Joint Authorities for Rulemaking of Unmanned Systems

JARUS guidelines on SORA

Annex A

Guidelines on collecting and presenting system and operation information for a specific UAS operation

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Annex A

Introduction

The primary purpose of this annex is to provide guidance on how to gather and present data and evidence to enable operators to produce a Concept of Operations (ConOps) supplemented by the required risk assessment for the operations of an unmanned aircraft in the Specific category.

The ConOps (Step#1 of the SORA process) not only describe the operation, but also provide insight into the operator's operational safety culture. It should also include how and when to interact with additional parties/organizations (e.g., Airport Authorities, ANSP). Therefore, when defining the ConOps the operator should give due consideration to all steps, mitigations and operational safety objectives provided intended to be utilized in the SORA process..

When the SORA process is successfully completed, a comprehensive safety portfolio (Step#10) should be the result and evidence of it should be provided to the Competent Authority. This annex also provides additional guidance to support applicants in documenting the risk assessment that validates the ConOps prior to an application to the Competent Authority for an Operational Authorisation.

This process is of utmost importance, as this constitutes the primary tool for engaging with the Competent Authority to enable evaluation of the proposed operation(s) to ensure that all risks identified are tolerable and ALARP.

This document does not replace civil regulations but provides recommendations and guidance as to how civil UAS operators can comply with those regulations in relation to the risk assessment requirements for Specific category operations. Wherever possible the guidance has been harmonised with any relevant emerging international UAS regulatory developments.

Annex A layout and description

This Annex is composed of 4 sections.

The first is an explanatory section:

A0: Key Principles for completing the necessary supporting application documents in the Specific Category – contains guidance on the purpose and suggested writing-process of the documents, and

The two sections below are a structured template for the Concept of Operations:

A1: ConOps Template for Operational Information – describes the operator and the operation(s) that they intend to conduct, including all procedures necessary for safe operations,

A2: ConOps Template for Technical Information – describes the technical characteristics of the UAS platform, and the equipment being used to support the operation.

The final section provides a template to assess the documents above:

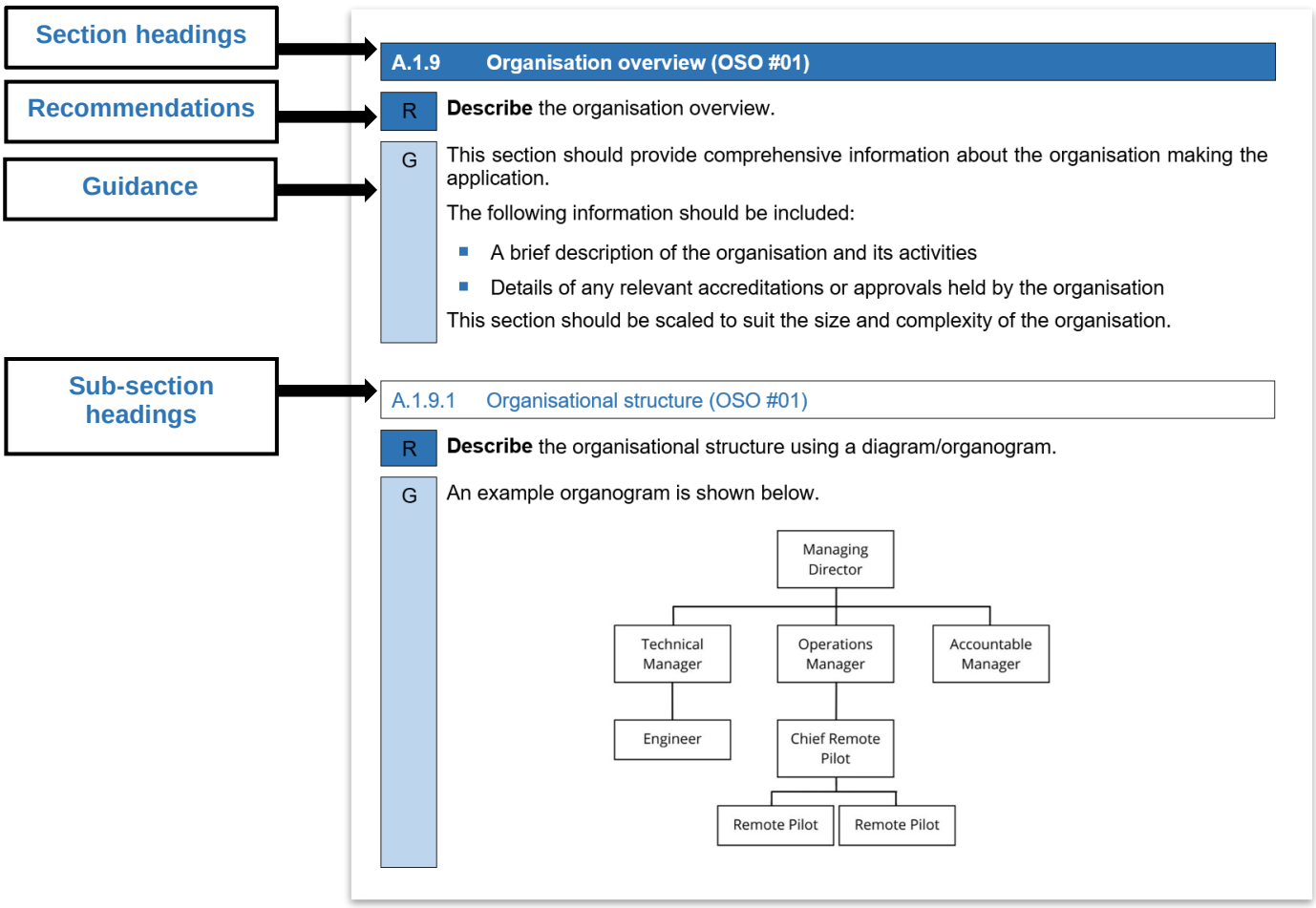
A3: SORA Risk Assessment writing template – describes a standardised method of documenting the safety risk assessment.

A.0 Key Principles for completing the necessary supporting application documents in the Specific Category

A.0.1 Annex Editorial Practices

In this document the following editorial practices were applied:

This annex lays out recommendations and guidance for applicants to prepare the supporting application documentation.



Recommendations are marked as 'R' and generally use the terms '**describe'** / '**detail'** / '**explain'** / '**declare'**. These indicate the recommended information that should be included in the ConOps.

Guidance is marked as 'G' and is intended to help the applicant to provide the information in the recommendations.

'Should' indicates a strong obligation (in other words, a person would need to provide clear justification for not complying with the obligation).

'May' indicates discretion can be used when assessing what information to provide.

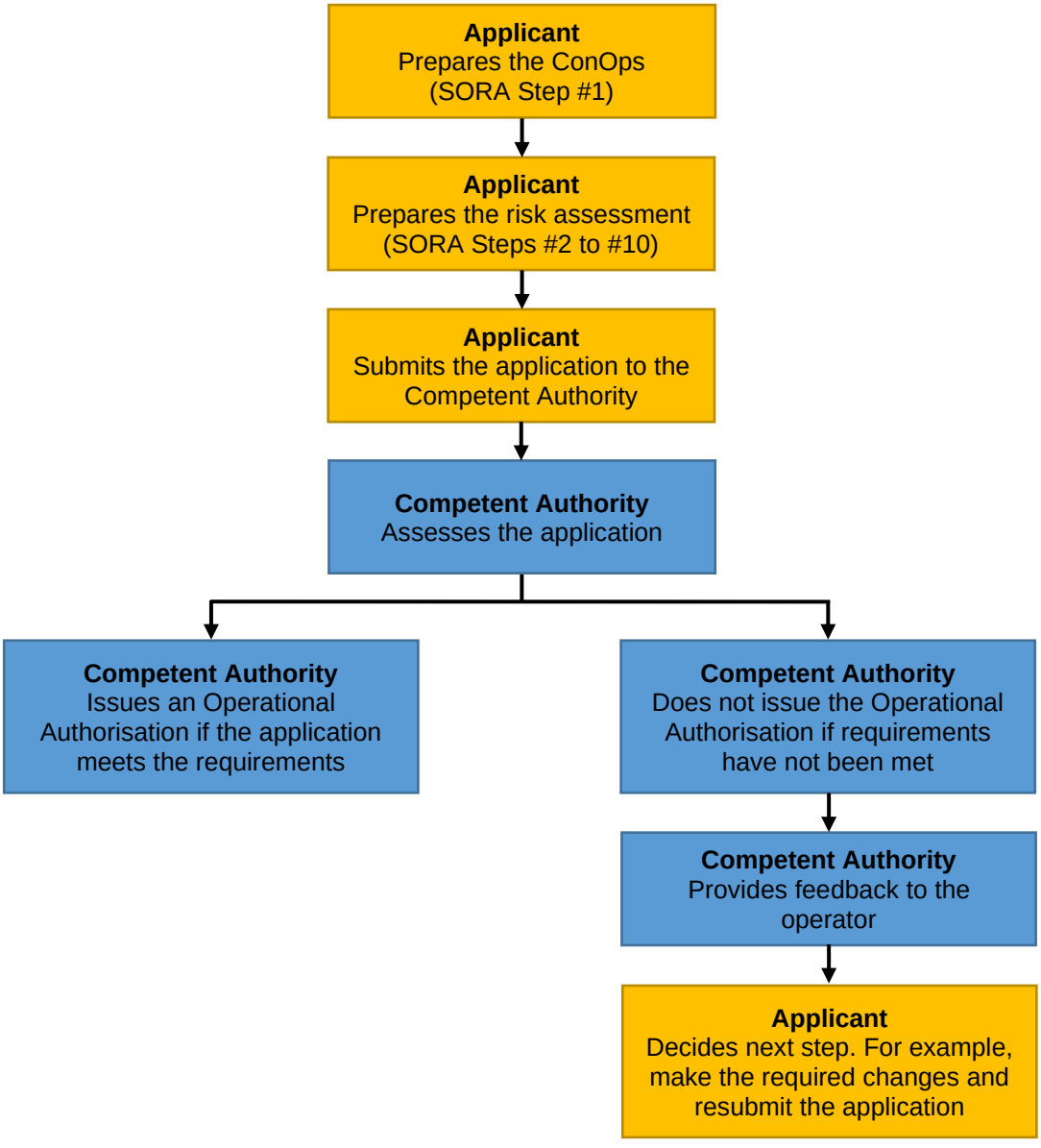
A.0.2 How does an application generally work?

The ConOps document serves as the basis for any Operational Authorisation in the Specific category. When the Competent Authority authorises a specific operation, it will usually do that, by accepting and authorising a ConOps. It will however only do that, if the ConOps can demonstrate that all identified risks are tolerable and as low as reasonably practicable (ALARP), which can be shown as the result of a risk assessment utilising the SORA methodology.

The first step of the SORA requires the applicant to collect and provide the relevant technical, operational and system information needed to assess the risk associated with the intended operation of the UAS. Section A1 and A2 of this annex provide a detailed framework for data collection.

Developing the ConOps can be an iterative process. As the SORA process is applied, additional mitigations and limitations may be identified, requiring additional associated technical details, procedures, and other information to be provided/updated in the ConOps. This should culminate with a ConOps that comprehensively describes the proposed operation as envisioned.

Applicants must ensure they complete all sections that are required for the proposed operation(s). All key safety aspects of the operations proposed should be described.



217 **Figure 1** Application Process

218

A.0.3 Recommended level of detail and use of supporting documents and references

R

The ConOps should enable the applicant to describe to the Competent Authority the intended operation(s) to a level of detail that effectively enables:

- the identification of GRC, ARC, associated mitigations, and SAIL determination.
- compliance with the required OSOs, mitigations and containment. The provisions can be assessed and verified with the information contained or referenced by it.

G

The applicant should only put information into the ConOps that is recommended above. For example, if a requirement has a low level of robustness, it is usually sufficient to self-declare the compliance by a statement in the ConOps or in supplemental compliance evidence documents.

Supporting documents evidencing a low level of robustness requirement can usually be kept internal to the operator's organisation and are not submitted to the Competent Authority and are not subject to version control. The Competent Authority may request further documents, if considered necessary for the given operation.

When an OSO or mitigation requires evidence to be available, this evidence should be submitted to the Competent Authority. This may be added to the ConOps or to the compliance evidence as required. For example, operational procedures used by the remote crew during the operation should be part of the ConOps.

219

A.0.4 ConOps file structure for operators with multiple types of operations or locations

R

If an operator uses more than one type of operation, each type should have its own ConOps, but the general operator information should be put in a separate top-level document, that is referenced by each ConOps.

If an operator intends to operate in multiple locations, with location specific mitigations, the ConOps should be structured such that each location specific information set is organised in a sub-chapter.

G

As shown in figure 2, the document information can be structured in sub-documents and sub-sections to accommodate the need to perform multiple operations, varying local conditions, different types of UAS with identical risk properties and associated differing training programmes, or differing procedures.

Disclaimer: The applicant may need to consult with the Competent Authority to discuss the individually appropriate document modularisation for complex organisations.

Appropriate references and version control applies to all subsections and sub-documents.

It is important that the Competent Authority can identify all document modules that together comprise the relevant ConOps requiring authorisation. Circular references or similar ambiguities should be avoided where possible.

220

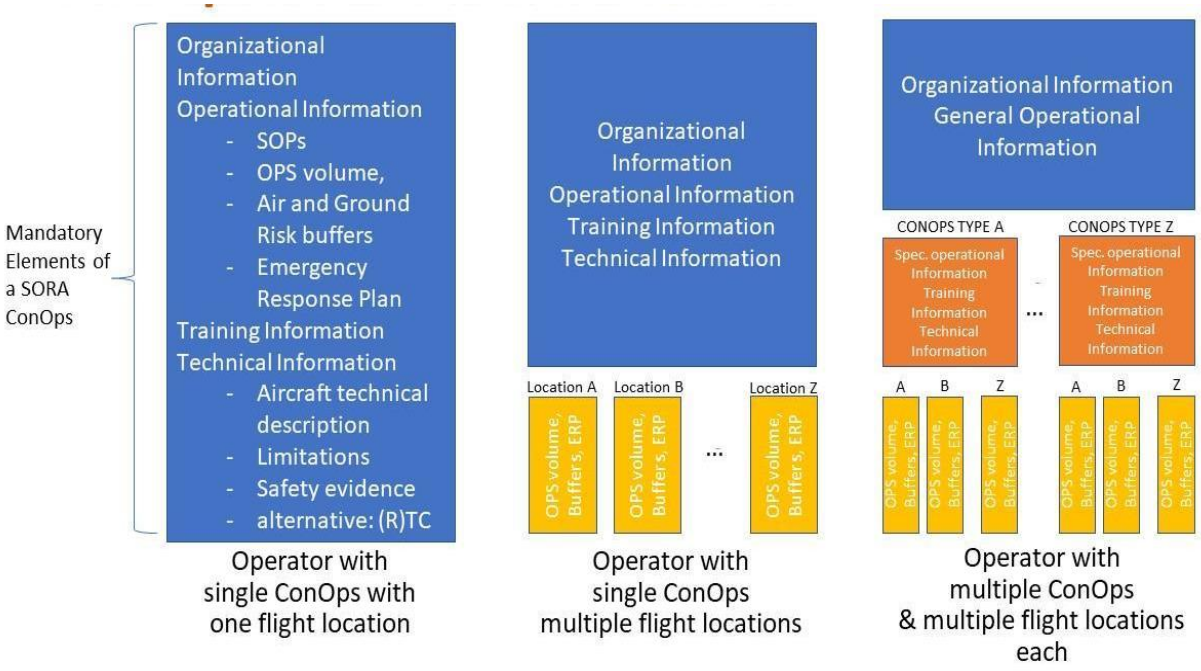


Figure 2 ConOps documents structure

A.1 ConOps operational manual template

This section provides a guidance template to be followed by applicants in order to provide recommended and relevant preliminary information.

The template below provides section headings detailing the subject areas that should be addressed when producing the Operations Manual, for the purposes of demonstrating that a UAS operation can be conducted safely. The template layouts as presented are not prescriptive, but the subject areas detailed should be included in the Operations Manual documentation as required for the particular operation(s), in order to provide the minimum required information and evidence to perform the SORA.

A.1.1 ConOps front cover

R

The front cover should contain the following information:

- The title – 'Operator ConOps'
- Applicant name and contact information
- Version number and the date of the document in this format – DD/MM/YYYY

A.1.2 Table of contents

R The table of contents should include all sections of the ConOps.

252

A.1.3 Amendment record

R The amendment record should include, as a minimum, the following information:

- Version number – this should be the same as the version number on the front cover of the ConOps
- The date of the amendment(s)
- A brief description of the amendment(s) and where the amendments are in the document, for example paragraph and/or page numbers
- If it is a variation application, all the relevant changes should be listed in the 'amendments incorporated' section under the heading 'Variation'. See the example table below
- The name and signature of the person who has amended the document. The signature may be scanned or electronic.
- A statement confirming the individual with the responsibility for ensuring that the document remains up to date

G An example amendment record is shown below in table format and can be revised according to the requirements of the Competent Authority.

Applicants may also use revision bars next to amended text in the relevant manuals to highlight where changes have been made.

253

254

255

ConOps version number	Amendment date	Amendments incorporated	Page(s) and/or paragraphs amended	Amended by	Signature
0	DD/MM/YYYY	Details of the changes	Page XX Paragraph XX	*Add name*	Add signature (signature can be electronic or wet)
This ConOps document is kept up to date by *add name*, Accountable Manager.					

256

A.1.4 Definitions, acronyms, and abbreviations

R A list of definitions, acronyms and abbreviations used in the ConOps should be included.

G Applicants should refer to JARUS SORA Annex I here for additional information.

Applicants should only include abbreviations relevant to their application.

257

A.1.5 Purpose and scope of the document

R

The purpose and scope of the document should:

- **Explain** the scope of the document, its intent, and the overarching operating strategy of the company/applicant
- **Explain** the purpose and scope of the ConOps with a brief description of the different parts of the document
- **Explain** the purpose and scope of the operation, with a brief description of the proposal.

G

If the operator uses more than one ConOps within their organisation, this section should briefly outline each of the operating strategies for each ConOps.

When explaining the purpose and scope of the operation(s), include information such as:

- VLOS/EVLOS/BVLOS
- Flight above 500 ft
- Type of location
  - Ground area
  - Airspace
- Type and size of aircraft

258

A.1.6 Changes to the organisation

R

Describe and **explain** how changes to the organisation are made and recorded and communicated to the Competent Authority.

G

Any changes that require reporting to the Competent Authority should be clearly marked as changes with any document submissions to the Competent Authority for approval.

259

A.1.7 Safety statement

R

The safety statement should be written in accordance with the recommendations listed below:

- The person accountable for the safe conduct of the company/applicant's operations should provide their full name and sign and date the statement.
- The statement should include, as a minimum, the following information:
  - A declaration that the company/applicant is safe to operate in the proposed environment.
  - A declaration that the system(s) to be employed can be operated safely
  - A commitment to operate within the bounds of that ConOps and any Competent Authority Operational Authorisation granted.

- A description of how safety will be prioritised.
- Where necessary, a commitment to conduct further mitigation actions as detailed within that ConOps.
- An undertaking to carry out the procedures or other actions that mitigate the safety risks throughout the period of authorisation.
- A clear statement that safety risks are managed by the applicant to be tolerable and will remain as low as reasonably practicable while being owned by accountable individuals within the applicant's organisation.

G This statement is normally signed by the Accountable Manager. Competent Authorities may request further information.

260

A.1.8 References

R List all references (documents, URL, manuals, appendices) mentioned in this document.

G Example document sets could include:

- Maintenance manuals
- Remote crew operating manuals
- SMS manuals
- Technical procedure manuals (TPM)

These reference documents could be standalone, comprehensive documents covering the relevant subject areas. Depending on the complexity of the operation (SAIL score), the reference documents can or cannot be considered as part of the operations manual relevant to the operation.

If referring to a document, the Competent Authority should be able to locate the relevant information within that reference document. If multiple reference paths need to be taken by the Competent Authority, there may be significant delay in processing the application.

An example reference table is shown below in table format.

#	Title, description
1	
2	

261

262 Detailed Recommendations and Guidance – Operator

263 This section provides a guidance template to be followed by applicants in order to provide
264 recommended and relevant operational and organisation information.

265

A.1.9 Organisation overview (OSO #01)

R **Describe** the organisation overview.

G

This section should provide comprehensive information about the organisation making the application.

The following information should be included:

- A brief description of the organisation and its activities
- Details of any relevant accreditations or approvals held by the organisation

This section should be scaled to suit the size and complexity of the organisation.

266

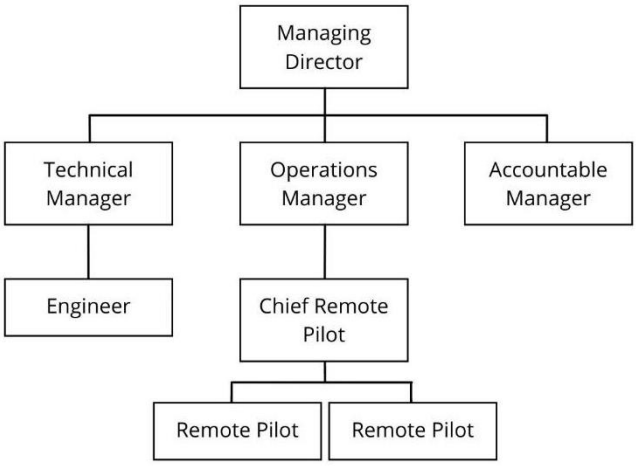
A.1.9.1 Organisational structure (OSO #01)

R

Describe the organisational structure using a diagram/organogram.

G

An example organogram is shown below.



267

A.1.9.2 Design and Production (OSO #02)

R

If the operator is also the manufacturer provide the following information:

- Information to identify the organization designing, manufacturing and/or producing the UAS is required. The operator should provide relevant details of the overview of their organisation whether it is part of the operator organisation or from a third-party manufacturer.
- If the organization is also responsible for the design and/or production of the UAS, this section should describe the structure of this department/section, including the design and/or the production process, and its relationship within the organization.

G

If the UAS is not manufactured or produced by the operator, i.e., by a third-party manufacturer, the operator should provide information on the manufacturer of the UAS to be used in Section A.2.

Note: If the operator is also the manufacturer separate organisations for design, production and flight operations may share the same safety management system depending on the complexity of the organisation.

268

A.1.9.3 Nominated personnel (OSO #01)

R **Explain** the roles of nominated personnel by including all the information below:

- The role titles
- A brief description of the role
- The name of the individuals holding any nominated role may be required to be included by the Competent Authority.

G Examples of nominated personnel/post holders include:

- Accountable Manager
- Operations Manager
- Technical Manager
- Chief Pilot
- Quality/ Safety Manager.

Multiple roles may be filled by the same person. However, in complex organisations, internal audit/ quality roles should be carried out by a person separated from the operation delivery roles.

269

A.1.10 Responsibilities and duties of the UAS operator (OSO #01)

R **Explain** the responsibilities and duties of the UAS operator, and how the UAS operator intends to meet the responsibility requirements set out in the requirements.

G To be added if required.

270

A.1.10.1 Additional operator licensing requirements

R **Describe** any necessary additional licences required for the operation of the UAS.

G Provide any copies of the licences.

The Competent Authority may define additional requirements.

271

A.1.10.2 Additional information

R Detail any additional information about the operation(s) that supports the application but has not already been covered in this section **should** be included by the applicant.

G Examples:

- Insurance documents
- Evidence of remote pilot competency
- Competent Authority authorisation
- Forms and templates used for site surveys
- Flight logs

- Operator registration certificate when applicable

272

A.1.10.3 Responsibilities and duties of the remote crew (OSO #01)

R

Explain the composition of the remote crew and associated support staff.

Explain the responsibilities and duties of the remote crew personnel and support staff, and how the UAS operator intends to meet the remote pilot responsibilities.

G

Examples of remote crew roles:

- The remote pilot(s)
- Safety officer
- Support personnel. Examples of support personnel:
  - Visual observer
  - Launch/recovery crew
  - Radio operators
  - Maintenance (if directly involved in flight operations)

Note: It is not necessary to include the names of the individuals who hold these roles.

273

A.1.10.4 Crew health (OSO #17)

R

Describe how physical and mental fitness is assured to enable flight crew to conduct the planned operations.

SAIL I and II

- **Describe** the crew fitness policy.

SAIL III and IV

- **Describe** the remote crew flight duty and resting time cycles and how this is logged.

SAIL V and VI

- **Describe** the level of medical fitness required.
- **Describe** the fatigue risk management system.

Note: Competent authorities may define standards or means of compliance that they deem adequate.

G

Although there are currently no mandatory aeromedical examination requirements for remote pilots or support staff, the operator should describe what requirements are imposed internally on the flight crew, and why these are appropriate for the operation.

For some operations, this may require a formal medical certificate, or a medical declaration.

A policy on alcohol and psychoactive substances should be in place, and appropriate.

274

A.1.11 Safety and Risk Management

R

Describe how safety is integrated within the organisation and any safety management system that is in place.

Describe the overarching safety culture within the organisation.

G

This section should provide a description of the methodology adopted in order to identify the risks associated with the UAS operations after the authorisation has been granted (via the SORA assessment process). Operators should set out a process similar to the below for continuous assessment of risk during operations.

SAIL I upwards

1. Threat and Error Management (TEM)

- The organisation will manage threats by:
  - adhering to maintenance requirements and standards
  - complying with operational requirements
  - thorough pre-flight inspections
  - application of appropriate site controls.
- The organisation will manage errors by:
  - training and currency of pilots to identify and react to errors in a timely manner
  - prioritising tasks: aviate, navigate and communicate
  - RPAS maintenance and configuration attention
  - employing a no-blame philosophy with regard to incident reporting debriefs.

The organisation considers TEM in all aspects of operating procedures. Continuing risk assessment is the key activity to identify and mitigate potential issues for current operations. Job-specific TEM is identified initially via pre-flight planning (during SORA process) and on-site prior to operation. A risk assessment should be conducted for any risk that has not been adequately mitigated by existing risk control measures and procedures. If an assumption made in the initial assessment is no longer valid, or if a crew member identifies a new risk, these matters are considered and detailed.

SAIL I and II

2. Compliance with legislation

Determine whether the operation can be conducted in compliance with applicable aviation legislation, with consideration given to all applicable Federal, State or Territory legislation.

3. Third-party considerations

- Conduct engagement with stakeholders as planned and continue discovery of new stakeholders that may be affected by current operations. These include:
  - property/landowners, including lessees
  - the general public
  - public not involved in RPAS operations

- organisations that may be affected by the operation.

Starting at SAIL III

4. Validation of identified risks & their treatments

- A number of assumptions are made about a planned or proposed operation, closer to the time of operation and during operation, those identified risks should be validated and logged.
- The following items should be recorded:
  - variations that exist to the initial assumptions
  - new risks or hazards that have been identified at the location
  - new risks or hazards that may occur during the operations at the location.

5. Safety risk assessment and mitigation

Note: Additional Risk Analysis tools could be utilised by the operator to assess and manage risk for continuous safety risk management. outside the scope of the SORA methodology.

Update this paragraph to show difference between what is assessed for authorisation and what operators can use for continuous assessment of risk during operations.

Detail any other relevant safety information as required.

275

A.1.11.1 Occurrence Reporting (OSO #08, #11, #14, #21, M3)

R

Explain the internal and external occurrence reporting procedures to include documentation and data logging procedures.

Describe how records and information are stored and made available, if required, to the Accident Investigation Body, Competent Aviation Authority, and other government entities (e.g., police) as applicable.

Note: Competent Authorities may define occurrences and reporting procedures as per their National requirements.

G

The standard operating procedures (SOP) may contain:

- Reporting procedures in case of:
  - damage to properties;
  - a collision with another aircraft; or
  - a serious or fatal injury (third party or own personnel)

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

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

When you are considering whether an occurrence is reportable, you should also consider other situations where the same thing could have happened. For example, the actual occurrence may have been ‘benign’ as it happened in a remote area. However, if the full scope of how the aircraft could be operated is considered, for

example over people, could the same occurrence in a different situation result in a more serious outcome?

Examples of occurrences that may be reported:

Operation of the aircraft

- Unintentional loss of control
- Loss of control authority over the aircraft
- Aircraft landed outside the designated area
- Aircraft operated beyond the limitations established in the relevant operating category or Operational Authorisation
- Aircraft operated without required licencing, registration, or Operational Authorisation
- Aircraft operated in an unairworthy or unflightworthy condition

Technical malfunction/failure of the aircraft or command unit

- Loss of command-and-control link (C2 link)
- Battery failure/malfunction
- Powerplant failure
- Aircraft structural failure (for example, part of the aircraft detaches during operation)
- Errors in the configuration of the command unit
- Display failures
- Flight programming errors
- Navigation failures

Confusion/liaison errors between flight crew members (human factors)

- Inter crew communication
- Briefing
- Competency oversights

Interaction with other airspace users and the public

- Conflict with another aircraft, such that a risk of collision may have existed
- Infringement of restricted/reserved airspace (Inc. Flight restriction zones [FRZ] around aerodromes)
- Inadvertent flight within close proximity of uninvolved persons (i.e., within the prescribed separation distances)

Other emergencies

- Any occurrence where the safety of the aircraft, operator, other airspace users or members of the public is compromised or reduced to a level whereby potential for harm or damage is likely to occur.

276

A.1.12 Emergency Response Plan (ERP) (M3)

R

Explain the emergency response plan (ERP).

The applicant should:

- Define a response plan for use in the event of a loss of control of the operation;
- Describe the procedures to limit the escalating effects of a crash; and
- Describe the procedures for use in the event of a loss of containment.

G

The purpose of the ERP is to reduce the *severity* of the consequence of a loss of control, by procedurally limiting the harm to third parties and UAS operator personnel.

The ERP is different from the emergency procedures which primarily deal with the handling of the UA.

The emergency procedures should explain how the ERP is activated.

The ERP should reflect the size, nature and complexity of activities performed by the organisation.

The emergency response plan should:

- Contain the action to be taken by the operator or specified individuals in an emergency
- Provide for a safe transition from normal to emergency operations and vice versa
- Ensure coordination with the ERPs of other organisations, where appropriate
- Describe general emergency training across the organisation, including periodic retraining
- Describe roles and clear delineation of responsibilities
- Contain necessary checklists and procedures that must be followed by UAS operator personnel, that form the ERP
- Contain any necessary ‘quick reference guides’ and contact information that may assist personnel in the implementation of the ERP
- Describe how the UAS operator will interact with other agencies and organisations during implementation of the ERP, including local air traffic service units and the emergency services
- Identify what the triggers are for implementing the ERP, and what actions must be carried out for each situation. Include how the emergency is immediately promulgated to other aviation related agencies, particularly in cases of a fly-away loss of control
- Include reference to the mandatory reporting requirements
- Explain what strategic mitigations are in place to assist the ERP. For example, clear labelling of hazardous substances on board the UA, including batteries, to inform any first responders or members of the public who may come across the crashed UA
- Describe what equipment is required for the ERP

277

A.1.13 UAS maintenance within the organisation (OSO #03)

R

This section should **describe** or provide references to:

- Describe the maintenance organisation, if required, to include any third-party organisations as required
- Describe the general maintenance philosophy of the UAS
- **Detail** the competence of the maintenance staff and any authorisations required, to include a system to record staff authorised to carry out maintenance
- **Describe** the maintenance logging system

From SAIL III upwards
Detail the maintenance program and any associated standards.

From SAIL V upwards
Detail the maintenance procedure manual.

G

The relevant maintenance instructions should be referenced here, however, these can be separate to the ConOps.

The system describing the maintenance logging should be addressed here.

From SAIL III upwards
The maintenance program and any associated standards should be part of this ConOps. This can be provided as a separate manual.

SAIL V and VI
The maintenance procedure manual should include information and procedures relevant to the maintenance facility, record keeping etc. This can be provided as a separate manual.

Note: For all SAIL scores Competent Authorities may request maintenance and inspection logs.

278

A.1.13.1 UAS configuration management (OSO #02, #03, #07, #11, #14, #21)

R

Describe how the operator manages changes to the UAS configuration.

Describe the process for introducing new UAS into the operation and how product conformity is assessed to meet the limitations of the approved ConOps.

G

Examples of design changes: hardware and software changes to equipment on the UA or CU. Installation of additional equipment from different manufacturers, for example hook-on devices (HOD).

Examples of change management include version control and the utilisation of modification standards.

In the context of this document the following terms are described as follows:

- Hardware – Physical components such as propulsion units, batteries, fasteners etc. This could also include payload configuration changes.
- Software – Programmes and operating information used by the UA such as auto-stabilisation, hover mode, low speed mode etc.

- Firmware – Software specifically designed for a piece of hardware such as a controller, battery, propulsion unit etc.

279

A.1.14 Security and Privacy

R

Describe the physical security of system elements and assets, for example ensuring adequate physical protection is afforded to system assets.

Describe the security governance to ensure the secure and safe operation of the system, for example security operating procedures are drafted, applied, reviewed, and maintained. This should include cyber security considerations.

G

Add guidance as required.

Note: this section may be required by the Competent Authority.

280

A.1.15 Logs and records (OSO #01)

R

Explain how logs and records are stored within the organisation.

Detail any additional logs and records that the organisation requires.

G

Examples of Logs and records to be stored by the operator could include:

- Flight logs
- Copies of any authorisations issued, including any other permissions received, such as airspace access permission.
- Maintenance records
- Modification records
- Site surveys and assessments
- Pilot competence
- Any relevant support staff such as maintenance personnel
- Any licences or approvals
- Minutes and records of action from any meetings relating to safety, including occurrence reports and subsequent investigations

Note 1: Competent Authorities may define time periods and types of records to be kept.

Note 2: Competent Authorities may provide templates for applicants.

281

282

Detailed Recommendations and Guidance – Operations

The following sections should provide information regarding the operations to be conducted by the UAS operator. In case of multiple ConOps, the following sections could be replicated, one for each individual ConOps.

Note: when seeking an authorisation for one or more ConOps, applicants may coordinate and agree with the Competent Authority the format of the submission. See paragraph A.0.4 for further information.

A.1.16 Operational information

R **Describe** the purpose of the operation.

G This section should provide high level details as to the purpose of the operation, examples could include but are not limited to the following:

- Cargo
- Dropping or dispensing or articles, to include aerial spraying
- Filming, infrastructure inspections, agriculture, surveillance
- Research, test, and development
- Swarming and light shows
- Emergency services operations, to include search and rescue

Note: State whether the planned operation involves dangerous goods. For any operation that involves the carriage of dangerous goods, a separate authorisation should be obtained.

All relevant information should be included to describe the purpose of the operation(s).

Diagrams and/or illustrations may be included to support the explanation.

A.1.16.1 Type(s) of operation (GRC and ARC determination, Strategic Air Risk mitigation, TMPR)

R **Detail** the type of operation(s) the operator intends to carry out – VLOS, EVLOS and/or BVLOS.

G *Add if required.*

A.1.16.2 Area(s) of operation and volumes of airspace considerations (GRC determination, M1, ARC determination, Strategic Air Risk mitigation)

R **Describe** the proposed area(s) of operation(s).

Describe the following:

- Operational volume, consisting of flight geography and a contingency volume
- Ground risk buffer

- Relevant adjacent area/airspace for the intended location of the operation

Detail the population density and the source of the data used.

Detail the Air Risk characterisation and the source of the data used.

G

Examples of information that may be included in the following subsections:

- The type and class of airspace to be used (e.g., segregated area, fully integrated, etc)
- If the operation(s) will take place within residential, commercial, industrial, or recreational areas.
- Planned maximum operating height
- The population density to be overflown, for example rural or urban
- Flight over assemblies of people

Applicants could provide the geographic data for the required location descriptions in a digital format or format acceptable to the Competent Authority.

293

A.1.16.3 Operating and environmental limitations and conditions (OSO #23, Strategic Air Risk mitigations, M1)

R

Describe the specific operating limitations and conditions defined by the operator that are deemed to be appropriate to the proposed operation(s).

G

The description should contain all the information needed to obtain a detailed understanding of how, where and under which limitations or conditions the operations should be performed.

Examples of information that should be included:

- Day or night operations
- Allowable weather conditions
  - Consider the aircraft performance limitations as outlined in Section A.2
- Times of operation:
  - Example, specific times of operation with lower traffic or a different population distribution to justify a lower risk level

294

A.1.16.4 Operation of different types of UAS

R

Explain the limitations in place for cases where the UAS operator seeks to operate various different types of UAS.

G

Examples: limitations for the class of UA, weight, manufacturer and/ or model.

295

A.1.17 Strategy and Procedures

R

Describe the overarching operation principles.

G

To be added if required.

296

A.1.17.1 Normal operating strategy (GRC and ARC determination, OSO #13, #16, Step #9)

R

Describe the normal operating strategy, including but not limited to:

- Phases of flight
- General safety measures
- Specific safety measures
- Containment measures
- Required mode-changes
- The level of automation or autonomous systems utilised by the crew during each phase of the flight
- Use of air traffic control services
- Mandatory supporting crew members, e.g., visual observers
- Location of the crew
- The technical means required for the support of multi-crew operations
- Any other information that is required to understand the operation

escribe the safety measures, that are put in place to ensure that the UAS can fulfil the operation within the approved limitations, and so that the operation remains in control. For example:

- Technical and/or procedural measures
- Crew training, to include multi-crew coordination, if applicable
- Coordination with ANSP

G

The intent of this section is to provide a clear understanding of how the operation takes place within the approved technical, environmental, and procedural limitations.

This section should also describe the mitigation measures implemented to reduce the risk, if any.

Consider inclusion of information on necessary third-party service providers if utilised in support of the operation.

For example:

- UTM service provider
- C2 link service provider
- Navigation services
- Communication services
- Surveillance services

What are the containment measures that keep the UA in the Operational Volume?

If required, what additional containment measures are in place to prevent the operation from exiting the Ground Risk Buffer?

Night operating procedures could include information such as:

- Details of how the daylight site survey identifies all hazards associated with night operations in that area
- Completing a hazard log and risk assessment, based on the site survey.
- Illumination of take-off, landing and/or nominated recovery areas. Consider the effect of illumination on a pilot's night vision capabilities
- Unmanned aircraft illumination/lighting requirements, consider the directionality of any lighting fitted to a UAS
- Weather limitations for the operation(s)

297

A.1.17.2 Standard Operating Procedures (SOP) (TMPR, OSO #08, #11, #14, #16.1, #19, #21)

R **Describe** the standard operating procedures (SOP) applicable to all operations for which an approval is requested.

G Checklists and SOP templates may be provided by a third-party.

The procedure for multi-crew coordination if more than one person is directly involved in the flight operations.

298

A.1.17.3 Task feasibility assessment

R **Describe** the process to determine the feasibility of each intended task. For example, explain how the relevant aspects associated with the operation are assessed and prioritised.

Explain how task feasibility is evaluated, who carries out the evaluation, what tools (apps/maps) are used and how it is determined if a task is feasible.

Explain how task feasibility documents are retained and retrieved when necessary.

G The ConOps should include templates of the documents used to record task. These may be included in an annex to the ConOps. The procedures detailing how these assessments are completed, and the associated record keeping requirements should also be detailed.

299

A.1.17.4 Site planning assessment

R **Describe** the process to carry out a site assessment.

Explain how the site planning assessment is carried out, who carries it out, and what tools (apps/maps) are used.

Explain how site planning assessment documents are retained and retrieved when necessary.

Explain the procedures for operating from the defined sites.

G The ConOps should include templates of the documents used to record operating site planning assessments. These may be included in an annex to the ConOps. The procedures detailing how these assessments are completed, and the associated record keeping requirements should also be detailed.

The following information should be included:

- Site survey:
  - Methods of surveying the operating areas, identifying hazards, and conducting additional risk assessments
- Any necessary spectrum analysis of the site
- Selection of main and alternate operating sites
- Size, shape, surroundings, surface, slope

Suitability of the landing zone, including considerations for automatic return to home (RTH), where applicable.

A site assessment should include a site visit, and available supporting information, described below.

The main factors that should be considered when determining suitability of an operating site are given below:

- The airspace classification and any notification procedures required, and any relevant airspace restrictions, including temporary restrictions promulgated by NOTAM
- Considerations when operating in close proximity to aerodromes or other aircraft
- Operations near sites notified as dangerous to aviation, such as live firing, gas venting, high-intensity radio transmission areas
- How minimum distances to uninvolved people and property will be maintained, considering the flight volume
- Relevant local byelaws
- Physical obstructions such as wires, masts, buildings etc
- Public access
- Landowner permission
- Potential operating sites
- Weather considerations

300

A.1.17.5 Notification to relevant third parties

R **Describe** which third parties need to be notified of the operation.

Explain how these third parties will be notified of the operation.

G Notification of a flight to other airspace users may be necessary by NOTAM. Reference should be made to NOTAM policy.

In some cases, promulgation of airspace changes necessary for the operation may be required. This will be arranged as part of any necessary airspace change, and may include changes to the AIP, AICs, and NOTAMs.

It may be necessary to inform local police of the planed flight to avoid interruption or concerns from the public.

All efforts should be made to inform third parties within the flight volume, which may

be in close proximity to the UA, and obtain any necessary agreement. A ‘letter drop’ is not sufficient to assume all third parties are ‘involved persons’.

301

A.1.17.6 Communications

R

Explain the communication methods between the following personnel, agencies and/or organisations as applicable:

- Air traffic service providers
- Emergency services
- The UAS flight crew
- Any other personnel, agencies and/or organisations relevant to the operations

Explain how communication is carried out. For example, two-way radio, telephone, flight notification apps or other methods.

Explain the back-up communication methods to be used in the event of failure of the primary communication method(s).

Detail any licences that may be needed for use of any communication equipment.

G

Communication methods should be suitably robust, depending on the nature of the communication.

The site survey section should consider any communication requirements detailed in this section. For example, a site with no mobile network coverage is clearly not suitable for an operation where a mobile telephone has been provided as a mitigation or is a communication requirement. Similarly, if two-way radio communication is a requirement, then this should be range tested in the operational environment at any proposed location.

Any range test should be representative of the operational environment; for example, a test early on a Sunday morning may result in a different outcome to a test on a weekday, where a nearby source of interference may be present only at certain times.

Any specific phraseology used by the operator for communication between flight crew should be detailed and included as part of any training for the remote crew.

302

A.1.17.7 Weather

R

Explain the weather limits for the operation(s).

Explain how weather forecasts are obtained prior to an operation and how the weather will be monitored during an operation.

G

Operators should consider the weather limitations imposed by the UAS manufacturer. Refer to A1.16.3 for more information.

303

A.1.17.8 Assembly and functional checks

R

Describe the checks to be conducted after the system has been assembled.

G

Examples of assembly and functional checks that **should** be conducted:

- Visual inspection of the aircraft and its structure to ensure the security of objects such as access panels, engines/motors, propellers/rotors, landing gear and external loads
- Check batteries are correctly installed
- Check the C2 link is functioning
- Check any flight termination devices are functioning correctly
- Check all electrical and avionics equipment is serviceable and functioning
- Check the flight controls and engines/motors function correctly
- Check the payload release mechanism(s) function correctly
- Complete items detailed by the UAS manufacturer

304

A.1.17.9 Flight procedures

R

Describe the pre-flight checks that should be conducted immediately prior to flight.

Describe the in-flight procedures and checks.

Describe the post-flight checks.

Describe the logging requirements after each flight.

Describe the process for reporting defects and maintenance actions.

Describe the de-brief process, and how this is logged.

G

Provide any checklists used to support these items and explain which (if any) items are memory items.

- Crew briefing:
  - Procedures for briefing the flight crew for the task, their responsibilities, duties, emergency actions etc
- Cordon procedure:
  - Procedures used to separate the UAS operation from uninvolved persons, such as establishing buffer zones, use and positioning of barriers, marshals etc
  - Response if uninvolved persons enter a cordon area
- Communications:
  - Explain any on site communication procedures not already covered in section 4.7 above
- Refuelling:
  - Procedures and precautions for changing and/or charging batteries, replenishment of liquid fluids etc
- Loading of equipment:

Precautions to be taken to ensure the secure attachment of loaded equipment

<u>Examples of pre-flight checks that should be carried out</u>:

- Check the reported and actual battery/fuel capacity is sufficient for the flight

- Check the C2 link and any functions associated with the loss of the link operate correctly
- Check the GNSS is receiving sufficient satellites to begin the flight
- Check the navigation system or command unit is programmed with the correct route information
- Check the flight controls and engines/motors function correctly
- Check the weather conditions will be suitable for the flight
- Check the flight termination system functions correctly
- Confirm there are no airspace restrictions in place, which may impact the flight volume, for example checking NOTAMS
- Ensure that no third parties are about to enter the area being used for take-off, and that any minimum distances set out in the authorisation are met

Examples of pre-take-off checks and procedures that may be necessary:

- Confirm there are no structures in the air above launch area (pylons, cables etc)
- Pre-take off 'look-out' to confirm no other aircraft are nearby.
- Control checks- full and free movement of controls, and correct 'sense'.
- Check instruments are all reading correctly and are legible.
- Check lights are turned on as necessary.

Examples of in-flight checks and procedures that may be necessary:

- Deconfliction procedures, actions to be taken in the event an aircraft approaches and enters the operational volume
- Regular in-flight checks, such as fuel/ power, C2 link status, temperatures, on board systems status, satellite coverage/GNSS functionality, and position
- Pre-landing checks, such as airspace lookout, ground lookout for uninvolved persons, check the landing area is clear, ensure the aircraft configuration is set up for landing, for example, gear down

Examples of after-landing checks and procedures that may be necessary:

- System checks, avionics shut down, motor/engine shut down checks, battery/fuel isolation

Logging requirements should include any actions necessary to log the flight hours of the aircraft, for example – the tech log.

Debrief the flight crew on the safety standards of the operations and take note if procedures can be improved for future operations with a background of collaboration and Crew Resource Management principles.

305

A.1.17.10 Contingency Procedures (TMPR, OSO #08, #11, #14, #19, #21)

R **Detail** the required contingency procedures and describe how these procedures return the operation to a normal state or allow safe cessation of the flight.

G Contingency procedures are applied when the safety margin of the operation has

been reduced.

UAS is considered still responding to remote crew control or automation inputs and remains within the pre-defined contingency volume.

Examples for contingencies to be considered:

- Incursion of aircraft or people on the ground in the operating volume
- Degradation of navigation function, e.g., GNSS
- Degradation of communication function
- Degradation of surveillance function, e.g., Electronic Conspicuity
- Degradation a C2 link (technical issue) that could lead to fly-away
- Degradation of aircraft performance, such as:
  - Loss of a motor
  - Loss of a flight control function

306

A.1.17.11 Emergency Procedures (TMPR, OSO #08, #11, #14, #19, #21)

R

Detail the emergency procedures to be carried out after an event that leads to a loss of control of the operation. This should include appropriate checklists as required.

Explain under what conditions the ERP is activated.

G

Emergency procedures are carried out when a loss of control of the operation has occurred and deal primarily with the handling of the UA to avoid or at least minimise, harm to uninvolved persons in the air or on the ground.

Examples of events that lead to a loss of control of the operation are listed below but not limited to:

- Aircraft exiting the operational volume
- Complete loss of flight control
- Complete loss of propulsion
- Abnormal environmental conditions

Note: The ERP is a separate set of procedures that may or may not be activated after the event that leads to a loss of control of the operation.

307

A.1.18 Remote crew competence (OSO #07, #09, #15, #16, #19, #22)

R

Describe the required remote crew competence for the proposed operation(s).

G

The processes and procedures that the UAS operator uses to develop and maintain the necessary competence for the remote crew (i.e., any person involved in the UAS operation should be set out).

- The necessary level of competence for each member of the remote crew and should include the level of competence for the remote pilot(s) as a minimum.
- Any necessary training requirement identified for each role.

- Any necessary currency requirements for each role.

If more than one person is directly involved in flight operations, training should cover multi-crew coordination.

308

A.1.18.1 Initial training and qualification

R **Describe** the processes and procedures that the UAS operator uses to qualify all staff involved in operations.

G The use of any training centre, facility or school should be detailed, including the course provided and any resulting qualification(s).

Note: The competence requirements for the remote pilots should be set out. There may be additional competence and training requirements specific to the operator and the operation that need to be addressed. These may be over and above the basic requirements of the Competent Authority.

309

A.1.18.2 Procedures for maintenance of currency

R **Describe** which processes and procedures the operator uses to ensure that the remote pilots or other operational staff acquire and maintain the required currency of competence to execute the various types of duties.

G Some elements may be required by the applicable regulations. Some elements could be specific to the individual operator and the particular type of mission.

Consideration should be given to the complexity of the operation, the types of operation that the remote pilots fly and the level of automation within the system, to arrive at a suitable currency requirement.

Details of how this currency requirement is monitored and met should be provided, including what mixture of training and operational flights may be used to maintain currency and how often a flight with a more senior pilot is required, for example, a biennial currency check.

310

A.1.18.3 Training program

R **Detail** the applicable training program for all staff involved in operations. This might simply be a reference to the program as required by regulation or, if the operator has developed a specific program, a reference to the operator's training program.

SAIL I and II

- **Declare** that the operator has a sufficient training program in place.
- **Detail** reference to training material used.

SAIL III to VI

- **Detail** the training syllabus.
- **Detail** how the operator organises competency based theoretical and practical training.

Note: Competent Authorities may request additional information and evidence as well as defining additional requirements.

G

All remote pilots and other staff personnel involved in the operations are required to achieve a level of competency proportionate to the risk of the operation and, therefore, to the SAIL identified during the risk assessment (e.g., SORA).

When identifying the training programme associated to the operations to be conducted, the UAS operator should define both theoretical knowledge and practical skill training that is needed for all personnel in charge of essential duties. Additional guidance can be found in the JARUS WG1 RPC.

Each theoretical training course should be complemented by the relevant learning objectives. These learning objectives should cover at least the following domains:

- air safety
- aviation regulations
- navigation
- human performance limitations
- airspace operating principles
- UAS general knowledge
- meteorology
- Technical and operational mitigation measures for air risks
- Operational procedures
- Managing data sources

Each practical training course should be adapted to the characteristics of the UAS operation and to the functions available on board the UAS.

The practical training should be developed to cover at least the following elements:

- Preparation of the UAS operation
- Preparation for the flight
- Flight under abnormal conditions
- Normal, contingency, and emergency procedures

The training program should be split into initial and recurrent training to ensure that the remote pilot and the other personnel covering essential roles maintain the needed skills over the time.

Periodicity, duration, and level of detail of the recurrent training should be proportionate with the level of risk to be managed during operations.

In case the UAS operation is expected to cover specific types of flights (e.g., night operations, transport of dangerous good, dropping of cargo, swarm operations etc), the theoretical and the practical training should be adapted to properly cover these types of operation.

311

A.1.18.4 Flight Simulated Training Devices (FSTD)

R

Describe the use of any FSTD used for acquiring and maintaining the practical skills of the remote pilots (if applicable).

Describe the conditions and restrictions in connection with such training (if applicable).

G

The description of any FSTD should be provided, including the purpose of such training and the technical details of the device. The fidelity of the FSTD should also be described, including under what circumstances it may be used (e.g., BVLOS only) and what phase of training the FSTD may be used for.

Any FSTD should be fit for purpose and be developed to a sufficient level of fidelity to be an accurate replica of flight of the UA. The acquisition, maintenance and use of an FSTD (and the associated procedures) should be described.

312

313

A.2 ConOps technical manual template

Introduction

This section details the recommendations and guidance relating to technical information on the UAS to be used by the applicant. In this section the applicant should detail the system(s) being used.

The template below provides section headings detailing the subject areas that should be addressed when producing the Operations Manual, for the purposes of demonstrating that a UAS operation can be conducted safely. The template layouts as presented are not prescriptive, but the subject areas detailed should be included in the Operations Manual documentation as required for the particular operation(s), in order to provide the minimum required information and evidence to perform the SORA.

For operators utilising COTS UAS access to technical data from the manufacturer may be limited. Operators should endeavour to provide as much information as possible. Where necessary operators should request the necessary data from the manufacturer to complete the relevant sections of this chapter where possible.

Detailed recommendations and guidance – Unmanned Aircraft and Systems

The information below should be included in ConOps A.2. The sections below should be considered, and applicants should add any additional relevant information as required.

This section should identify the name and type of the unmanned aircraft to be used and provide technical descriptions and details of the systems used by the unmanned aircraft in connection with the flights that are covered by the application.

If the used UAS has a (restricted) type certificate, has a form of pre-approval by the competent authority (e.g. a design review report up to a specified SAIL) or is otherwise known to the authority, the content of section A.2 should be limited only to the technical information that is necessary to supplement the operational and training requirements of SORA. As a minimum, the competent authority needs to be able to assess the appropriateness of the operational safety objectives regarding organisation and training which may require technical detail of the used UAS.- What to submit in A.2 if don't have a design review or a restricted TC

If the UAS has no form of pre-approval by an authority, the level of technical detail described in this section of the ConOps must be sufficient such that the competent authority can assess whether the design meets the technical design related OSOs for the relevant SAIL of an application.

Note: this section is not expected to be fully completed by every operator, but to prompt the operator to fill out as much information as necessary, dependent on the SAIL score and ConOps.

A.2.1 Details of design and manufacturing – (OSO #2, #4 and #05)

R	**Detail** the designer and/or manufacturer of the unmanned aircraft. **Explain** any technical or design standards adopted, whether aviation related or not. If available, this should include evidence of test and evaluation.
G	If the manufacturer is an approved design or manufacturing organisation, then

evidence of this approval should be provided.

Examples of industry conformance standards: EUROCAE and RTCA, or product standards such as ISO, ASTM, and STANAG. Refer to individual websites for further information on standards developed by these bodies.

Any evidence or data available from tests or evaluations should be included in an Annex to the ConOps.

Refer to SORA V2.5 Annex E OSO#04 for guidance on this section.

348

A.2.2 Unmanned aircraft physical characteristics (GRC)

R

Describe in detail the physical characteristics of the aircraft (mass, centre of gravity (CG), dimensions, etc.). Include photos, diagrams, and schematics, whatever deemed necessary to support the description of the UA.

Explain which dimension is considered to be the characteristic dimension for the purpose of the GRC score.

G

Applicants should consider the following points:

Mass	Empty Mass	
	Maximum Take-Off Mass (MTOM)	
	Payload Mass	
Dimensions for Fixed-wing	Wingspan	
	Fuselage Length	
	Fuselage Diameter	
Dimensions for Rotorcraft / Multirotor	Length of aircraft body	
	Width of aircraft body	
	Height of aircraft body	
	Propeller Dimensions	
	Propeller Configuration	
Centre of Gravity (CG) - define the centre of gravity location and limits. Note: CG position and limits are only to be explained if the aircraft can be changed in configuration or loaded/unloaded by the operator.		

349

A.2.2.1 Unmanned aircraft performance characteristics (GRC Analysis, OSO #23, #24)

R

Explain in detail the performance characteristics (design flight envelope) of the

unmanned aircraft, including the environmental and weather limitations.

G

The following information should be included:

Flight duration/endurance	
Maximum range	
Maximum operating height (service ceiling)	
Maximum airspeed	
Maximum cruising speed	
Minimum airspeed (manoeuvring/stall speed)	
Maximum flight load	
Maximum payload	
Effects of differing payloads on the flight envelope	
Available glide distances	
Kinetic Energy (if required for GRC assessment)	
Environmental/weather limitations	
Any other relevant information	

For environmental and weather limitations the following should be considered:

- Wind speed limitations such as headwind, crosswind, and gusts.
- Turbulence restrictions
- Rain, hail, snow, ash resistance or sensitivity
- Minimum visibility conditions, if applicable
- Outside air temperature (OAT) limits
- In-flight icing:
  - Does the proposed operating environment include operations in icing conditions?
  - Does the system have an icing detection capability? If so, what indications, if any, does the system provide to the operator (if an operator is in the loop), and/or how does the system respond?
  - Does the system have any icing protection capability of the aircraft? Include any test data that demonstrates the performance of the icing protection system.

Note: Applicants should determine from their SAIL score the level of assessment and information needed to qualify the UAS from an environmental conditions' perspective.

350

A.2.3 Electrical power system (OSO #04)

R

Describe in detail the electrical power system and the electrical load distribution.

G

The following information should be included:

Batteries	Quantity	
	Type	
	Arrangement	
Generator	Type	
	Specification	
Electrical loads (if applicable)		
Electrical load shedding arrangements (if applicable)		
Alternate electrical power supplies		
Any other relevant information		

Electrical schematic diagrams may help describe the system layout, it's components and the electrical load distribution.

An electrical load analysis may help when describing the system and the electrical load distribution.

Include any manufacturer supplied data relating to equipment or components included in the system i.e., data sheets, specification sheets, performance data etc.

351

A.2.4 Propulsion system (OSO #04)

R

Describe the propulsion system and its ability to provide reliable and sufficient power to take-off, climb, and maintain flight at the expected mission altitudes.

G

This should include the system's ability to provide reliable and sufficient power for take-off, climb and the maintenance of altitude for the expected operation(s).

The following information should be included:

Engines	Type	
	Quantity	
	Power output	
	Propeller type	
Any other relevant information		

Fuel-powered propulsion systems:

- What type (manufacturer and model) of engine is used?
- How many engines are installed?
- How is the engine performance monitored?

- What status indicators, alerts (such as warning, caution and advisory) messages are provided to the operator?
- How does the UA respond, and what safeguards are in place to mitigate the risk of engine power loss for each of the following?
  - Fuel starvation
  - Fuel contamination
  - Failed signal input from the control station
  - Engine controller failure
- Does the engine have in-flight restart capabilities? If so, describe the manual and/or automatic features of this capability.

Electric-powered propulsion systems:

- Provide a high-level description of the electrical distribution architecture. Include items such as regulators, switches, buses, and converters, as necessary.
- What type of motor is used?
- How many motors are installed?
- What is the max continuous power output of the motor [Watt]?
- What is the max peak power output of the motor [Watt]?
- What current range does the motor have [Amps]?
- Does the propulsion system have a separate electrical source? If not, how is the power managed with respect to the other systems of the UA?
- How is power generated on-board the aircraft (for example, generator, alternator, batteries)?
- If a limited life power source such as batteries is used, what is the useful life of the power source during normal and emergency conditions? How was this determined?
- How is information on battery status and remaining battery capacity provided to the operator (if one is in the loop) or watchdog system?
- If available, describe the source(s) of backup power in the event of loss of the primary power source.
  - What systems are powered during backup power operation?
  - Is there any automatic or manual load shedding?
  - How much operational time does the backup power source provide? Include the assumptions used to make this determination.
- How is the propulsion system performance monitored?
- What status indicators and alerts (such as warning, caution and advisory) messages are provided to the operator?
- Does the motor have in-flight reset capabilities? If so, describe the manual and/or automatic features of this capability.

Other propulsion systems:

- Provide a description to a level of detail equivalent to the fuel and electrical propulsions sections above.

G

Use of schematic diagrams may help describe the system layout.

If applicable, describe any redundancy in the propulsion system that allows sustainment of flight after a failure or degradation in the propulsion system.

If applicable, describe any in-flight restart capabilities.

Include any manufacturer supplied data relating to equipment or components included in the system i.e., data sheets, specification sheets, performance data etc.

352

A.2.5 Fuel system (OSO #04)

R **Describe** in detail the unmanned aircraft fuel system and its installation.

G The following information should be included:

Fuel Type	
Status indicators/alert messages	
Hazardous substances	
Any other relevant information	

Use of schematic diagrams may help describe the system layout.

Examples of fuel type include electrical, liquid, hybrid, solar etc.

Examples of indicators or alert messages include warning, caution and advisory for low fuel level, low fuel pressure etc.

Include any manufacturer supplied data relating to equipment or components included in the system i.e., data sheets, specification sheets, performance data etc.

353

A.2.5.1 Fuel system safety (OSO #05)

R **Describe** safety considerations in relation to hazards created by the fuel system.

G Highlight any hazardous substances that are associated with this fuel system such as flammability, corrosiveness, irritant etc.

If batteries or other high energy devices are used on the unmanned aircraft, then these should be clearly identified and labelled on the aircraft.

354

A.2.6 Flight control system (OSO #05, #18)

R **Explain** how the unmanned aircraft is controlled.

G The following information should be included:

- A description of all major flight control components.
- Details of any automatic functions.
- Flight modes available to the unmanned aircraft.

- Any forms of redundancy within the flight control system.
- Any other relevant information

Use of schematic diagrams may help describe the system layout and how this is constructed.

Include any manufacturer supplied data relating to equipment or components included in the system i.e., data sheets, specification sheets, performance data etc.

355

A.2.6.1 Flight control surfaces (OSO #04)

R **Describe** the design and operation of the flight control surfaces and servos/actuators etc.

G Operators should include a diagram showing the location of the control surfaces and servos/actuators.

Examples of major flight control components: Control units, actuators, and control linkages etc.

356

A.2.6.2 Auto flight functions (OSO #04, #18)

R **Describe** and detail the auto flight functions.

G Examples of auto flight functions: autopilot, automatic take-off and landing, and stabilisation.

Are any of the auto flight functions commercial off-the-shelf (COTS) equipment? If so, name the type/manufacturer and provide the criteria that was used in selecting the COTS equipment.

357

A.2.7 Navigation (OSO #04, #13)

R **Describe** in detail the system(s) and method(s) used for navigation.

Explain how the system identifies and responds to the following:

- Loss of the primary means of navigation.
- Loss of the secondary means of navigation, if available.

Explain how relevant data is presented to the remote pilot on the following:

- The normal functioning of the navigation system.
- Geo-awareness for the purpose of supporting avoidance of specific areas or confinement to a given area.
- Any failures of the navigation system.

G The following information should be included:

Sensors	Type	
	Quantity	
Telemetry links		

Backup means of navigation	
Automatic navigation functions	
Geo-awareness functions	
Any other relevant information	

How does the UAS determine its current position (i.e., longitude, latitude, altitude, heading)?

How does it navigate to its intended destination (i.e., waypoints, vectoring, flight track)?

Example of telemetry links: data transmitted to CU from the UA.

Examples of systems and methods include use of a certified GNSS source, inertial measurement devices, altitude correction software etc.

358

A.2.7.1 Navigation position error (consider relevant OSOs, will be updated when SORA 2.5 is finalized)

R

G

359

A.2.8 Detect and Avoid (DAA) systems (*if used*) (TMPR, OSO #04)

R

Describe in detail any detect and avoid system fitted to support the following functions:

Ground risk:

- Terrain and obstacle avoidance

Technical air risk mitigation:

- Adverse weather avoidance
- Mid-air traffic deconfliction and collision avoidance

Explain which system/equipment if installed for non-cooperative conflict avoidance.

- **Describe** any interface from the conflict avoidance to the flight control computer.
- **Describe** the known limitations of the detect and avoid system.

G

If any of the equipment holds a valid approval, evidence of approval documents should be included in an annex to the ConOps.

If the equipment is not an approved product, applicants should provide the criteria that was used to select this equipment.

Examples of technical solutions for aircraft conflict avoidance could include the use of:

Electronic Conspicuity (EC) devices such as:

- ADS-B Out/In transponder.
- Mode-S ES (Extended Squitter) transponder.
- FLARM (Flight Alarm)

- Power FLARM
- Pilot Aware Rosetta
- Sky Echo 2
- Remote ID (both Network and Direct)

Examples of technical solutions for terrain and obstacle avoidance could include:

- TAWS (Terrain Awareness and Warning Systems).
- LIDAR (Light Detection and Ranging).
- Optical sensors.
- Laser ranging equipment.
- RADALT (Radar Altimeter).

Is the equipment qualified? If so, list the detailed qualification to the respective standard.

If the equipment is not qualified, provide the criteria that was used in selecting the system.

Non-cooperative traffic Conflict Avoidance:

- What equipment is installed for non-cooperative Conflict Avoidance (e.g., vision based, PSR data, LIDAR, etc.)?
- If the equipment is qualified, list the detailed qualification to the respective standard.
- If the equipment is not qualified, provide the criteria that was used in selecting the system. Describe any interface from the Conflict Avoidance to the flight control computer.

What are the principles governing Detect and Avoid systems installed?

Are these systems automated or do they require human input?

What is the role of the pilot or any crew member in the detect and avoid event sequence?

What are the known limitations of the Detect and Avoid system?

Does the system have its own built-in test (BIT)? What are the BIT test parameters?

Note: The information provided in this section supports operational procedures contained in Section A.1.

360

A.2.9 Command unit (CU) (OSO #06, #18, #19.3, #20)

R **Explain** what elements make up the command unit and describe in detail the operating system and any relevant technical specifications.

G The following information should be included:

- Details of hardware and software update processes.
- Command unit functions and capabilities.
- Information that the command unit provides to the remote pilot and how it is presented.

- Radio signal strength and/or health indicator or similar display to the remote pilot.
- What alerts, such as warning, caution and advisory, does the system provide to the operator.
- Power supply arrangements for the command unit, and redundancies if any.

The following information should be included:

- How is the radio signal strength and health value determined?
- What are the radio signal threshold values that represent a critically degraded signal?
- Description of control handover method if flights involve transfer of control between two command units. It should include operational management of C2 link.
- What critical commands are safeguarded from inadvertent activation and how is that achieved, for example, if a 'kill switch' is fitted, is it protected by switch guards, key activated or a two-step process etc.
- What provisions are taken against a command unit display or interface lock-up?
- What precautionary measures are used to ensure that flight-critical processing is maintained if multiple programs are running concurrently on the ground control computer?

Use of schematic diagrams may help describe the system layout.

Use of functional diagrams to support system description and capability features is encouraged.

Screen captures of the control station displays are acceptable.

Command Unit elements include fixed or mobile installation such as a laptop computer, tablet, or similar portable device.

Examples of information provided to the remote pilot include, airspeed, altitude, aircraft position etc.

Examples of displayed warnings: low fuel or battery, failure of critical systems, operation out of control etc.

Include any manufacturer supplied data relating to equipment or components included in the system i.e., data sheets, specification sheets, performance data etc.

361

A.2.10 Command and control (C2) link (OSO #06, #24)

R

Explain how command and control instructions, as well as telemetry data, are relayed between the command unit and the unmanned aircraft.

Describe in detail operational C2 link management, including frequency switchovers and C2 link contingency situations.

Describe what support functions will inform the remote crew on link quality and possible degradation or loss and automatic functions in case of a loss of link.

G

Providing a detailed control system architecture diagram that includes informational or data flows and subsystem performance may assist in explaining the requirements above.

- Which relevant and recognised standard(s) is the system compliant with, if applicable?

The following information should be included:

C2 Link	RLOS	
	BRLOS	
Transceivers / Modems	Power levels	
	Transmission schemes	
Operating frequencies used		
Third party link service provider		
Data rates		
Latencies		
Means of protection against harmful interference		
Any other relevant information		

Provide the Link Budget Calculation, wherever possible.

C2 link could include, direct (RLOS) or relayed (BRLOS). BRLOS includes all satellite systems or relaying C2 link through UA in the air to extend the signal range.

For satellite links, estimate the latencies associated with using the satellite link for aircraft control and for air traffic control (ATC) communications.

Examples to make the C2 link secure: pairing, encryption, back up link etc. It is recommended to use licensed spectrum for BVLOS operations to minimise the chances of external interference and to improve latency.

hat alerts, such as warning, caution and advisory, does the system provide to the operator and how is it displayed or conveyed.

What design characteristics or procedures are in place to maintain the availability, continuity, and integrity of the datalink. Factors to consider:

- RF or other interference
- Flight beyond communications range
- Antenna masking (during turns and/or at high attitude angles)
- Loss of command unit functionality
- Loss of unmanned aircraft functionality
- Atmospheric attenuation including precipitation
- RF wireless site survey to ensure reliable connectivity, it may include:
  - Survey for frequency coverage throughout the potential operating area.
  - Survey for frequency capacity to ensure sufficient bandwidth to support all predicted operations.

Are there any technical features that allow for the reestablishment of the control link in a reasonable timeframe?

Examples of automatic functions in case of lost link:

- Return to home.
- Triggering of an emergency recovery function.

What are the control link(s) connecting the UA the CS and any other ground systems or infrastructures, if applicable? Specifically address the following items:

- What frequency spectrum will be used for the control link and how has the use of this spectrum been coordinated? If spectrum approval is not required, under what regulation is the use of the frequency authorised? What is the maximum power output/range?
- What type of signal processing and/or link security (i.e., encryption) is employed?
- What is the datalink margin in terms of the overall link bandwidth at the maximum anticipated distance from the CS? How is this determined?
- Is there a radio signal strength and/ or health indicator or similar display to the operator? How is the signal strength and health value determined, and what are the threshold values that represent a critically degraded signal?

Does the system employ redundant and/or independent control links? If so, how different is the design? What are the likely common failure modes?

362

A.2.11 Take-off and landing mechanisms (OSO #04)

R **Describe** in detail the take-off and landing mechanisms fitted to the unmanned aircraft.

G If there is more than one option available for take-off or landing mechanisms, what is the primary option followed by any secondary options?

If a take-off or landing mechanism is employed for a specific form of operation, state this clearly along with references to any operational conditions.

Example of take-off mechanism: launchers.

Examples of landing gear mechanism: wheels, skids, rails.

363

A.2.12 Emergency recovery and safety systems (M2, Main Body Step 9, OSO #10, #12)

R **Explain** any systems fitted to the unmanned aircraft or command unit that contribute to safe handling or recovery of the unmanned aircraft in the event of loss of control or situational awareness.

G Use of schematic diagrams may help describe the system layout and how this is constructed to include the following examples, if installed:

- A flight termination system (FTS) function that aims to immediately end the flight
- An Automatic Recovery System (ARS) that is implemented through UAS crew command or by the on-board systems. This may include automatic pre-programmed course of action to reach a predefined and unpopulated forced landing area
- Any combination of the above, or other.

Examples of safety systems could include the following:

- Ballistic parachutes
- Propeller guards
- Return to home function

- Flight termination functions
- Tethering systems
- Geo-fencing, or geo-caging
- Airbags

Include any manufacturer supplied data relating to equipment or components included in the system i.e., data sheets, specification sheets, performance data etc.

364

A.2.13 Auxiliary Systems

R **Detail** any auxiliary systems installed on the aircraft.

G Examples of auxiliary systems include Remote ID systems used to broadcast RPAS information.

Include any manufacturer supplied data relating to equipment or components included in the system i.e., data sheets, specification sheets, performance data etc.

365

A.2.14 Failure conditions (OSO #05, #10, #12, #19.3)

R **Detail** and **explain** all known failure conditions relating to safety critical systems.

G *Additional guidance to be added as required.*

366

A.2.14.1 Single points of failure (SPOF) (OSO #05, #10, #12)

R **Describe** in detail the SPOF for the unmanned aircraft system (unmanned aircraft and command unit).

The following steps should be carried out and **explained**:

- Identify each SPOF related to the system as a whole.
- Address each identified SPOF through suitable technical or operational mitigations.
- Explain the technical or operational mitigations.

G A single point of failure is a part of a system that, if it fails, will stop the entire system from working. SPOFs are undesirable in any system with a goal of high availability or reliability.

Where SPOF are identified, it is expected that these will be appropriately addressed through suitable technical or operational mitigations.

Example of SPOF: The transmitter from the control unit fails resulting in a loss of command and control signal.

Example of *technical* mitigation: Secondary transmitter or similar form of redundancy.

Example of *operational* mitigation: A ‘return to home’ function in the event of a loss of signal.

367

A.2.14.2 Failure modes (OSO #05, #10 and #12)

R

Explain the failure modes for the unmanned aircraft system (unmanned aircraft and command unit).

The following steps should be carried out and explained:

- **Identify** the relevant failure modes for the entire system.
- **Explain** if the systems need remote crew action to perform the required function.
- **Explain** how each failure mode is addressed through suitable technical or operational mitigations.

ote: The operational mitigations identified here should be linked to Section A.1.

G

Failure conditions are defined as effects on the aircraft, both direct and consequential, caused or contributed to by one or more failures, considering relevant adverse operational or environmental conditions.

Example of failure modes: Propellers fitted incorrectly.

Example of preventative strategies: Follow manufacturers installation instructions.

Example of addressing failure modes: Incorporate a pre-flight check of propellers to ensure they are correctly fitted.

The manufacturers of Commercial Off the Shelf (COTS) equipment or unmanned aircraft systems should provide failure mode data.

Applicants should consider failure modes of the UA system that lead to an exit of the Operational Volume and the impact on their operational procedures described in Section A.1 and how these are mitigated (refer to Step 9 of SORA Main Body for further guidance). The data supporting this analysis should be provided as part of the ConOps or as a separate compliance document.

If there are technical systems supporting containment, (Step 9 of SORA Main Body) this should also be explained here.

How does the unmanned aircraft respond, and what safeguards are in place to mitigate the risk of propulsion system loss for each of the following?

- Low battery
- Failed signal input from the control station
- Motor controller failure

/hat are the most critical propulsion-related failure modes/conditions and their impact on system operation?

368

A.2.15 External lighting

R

Describe any external lighting on the unmanned aircraft if fitted for the purpose of visual conspicuity or aircraft separation.

G

What is the location, colour and type of lighting fitted to the unmanned aircraft?

What is the operating function of any lighting i.e., controlled remotely or always active?

What lighting modes, if any, are available i.e., flashing, strobe effect etc.

Note: This may be for the purpose of VLOS Strategic Mitigation, and to warn other airspace users. This section supports the normal operating strategy contained in Section A1.

369

A.2.16 Payloads (OSO #04)

R **Explain** the payloads to be carried by each unmanned aircraft.

G The following information should be included:

- Payload type.
- Any other relevant information.

For equipment payloads, the following information should also be included:

- Details of the electrical power or data connection to the unmanned aircraft.
- Details of the effects on weight and balance.
- Details of any sensors.
- Explanation of how data is transmitted from the UA without presenting a hazard to the UA or becoming a source of distraction for the remote pilot.
- Any other relevant information.

Payload examples:

- Deployable
- Crop spraying cannisters
- Surface mapping hardware
- Cargo
- Data acquisition equipment such as a camera, infra-red scanners, LIDAR.

If cargo is being transported how is this stored, i.e., a crash resistant container.

Note: If dangerous goods are part of the payload, applicants should refer to the Competent Authority for the regulatory requirements.

370

A.2.17 Change management and modifications to the system (OSO #07)

R **Describe** the change management and system modification process.

G Refer to Section A.1 paragraph A1.13.1 for further information.

371

A.2.18 Life cycle maintenance, inspections, and repairs (OSO #03, OSO #07)

R <u>Maintenance</u>

Describe in detail the maintenance regime for the UAS.

Inspections

Explain the inspections that need to be carried out.

Repairs

Explain the repair methodology.

G

Maintenance

The following information should be included:

- Description of scheduled maintenance intervals, timescales, and associated tasks
- Maintenance procedures and where these are sourced from, for example, manufacturer driven or based on operational experience and equipment reliability
- How scheduled and unscheduled maintenance tasks are recorded and where these records are stored

Which staff carry out these tasks and what is the scope of their approval to do so?

If a third party provide any of these services, then this should be detailed and described here.

Inspections

What inspection tasks are carried out?

Repairs

What repairs are carried out? And by whom?

Manufacturers will generally provide maintenance information with the platform. The operator should use this to define their maintenance program.

Repair methodology example: how will the integrity of the repair be assessed as conforming to meeting, or exceeding the requirement of the original design data?

372

A.2.18.1 Parts (OSO #03)

R

Explain how parts are procured and validated.

Explain how suppliers are chosen and how the suitability of the parts is determined.

G

Are the parts are sourced directly from the equipment manufacturer, or via third party vendors? If from third party vendors, how are these checked for suitability etc?

373

A.2.19 Ground support equipment, transportation, and storage

R

Describe all the support equipment that is used on the ground, such as launch or recovery systems, generators, and power supplies.

Describe the standard equipment available, and what is the backup or emergency equipment.

Explain how the UAS is moved by the ground crew.

Explain additional requirements for transportation of batteries/fuel, or any other

supporting equipment required.

Explain how and where the UAS and supporting equipment is stored.

Describe the procedures and routines for maintaining batteries over storage periods.

G

Example: the use of transportation cases and any special methods necessary due to manufacturer recommendations or equipment sensitivity and fragility.

What storage requirements are best practice and required by the manufacturer to prevent inadvertent damage to the equipment?

Consider electrostatic damage of electronic components, dust, water ingress and other environmental factors that could affect the equipment.

It is generally considered best practice for batteries to be stored in a fire-safe container for the dual purpose of protection against fire and containment of potential fire.

Battery manufacturer guidance with regards to storage conditions should be adhered to as much as possible.

Procedures and routines following exposure to unwanted conditions should be detailed.

Note: This section links to the normal operating strategy contained in Chapter A1.

374

A.2.20 Documents

R

Detail and include any documents necessary to support ConOps. These should be included in an annex to the ConOps document.

G

Examples:

- Equipment approvals such as ETSO/ TSO etc.
- System safety analysis to include fault tree analysis where appropriate.
- Any evidence supporting the claims made in this chapter as to the integrity of the system(s) being used.
- Where used, ensure references to supporting documents are clear and identifiable.

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A.3 SORA risk assessment template

How to use this chapter

This section is intended to support the applicant to compile all information necessary for the comprehensive safety portfolio (SORA Step #10). The remarks fields are intended for the applicant to explain their reasoning, e.g. why they have chosen a particular assessment or why they meet a particular requirement. Effectively, this template describes and documents all steps of the SORA process and is thus a pre-requisite for a successful application.

By having this questionnaire type template for the documentation of the risk assessment, applicants are encouraged to focus on the information that needs to be provided and to refrain from having unnecessary long explanations of how an operation works inside this documentation. The SORA is supposed to be a tool to analyze a ConOps, thus only information on the assumptions and links to the supporting evidence need to be given here.

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Step #1 Concept of Operations	
#1 Short description of proposed operations	**The applicant may use this field for a very brief summary of the intended operation that is described in the ConOps. It should be noted, that only the description in the referred ConOps (#1.2) is relevant for the approval of an operation.**
#1.1 Type of operation	☐Visual line of sight (VLOS) ☐Extended visual line of sight (EVLOS) ☐Beyond visual line of sight (BVLOS)
#1.2 Reference to Concept of Operations file and relevant locations	Give reference to the file name and revision number of the assessed ConOps: _____ Give reference to GPS coordinates for the operational volume and the the risk buffers as a separate file using either e.g. .txt, .kmz or .kml, if the location is not sufficiently described in the ConOps reference above: _____
Remarks ***The applicant should make sure that the revision of the risk assessment and ConOps are compatible. An updated revision of the ConOps might or might not require an adapted revision of the SORA risk assessment depending on the type of change at the discretion of the Competent Authority.*** ***This field may be used to inform the Competent Authority of operation specific applicant assumptions, references to similar already approved missions or whatever is appropriate to support the authority in its evaluation.***	
Step #2 UAS intrinsic Ground Risk Class	
#2.1 Type of operational areas on the ground (including flight geography, contingency volume and ground risk buffer)	☐Controlled ground area ☐Sparsely populated area ☐Populated area ☐Over assemblies of people

	☐Actual density of ppl/km^2: _____ (if available)
#2.3 maximum characteristic dimension	
#2.4typical expected kinetic energy	
#2.4.1 reference to the kinetic energy computation if applicable	file reference and/or reference to the relevant part of the technical description in the ConOps
#2.5 Specify the Intrinsic Ground Risk Class	

Remarks/Reasoning for Step #2

This field may be used to explain the derived risk class.

- ***How did the applicant choose the reference speed for the kinetic energy computation?***
- ***How can the applicant justify that the population density is assessed accurately (data source)?***

  How does the applicant verify that the outer limits of the ground risk buffer are used for the GRC assessment?

Please note: if the kinetic energy computation is simple, the applicant may also put it here.

Step #3 Final GRC determination	
#3.1 Specify the applied ground risk mitigations, if applicable (tick one per mitigation)	M1 Strategic mitigations for ground risk Specify the level of robustness: ☐None ☐Low ☐Medium ☐High M2 Effects of ground impact are reduced Specify the level of robustness:

	☐Low/None ☐Medium ☐High M3 An emergency response plan (ERP) is in place, the UAS operator is validated and effective Specify the level of robustness: ☐Low/None ☐Medium ☐High
#3.2 Specify the Final Ground Risk Class	

Remarks/Reasoning for Step #3

This field may be used to explain the underlying assumption of the applied mitigation, e.g.

- Why is the used M2 method appropriate to lower the GRC?
- Which official did you coordinate the M3 ERP with if applicable?

Why is the used M1 strategic mitigation method appropriate? Which sources were used for the assessment?

Step #4 Initial Air Risk Class	
#4.1 Classification of the airspace where the operation is intended to be conducted (multiple answers possible)	☐A ☐B ☐C ☐D ☐E ☐F ☐G ☐Restricted area ☐Danger area ☐TMZ ☐RMZ ☐ATZ
#4.2 Specify the Initial Air Risk Class and the reasoning for choosing it (multiple answers possible)	☐ARC-a ☐ARC-b ☐ARC-c ☐ARC-d

Remarks/Reasoning for Step #4

Explain what data source was used to determine the airspace classification.

Step #5 Strategic air risk mitigations and final Air Risk Class	
#5.1 Specify, if strategic mitigations of the Air Risk Class were applied	☐Yes ☐No
#5.2 Type of strategic mitigation	☐Boundary ☐Chronology ☐Time of exposure ☐Common structures ☐Common flight rules
#5.3 Residual Air Risk Class (after strategic mitigation)	☐ARC-b ☐ARC-c ☐ARC-d
Remarks/Reasoning for Step #5 ● **This step must be repeated for all Initial ARC identified in Step #4 if they are Arc-c or Arc-d and strategic mitigations are available**	
Step #6 TMPR and robustness level	
#6 Tactical Mitigations Performance Requirements (refer to Annex D)	☐VLOS ☐BVLOS ☐No requirement (ARC-a) ☐Low (ARC-b) ☐Medium (ARC-c) ☐High (ARC-d)
Remarks/Reasoning for Step #6 ● **Explain the technology selected for the detect function and how the required performance is ensured**	

Step #7 SAIL determination!	
#7 Specific Assurance and Integrity Level	☐SAIL I ☐SAIL II ☐SAIL III ☐SAIL IV ☐SAIL V ☐SAIL VI
Remarks for Step #7 (MA Input) • **Usually no remarks are necessary unless the operator plans to deviate from the SAIL mapping table, which the authority might only allow in certain unusual boundary cases.**	
Step #8 Identification of Operational Safety Objectives	
#8 Operational Safety Objectives	As per identified SAIL from Step #7 and 2.5.2 of AMC1 to Article 11 (Table 6) of RG (EU) 2019/947
Remarks/Reasoning for Step #8 (MA Input) • *Compliance evidence with various OSOs needs inputs from Operator, UAS designer and manufacturer, depending on the required LOR and OSO category.* • *Which sources have been used for the compliance for which OSO? Example: Some evidence supplied by an OEM, others by service providers, others by the operator itself. It may be useful to identify this work share at this stage in order to ease the Step #10.*	
Step #9 Adjacent area / airspace considerations	
#9 Safety requirement for containment (if one of the checkboxes is ticked, enhanced containment measures apply)	Please specify: The adjacent areas: ☐ contain assemblies of people ☐ are ARC-d If the operational volume is in a populated area: ☐ M1 mitigation was applied ☐ The operating area is controlled ground area
Remarks/Reasoning for Step #9 (MA inputs) • *Some quick tips to better define adjacent area (Step#9 under update?)* • Step #9 may be analysed and assessed together with OSO#10 and OSO#12 (single failure criterion, SW-HW methodology)	
Step #10 Comprehensive safety portfolio	

#10 Compliance matrix for safety requirements	Please completely fill in the compliance matrix for SORA Step #10 that can be found on the next page. Have all safety requirements been described and met? ☐Yes ☐No
Place, Date	**Name and Signature**

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402 **Step #10 Comprehensive Safety Portfolio**

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Ground Risk Mitigations – SORA Annex B			
Mitigation	**Level of robustness**	**Remarks** (e.g. competent authority design verification)	**Reference to documentation**
M1 Strategic mitigation for ground risk	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
M1 Tethered operation (fill in only if tethered operation)	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
M2 Effects of ground impact are reduced (e.g. parachute)	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
M3 An emergency response plan (ERP) is in place, the UAS operator is validated and effective	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:

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Strategic Air Risk Mitigations – SORA Annex C			
	ARC reduction	**Remarks** (e.g. competent authority design verification)	**Reference to documentation**
Air Risk Class mitigation	☐ ARC-d (AEC 1 or 2) ☐ ARC-c		Document name: Chapter number:

	☐ ARC-d (AEC 1 or 2) □ ARC-b ☐ ARC-d (AEC 3) □ ARC-c ☐ ARC-d (AEC 3) □ ARC-b ☐ ARC-c (AEC 4) □ ARC-b ☐ ARC-c (AEC 5) □ ARC-b ☐ ARC-c (AEC 6,7,8) □ ARC-b ☐ ARC-c (AEC 9) □ ARC-b		Page number:

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Tactical Mitigations Performance Requirements – SORA Annex D			
	TMPR	**Remarks** (e.g. competent authority design verification)	**Reference to documentation**
TMPR level	☐ VLOS ☐ BVLOS ☐ No requirement (ARC-a) ☐ Low requirement (ARC-b) ☐ Medium requirement (ARC-c) ☐ High requirement (ARC-d)		Document name: Chapter number: Page number:
TMPR function	Detect		Document name: Chapter number: Page number:
	Decide		Document name: Chapter number: Page number:
	Command		Document name: Chapter number:

			Page number:
	Execute		Document name: Chapter number: Page number:
	Feedback loop		Document name: Chapter number: Page number:
TMPR robustness	TMPR integrity and assurance objectives		Document name: Chapter number: Page number:

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Adjacent area/airspace considerations			
	Level of containment	**Remarks** (e.g. competent authority design verification)	**Reference to documentation**
Safety requirement	☐ Basic containment ☐ Enhanced containment		Document name: Chapter number: Page number:

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Operational Safety Objectives – SORA Annex E			
	Level of robustness	**Remarks** (e.g. competent authority design verification)	**Reference to documentation**
OSO #01 **Ensure that the UAS operator is competent and/or proven**	☐ Optional ☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #02 **UAS manufactured by competent and/or proven entity**	☐ Optional ☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #03 **UAS maintained by competent and/or proven entity**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #04 **UAS developed to authority recognised**	☐ Optional ☐ Low ☐ Medium		Document name: Chapter number: Page number:

design standards	☐ High		
OSO #05 **UAS is designed considering system safety and reliability**	☐ Optional ☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #06 **C3 link characteristics are appropriate for the operation**	☐ Optional ☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #07 **Inspection of the UAS (product inspection) to ensure consistency with the ConOps**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #08 **Operational procedures are defined, validated and adhered to**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #09 **Remote crew trained and current and able to control the abnormal situation**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #10 **Safe recovery from a technical issue**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #11 **Procedures are in-place to handle the deterioration of external systems supporting UAS operations**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #12 **The UAS is designed to manage the deterioration of external systems supporting UAS**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:

operations			
OSO #13 **External services supporting UAS operations are adequate for the operation**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #14 **Operational procedures are defined, validated and adhered to**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #15 **Remote crew trained and current and able to control the abnormal situation**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #16 **Multi-crew coordination**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #17 **Remote crew is fit to operate**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #18 **Automatic protection of the flight envelope from human error**	☐ Optional ☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #19 **Safe recovery from human error**	☐ Optional ☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #20 **A human factors evaluation has been performed and the human machine interface (HMI) found appropriate for the mission**	☐ Optional ☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #21 **Operational procedures are defined, validated and adhered to**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:

OSO #22 **The remote crew is trained to identify critical environmental conditions and to avoid them**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number
OSO #23 **Environmental conditions for safe operations are defined, measurable and adhered to**	☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
OSO #24 **UAS is designed and qualified for adverse environmental conditions**	☐ Optional ☐ Low ☐ Medium ☐ High		Document name: Chapter number: Page number:
Place, Date		**Name and Signature**	

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