENT

[…]

C.3.3 SORA flight rules assumptions

Today, UAS flight operations under the 'specific' category cannot fully comply with the IFR and VFR rules as written. Although IFR infrastructures and mitigations are designed for manned aircraft operations (e.g. minimal safe altitudes, equipage requirements, operational restrictions, etc.), it may be possible for a UAS to comply with the IFR requirements. UAS operating at very low levels (e.g. ~~400~~ operational volume's ceiling below 150m (~500 ft) AGL~~and below~~) may technically comply with the IFR requirements ~~rules~~, but the IFR infrastructure was not designed with that airspace in mind; therefore, mitigations for this airspace would be derived, and would be highly impractical and inefficient. When operating BVLOS, a UAS cannot comply with VFR[12].

[…]

C.6.2 Lowering the initial ARC using operational restrictions (optional)

[…]

Operational environment, AEC and ARC			
Operations in:	**Initial generalised density rating**	**Corresponding AEC**	**Initial ARC**
Airport/heliport environment			
OPS in an airport/heliport environment in class B, C or D airspace	5	AEC 1	ARC-d
OPS in an airport/heliport environment in class E airspace or in class F or G	3	AEC 6	ARC-c
Operations above 150 m(~~4~~500 ft) AGL but below flight level 600			
OPS > 150 m (~~4~~500 ft) AGL but < FL 600 in a Mode-S Veil or transponder mandatory zone (TMZ)	5	AEC 2	ARC-d
OPS > 150 m (~~4~~500 ft) AGL but < FL 600 in controlled airspace	5	AEC 3	ARC-d
OPS > 150 m (~~4~~500 ft) AGL but < FL 600 in uncontrolled airspace over an urban area	3	AEC 4	ARC-c
OPS > 150 m (~~4~~500 ft) AGL but < FL 600 in uncontrolled airspace over a rural area	2	AEC 5	ARC-c
Operations below 150 m(~~4~~500 ft) AGL			
OPS < 150 m (~~4~~500 ft) AGL in a Mode-S Veil or TMZ	3	AEC 7	ARC-c

[12] A UAS operating under VLOS may be able to comply with VFR.

Operational environment, AEC and ARC			
Operations in:	**Initial generalised density rating**	**Corresponding AEC**	**Initial ARC**
OPS < 150 m (~4500 ft)) AGL in controlled airspace	3	AEC 8	ARC-c
OPS < 150 m (~4500 ft) AGL in uncontrolled airspace over an urban area	2	AEC 9	ARC-c
OPS < 150 m (~4500 ft) AGL in uncontrolled airspace over a rural area	1	AEC 10	ARC-b
Operations above flight level 600			
OPS > FL 600	1	AEC 11	ARC-b
Operations in atypical or segregated airspace			
OPS in atypical/segregated airspace	1	AEC 12	ARC-a

Table C.1 —– Initial air risk ~~category~~ class assessment

[…]

Example 1: A UAS operator ~~is~~ intends~~ing~~ to operate in an airport/heliport environment, in class C airspace, which corresponds to AEC 1.

[…]

Example 2: A UAS operator ~~is~~ intends~~ing~~ to operate in an airport/heliport environment, in class G airspace, with a corresponding level of AEC 6.

[…]

Example 3:

A UAS operator ~~is~~ intends~~ing~~ to operate below 150 m (~4500 ft) AGL, in a class G (uncontrolled) airspace, over an urbanised area, with a corresponding level of AEC 9.

[…]

C.6.3 Lowering the initial ARC by common structures and rules (optional)

Today, aviation airspace rules and structures mitigate the risk of collision. As the airspace risk increases, more structures and rules are implemented to reduce the risk. In general, the higher the aircraft density, the higher the collision risk, and the more structures and rules are required to reduce the collision risk.

In general, manned aircraft do not use very low level (VLL) airspace, as it is below the minimum safe height to perform an emergency procedure, 'unless at such a height as will permit, in the event of an emergency arising, a landing to be made without undue hazard to persons or property on the surface' (Ref. point SERA.3105 of the SERA Regulation). Subject to permission from the competent authority, special flights may be granted permission to use this airspace. Every aircraft will cross VLL airspace in an airport environment for take-off and landing.

With the advent of UAS operations, VLL airspace is expected to soon become more crowded, requiring more common structures and rules to lower the collision risk. It is anticipated that U-space services will provide these risk mitigation measures. This will require mandatory participation by all aircraft in that airspace, similar to how the current flight rules apply to all manned aircraft operating in a particular airspace today.

~~The~~ SORA does not allow the initial ARC to be lowered through strategic mitigation by common structures and rules for all operations in AEC 1, 2, 3, 4, 5, and 11~~.~~[13]. Outside the scope of ~~the~~ SORA, a UAS operator may appeal to the competent authority to lower the ARC by strategic mitigation by using common structures. The determination of acceptability falls under the normal airspace rules, regulations and safety requirements for ATM/ANS providers.

Similarly, ~~the~~ SORA does not allow for lowering the initial ARC through strategic mitigation by using common structures and rules for all operations in AEC 10[14].

The maximum amount of ARC reduction through strategic mitigation by using common structures and rules is by one ARC level.

~~The~~ SORA does allow for lowering the initial ARC through strategic mitigation by structures and rules for all operations below 150 m (~~4~~500 ft) AGL within VLL airspace (AECs 7, 8, 9 and 10).

[…]

[13] AEC 1, 2, 3, 4, and 5 already have manned airspace rules and structures defined by Regulation (EU) No 923/2012. Any UAS operating in these types of airspace shall comply with the applicable airspace rules, regulations and safety requirements. As such, no lowering of the ARC by common structures and rules is allowed, as those mitigations have already been accounted for in the assessment of those types of airspace. Lowering the ARC for rules and structures in AEC 1, 2, 3, 4, 5, and 11 would amount to double counting of the mitigations.

[14] AEC 10: the initial ARC is ARC-b. To lower the ARC in these volumes of airspace (to ARC-a) requires the operational volume to meet one of the requirements of atypical/segregated ~~A~~airspace.

Annex E to AMC1 to Article 11

INTEGRITY AND ASSURANCE LEVELS FOR THE OPERATIONAL SAFETY OBJECTIVES (OSOs)

[…]

E.2 OSOs related to technical issues with the UAS

[…]

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #01 Ensure that the UAS operator is competent and/or proven	Criteria	The elements delineated in the level of integrity are addressed in the ConOps.	Prior to the first operation, ~~a~~the competent authority of the MS or an entity that is designated by the competent authority~~third party~~ performs an audit of the organisation.	The applicant holds an organisational operating certificate (e.g LUC) or has a recognised flight test organisation. In addition, the competent authority of the MS or an entity that is designated by the~~a~~ competent authority~~third party~~ verifies the UAS operator's competencies.
	Comments	*N/A*	*N/A*	*N/A*

OSO #02 — UAS designed and produced by a competent and/or proven entity

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #02 UAS ~~manufactured~~ designed and produced by a competent and/or proven entity	Criteria for design	As a minimum, design documentation covers: (a) the specification of the materials; and (b) the suitability and durability of the materials used.	Same as low. In addition, design documentation also covers: (a) the configuration control; and (b) identification and traceability.	The design organisation complies with Subpart J of Annex I (Part 21) to Regulation (EU) No 748/2012.

	Criteria for production	As a minimum, ~~manufacturing~~production procedures cover~~:~~ ~~(a) the specification of materials;~~ ~~(b) the suitability and durability of materials used; and~~ ~~(c)~~ the processes necessary to allow for repeatability in manufacturing, and conformity within acceptable tolerances.	Same as low. In addition, ~~manufacturing~~production procedures also cover: (a) the configuration control; (b) the verification of incoming products, parts, materials, and equipment; (c) identification and traceability; (d) in-process and final inspections & testing; (e) the control and calibration of tools; (f) handling and storage; and (g) the control of non-conforming items.	The ~~manufacturer~~production organisation complies with the organisational requirements that are defined in Subpart F or G of Annex I (Part 21) to Regulation (EU) No 748/2012.
	Comments	*N/A*	*N/A*	*N/A*

TECHNICAL ISSUE WITH THE UAS		**Level of assurance**		
		Low	**Medium**	**High**
OSO #02 UAS ~~manufactured~~ designed and produced by a competent and/or proven entity	Criteria for design	The specifications, suitability and durability of the materials are declared against a standard recognised by the competent authority and/or in accordance with means of compliance acceptable to the competent authority.	Same as low. In addition, evidence is available that the UAS has been designed in accordance with design procedures. The competent authority should request the applicant to use a UAS for which EASA has verified the claimed integrity through a DVR.	Same as medium. In addition, the competent authority should request the applicant to operate a UAS designed by an organisation approved by EASA according to Subpart J of Annex I (Part 21) to Regulation (EU) No 748/2012.
	Criteria for production	The declared ~~manufacturing~~ production procedures are developed to a standard that is considered adequate by the competent authority that issues the operational authorisation and/or in accordance with a means of compliance acceptable to that authority. ~~The competent authority may request EASA to validate the claimed integrity.~~	Same as low. In addition, evidence is available that the UAS has been ~~manufactured~~produced in conformance with~~/to~~ its design. ~~The competent authority may request EASA to validate the claimed integrity.~~	Same as medium. In addition~~:~~, the competent authority of the MS or an entity that is designated by the competent authority ~~EASA~~ validates compliance with the production organisational requirements that are defined in Subpart F or G of Annex I (Part 21) to Regulation (EU) No 748/2012.
	Comments	*N/A*	*N/A*	*N/A*

OSO #03 — UAS maintained by competent and/or proven entity

[…]

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	**Medium**	**High**
OSO #03 UAS maintained by a competent and/or proven entity (e.g. industry standards)	Criterion #1 (Procedure)	(a) The maintenance instructions are documented. (b) The maintenance conducted on the UAS is recorded in a maintenance log system[1/2]. (c) A list of the maintenance staff authorised to carry out maintenance is established and kept up to date.	Same as low. In addition: (a) The maintenance programme is developed in accordance with standards considered adequate by the competent authority of the MS and/or in accordance with a means of compliance acceptable to that authority. In addition, if the UAS has a DVR or a (R)TC, the maintenance programme includes the scheduled maintenance requirements developed as part of the design. (b) A list of the maintenance staff with maintenance release authorisation is established and kept up to date.	Same as medium. In addition, the maintenance programme and the maintenance procedures manual are validated by the competent authority of the MS or by an entity that is designated by the ~~a~~ competent authority~~third party~~.
	Comments	*[1] The ~~O~~objective is to record all the maintenance performed on the aircraft, and why it is performed (rectification of defects or malfunctions, modifications, scheduled maintenance, etc.).* *[2] The maintenance log may be requested for inspection/audit by the approving authority or an authorised representative.*	*N/A*	*N/A*
	Criterion #2 (Training)	A record of all the relevant qualifications, experience and/or training completed by the maintenance staff is established and kept up to date.	Same as low. In addition: (a) The initial training syllabus and training standard, including theoretical/practical elements, duration, etc., is defined and is	Same as medium. In addition: (a) A programme for the recurrent training of staff holding a maintenance release authorisation is established; and

			commensurate with the authorisation held by the maintenance staff. (b) For staff that hold a maintenance release authorisation, the initial training is specific to that particular UAS model/family. (c) All maintenance staff have undergone initial training.	(b) This programme is validated by the competent authority of the MS or by an entity that is designated by the~~a~~ competent authority~~third party~~.
	Comments	*N/A*	*N/A*	*N/A*

OSO #04 — UAS developed to authority recognised design standards

[…]

TECHNICAL ISSUE WITH THE UAS		**Level of assurance**		
		Low	**Medium**	**High**
OSO #04 UAS developed to authority recognised design standards	Criteria	~~Consider the criteria defined in Section 9~~ The competent authority should request the applicant to use a UAS for which EASA has verified the claimed integrity through a DVR.	The competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012	The competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012
	Comments	~~The competent authority may request EASA to validate the claimed integrity.~~ *N/A*	*N/A*	*N/A*

OSO #05 — UAS is designed considering system safety and reliability

[…]

TECHNICAL ISSUE WITH THE UAS		**Level of assurance**		
		Low	**Medium**	**High**
OSO #05 UAS is designed considering system safety and reliability	Criteria	A functional hazard assessment[1] and a design and installation appraisal that show~~s~~ that hazards are minimised, are available. ~~The competent authority may request EASA to validate the claimed integrity.~~	Same as low. In addition: (a) Safety analyses are conducted in line with standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.	The competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
			(b) A strategy for the detection of single failures of concern includes pre-flight checks. The competent authority ~~may request request EASA to validate the claimed integrity.~~ should request the applicant to use a UAS for which EASA has validated the claimed integrity through a DVR	(Part 21) to Regulation (EU) No 748/2012 ~~Same as medium. In addition, safety analyses and development assurance activities are validated by EASA.~~
	Comments	*[1] The severity of failure conditions (no safety effect, minor, major, hazardous and catastrophic) should be determined according to the definitions provided in JARUS AMC RPAS.1309 Issue 2.*	*N/A*	*N/A*

OSO #06 — C3 link characteristics (e.g. performance, spectrum use) are appropriate for the operation

[…]

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #06 C3 link characteristics (e.g. performance, spectrum use) are appropriate for the operation	Criteria	The applicant declares that the required level of integrity has been achieved. ~~Consider the assurance criteria defined in Section 9 (low level of assurance). The competent authority may request EASA to validate the claimed integrity~~.	~~Demonstration of the C3 link performance is in accordance with standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority. The competent authority may request EASA to validate the claimed integrity.~~ The competent authority should request the applicant to use a UAS for which EASA has verified the claimed integrity through a DVR.	The competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012 ~~Same as medium. In addition, evidence is validated by EASA.~~
	Comments	*N/A*	*N/A*	*N/A*

OSO #07 — Inspection of the UAS (product inspection) to ensure consistency with the ConOps

[…]

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	**Medium**	**High**
OSO #07 Inspection of the UAS (product inspection) to ensure consistency with the ConOps	Criterion #1 (Procedures)	Product inspection is documented and accounts for the manufacturer's recommendations, if available.	Same as low. In addition, the product inspection is documented using checklists.	Same as medium. In addition, the product inspection ~~is~~ procedures are validated by the competent authority of the MS or by an entity that is designated by the~~a~~ competent authority~~third party~~.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Training)	The remote crew is trained to perform the product inspection, and that training is self-declared (with evidence available).	(a) A training syllabus including a product inspection procedure is available. (b) The UAS operator provides competency-based, theoretical and practical training.	~~A~~The competent authority of the MS or an entity that is designated by the competent authority~~third party~~: (a) validates the training syllabus; and (b) verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

E.3 OSOs related to operational procedures

OPERATIONAL PROCEDURES		Level of integrity		
		Low	Medium	High
OSO #08, OSO #11, OSO #14 and OSO #21	Criterion #1 (Procedure definition)	(a) Operational procedures[1] appropriate for the proposed operation are defined and, as a minimum, cover the following elements: (1) Flight planning; (2) Pre- and post-flight inspections; (3) Procedures to evaluate the environmental conditions before and during the mission (i.e. real-time evaluation); (4) Procedures to cope with unexpected adverse operating conditions (e.g. when ice is encountered during an operation not approved for icing conditions); (5) Normal procedures; (6) Contingency procedures (to cope with abnormal situations); (7) Emergency procedures (to cope with emergency situations); (8) Occurrence-reporting procedures; and ~~Note: normal, contingency and emergency procedures are compiled in an OM.~~ (b) The limitations of the external systems supporting the UAS operation[2] are defined in an OM.		
	Comments	*[1] Operational procedures cover the deterioration~~3~~ of the UAS itself and any external system supporting the UAS operation.* *To properly address the deterioration of external systems required for the operation, it is recommended to:* *(a) identify these 'external systems';* *(b) identify the modes of deterioration of the 'external systems' (e.g. complete loss of GNSS, GDOP/PDOP, latency issues, etc.) which would lead to a loss of control of the operation;* *(c) describe the means to detect these modes of deterioration of the external systems ; and* *(d) describe the procedure(s) used when deterioration is detected (e.g. activation of the emergency recovery capability, switch to manual control, etc.).* *[2] In the scope of this assessment, external systems supporting the UAS operation are defined as systems that are not already part of the UAS but are used to:* *(a) launch/~~take off~~take off the UA;* *(b) make pre-flight checks; or* *(c) keep the UA within its operational volume (e.g. GNSS, satellite systems, air traffic management, U-~~S~~space).* *External systems activated/used after a loss of control of the operation are excluded from this definition.* *~~[3] To properly address the deterioration of external systems required for the operation, it is recommended to:~~* *~~(a) identify these 'external systems';~~* *~~(b) identify the modes of deterioration of the 'external systems' (e.g. complete loss of GNSS, drift of the GNSS, latency issues, etc.) which would lead to a loss of control of the operation;~~* *~~(c) describe the means to detect these modes of deterioration of the external systems/facilities; and~~*		

OPERATIONAL PROCEDURES		Level of integrity		
		Low	**Medium**	**High**
		~~(d) describe the procedure(s) used when deterioration is detected (e.g. activation of the emergency recovery capability, switch to manual control, etc.).~~		
	Criterion #2 (Procedure complexity)	Operational procedures are complex and may potentially jeopardise the crew's ability to respond by increasing ~~raising~~ the remote crew's workload and/or their interaction~~s~~ with other entities (e.g. ATM, etc.).	Contingency/emergency procedures require manual control by the remote pilot[2] when the UAS is usually automatically controlled.	Operational procedures are simple.
	Comments	*N/A*	*[2] ~~This is still under discussion since~~ It should be considered that not all UAS have a mode where the pilot could directly control the surfaces; moreover, ~~some people claim~~ it may require~~s~~ significant skill not to make things worse.*	*N/A*
	Criterion #3 (Consideration of Potential Human Error)	At a minimum, operational procedures provide: (a) a clear distribution and assignment of tasks, and (b) an internal checklist to ensure staff are adequately performing their assigned tasks.	Operational procedures take human error into consideration.	Same as medium. In addition, the remote crew[3] receives crew resource management (CRM)[4] training.
	Comments	*N/A*	*N/A*	*[3] In the context of ~~the~~ SORA, the term 'remote crew' refers to any person involved in the mission.* *[4] CRM training focuses on the effective use of all the remote crew to ensure safe and efficient operation, reducing error, avoiding stress and increasing efficiency.*

OPERATIONAL PROCEDURES		Level of assurance		
		Low	**Medium**	**High**
OSO #08, OSO #11, OSO #14 and OSO #21	Criteria	(a) Operational procedures do not require validation against either a standard or a means of compliance that is considered adequate by the competent authority of the MS. (b) The adequacy of the operational procedures is declared, except for emergency procedures, which are tested.	(a) Normal, contingency, and emergency procedures are documented and part of the operations manual (OM). ~~(a)~~(b) Operational procedures are validated against standards considered adequate by the competent authority of the MS and/or in accordance with the means of compliance acceptable to that authority[1]. ~~(b)~~(c) The ~~A~~adequacy of the procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided that the representativeness of the simulation means is proven valid for the intended purpose with positive results~~.~~; or (3) any other means acceptable to the competent authority.	Same as medium. In addition: (a) Flight tests performed to validate the procedures and checklists cover the complete flight envelope or are proven to be conservative. (b) The procedures, checklists, flight tests and simulations are validated by the competent authority of the MS or by an entity that is designated by the~~a~~ competent authority~~third party~~.
	Comments	*N/A*	~~N/A~~[1] *AMC2 UAS.SPEC.030(3)(e) (Operational procedures for medium and high levels of robustness) is considered an acceptable means of compliance.*	

E.4 OSOs related to remote crew training

[…]

REMOTE CREW COMPETENCIES		Level of assurance		
		Low	Medium	High
OSO #09, OSO #15 and OSO #22	Criteria	Training is self-declared (with evidence available).	(a) Training syllabus is available and kept up to date. (b) The UAS operator provides competency-based, theoretical and practical training.	The competent authority of the MS or an entity that is designated by the~~A~~ competent authority~~third party~~: (a) validates the training syllabus; and (b) verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

E.5 OSOs related to safe design

[…]

		Level of assurance		
		Low	Medium	High
OSO #10 & OSO #12	Criteria	A design and installation appraisal is available. In particular, this appraisal shows that: (a) the design and installation features (independence, separation and redundancy) satisfy the low integrity criterion; and (b) particular risks relevant to the ConOps (e.g. hail, ice, snow, electromagnetic interference, etc.) do not violate the independence claims, if any.	Same as low. In addition, the level of integrity claimed is substantiated by analysis and/or test data with supporting evidence. ~~For~~ If the operation is classified as SAIL IV,~~T~~the competent authority ~~may~~ should request the applicant to use a UAS for which EASA has verified the claimed integrity through a DVR. ~~EASA to validate the claimed integrity.~~	The competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012 ~~Same as medium. In addition, EASA validates the level of integrity claimed.~~
	Comments	*N/A*	*N/A*	*N/A*

E.6 OSOs related to the deterioration of external systems supporting UAS operations

For the purpose of ~~the~~ SORA and this specific OSO, the term 'external services supporting UAS operations' encompasses any service providers necessary for the safety of the flight, such as communication service providers (CSPs) and U-space service providers[15].

[…]

DETERIORATION OF EXTERNAL SYSTEMS SUPPORTING UAS OPERATIONS BEYOND THE CONTROL OF THE UAS		Level of assurance		
		Low	Medium	High
OSO #13 External services supporting UAS operations are adequate for the operation	Criteria	The applicant declares that the requested level of performance for any externally provided service necessary for the safety of the flight is achieved (without evidence being necessarily available).	The applicant has supporting evidence that the required level of performance for any externally provided service required for the safety of the flight can be achieved for the full duration of the mission. This may take the form of a service-level agreement (SLA) or any official commitment that prevails between a service provider and the applicant on the relevant aspects of the service (including quality, availability, and responsibilities). The applicant has a means to monitor externally provided services which affect flight-critical systems and take	Same as medium. In addition: (a) the evidence of the performance of an externally provided service is achieved through demonstrations; and (b) the competent authority of the MS or an entity that is designated by the~~a~~ competent authority~~third party~~ validates the claimed level of integrity.

[15] External service should be understood as any service that is provided to the UAS operator, which is necessary to ensure the safety of a UAS operation and is provided by a service provider other than the UAS operator. Examples of external services are:

- provision of geographical zones data and geographical limitations (including orography);
- collection and transfer of occurrence data;
- training and assessment of remote pilots;
- communication services that support the C2 link and any other safety-related communication;
- services that support navigation, e.g. GNSS services (compliance with requirement UAS.STS-01.030(6) could be ensured by referring to the conditions of use of such services in the corresponding Service Definition Document (SDD) or an equivalent one if available.);
- provision of services related to flight planning and management, including related safety assessments; and
- U-space services, which are defined in the corresponding regulation(s) and may include one or more of the above-mentioned services.

			appropriate actions if real-time performance could lead to the loss of control of the operation.	
	Comments	*N/A*	*N/A*	*N/A*

E.7 OSOs related to ~~H~~human ~~E~~error

[…]

HUMAN ERROR		**Level of assurance**		
		Low	**Medium**	**High**
OSO #16 Multi-crew coordination	Criterion #1 (Procedures)	(a) Procedures ~~do~~are not ~~require~~ validated~~ion~~ against either a standard or a means of compliance considered adequate by the competent authority of the MS. (b) The adequacy of the procedures and checklists is declared.	(a) Procedures are validated against standards considered adequate by the competent authority of the MS and/or in accordance with the means of compliance acceptable to that authority[1]. (b) The~~A~~adequacy of the procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided that the representativeness of the simulation means is proven valid for the intended purpose with positive results~~.~~; or (3) any other means acceptable to the competent authority.	Same as medium. In addition: (a) flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative; and (b) the procedures, flight tests and simulations are validated by the competent authority of the MS or an entity designated by the~~a~~ competent authority~~third party~~.
	Comments	*N/A*	~~*N/A*~~[1] *AMC2 UAS.SPEC.030(3)(e) (Operational procedures for medium and high levels of robustness) is considered an acceptable means of compliance.*	*N/A*
	Criterion #2 (Training)	Training is self-declared (with evidence available).	(a) Training syllabus is available. (b) The UAS operator provides competency-based, theoretical and practical training.	The competent authority of the MS or an entity that is designated by the~~A~~ competent authority~~third party~~:

HUMAN ERROR		Level of assurance		
		Low	**Medium**	**High**
				(a) validates the training syllabus; and (b) verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #3 (Communication devices)	~~Consider the criteria defined in Section 9~~ *N/A*	*The applicant has supporting evidence that the required level of integrity is achieved. This is typically done by testing, analysis, simulation[1], inspection, design review or through operational experience.*	The competent authority should request the applicant to operate a UAS designed by an organisation approved by EASA according to Subpart J of Annex I (Part 21) to Regulation (EU) No 748/2012.
	Comments	*N/A*	*[1] When simulation is performed, the validity of the targeted environment that is used in the simulation needs to be justified.*	*N/A*

OSO #17 — Remote crew is fit to operate

[…]

HUMAN ERROR		Level of assurance		
		Low	**Medium**	**High**
OSO #17 Remote crew is fit to operate	Criteria	The policy to define how the remote crew declares themselves fit to operate (before an operation) is documented. The remote crew fit-to-operate declaration ~~of fit to operate~~ (before an operation) is based on a policy defined by the applicant.	Same as ~~L~~low. In addition: — Remote crew duty, flight duty and the resting time~~s~~ policy are documented. — Remote crew duty cycles are logged and cover at a minimum: — when the remote crew member's duty day commences, — when the remote crew members are free from duties, and	Same as ~~M~~medium. In addition: — Medical standards considered adequate by the competent authority and/or the means of compliance acceptable to that authority are established and the competent authority of the MS or an entity that is designated by the~~a~~ competent authority~~third party~~ verifies that the remote crew is medically fit.

			— resting times within the duty cycle. — There is evidence that the remote crew is fit to operate the UAS.	— The competent authority of the MS or an entity that is designated by the~~A~~ competent authority~~third party~~ validates the duty/flight duty times. — If an FRMS is used, it is validated and monitored by the competent authority of the MS or an entity that is designated by the~~a~~ competent authority~~third party~~.
	Comments	*N/A*	*N/A*	*N/A*

OSO #18 — Automatic protection of the flight envelope from human errors

[…]

HUMAN ERROR		**Level of assurance**		
		Low	**Medium**	**High**
OSO #18 Automatic protection of the flight envelope from human errors	Criteria	The automatic protection of the flight envelope has been developed in-house or out of the box (e.g. using commercial off-the-shelf elements), without following specific standards. ~~The competent authority may request EASA to validate the claimed integrity.~~	~~The automatic protection of the flight envelope has been developed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.~~ The competent authority ~~may~~ should request the applicant to use a UAS for which EASA has verified the claimed integrity through a DVR ~~EASA to validate the claimed integrity~~.	The competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012 ~~Same as Medium. In addition, evidence is validated by EASA.~~
	Comments	*N/A*	*N/A*	*N/A*

OSO #19 — Safe recovery from human errors

[…]

HUMAN ERROR		Level of assurance		
		Low	**Medium**	**High**
OSO #19 Safe recovery from ~~H~~human ~~E~~error	Criterion #1 (Procedures and checklists)	–(a) Procedures and checklists ~~do~~are not ~~require~~ validated~~ion~~ against either a standard or a means of compliance considered adequate by the competent authority of the MS. –(b) The adequacy of the procedures and checklists is declared.	–(a) Procedures and checklists are validated against standards considered adequate by the competent authority of the MS and/or in accordance with the means of compliance acceptable to that authority[1]. –(b) The~~A~~adequacy of the procedures and checklists is proven through: –(1) dedicated flight tests; or –(2) simulation, provided that the representativeness of the simulation means is proven valid for the intended purpose with positive results~~.~~; or –(3) any other means acceptable to the competent authority of the MS.	Same as ~~M~~medium. In addition: –(a) Flight tests performed to validate the procedures and checklists cover the complete flight envelope or are proven to be conservative. –(b) The procedures, checklists, flight tests and simulations are validated by the competent authority of the MS or an entity that is designated by the~~a~~ competent authority~~third party~~.
	Comments	*N/A*	~~N/A~~[1] *AMC2 UAS.SPEC.030(3)(e) (Operational procedures for medium and high levels of robustness) is considered an acceptable means of compliance.*	*N/A*
	Criterion #2 (Training)	Consider the criteria defined for the level of assurance of the generic remote crew training OSO (i.e. OSO #09, OSO #15 and OSO #22) corresponding to the SAIL of the operation.		
	Comments	*N/A*	*N/A*	*N/A*

HUMAN ERROR		Level of assurance		
		Low	Medium	High
	Criterion #3 (UAS design)	The applicant declares that the required level of integrity has been achieved[1]. ~~The competent authority may request EASA to validate the claimed integrity.~~	The applicant has supporting evidence that the required level of integrity is achieved. That evidence is provided through testing, analysis, simulation[2], inspection, design review or operational experience. If the operation is classified as SAIL IV~~,~~ ~~EASA validates the claimed integrity. In all other cases~~, the competent authority ~~may~~ should request the applicant to use a UAS for which EASA has verified the claimed integrity through a DVR ~~EASA to validate the claimed integrity~~. If the operation is classified as SAIL V the competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012.	The competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012. ~~EASA validates the claimed level of integrity.~~
	Comments	*[1] Supporting evidence may or may not be available.*	*[2] When simulation is performed, the validity of the targeted environment that is used in the simulation needs to be justified.*	*N/A*

OSO #20 — A ~~H~~human ~~F~~factors evaluation has been performed and the HMI has been found appropriate for the mission

[…]

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
OSO #20 A Human Factors evaluation has been performed and the HMI has been found appropriate for the mission	Criteria	The applicant conducts a human factors evaluation of the UAS to determine whether the HMI is appropriate for the mission. The HMI evaluation is based on inspection or analyses. ~~The competent authority may request EASA to witness the HMI evaluation of the UAS.~~	Same as Low but the HMI evaluation is based on demonstrations or simulations.[1] ~~If the operation is classified as SAIL V, EASA witnesses the HMI evaluation of the UAS. In all other cases,~~ The competent authority ~~may~~ should request EASA to witness the HMI evaluation of the UAS.	Same as Medium. In addition, EASA witnesses the HMI evaluation of the UAS and the competent authority of the MS or an entity that is designated by the~~a~~ competent authority~~third party~~ witnesses the HMI evaluation of the possible electronic means used by the A~~V~~O.
	Comments	*N/A*	*[1] When simulation is performed, the validity of the targeted environment that is used in the simulation needs to be justified.*	*N/A*

E.8 OSOs related to ~~A~~adverse ~~O~~operating ~~C~~conditions

OSO #23 — Environmental conditions for safe operations are defined, measurable and adhered to

[…]

ADVERSE OPERATING CONDITIONS		Level of assurance		
		Low	**Medium**	**High**
OSO #23 Environmental conditions for safe operations defined, measurable and adhered to	Criterion #1 (Definition)	~~Consider the criteria defined in Section 9.~~ The applicant declares that the required level of integrity has been achieved.	The applicant has supporting evidence that the required level of integrity is achieved. This is typically done by testing, analysis, simulation, inspection, design review or through operational experience. If the operation is classified as SAIL IV, the competent authority should	The competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012

			request the applicant to use a UAS for which EASA has issued a DVR.	
	Comments	*N/A*		
	Criterion #2 (Procedures)	–(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority of the MS. –(b) The adequacy of the procedures and checklists is declared.	–(a) Procedures are validated against standards considered adequate by the competent authority of the MS and/or in accordance with the means of compliance acceptable to that authority[1]. –(b) The ~~A~~adequacy of the procedures and checklists is proved~~d~~n through: –(1) ~~D~~dedicated flight tests; or –(2) ~~S~~simulation, provided that the representativeness of the simulation means is proven valid for the intended purpose with positive results~~.~~; or –(3) any other means acceptable to the competent authority of the MS.	Same as ~~M~~medium. In addition: –(a) Flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative. –(b) The procedures, flight tests and simulations are validated by the competent authority of the MS or an entity that is designated by the~~a~~ competent authority~~third party~~.
	Comments	*N/A*	~~*N/A*~~[1] *AMC2 UAS.SPEC.030(3)(e) (Operational procedures for medium and high levels of robustness) is considered an acceptable means of compliance.*	*N/A*
	Criterion #3 (Training)	Training is self-declared (with evidence available).	– Training syllabus is available. – The UAS operator provides competency-based, theoretical and practical training.	The competent authority of the MS or an entity that is designated by the~~A~~ competent authority~~third party~~: – ~~V~~validates the training syllabus~~.~~; and – ~~V~~verifies the remote crew competencies.

	Comments	*N/A*	*N/A*	*N/A*

OSO #24 — UAS is designed and qualified for adverse environmental conditions (e.g. adequate sensors, DO-160 qualification)

[…]

ADVERSE OPERATING CONDITIONS		**Level of assurance**		
		N/A	**Medium**	**High**
OSO #24 UAS is designed and qualified for adverse environmental conditions	Criteria	N/A	~~Consider the criteria defined in Section 9~~ The applicant has supporting evidence that the required level of integrity has been achieved. This is typically done by testing, analysis, simulation[2], inspection, design review or through operational experience.	If the operation is classified as SAIL IV, the competent authority should request the applicant to use a UAS for which EASA has issued a DVR. If the operation is classified SAIL V or VI, the competent authority should request the applicant to use a UAS for which EASA has issued a type certificate or restricted type certificate in accordance with Annex I (Part 21) to Regulation (EU) No 748/2012.
	Comments	*N/A*	*[2] When simulation is performed, the validity of the targeted environment that is used in the simulation needs to be justified.* ~~*N/A*~~	*N/A*

~~**E.9 Assurance level criteria for technical OSO**~~

		~~**LEVEL of ASSURANCE**~~		
		~~**Low**~~	~~**Medium**~~	~~**High**~~
~~**TECHNICAL OSO**~~	~~Criteria~~	~~The applicant declares that the required level of integrity has been achieved[1].~~	~~The applicant has supporting evidence that the required level of integrity is achieved. This is typically done by testing, analysis, simulation[2], inspection, design review or through operational experience.~~ ~~The competent authority may request EASA to validate the claimed integrity.~~	~~EASA validates the claimed level of integrity.~~