Guidance instructions for writing SORA under EASA 947/945

In Order to use this Guidance instructions you must have the relevant OSO opened in front of you and then open up the Guidance instructions to the same OSO.

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

This is the first OSO. As you can see under the SAIL Colum you can see that you are operating under SAIL II. So for the first OSO the minimum achievement must meet a Overall Robustness is LOW. The way to achieve this is to see is written in the integrity level column as to what is required for you to achieve a LOW level of Integrity. The Level of Integrity is the Safety Gain of the operation.

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #01 Ensure that the UAS operator is competent and/or proven	Criteria	The applicant is knowledgeable of the UAS being used and as a minimum has the following relevant operational procedures: checklists, maintenance, training, responsibilities, and associated duties.	Same as low. In addition, the applicant has an organisation appropriate[1] for the intended operation. Also, the applicant has a method to identify, assess, and mitigate the risks associated with flight operations. These should be consistent with the nature and extent of the operations specified.	Same as medium.
	Comments	*N/A*	*[1] For the purpose of this assessment, 'appropriate' should be interpreted as commensurate with/proportionate to the size of the organisation and the complexity of the operation.*	*N/A*

Once you have read the requirements you then have to go to the Requirements for the Level of Assurance.

The Level of Assurance is the method of proof for the operation.

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 competent third party performs an audit of the organisation	The applicant holds an organisational operating certificate or has a recognised flight test organisation. In addition, a competent third party recurrently verifies the UAS operator's competences.
	Comments	*N/A*	*N/A*	*N/A*

(1) A **low** level of assurance is where the applicant simply declares that the required level of integrity has been achieved.

(2) A **medium** level of assurance is where the applicant provides supporting evidence that the required level of integrity has been achieved. This is typically achieved by means of testing (e.g. for technical mitigations) or by proof of experience (e.g. for human-related mitigations).

(3) A **high** level of assurance is where the achieved integrity has been found to be acceptable by a competent third party.

If you can achieve the Low Level of Assurance then your overall level of Robustness is LOW. This was selected by the Robustness table.

Robustness Table	Low Assurance	Medium Assurance	High Assurance
Low Integrity	Low robustness	Low robustness	Low robustness
Medium Integrity	Low robustness	Medium robustness	Medium robustness
High Integrity	Low robustness	Medium robustness	High robustness

The way this is portrayed in the operations manual is as follows.

Category: **Technical issue with the UAS** OSO01
Topic: **Ensure the UAS operator is competent and/or proven**

Level of Integrity:
• [Company] is truly knowledgeable of the UAS being used.
• There are relevant operational procedures in place (see Section 4.1)
  ○ Checklists
  ○ Maintenance
  ○ Training
  ○ Responsible
  ○ Associated duties
• There is a method to identify and assess the risk associated to the operation, based on the design of the operation made by the FOM and the flight preparations risk management sated. Based on the above:

Level of integrity OSO01: Low
Level of assurance: • The elements detailed in the level of integrity are addressed in this ConOPS. Based on the above:
Level of assurance for OSO01: Low
Based on the above, the over all level of Robustness for OSO01 is: Low

OSO #01 — Ensure that the UAS operator is competent and/or proven

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #01 Ensure that the UAS operator is competent and/or proven	Criteria	The applicant is knowledgeable of the UAS being used and as a minimum has the following relevant operational procedures: checklists, maintenance, training, responsibilities, and associated duties.	Same as low. In addition, the applicant has an organisation appropriate[1] for the intended operation. Also, the applicant has a method to identify, assess, and mitigate the risks associated with flight operations. These should be consistent with the nature and extent of the operations specified.	Same as medium.
	Comments	*N/A*	*[1] For the purpose of this assessment, 'appropriate' should be interpreted as commensurate with/proportionate to the size of the organisation and the complexity of the operation.*	*N/A*

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 competent third party performs an audit of the organisation	The applicant holds an organisational operating certificate or has a recognised flight test organisation. In addition, a competent third party recurrently verifies the UAS operator's competences.
	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 by competent and/or proven entity	Criteria	As a minimum, manufacturing 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 procedures also cover: (a) 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 complies with the organisational requirements that are defined in 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 by competent and/or proven entity	Criteria	The declared manufacturing procedures are developed to a standard considered adequate by the competent authority 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 in conformance to its design. The competent authority may request EASA to validate the claimed integrity.	Same as medium. In addition: EASA validates compliance with the organisational requirements that are defined in 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 integrity		
		Low	Medium	High
OSO #03 UAS maintained by competent and/or proven entity (e.g. industry standards)	Criteria	(a) The UAS maintenance instructions are defined, and, when applicable, cover the UAS designer's instructions and requirements. (b) The maintenance staff is competent and has received an authorisation to carry out UAS maintenance. (c) The maintenance staff use the UAS maintenance instructions while performing maintenance.	Same as low. In addition: (a) Scheduled maintenance of each UAS is organised and in accordance with a maintenance programme. (b) Upon completion, the maintenance log system is used to record all the maintenance conducted on the UAS, including releases. A maintenance release can only be accomplished by a staff member who has received a maintenance release authorisation for that particular UAS model/family.	Same as medium. In addition, the maintenance staff work in accordance with a maintenance procedure manual that provides information and procedures relevant to the maintenance facility, records, maintenance instructions, release, tools, material, components, defect deferral, etc.
	Comments	*N/A*	*N/A*	*N/A*

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	**Medium**	**High**
OSO #03 UAS maintained by 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 and/or in accordance with a means of compliance acceptable to that authority. (b) A list of 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 a competent third party.
	Comments	*[1] 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 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.	Same as medium. In addition: (a) A programme for the recurrent training of staff holding a maintenance release authorisation is established; and (b) This programme is validated by a competent 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 integrity		
		Low	Medium	High
OSO #04 UAS developed to authority recognised design standards	Criteria	The UAS is designed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a low level of integrity and the intended operation.	The UAS is designed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a medium level of integrity and the intended operation.	The UAS is designed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a high level of integrity and the intended operation.
	Comments	*In case of experimental flights that investigate new technical solutions, the competent authority may accept that recognised standards are not met.*		

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		
	Comments	*The competent authority may request EASA to validate the claimed integrity.*	*If the operation is classified as SAIL V, EASA validates the claimed integrity. In all other cases, the competent authority may request EASA to validate the claimed integrity.*	*N/A*

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

This OSO complements:

(a) the safety requirements for containment defined in the main body; and

(b) OSO #10 and OSO #12, which only address the risk of a fatality while operating over populated areas or assemblies of people.

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #05 UAS is designed considering system safety and reliability	Criteria	The equipment, systems, and installations are designed to minimise hazards[1] in the event of a probable[2] malfunction or failure of the UAS.	Same as low. In addition, the strategy for detection, alerting and management of any malfunction, failure or combination thereof, which would lead to a hazard, is available.	Same as medium. In addition: (a) Major failure conditions are not more frequent than remote[3]; (b) Hazardous failure conditions are not more frequent than extremely remote[3]; (c) Catastrophic failure conditions are not more frequent than extremely improbable[3]; and (d) SW and AEH whose development error(s) may cause or contribute to hazardous or catastrophic failure conditions are developed to an industry standard or a methodology considered adequate by EASA and/or in accordance with means of compliance acceptable to EASA[4].
	Comments	*[1] For the purpose of this assessment, the term 'hazard' should be interpreted as a failure condition that relates to major, hazardous, or catastrophic consequences.* *[2] For the purpose of this assessment, the term 'probable' should be interpreted in a qualitative way as 'anticipated to occur one or more times during the entire system/operational life of a UAS'.*	*N/A*	*[3] Safety objectives may be derived from JARUS AMC RPAS.1309 Issue 2 Table 3 depending on the kinetic energy assessment made in accordance with Section 6 of EASA policy E.Y013-01.* *[4] Development assurance levels (DALs) for SW/AEH may be derived from JARUS AMC RPAS.1309 Issue 2 Table 3 depending on the kinetic energy assessment made in accordance with Section 6 of EASA policy E.Y013-01.*

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 shows 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. (b) A strategy for the detection of single failures of concern includes pre-flight checks. The competent authority may request EASA to validate the claimed integrity.	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
(a) For the purpose of the SORA and this specific OSO, the term ‘C3 link’ encompasses:
(1) the C2 link; and
(2) any communication link required for the safety of the flight.
(b) To correctly assess the integrity of this OSO, the applicant should identify the following:
(1) The performance requirements for the C3 links necessary for the intended operation.
(2) All the C3 links, together with their actual performance and RF spectrum usage.
Note: The specification of the performance and RF spectrum for a C2 Link is typically documented by the UAS designer in the UAS manual.
Note: The main parameters associated with the performance of a C2 link (RLP) and the performance parameters for other communication links (e.g. RCP for communication with ATC) include, but are not limited to, the following:
(i) the transaction expiration time;

(ii) the availability;
(iii) the continuity; and
(iv) the integrity.
Refer to the ICAO references for definitions.
(3) The RF spectrum usage requirements for the intended operation (including the need for authorisation if required).
Note: Usually, countries publish the allocation of RF spectrum bands applicable in their territories. This allocation stems mostly from the International Communication Union (ITU) Radio Regulations. However, the applicant should check the local requirements and request authorisation when needed since there may be national differences and specific allocations (e.g. national sub-divisions of ITU allocations). Some aeronautical bands (e.g. AM(R)S, AMS(R)S 5030-5091MHz) were allocated for potential use in UAS operations under the ICAO scope for UAS operations classified as cat. C (‘certified’), but their use may be authorised for operations under the ‘specific’ category. It is expected that the use of other licensed bands (e.g. those allocated to mobile networks) may also be authorised under the ‘specific’ category. Some un-licensed bands (e.g. industrial, scientific and medical (ISM) or short-range devices (SRDs)) may also be acceptable under the ‘specific’ category; for instance, for operations with lower integrity requirements.
(4) Environmental conditions that might affect the performance of C3 links.

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #06 C3 link characteristics (e.g. performance, spectrum use) are appropriate for the operation	Criteria	(a) The applicant determines that the performance, RF spectrum usage[1] and environmental conditions for C3 links are adequate to safely conduct the intended operation. (b) The remote pilot has the means to continuously monitor the C3 performance and ensures that the performance continues to meet the operational requirements[2].	Same as low[3].	Same as low. In addition, the use of licensed[4] frequency bands for C2 Links is required.
	Comments	*[1] For a low level of integrity, unlicensed frequency bands might be acceptable under certain conditions, e.g.:* *(a) the applicant demonstrates compliance with other RF spectrum usage requirements (e.g. Directive 2014/53/EU), by showing that the UAS equipment is compliant with these requirements; and* *(b) the use of mechanisms to protect against interference (e.g. FHSS, frequency de-confliction by procedure).* *[2] The remote pilot has continual and timely access to the relevant C3 information that could affect the safety of flight. For operations requesting only a low level of integrity for this OSO, this could be achieved by monitoring the C2 link signal strength and receiving an alert from the UAS HMI if the signal strength becomes too low.*	*[3] Depending on the operation, the use of licensed frequency bands might be necessary. In some cases, the use of non-aeronautical bands (e.g. licensed bands for cellular network) may be acceptable.*	*[4] This ensures a minimum level of performance and is not limited to aeronautical licensed frequency bands (e.g. licensed bands for cellular network). Nevertheless, some operations may require the use of bands allocated to the aeronautical mobile service for the use of C2 Link (e.g. 5030 – 5091 MHz).* *In any case, the use of licensed frequency bands needs authorisation.*

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	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.	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
The intent of this OSO is to ensure that the UAS used for the operation conforms to the UAS data used to support the approval/authorisation of the operation.

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #07 Inspection of the UAS (product inspection) to ensure consistency with the ConOps	Criteria	The remote crew ensures that the UAS is in a condition for safe operation and conforms to the approved ConOps.[1]		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see the table below).*		

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 validated by a competent 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 competent 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		

OPERATIONAL PROCEDURES		Level of integrity		
		Low	Medium	High
		Note: normal, contingency and emergency procedures are compiled in an OM. (b) The limitations of the external systems supporting UAS operation[2] are defined in an OM.		
	Comments	*[1] Operational procedures cover the deterioration3 of the UAS itself and any external system supporting UAS operation.* *[2] In the scope of this assessment, external systems supporting UAS operation are defined as systems that are not already part of the UAS but are used to:* *(a) launch/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-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* *(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 raising the remote crew's workload and/or the interactions 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 not all UAS have a mode where the pilot could directly control the surfaces; moreover, some people claim it requires 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.
OPERATIONAL PROCEDURES		**Level of integrity**		
		Low	**Medium**	**High**
	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.*

E.4 OSOs related to remote crew training

(a) The applicant needs to propose competency-based, theoretical and practical training that:

(1) is appropriate for the operation to be approved; and

(2) includes proficiency requirements and recurrent training.

(b) The entire remote crew (i.e. any person involved in the operation) should undergo competency-based, theoretical and practical training specific to their duties (e.g. pre-flight inspection, ground equipment handling, evaluation of the meteorological conditions, etc.).

REMOTE CREW COMPETENCIES		Level of integrity		
		Low	Medium	High
OSO #09, OSO #15 and OSO #22	Criteria	The competency-based, theoretical and practical training is adequate for the operation[1] and ensures knowledge of: (a) the UAS Regulation; (b) airspace operating principles; (c) airmanship and aviation safety; (d) human performance limitations; (e) meteorology; (f) navigation/charts; (g) the UAS; and (h) operating procedures.		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		

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. (b) The UAS operator provides competency-based, theoretical and practical training.	A competent 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

(a) The objectives of OSO#10 and OSO#12 are to complement the technical containment safety requirements by addressing the risk of a fatality while operating over populated areas or assemblies of people.

(b) In the scope of this assessment, external systems supporting UAS operations are defined as systems that are not already part of the UAS but are used to:

(1) launch/take off the UA;

(2) make pre-flight checks; or

(3) keep the UA within its operational volume (e.g. GNSS, satellite systems, air traffic management, U-space).

External systems activated/used after a loss of control of the operation are excluded from this definition.

		LEVEL of INTEGRITY		
		Low	**Medium**	**High**
OSO #10 & OSO #12	Criteria	When operating over populated areas or assemblies of people, it can be reasonably expected that a fatality will not occur from any probable[1] failure[2] of the UAS or any external system supporting the operation.	When operating over populated areas or assemblies of people, it can be reasonably expected that a fatality will not occur from any single failure[3] of the UAS or any external system supporting the operation. SW and AEH whose development error(s) could directly lead to a failure affecting the operation in such a way that it can be reasonably expected that a fatality will occur, are developed to a standard considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority.	Same as medium
	Comments	*[1] For the purpose of this assessment, the term 'probable' should be interpreted in a qualitative way as, 'anticipated to occur one or more times during the entire system/operational life of a UAS'.* *[2] 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.*	*[3] Some structural or mechanical failures may be excluded from the no-single failure criterion if it can be shown that these mechanical parts were designed to a standard considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority*	

		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	Same as low. In addition, the level of integrity claimed is substantiated by analysis and/or test data with supporting evidence. The competent authority may request EASA to validate the claimed integrity.	Same as medium. In addition, EASA validates the level of integrity claimed.
		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
		(b) particular risks relevant to the ConOps (e.g. hail, ice, snow, electromagnetic interference, etc.) do not violate the independence claims, if any.		
	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.

DETERIORATION OF EXTERNAL SYSTEMS SUPPORTING UAS OPERATIONS BEYOND THE CONTROL OF THE UAS		Level of integrity		
		Low	Medium	High
OSO #13 External services supporting UAS operations are adequate for the operation	Criteria	The applicant ensures that the level of performance for any externally provided service necessary for the safety of the flight is adequate for the intended operation. If the externally provided service requires communication between the UAS operator and the service provider, the applicant ensures there is effective communication to support the service provision. Roles and responsibilities between the applicant and the external service provider are defined.		
	Comments	*N/A*	*N/A*	*Requirements for contracting services with the service provider may be derived from ICAO Standards and Recommended Practices (SARPs) that are currently under development.*

DETERIORATION OF EXTERNAL SYSTEMS SUPPORTING UAS OPERATION 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 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, responsibilities). The applicant has a means to monitor externally provided services which affect flight critical systems and take appropriate actions if real-time performance could lead to the loss of control of the operation.	Same as medium. In addition: (a) the evidence of the performance of an externally provided service is achieved through demonstrations; and (b) a competent third party validates the claimed level of integrity.
	Comments	*N/A*	*N/A*	*N/A*

E.7 OSOs related to Human Error

OSO #16 — Multi-crew coordination

This OSO applies only to those personnel directly involved in the flight operation.

HUMAN ERROR		Level of integrity		
		Low	Medium	High
OSO #16 Multi crew coordination	Criterion #1 (Procedures)	Procedure(s) to ensure coordination between the crew members and robust and effective communication channels is (are) available and at a minimum cover: (a) assignment of tasks to the crew, and (b) establishment of step-by-step communications.[1]		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see the table below).*		
	Criterion #2 (Training)	Remote crew training covers multi-crew coordination	Same as low. In addition, the remote crew[2] receives CRM[3] training.	Same as medium.
	Comments	*N/A*	*[2] In the context of the SORA, the term 'remote crew' refers to any person involved in the mission.* *[3] CRM training focuses on the effective use of all the remote crew to assure a safe and efficient operation, reducing error, avoiding stress and increasing efficiency.*	*N/A*
	Criterion #3 (Communication devices)	N/A	Communication devices comply with standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.	Communication devices are redundant[4] and comply with standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.
	Comments	*N/A*	*N/A*	*[4] This implies the provision of an extra device to cope with the failure of the first device.*

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	Medium	High
OSO #16 Multi crew coordination	Criterion #1 (Procedures)	(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority. (b) The adequacy of the procedures and checklists is declared.	(a) Procedures are validated against standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority. (b) Adequacy of the procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided the simulation is proven valid for the intended purpose with positive results.	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 a competent third party.
	Comments	*N/A*	*N/A*	*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.	A competent third party: (a) validates the training syllabus; and (b) verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	Medium	High
	Criterion #3 (Communication devices)	Consider the criteria defined in Section 9		
	Comments	*N/A*	*N/A*	*N/A*

OSO #17 — Remote crew is fit to operate

(a) For the purpose of this assessment, the expression ‘fit to operate’ should be interpreted as physically and mentally fit to perform their duties and safely discharge their responsibilities.

(b) Fatigue and stress are contributory factors to human error. Therefore, to ensure that vigilance is maintained at a satisfactory level of safety, consideration may be given to the following:

(1) remote crew duty times;

(2) regular breaks;

(3) rest periods; and

(4) handover/takeover procedures.

HUMAN ERROR		Level of integrity		
		Low	Medium	High
OSO #17 Remote crew is fit to operate	Criteria	The applicant has a policy defining how the remote crew can declare themselves fit to operate before conducting any operation.	Same as low. In addition: — Duty, flight duty and resting times for the remote crew are defined by the applicant and adequate for the operation. — The UAS operator defines requirements appropriate for the remote crew to operate the UAS.	Same as Medium. In addition: — The remote crew is medically fit, — A fatigue risk management system (FRMS) is in place to manage any escalation in duty/flight duty times.
	Comments	*N/A*	*N/A*	*N/A*

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 declaration of fit to operate (before an operation) is based on policy defined by the applicant.	Same as Low. In addition: — Remote crew duty, flight duty and the resting times 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 — resting times within the duty cycle. — There is evidence that the remote crew is fit to operate the UAS.	Same as Medium. In addition: — Medical standards considered adequate by the competent authority and/or means of compliance acceptable to that authority are established and a competent third party verifies that the remote crew is medically fit. — A competent third party validates the duty/flight duty times. — If an FRMS is used, it is validated and monitored by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*

OSO #18 — Automatic protection of the flight envelope from human errors
(a) Each UA is designed with a flight envelope that describes its safe performance limits with regard to minimum and maximum operating speeds, and its operating structural strength.
(b) Automatic protection of the flight envelope is intended to prevent the remote pilot from operating the UA outside its flight envelope. If the applicant demonstrates that the remote-pilot is not in the loop, this OSO is not applicable.
(c) A UAS implementing such an automatic protection function will ensure that the UA is operated within an acceptable flight envelope margin even in the case of incorrect remote-pilot control inputs (human errors).
(d) UAS without automatic protection functions are susceptible to incorrect remote-pilot control inputs (human errors), which can result in the loss of the UA if the designed performance limits of the aircraft are exceeded.
(e) Failures or development errors of the flight envelope protection are addressed in OSOs #5, #10 and #12.

HUMAN ERROR		LEVEL of INTEGRITY		
		Low	Medium	High
OSO #18 Automatic protection of the flight envelope from human errors	Criteria	The UAS flight control system incorporates automatic protection of the flight envelope to prevent the remote pilot from making any single input under normal operating conditions that would cause the UA to exceed its flight envelope or prevent it from recovering in a timely fashion.	The UAS flight control system incorporates automatic protection of the flight envelope to ensure the UA remains within the flight envelope or ensures a timely recovery to the designed operational flight envelope following remote pilot error(s).[1]	
	Comments	*N/A*	*[1] The distinction between a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*	

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 request EASA to validate the claimed integrity.	Same as Medium. In addition, evidence is validated by EASA.
	Comments	*N/A*	*N/A*	*N/A*

OSO #19 — Safe recovery from human errors

(a) This OSO addresses the risk of human errors which may affect the safety of the operation if not prevented or detected and recovered in a timely fashion.

i) Errors can be made by anyone involved in the operation.

ii) An example could be a human error leading to the incorrect loading of the payload, with the risk of it falling off the UA during the operation.

iii) Another example could be a human error not to extend the antenna mast, thus reducing the C2 link coverage.

Note: the flight envelope protection is excluded from this OSO since it is specifically covered by OSO #18.

(b) This OSO covers:

i) procedures and lists,

ii) training, and

iii) UAS design, i.e. systems detecting and/or recovering from human errors (e.g. safety pins, use of acknowledgment features, fuel or energy consumption monitoring functions …)

HUMAN ERROR		LEVEL of INTEGRITY		
		Low	Medium	High
OSO #19 Safe recovery from Human Error	Criterion #1 (Procedures and checklists)	Procedures and checklists that mitigate the risk of potential human errors from any person involved with the mission are defined and used. Procedures provide at a minimum: — a clear distribution and assignment of tasks, and — an internal checklist to ensure staff are adequately performing their assigned tasks.		
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Training)	— The remote crew[1] is trained to use procedures and checklists. — The remote crew[1] receives CRM[2] training.[3]		
	Comments	*[1] In the context of SORA, the term 'remote crew' refers to any person involved in the mission.* *[2] CRM training focuses on the effective use of all the remote crew to ensure a safe and efficient operation, reducing error, avoiding stress and increasing efficiency.* *[3] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		
	Criterion #3 (UAS design)	Systems detecting and/or recovering from human errors are developed according to industry best practices.	Systems detecting and/or recovering from human errors are developed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.	Same as medium.
	Comments	*N/A*	*N/A*	*N/A*

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	Medium	High
OSO #19 Safe recovery from Human Error	Criterion #1 (Procedures and checklists)	— Procedures and checklists do not require validation against either a standard or a means of compliance considered adequate by the competent authority. — The adequacy of the procedures and checklists is declared.	— Procedures and checklists are validated against standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. — Adequacy of the procedures and checklists is proven through: — Dedicated flight tests, or — Simulation, provided the simulation is proven valid for the intended purpose with positive results.	Same as Medium. In addition: — Flight tests performed to validate the procedures and checklists cover the complete flight envelope or are proven to be conservative. — The procedures, checklists, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	*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*
	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 V, EASA validates the claimed integrity. In all other cases, the competent authority may request EASA to validate the claimed integrity.	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 Human Factors evaluation has been performed and the HMI found appropriate for the mission.

HUMAN ERROR		LEVEL of INTEGRITY		
		Low	Medium	High
OSO #20 A Human Factors evaluation has been performed and the HMI found appropriate for the mission	Criteria	The UAS information and control interfaces are clearly and succinctly presented and do not confuse, cause unreasonable fatigue, or contribute to remote crew errors that could adversely affect the safety of the operation.		
	Comments	*If an electronic means is used to support potential VOs in their role to maintain awareness of the position of the unmanned aircraft, its HMI:* *— is sufficient to allow the VOs to determine the position of the UA during operation; and* *— does not degrade the VO's ability to:* *— scan the airspace visually where the unmanned aircraft is operating for any potential collision hazard; and* *— maintain effective communication with the remote pilot at all times.*		

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	Medium	High
OSO #20 A Human Factors evaluation has been performed and the HMI 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 request EASA to witness the HMI evaluation of the UAS.	Same as Medium. In addition, EASA witnesses the HMI evaluation of the UAS and a competent third party witnesses the HMI evaluation of the possible electronic means used by the VO.
	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 Adverse Operating Conditions

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

ADVERSE OPERATING CONDITIONS		LEVEL of INTEGRITY		
		Low	Medium	High
OSO #23 Environmental conditions for safe operations are defined, measurable and adhered to	Criterion #1 (Definition)	The environmental conditions for safe operations are defined and reflected in the flight manual or equivalent document.[1]		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		
	Criterion #2 (Procedures)	Procedures to evaluate environmental conditions before and during the mission (i.e. real-time evaluation) are available and include assessment of meteorological conditions (METAR, TAFOR, etc.) with a simple recording system.[2]		
	Comments	*[2] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		
	Criterion #3 (Training)	Training covers assessment of meteorological conditions.[3]		
	Comments	*[3] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		

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		
	Comments	*N/A*		
	Criterion #2 (Procedures)	— Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority. — The adequacy of the procedures and checklists is declared.	— Procedures are validated against standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. — The adequacy of the procedures is proved through: — Dedicated flight tests, or — Simulation, provided the simulation is proven valid for the intended purpose with positive results.	Same as Medium. In addition: — Flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative. — The procedures, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	*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.	A competent third party: — Validates the training syllabus. — 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)
(a) To assess the integrity of this OSO, the applicant determines:
(1) whether credit can be taken for the equipment environmental qualification tests / declarations, e.g. by answering the following questions:
(i) Is there a Declaration of Design and Performance (DDP) available to the applicant stating the environmental qualification levels to which the equipment was tested?
(ii) Did the environmental qualification tests follow a standard considered adequate by the competent authority (e.g. DO-160)?
(iii) Are the environmental qualification tests appropriate and sufficient to cover all the environmental conditions related to the ConOps?
(iv) If the tests were not performed following a recognised standard, were the tests performed by an organisation/entity that is qualified or that has experience in performing DO-160 like tests?
(2) Can the suitability of the equipment for the intended/expected UAS environmental conditions be determined from either in-service experience or relevant test results?
(3) Any limitations which would affect the suitability of the equipment for the intended/expected UAS environmental conditions.
(b) The lowest integrity level should be considered for those cases where a UAS equipment has only a partial environmental qualification and/or a partial demonstration by similarity and/or parts with no qualification at all.

ADVERSE OPERATING CONDITIONS		LEVEL of INTEGRITY		
		N/A	Medium	High
OSO #24 UAS is designed and qualified for adverse environmental conditions	Criteria	N/A	The UAS is designed to limit the effect of environmental conditions.	The UAS is designed using environmental standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.
	Comments	*N/A*	*N/A*	*N/A*

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	
	Comments	*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.
	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*