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Abstract

This document defines the functional requirements (FRD), at TRL2, for SESAR solution 0520 “Integrated risk models for Unmanned Aerial Systems (UAS) in the U-space”. The objective of this document is to analyse and define a SW Tool linking the Operational Authorisation process of the UAS Operations in the Specific category, with the operation in U-space airspace.

Authoring & approval

Author(s) of the document

Organisation name	Date
INECO	29 th June 2026
UPV	05 th June 2026

Reviewed by

Organisation name	Date
DLR	10 th June 2026
EuroUSC Italia	19 th May 2026
ENGAGE	09 th June 2026
UPV	11 th June 2026
COLLINS	15 th June 2026
CRIDA	29 th June 2026

Approved for submission to the SESAR 3 JU by

Organisation name	Date
INECO	29 th June 2026
UPV	29 th June 2026
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Rejected by¹

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¹ Representatives of the beneficiaries involved in the project.

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U-AGREE

U-SPACE AIR AND GROUND RISK MODELS ENHANCEMENT

U-AGREE

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1 Executive summary

This document defines the functional requirements (FRD), at TRL2, for SESAR solution 0520 “Integrated risk models for Unmanned Aerial Systems (UAS) in the U-space”. The objective of this document is to analyse and define a SW Tool linking the Operational Authorisation process of the UAS Operations in the Specific category, with the operation in U-space airspace.

Currently, UAS operations in Europe are very limited due to complexity and constraints to get an operational authorisation to fly in the Specific Category, following the SORA process. U-space is considered an enabler to speed up UAS operations, but as they still need a previous operational authorisation, is necessary to integrate both processes, improving the risk models. The enhanced risk models, developed by Solution 0520, address these gaps, by including mid-air collisions (both UAS-to-UAS and UAS-to-manned aircraft), impacts on critical infrastructure, privacy concerns, and environmental effects, as well as the mitigating effect of U-space services.

This document, considers two operational scenarios, with different time horizons:

1. OS-3 (S/T) Pre-flight risk assessment using SORA 2.5 risk models and U-space enabled data exchange: SORA verification through U-space tool to develop risk estimation and mitigation in SORA assessments for operations in U-space airspaces according to Commission Implementing Regulation (EU) 2021/664 [9].
2. OS-4 (L/T) Pre-flight risk assessment using U-AGREE risk models and an approval process embedded in the U-space workflow: SORA process integration in U-space.

OS-4 includes all the Functional Requirements for OS-3 and additional ones, considering the risk models developed in U-AGREE.

The functional requirements for a SORA SW Tool are provided in this document, considering OS-3 as a baseline and upgrading them for OS-4.

- In a short term, the SORA Tool bridges the SORA assessment with the U-space by using the flight authorisation to check the purposed mitigations can be applied and therefore serving as evidence for the SORA mitigations and OSOs.
- In a later phase, SORA and U-space processes will be fully integrated. Instead of aiding with the SORA process, and then checking that it is properly followed, it is part of the flight authorisation process.

The SW Tool is decomposed in 4 main Functions:

- (1) SORA calculation Function
- (2) NSA Evidence generation Function
- (3) SORA checking Function
- (4) ARA Reassessment Support Function.

This document defined the Functional Requirements for these 4 Functions, considering both OS.

2 Introduction

2.1 Purpose of the document

This document defines the functional requirements (FRD) for SESAR solution 0520 at TRL2. The objective of this document is to analyse and define a SW Tool linking the Operational Authorisation process of the UAS Operations in the Specific category, to the operation in U-space airspace.

2.2 Scope

This document provides the Functional view, analysis of interactions and functional decomposition, as well as defines the Functional Requirements, for the defined SW Tool.

2.3 Intended readership

This document is intended for a broad range of stakeholders involved in the development, implementation, and oversight of U-space operations and airspace risk assessment within the SESAR 3 JU ER02 framework. The key stakeholders addressed in this document are:

- **Regulatory and Supervisory Authorities (e.g., Civil Aviation Authorities, SESAR 3 JU, EASA, NSA):** To assess the alignment of the U-AGREE solution with regulatory frameworks and its impact on U-space airspace designation and operations.
- **Air Navigation Service Providers (ANSPs):** To understand how the U-AGREE solution can help to quantify and mitigate the risk of UAS operations in controlled airspace.
- **Common Information Service Providers (CISPs):** To understand the integration of risk models as part of authorisation processes within U-space airspaces, and the role of the centralized actors withing the U-space ecosystem in this process.
- **U-space Service Providers (USSPs):** To explore the application of the U-AGREE solution for enhancing safety, security, and compliance of U-space operations, and how U-space services provided by USSPs are mitigating the risks for UAS operations in U-space airspace.
- **UAS Operators and Industry Stakeholders:** To evaluate the potential impact of U-AGREE's risk assessment framework on operational efficiency and regulatory compliance, by facilitating the U-plans approval process and ensuring safety.
- **Research and Academic Institutions:** To contribute to the advancement of risk assessment methodologies and integration of artificial intelligence into U-space safety mechanisms.

2.4 Background

Most UAS operations fall in the 'specific' category, which requires an operational authorisation issued by the competent authority to be performed, based on the acceptance of the adequate mitigation of the risks of the operation. To develop the necessary operational risk assessment, European Union

Aviation Safety Agency (EASA) considers as an acceptable means of compliance the SORA (Specific Operations Risk Assessment) methodology, developed by Joint Authorities for Rulemaking on Unmanned Systems (JARUS).

SORA is a risk assessment methodology used to establish a sufficient level of confidence so a specific operation can be conducted safely. It allows the evaluation of the intended concept of operation and a categorization into 6 different Specific Assurance and Integrity Levels (SAIL), which define the operational safety objectives to be met for each SAIL.

On the other hand, for U-space implementation, the European Commission Implementing Regulation (EU) 2021/664 mandates that an Airspace Risk Assessment (ARA) must support the decision to designate any U-space airspace.

An ARA evaluates the risks related to UAS operations in a specific airspace and outlines the measures to mitigate those risks. It is the basis for the definition of UAS capabilities and performance requirements, U-space service performance requirements, and the operational conditions, airspace constraints and other measures necessary to reduce risks to an acceptable level.

In order to boost the development of the UAS sector, SORA and ARA need to be coordinated as the European Commission Implementing Regulation EU 2019/947 and EU 2019/945 apply within the designated U-space airspace.

The ongoing coordination between SORA and ARA in their future developments, addressing both air and ground risk considerations, includes:

Air Risk

- Alignment in defining the different precursors to the Mid-Air Collision (MAC) within U-space airspace considering both UAS vs Manned conflicts and UAS vs UAS conflicts
- Alignment in quantifying volume-based events (e.g., distance to the accident, time to collision and conditional probabilities), with special focus on Type 1 and Type 2 encounters as well as future Type 0 encounters (UAS-UAS). This includes establishing different target levels of safety for various encounter types
- Consideration and alignment on the severity of MAC and the potential harmful effect to people on board.
- Differentiation in Scope (reference by which air risk events and metrics are defined):
 - o SORA evaluates the risk for an individual flight with respect to the airspace it is operating in.
 - o ARA assesses the risk for all flights within the airspace they operate in.
- Strategic and tactical mitigations outlined in SORA are also aligned into the ARA method as possible mitigations for flights in the Specific Category.

Ground Risk

When two UAS collide in the air, both aircraft are expected to fall to the ground, potentially causing harm to people. The models described in Annex F of SORA version 2.5 (developed by JARUS) serve as the primary reference for assessing third-party ground risk in ARA.

However, for ground risk, as well as for air risk, SORA approach/scope is different:

- SORA assesses ground risk for an individual flight, considering the population density as the one in the area during the moment an operation is conducted. Since it is operation centric, the flight characteristics of the drone and the conditions are considered to calculate the critical area, i.e. the impacted area on the ground, and potential affected population.
- ARA evaluates ground risk for all flights within the airspace they operate in, requiring population density and critical area assessments at a macro level. This may involve defining these parameters based on:
 - o Worst case scenario (e.g., large UAS operating in the most populated area), or,
 - o An average scenario (e.g., average values for population density and critical area and defining the expected demand using use cases)
- In order to obtain the TLS for third party ground fatalities due to UAS-UAS collisions as part of the ARA safety risk assessment, it would be recommended to align with the SORA 2.5 Annex F and consider the target level of safety for third party ground risk and apply an apportionment factor for fatalities due to UAS-UAS MAC.

Finally, coordination is required between SORA operational volumes and U-space airspace 4D volumes, including deviation thresholds, to ensure UAS flight authorisations align with the operational authorisations granted for Specific Category operations within U-space airspace.

To implement this coordination among ARA/U-space and SORA, a SW Tool is considered essential. This document outlines the Functional Requirements for such tool.

2.5 Structure of the document

The document is structured as follows:

- Chapter 1 contains the Executive Summary;
- Chapter 2 introduces the document, in terms of scope, purpose, intended readership. It also provides also a glossary of the terms and acronyms;
- Chapter 3 contains an overview of the solution, and functional architecture views for each of the proposed Operational Scenarios studied in this document;
- Chapter 4 gathers the functional requirements for component;
- Chapter 5 describes the assumptions used in this document;
- Chapter 6 lists the applicable and reference documents.

2.6 Glossary of terms

Term		Definition	Source of the definition
Airspace Risk Assessment		Evaluation of operational, safety and security risks that takes into account the required levels of safety performance as defined in the European Plan for Aviation Safety and the State Safety	COMMISSION IMPLEMENTING

	Program referred to in Articles 6 and 7 of Regulation (EU) 2018/1139, the type, complexity and density of the traffic, the location, altitudes or heights and the airspace classification	REGULATION (EU) 2021/664
Visual Line of Sight (VLOS)	Type of UAS operation in which, the remote pilot is able to maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions	EASA
Beyond Visual Line of Sight (BVLOS)	Type of UAS operation which is not conducted in VLOS	EASA
Extended Visual Line of Sight (EVLOS)	A UAS operation whereby the remote pilot maintains uninterrupted situational awareness of the airspace in which the UAS operation is being conducted via visual airspace surveillance through one or more human Visual Observers (VOs), possibly aided by technological means. The remote pilot has direct control of the UAS at all times.	EASA
Common Information Service Provider (CISP)	Actor that provides USSPs with the necessary information.	ENAIRE
Specific Operations Risk Assessment (SORA)	Methodology for the classification of the risk posed by a drone flight in the specific category of operations and for the identification of mitigations and of the safety objectives.	EASA
U-SPACE	Set of new services and specific procedures designed to support safe, efficient and secure access to airspace for large numbers of drones. These services rely on a high level of digitalization and automation of functions, whether they are on board the drone itself, or are part of the ground-based environment.	Blueprint

Table 1: glossary of terms

2.7 List of acronyms

Term	Definition
AMSL	Above Mean Sea Level
ANSP	Air Navigation Service Provider
ARA	Airspace Risk Assessment
ARC	Air Risk Class
ATC	Air Traffic Control
ATM	Air Traffic Management
AIP	Aeronautical Information Publication
BVLOS	Beyond Visual Line of Sight
C3	Command, Control and Communication
CISP	Common Information Service Provider
CNS	Communication, Navigation and Surveillance
ConOps	Concept of Operations
CTR	Control Zone
DAR	Dynamic Airspace Reconfiguration
DOP	Dilution of Precision
DVR	Design Verification Report
EASA	European Union Aviation Safety Agency
EU	European Union
EVLOS	Extended Visual Line of Sight
FA	Flight Authorisation
FATO	Final Approach and Take-Off Area
FCFS	First Come, First Served
GA	General Aviation
GCS	Ground Control Station

GIS	Geographic Information System
GHSL	Global Human Settlement Layer
GRB	Ground Risk Buffer
GRC	Ground Risk Class
iGRC	intrinsic Ground Risk Class
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HEMS	Helicopter Emergency Medical Services
ICD	Interface Control Document
IR	Implementing Regulation
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
JU	Joint Undertaking
KOM	Kick-Off Meeting
KPI	Key Performance Indicator
LPWAN	Low-Power Wide-Area Network
MAC	Mid-Air Collision
M1	Ground risk mitigation (strategic/tactical)
M2	Reduction of UA impact dynamics mitigation
MTOM	Maximum Take-Off Mass
NOTAM	Notice to Airmen
NRI	Network Remote Identification
NSA	National Supervisory Authority
OSD	Operational Service and Environment Definition
OSO	Operational Safety Objective
OS-3	Operational Scenario 3
OS-4	Operational Scenario 4

PDRA	Pre-defined Risk Assessment
RFI	Radio Frequency Interference
SAC	Special Area of Conservation
SAIL	Specific Assurance and Integrity Level
SAR	Search and Rescue
SESAR	Single European Sky ATM Research
SID	Standard Instrument Departure
SORA	Specific Operations Risk Assessment
SRIA	Strategic Research and Innovation Agenda
STAR	Standard Terminal Arrival Route
STS	Standard Scenario
TRL	Technology Readiness Level
TLS	Target Level of Safety
TMPR	Tactical Mitigation Performance Requirements
U-AGREE	U-space Air and Ground Risk Models Enhancement
UAM	Urban Air Mobility
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
USSP	U-space Service Provider
UTM	UAS Traffic Management
VCA	Vertiport-Corridor-Airport
VFR	Visual Flight Rules
VLL	Very Low Level
VLOS	Visual Line of Sight
VO	Visual Observer
VTOL	Vertical Take-Off and Landing

Table 2: list of acronyms

3 Functional architecture view

3.1 SESAR solution overview

SESAR Solution 0520 – Integrated risk models for Unmanned Aerial Systems (UAS) in the U-space – develops risk models to facilitate the authorisation of UAS operations.

Risk models are essential for ensuring aviation safety, as they link potential hazards faced by aircraft to their quantifiable negative impacts. This connection allows for evaluating whether these risks are acceptable by establishing a threshold, usually called Target Level of Safety (TLS), which represents what society consider is ‘acceptably safe’.

As UAS operations continue to expand, there is an urgent need to develop new risk models to evaluate the potential hazards associated with these activities. The EASA has adopted the SORA developed by the JARUS, with some minor modifications. However, the SORA risk models basically consider the risk of individual operations. Therefore, some improvements are necessary so they can support ARA process for the designation of U-space airspaces.

Advanced risk models enhance capacity and safety for Unmanned Aerial Systems operations in U-Space. Current risk models, such as SORA, are essential to aviation safety but have limitations in addressing the complexities and risks posed by unmanned aerial systems (UAS) operating at very low levels (VLL) in urban areas. These limitations make it challenging to ensure both safety and regulatory compliance, potentially slowing down the growth of UAS use in urban areas.

The enhanced risk models tailored to UAS in urban VLL environments address these gaps, by including mid-air collisions (both UAS-to-UAS and UAS-to-manned aircraft), impacts on critical infrastructure, privacy concerns, and environmental effects, as well as the mitigating effect of U-space services.

3.1.1 Supporting reasons for this SESAR solution

Currently, UAS operations in Europe are very limited due to complexity and constraints to get an operational authorisation to fly in the Specific Category, following the SORA process.

U-space is considered an enabler to speed up UAS operations, but as they still need a previous operational authorisation it is necessary to integrate both processes to obtain the benefits provided by U-space to facilitate the development of the operations. Furthermore, the use of quantitative models would facilitate the authorisation process and the enhancement of ARA, connecting both sides.

3.1.2 ATM capabilities addressed by the SESAR solution

SESAR solution capabilities	Comments on potential updates required at capability level
-----------------------------	--

U-space capability	Optimised Decision-Making	The integration of the risk models and, above all, the SORA tool will facilitate the decision making
Risk-Based airspace structuring (Level 3 capability)		The airspace structures should consider the updated model provided by U-AGREE

Table 3: SESAR Solution 0520 capabilities

3.1.3 Stakeholders impacted by the SESAR solution

Stakeholder	Involvement	Why it matters to the stakeholder
ANSP	Provides traffic and operational data used in the risk assessment process and supports the implementation of airspace management measures.	Helps ensure that U-space airspaces and associated mitigations remain compatible with existing ATM operations and manned traffic flows.
Airport operators	May use the results of the risk models when assessing UAS operations in the vicinity of aerodromes and airports.	Supports the safe coexistence of UAS and airport operations and helps identify appropriate operational constraints and mitigations.
Network manager	Indirect stakeholder interested in the impact of large-scale U-space deployment on airspace organisation and network performance.	Supports harmonised implementation of U-space concepts and contributes to maintaining overall network safety and efficiency.
Scheduled airlines (mainline and regional), Business aviation, IFR General aviation	Impacted by the designation of U-space airspaces and associated operational constraints.	Benefit from ensuring that UAS operations do not introduce unacceptable risks to manned aviation operations.
Rotorcraft, VFR General aviation	Directly affected by the coexistence of UAS and manned aircraft in low-level airspace.	Benefit from improved assessment of collision risks and the implementation of proportionate mitigations in shared airspace environments.

UAS operators	Use the risk models and associated tools to support SORA assessments and operational planning.	Facilitates access to airspace, supports regulatory compliance and enables more predictable and scalable UAS operations.
Military	May operate in or near U-space airspaces and interact with civil UAS operations.	Ensures that military operations can coexist safely with U-space activities and that airspace constraints remain compatible with mission requirements.
Common information service provider (CISP)	Provides information services supporting U-space operations and risk assessment activities.	Benefits from clearly defined information requirements and performance targets derived from the risk models.
U-space service provider (USSP)	Uses the outputs of the risk models to support flight authorisation, tactical services and operational monitoring.	Supports safe service provision and helps demonstrate that U-space services achieve the required safety performance.
Insurance Companies	May use the outputs of risk assessments to better understand operational risk exposure.	Supports risk-informed underwriting and the development of insurance products for UAS operations.
Citizens/City Hall /Local Government	Indirect stakeholders affected by the deployment of U-space services and UAS operations over populated areas.	Benefit from improved safety, transparency and public acceptance of UAS operations.
Regulatory Authorities	Use the risk models to support U-space designation, oversight activities and regulatory decision-making.	Enables evidence-based regulation and verification that acceptable safety levels are achieved.

Researchers/R&D organizations	Contribute to the development, validation and improvement of risk assessment methodologies.	Gain access to advanced models, operational data and research opportunities supporting innovation in U-space and aviation safety.
Standardisation bodies	May use project results to support the development of standards and guidance material.	Benefits from validated methodologies and performance requirements that can contribute to future standards and recommended practices.

Table 4: SESAR Solution 0520 stakeholders

3.2 SESAR solution functional view

3.2.1 Interaction(s) identification

This document considers two operational scenarios, with different time horizons:

1. OS-3 (S/T) Pre-flight risk assessment using SORA 2.5 risk models and U-space enabled data exchange: SORA verification through U-space tool to develop risk estimation and mitigation in SORA assessments for operations in U-space airspaces according to Commission Implementing Regulation (EU) 2021/664.
2. OS-4 (L/T) Pre-flight risk assessment using U-AGREE risk models and an approval process embedded in the U-space workflow: SORA process integration in U-space.

Short Term Operational Scenario (OS-3)

In a short term, the SORA Tool bridges the SORA assessment with the U-space by using the flight authorisation to check if the proposed mitigations can be applied and therefore serving as evidence for the SORA mitigations and OSOs. It will as well aid with the SORA preparation, calculating GRC and ARC and proposing what mitigations can be applied. Finally, the stored SORAs and flight authorisations assigned can be used for ARA reassessment. The information about the operations during all the stages can be used to calculate the ARA safety requirements for the particular U-space and showcase an up-to-date state of those KPIs.

The following picture represents the interactions of the Tool with the SORA and U-space processes:

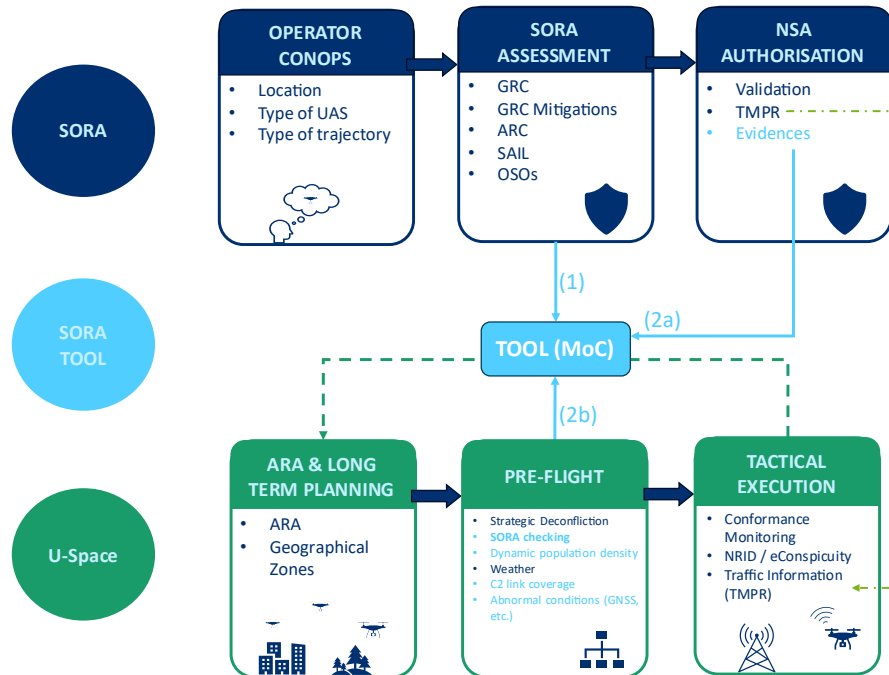


Figure 1: SORA Tool short term diagram

To be able to develop the required processes, the Tool is decomposed in 4 main Functions:

- (1) SORA calculation Function
- (2a) NSA Evidence generation Function
- (2b) SORA checking Function
- (3) ARA Reassessment Support Function.

The required interfaces for each one of these Functions are:

(1) Tool SORA calculation Interface:

- UI (User Interface, generally Graphical) to define trajectory-area/UAS selection.
- EASA's Drone database (M2, containment or DVR for the selected UAS).
- Population density database (e.g. GHSL).
- Sheltering database (e.g. Copernicus Land Monitoring service).
- Airspace/AIP database (e.g. INSIGNIA in Spain).
- National UAS Geographical zones database.

(2a) Tool Evidences Interfaces:

- NSA access to SORA calculations and validations' records

- NSA access to OSO#6 (C3 link performance is appropriate for the operation) and OSO#13 (External services supporting UAS operations are adequate for the operation) verification for each operation [6].

(2b) Tool SORA checking Interfaces:

- USSP Flight Authorisation /Operational Intent
- Weather forecast/nowcast service
- EASA's Drone database
- Dynamic Population density database
- Sheltering database
- Airspace/AIP database
- NOTAM database
- National UAS Geographical zones database
- U-space Dynamic UAS Geographical zones/Restrictions service
- GNSS Monitoring Service
- 4G/5G network Monitoring Service

(3) Tool ARA Reassessment Support Interfaces:

- ARA Service/Authority access to SORA records

Long Term Operational Scenario (OS-4)

In a later phase, SORA and U-space processes will be fully integrated. Instead of supporting the SORA process, and then checking whether it is properly followed, it is part of the flight authorisation process. With the operator concept of operations and the suggestions of the Tool to comply with it, the SORA is calculated and sent to the NSA, which gives an automated authorisation, granting the operation instantly. During pre-flight the SORA is checked and after the operation all the information is stored for the NSA to confirm the compliance of the operation. Instead of using qualitative measurements of air and ground risk, the upgraded risk modules from U-AGREE can be used, and further refine the resulting measurements, allowing more capacity. Furthermore, with the SORA authorisation being quicker, the number of operations will increase, and therefore other risks as the collisions between UAS or environmental risks should be included as part of the assessment.

The following picture represents the interactions of the Tool:

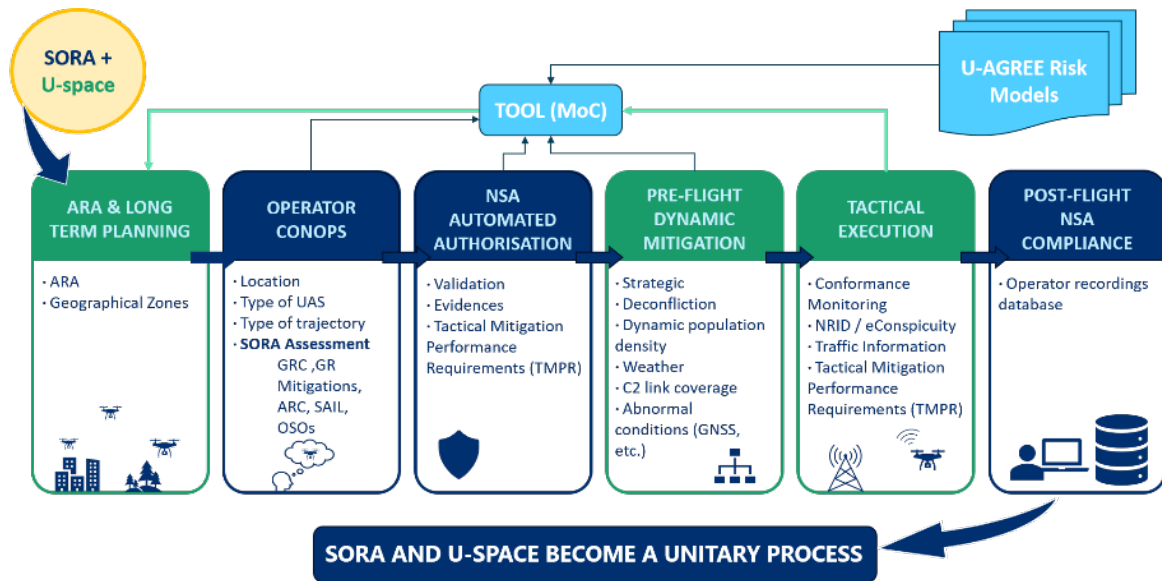


Figure 2: SORA Tool long term diagram

3.2.2 Functional decomposition

To be able to develop the requires processes, the Tool is decomposed in 4 main Functions:

- (1) SORA calculation Function
- (2a) NSA Evidence generation Function
- (2b) SORA checking Function
- (3) ARA Reassessment Support Function.

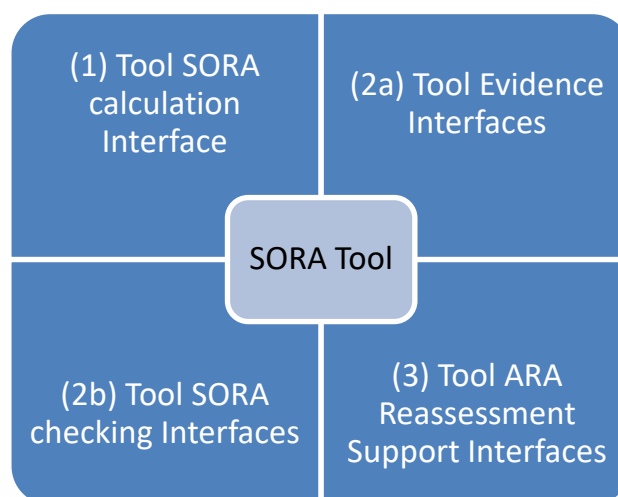


Figure 3: SORA Tool components

The Functional decomposition of each of the blocks is shown below:

(1) SORA calculation Function

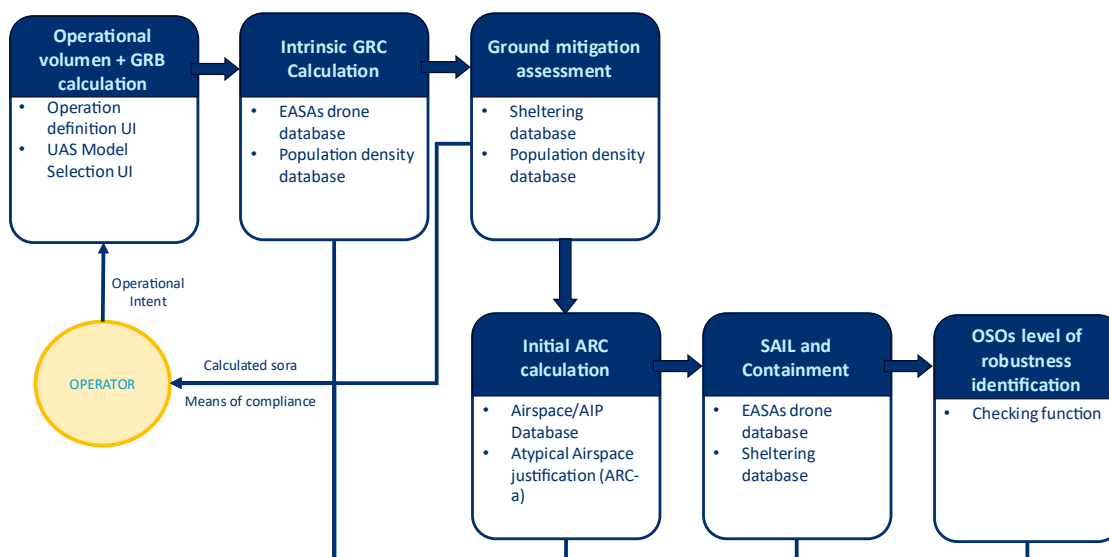


Figure 4: SORA Calculation interface diagram

(2a) NSA Evidence generation Function

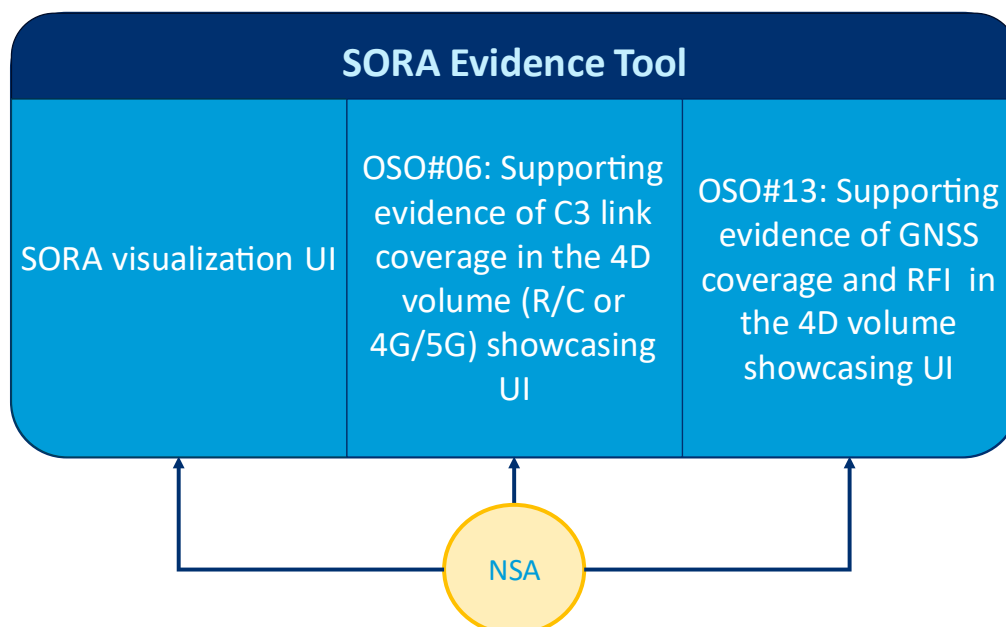


Figure 5: SORA Evidence tool interface diagram

(2b) SORA checking Function

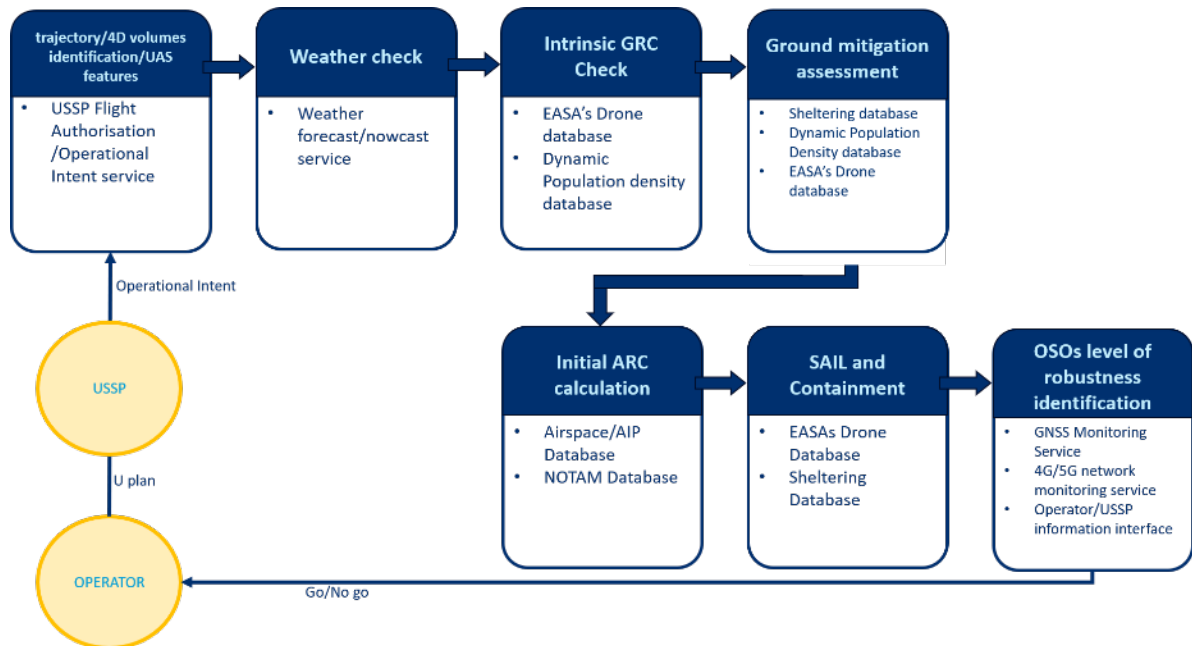


Figure 6: SORA Checking interface diagram

(3) ARA Reassessment Support Function

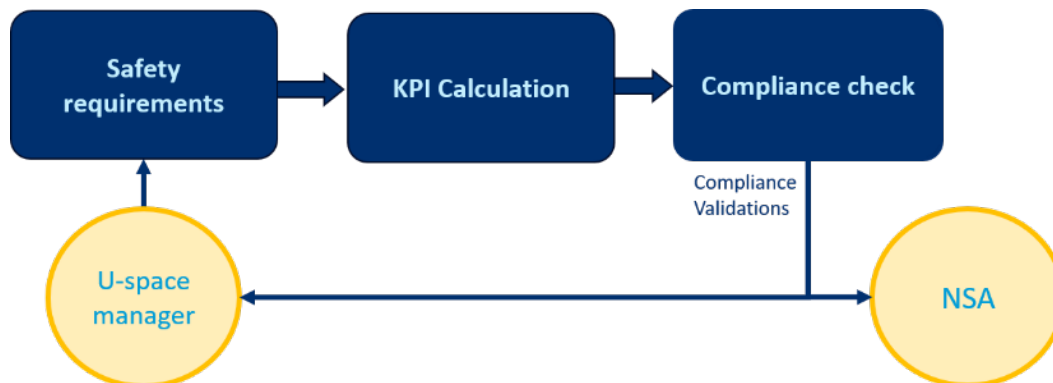


Figure 7: ARA reassessment diagram

3.3 High level impact of the SESAR solution on the baseline SESAR architecture

Technical systems impacted by the SESAR solution	Functions / roles impacted by the SESAR solution	Comments on required updates
U-space Service Provider	Flight Authorisation Service	The FA process should include a verification of the compliance of the proposed operation with the SORA Operational Authorisation

Table 5: Systems impacted by SESAR Solution 0520

4 Functional requirements

[REQ]

Identifier	REQ-SOL0520-FRD.0010
Title	UI Support to define trajectory-area/UAS selection
Requirement	A SORA Tool shall allow the operator to define the Flight Geography and select the operation's UAS.
Status	<In Progress>
Rationale	The tool depends on the flight geography and UAS type and features to properly conduct the SORA for the operation.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Volume Definition
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0020
Title	EASA Drone database access
Requirement	A SORA Tool shall have an available interface with the EASA Drone database.
Status	<In Progress>

Rationale	The EASA drone database gives information on the performance of the UAS model that can be used to calculate iGRC and containment.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0030
Title	Semantic Model calculation
Requirement	A SORA Tool shall calculate the Contingency Volume and Ground Risk Buffer based on the defined flight geography and selected UAS performances.
Status	<In Progress>
Rationale	The tool depends on the Operational Volume (flight geography+contingency) and UAS type and features to properly conduct the SORA of the operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
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<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Volume Definition
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0040
Title	Intrinsic GRC Calculation
Requirement	A SORA Tool shall be able to calculate the iGRC.
Status	<In Progress>
Rationale	The calculation of the iGRC is used both in the calculation function of the tool and to later assess the iGRC has not changed due to the dynamic population density.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Ground Risk Operations Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0050
Title	Population Density Database access
Requirement	A SORA Tool shall receive static population density data from a database.
Status	<In Progress>
Rationale	The tool must use the population data for accurately calculating the proper ground risk.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0060
Title	Ground risk mitigation definition UI
Requirement	A SORA Tool shall allow the operator to declare strategic and tactical mitigations for the ground risk (M1) and reduction of the UA impact dynamics (M2).
Status	<In Progress>
Rationale	The iGRC mitigations need to be known to calculate the Final GRC.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Ground Risk Operations Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0070
Title	Sheltering database access
Requirement	A SORA Tool shall be able to evaluate the sheltering factor for a UAS Operational Volume gathering the data from an official database.
Status	<In Progress>
Rationale	The sheltering depends on the presence of buildings, structures or trees in the area studied.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering

<ALLOCATED_TO>	<Business function>	USSP Operations	Operations/CISP
<ALLOCATED_TO>	<Role>	Aeronautical Manager	Information
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space	

[REQ]

Identifier	REQ-SOL0520-FRD.0080
Title	M1 mitigation assessment
Requirement	A SORA Tool shall be able to validate M1 mitigations.
Status	<In Progress>
Rationale	The M1 mitigations depend on the population sheltering and density in the given area, so they must be assessed.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Ground Risk Operations Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0090
Title	M2 mitigation assessment

Requirement	A SORA Tool shall be able to check M2 mitigations in the EASA Drone database.
Status	<In Progress>
Rationale	EASA publishes the UAS approved class marking, design verification reports and M2 mitigations.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Ground Risk Operations Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0100
Title	Final Ground Risk Calculation
Requirement	A SORA Tool shall be able to calculate the Final GRC.
Status	<In Progress>
Rationale	The calculation of the Final GRC depends on the iGRC and M1-M2 mitigations.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier

<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Ground Risk Operations Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0110
Title	Initial ARC Calculation
Requirement	A SORA Tool shall be capable of using AIP data to assess the ARC.
Status	<In Progress>
Rationale	The initial ARC is part of the SORA calculation, and has to be checked before the operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Air Risk Operational Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0120
Title	Airspace/AIP Database access
Requirement	A SORA Tool shall receive AIP information from a database.
Status	<In Progress>
Rationale	The Airspace configuration is necessary to properly estimate the iARC.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations/CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0130
Title	Atypical Airspace selection UI
Requirement	A SORA Tool shall allow the operator to define the operation will be developed in an atypical airspace (ARC-a).
Status	<In Progress>
Rationale	Even if under U-space there is no necessity to segregate airspace, some operations might need ARC-a and so it has to be considered (In U-space airspaces ARC-a and ARC-b can be equivalent).

Category	<Operational>
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[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Air Risk Operational Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0140
Title	Strategic mitigations UI
Requirement	A SORA Tool shall allow the operator to define strategic mitigations to reduce the initial ARC.
Status	<In Progress>
Rationale	Strategic mitigations cannot be automated and therefore the operator has to fill them manually for the final ARC to be calculated
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3

<ALLOCATED_TO>	<Business service>	Air Risk Operational Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0141
Title	Supporting evidence for strategic mitigations
Requirement	A SORA Tool shall be able to provide air traffic data to validate strategic mitigations to the air risk.
Status	<In Progress>
Rationale	Strategic mitigations cannot be automated, but evidence can be provided via the service to facilitate the approval by the NSA.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Air Risk Operational Planning Safety Service
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	Aviation Security Expert
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0150
Title	residual ARC calculation

Requirement	A SORA Tool shall apply the mitigations considered to calculate the residual ARC.
Status	<In Progress>
Rationale	The initial ARC is part of the SORA calculation, and has to be checked before the operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Air Risk Operational Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0160
Title	U-space user validation for TMPR
Requirement	A SORA Tool shall be able to identify operations under a U-space airspace and validate the tactical mitigations with the operator subscription to a USSP provider.
Status	<In Progress>
Rationale	Operators flying while using a USSP subscription will automatically have at least air risk class b.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
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<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Air Risk Operational Planning Safety Service
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	Aviation Security Expert
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0170
Title	SAIL calculation
Requirement	A SORA Tool shall be able to calculate the SAIL.
Status	<In Progress>
Rationale	SAIL calculation is necessary to assure the flight category of the operation is within the expected boundaries.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0180
Title	Adjacent Area calculation
Requirement	A SORA Tool shall be capable of calculating the adjacent area of the operation.
Status	<In Progress>
Rationale	The adjacent area is used to calculate the containment level.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0190
Title	Containment level calculation
Requirement	A SORA Tool shall be able to calculate containment level.
Status	<In Progress>
Rationale	Containment level calculation is necessary to assure the flight category of the operation is within the expected boundaries.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0200
Title	Containment requirements identification
Requirement	A SORA Tool shall identify the necessary requirements for the containment.
Status	<In Progress>
Rationale	Containment requirements are tied to the containment level and it affects the evidences needed.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0210
Title	OSOs level of robustness identification
Requirement	A SORA Tool shall identify the necessary level of robustness for the OSOs given a SAIL.
Status	<In Progress>
Rationale	OSOs level of robustness is tied to the necessities of the operation and level of evidence needed.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Calculation
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0220
Title	Supporting evidence of C3 link coverage in the 4D volume (R/C or 4G/5G)
Requirement	A SORA Tool shall serve as an evidence of the C3 link coverage in case of usage of cellular connectivity.
Status	<In Progress>
Rationale	By supervising the network coverage before the operation, the OSO#6 is covered by its use. Gathering information from a wide number of operations, comparing real performances and

	the predictions from the tool, the SORA tool will provide evidence valid for the NSA.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Tool evidences function
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0230
Title	Supporting evidence of GNSS coverage and RFI in the 4D volume
Requirement	A SORA Tool shall serve as evidence of the GNSS coverage and RFI.
Status	<In Progress>
Rationale	By supervising the network coverage before the operation, the OSO#13 is covered by its use. Gathering information from a wide number of operations, comparing real performances and the predictions from the tool, the SORA tool will provide evidence valid for the NSA.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier

<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Tool evidences function
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0240
Title	NSA UI to check evidences pre and post flight for particular operations
Requirement	A SORA Tool shall give access to the NSA to a database with the predictions and real performances for particular operations.
Status	<In Progress>
Rationale	To ensure the transparency of the tool, the ability to constanly check it's validity as an evidence is needed.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Tool evidences function
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0250
Title	FA data acquisition: trajectory/4D volumes identification/UAS features
Requirement	A SORA Tool shall be capable of receiving flight authorisation and operation information from the USSP.
Status	<In Progress>
Rationale	To properly check during the pre-flight phase if the operation is compliant of the assigned SORA, the U-plan must be received.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Flight Authorisation Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0260
Title	SORA database access
Requirement	A SORA Tool shall receive validated SORA summaries to assure compliance with the operation authorised by the NSA.
Status	<In Progress>
Rationale	Due to security, the information of the final, accepted SORA given by the authority shall not be stored in the SORA Tool, but it has to be

	accessible to validate it during the checking phase.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0270
Title	Semantic model verification for 4D volume
Requirement	A SORA Tool shall be able to calculate the SORA operational volume and the ground risk buffer from the UFA of a specific operation and compare with the SORA authorisation received from the NSA.
Status	<In Progress>
Rationale	To assure the operation flown is within the authorised area the semantic model has to be calculated and compared with the accepted SORA.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
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<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Ground Risk Operations Planning Safety Service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0280
Title	Weather data acquisition
Requirement	A SORA Tool shall acquire weather data from a forecast/nowcast service.
Status	<In Progress>
Rationale	Weather data can be used to check for abnormal/degraded conditions and confirm/deny the operation and calculate properly the semantic model.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager

<ALLOCATED_TO>	<Sub-Operating Environment>	U-space
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[REQ]

Identifier	REQ-SOL0520-FRD.0290
Title	Verification of selected UAS
Requirement	A SORA Tool shall identify the requested UAS for the operation from the FA Request data.
Status	<In Progress>
Rationale	The SORA checking needs to verify that the selected UAS is within the Operational Authorisation given to de operator.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0300
Title	Dynamic population density database access
Requirement	A SORA Tool shall gather dynamic population density information.
Status	<In Progress>

Rationale	The M1 mitigations depend on the dynamic density, and it is possible to check the iGRC at the moment of operation to assure compliance.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0310
Title	NOTAM database access
Requirement	A SORA Tool shall access the NOTAM database.
Status	<In Progress>
Rationale	Even if the SORA has been filled, there could be deviations in the airspace from the original formulation, and it has to be taken into consideration during the check.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier

<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0320
Title	GNSS Monitoring Service
Requirement	A SORA Tool shall acquire GNSS availability data from a GNSS Monitoring service.
Status	<In Progress>
Rationale	The current status of the GSS signal in the air is necessary to fulfil the OSO#13.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0330
Title	4G/5G network monitoring service
Requirement	A SORA Tool shall acquire network availability data from a public mobile network.
Status	<In Progress>
Rationale	The current status of the network is necessary to fulfil the OSO#6.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0340
Title	Verification of C3 link coverage in the 4D volume
Requirement	A SORA Tool shall be able to analyse the C3 link coverage and verify it is safe to continue with the operation.
Status	<In Progress>

Rationale	To assure the OSO#6 is fulfilled with sufficient capacity, the SORA Tool must check the state of the network prior to the operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0350
Title	verification of GNSS coverage and RFI in the 4D volume
Requirement	A SORA Tool shall be able to analyse the GNSS coverage and verify it is safe to continue with the operation.
Status	<In Progress>
Rationale	To assure the OSO#13 is fulfilled with sufficient capacity, the SORA Tool must check the state of the GNSS prior to the operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
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<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0370
Title	Verification that environmental conditions are safe
Requirement	A SORA Tool shall be able to validate the OSO #23, environmental conditions.
Status	<In Progress>
Rationale	The environmental conditions comprise weather and other external factors, already checked to calculate a proper contingency volume.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0360
Title	Analysis of airspace
Requirement	A SORA Tool shall be able to analyse the data gathered and check whether or not the air risk is secure.
Status	<In Progress>
Rationale	To assure the airspace is still safe, it is critical to check with the updated sources that the operation is within the limits defined during the SORA phase.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0380
Title	Operator/USSP information interface
Requirement	A SORA Tool shall be able to interact with the USSP and the operator to return the validity check for the requested Flight authorisation.
Status	<In Progress>
Rationale	The result of the SORA tool check has to be received by the USSP, and ultimately the

	operator, before the flight authorisation is accepted.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0390
Title	Logging and SORA Database provision
Requirement	A SORA Tool shall keep an anonymised logging and SORA checking confirmation/deny database for ARA reassessment.
Status	<In Progress>
Rationale	The information gathered during the pre-flight phase of the operation can be used to further improve the results.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking

<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	ARA reassessment service
<ALLOCATED_TO>	<Business function>	USSP Operations / Regulatory Operations
<ALLOCATED_TO>	<Role>	Aviation Security Expert
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0400
Title	Risk database provision
Requirement	A SORA Tool shall provide an anonymised risk database for ARA reassessment.
Status	<In Progress>
Rationale	The historical risk map can be used to compare with the initial assumptions and further refine the ARA.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	ARA reassessment service
<ALLOCATED_TO>	<Business function>	USSP Operations / Regulatory Operations
<ALLOCATED_TO>	<Role>	Aviation Security Expert
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0410
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Title	Collision database provision
Requirement	A SORA Tool shall provide an anonymised collision likelihood database for ARA reassessment.
Status	<In Progress>
Rationale	The historical collision likelihood map can be used to compare with the initial assumptions and further refine the ARA.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	SORA Checking
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	ARA reassessment service
<ALLOCATED_TO>	<Business function>	USSP Operations / Regulatory Operations
<ALLOCATED_TO>	<Role>	Aviation Security Expert
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0420
Title	SORA Annex F compliance
Requirement	A SORA Tool shall comply with annex F high level of robustness for GRC and ARC calculations.
Status	<In Progress>
Rationale	For the SORA Tool to be compliant, it must be built in accordance with the SORA definition of its services.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	General
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	Systems Engineer
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0430
Title	Secure interfaces
Requirement	A SORA Tool shall use standard and secure protocols to interface with all external services.
Status	<In Progress>
Rationale	Using standard and secure protocols to interface with all external services assures the security of the tool.
Category	<Security>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	General
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Security
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	Systems Engineer
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0440
Title	Data model shared with USSP
Requirement	A SORA Tool shall comply with any applicable standards with regards to USSPs for FAS data sharing and for the generation of SORA operational volumes.
Status	<In Progress>
Rationale	For interacting with the USSPs a shared data model has to be used.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	General
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	Systems Engineer
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0450
Title	Anonimisation of stored data
Requirement	A SORA Tool shall anonymise shared data to keep it's users protected.
Status	<In Progress>
Rationale	Third parties shall access the ground risk, air risk and collision risk historical databases to improve their results, without knowledge of the operators involved.
Category	<Security>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	General
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	Systems Engineer
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0460
Title	Historical flight data for the U-space
Requirement	A SORA Tool shall gather historical flight data for the U-space.
Status	<In Progress>
Rationale	The historical flight data can be used to calculate the maximum collision risk of a trajectory.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Air Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations

<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0470
Title	Minimum and maximum cell size for air risk
Requirement	A SORA Tool shall calculate or retrieve the size of the cell — cube or cuboid — in which the airspace is divided to estimate the risk in the air risk model.
Status	<In Progress>
Rationale	Different motivations could determine the cell size: the capabilities of the aircraft asking for flight authorization, a value determined by authorities, or just a fixed selected value that would allow to speed the calculation process.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Air Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0480
Title	Wildlife mapping tool data acquisition
Requirement	A SORA Tool shall be able to access a historical wildlife database.
Status	<In Progress>
Rationale	Due to drone operations taking place at a wildlife prone altitude, it is necessary to manage the risk of collision with them.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Air Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0490
Title	Wildlife risk assessment calculation
Requirement	A SORA Tool shall be able to calculate the impact wildlife can have on the operation during the checking phase to assure it will not cause a collision risk.
Status	<In Progress>
Rationale	Due to drone operations taking place at a bird prone altitude, it is necessary to manage the risk of collision with them.

Category	<Operational>
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[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Air Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0500
Title	Building material properties database
Requirement	A SORA Tool shall have an available building material database with the kinetic absorption values for calculating sheltering. Moreover, there should be a database which allows to map the materials available to representative structural materials used in EU.
Status	<In Progress>
Rationale	To properly calculate the sheltering of a specific operation, the properties of the potential materials impacted are necessary, including the typology of building materials used in a certain geographical area, and the maximum KE absorbable by the impacted building without resulting in any penetration.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
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<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced calculation Ground Risk
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Contextual Gathering Information
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Manager Information
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0510
Title	Building material proportion database
Requirement	A SORA Tool shall have a database which provides the different probabilities of impacting certain structural materials in a given geographical area.
Status	<In Progress>
Rationale	The proportion of materials on the ground will greatly affect the sheltering effectiveness.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced calculation Ground Risk
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Contextual Gathering Information

<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0520
Title	Obstacle database
Requirement	A SORA Tool shall access an obstacles (i.e. buildings) database for a specific area to evaluate a potential reduction of critical area.
Status	<In Progress>
Rationale	The critical area is assumed to be calculated without obstacles, but it might get reduced depending on the characteristics of the operational area.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Ground Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Contextual Information Gathering
<ALLOCATED_TO>	<Business function>	USSP Operations / CISP Operations
<ALLOCATED_TO>	<Role>	Aeronautical Information Manager
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0525
Title	Safety Requirement calculation
Requirement	A SORA Tool shall calculate the KPIs derived from the safety requirements for the U-space.
Status	<In Progress>
Rationale	Since the tool has information on all operations happening in a U-space, it is possible to keep up to date calculations of the safety requirements.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	ARA reassessment
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0526
Title	Safety requirement UI
Requirement	A SORA Tool shall provide the safety requirements data to the interested parties.
Status	<In Progress>
Rationale	Since the users of the ARA reassessment might not have their own metrics display, it is necessary to have one.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	ARA reassessment
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	ARA reassessment service
<ALLOCATED_TO>	<Business function>	USSP Operations / Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0530
Title	Enhanced ground risk calculation
Requirement	A SORA Tool shall calculate the final ground risk by applying mitigations via quantitative methods.
Status	<In Progress>
Rationale	The SORA tool shall be able to calculate mitigations in a quantitative manner, especially the "sheltering" mitigation and the M2 mitigation.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Ground Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service

<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0540
Title	Frontal Area Estimation
Requirement	A SORA Tool shall be able to estimate the frontal area of the UA.
Status	<In Progress>
Rationale	This information is fundamental to properly evaluate the maximum KE absorbable by the impacted building and the UA terminal velocity.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Ground Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0550
Title	Drag coefficient estimation
Requirement	A SORA Tool shall be able to calculate the drag coefficient of a vehicle.

Status	<In Progress>
Rationale	The drag coefficient of a vehicle affects the terminal speed, and therefore the kinetic energy it can obtain.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Ground Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0560
Title	Modelling Descent Dynamics
Requirement	A SORA Tool shall be able of calculating the descent dynamics for quadrotors (Ballistic Drop) and gliders (Glide/Cruise Descent).
Status	<In Progress>
Rationale	Using proper descent dynamics assures the ground risk is calculated in the correct way.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
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<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Ground Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0570
Title	Impact kinetic energy calculation
Requirement	A SORA Tool shall be able to calculate the impact kinetic energy of a UAS.
Status	<In Progress>
Rationale	With the kinetic energy it is possible to assess the ground lethality of an operation quantitatively instead of qualitatively.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Ground Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0580
Title	Safety Service tool
Requirement	A SORA Tool shall comply with the safety service definition by SORA Annex H.
Status	<In Progress>
Rationale	During the SORA validation step, the SORA tool shall assess iGRC correctly, and serve as a helper to properly define the operational area and detect which mitigations are needed.
Category	<Performance>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	General
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0585
Title	Operator support analysis
Requirement	A SORA Tool shall provide suggestions about modifications of the flight geometry and overflown areas to comply with the authorised SORA.
Status	<In Progress>
Rationale	During the SORA validation step, the SORA tool shall assess the surrounding areas to the defined

	operation to provide alternatives to meet the authorised GRC and ARC.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	General
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0590
Title	Determine vertical units reference use
Requirement	Check if the traffic in the area makes use of geometric or barometric vertical references.
Status	<In Progress>
Rationale	Different altitude references mean traffic prone to break the separation minima.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	General
<ALLOCATED_TO>	<System>	3

<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0600
Title	Altitude raster database access
Requirement	A SORA Tool shall have a database with the ground altitude to transform the altitude from the ground of the UAS.
Status	<In Progress>
Rationale	Due to the standard allowing flight authorisations to be sent in AMSL, the altitudes might be received in that reference and have to be transformed prior to calculating any risk.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	General
<ALLOCATED_TO>	<System>	3
<ALLOCATED_TO>	<Business service>	SORA Planning service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0610
Title	Acceptable wildlife collision risk

Requirement	A SORA Tool shall define an acceptable collision risk with wildlife.
Status	<In Progress>
Rationale	Since risk 0 is impossible, it is necessary to decide on a tolerable risk to accept the operation.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Air Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0620
Title	Acceptable air collision risk
Requirement	A SORA Tool shall define an acceptable collision risk with manned aircraft.
Status	<In Progress>
Rationale	Since risk 0 is impossible, it is necessary to decide on a tolerable risk to accept the operation.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element	Type Identifier

<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced Air Risk calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0630
Title	Noise pollution impact service
Requirement	A SORA Tool shall enhance the checking by studying the potential noise impact of the operation.
Status	<In Progress>
Rationale	Even if under the current SORA implementation, the noise pollution is not contemplated, as operations get closer to urban areas, noise shall be part of the decision criterium to accept an operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Other Risks Calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0640
Title	Visual pollution impact service
Requirement	A SORA Tool shall enhance the checking by studying the potential visual pollution impact of the operation.
Status	<In Progress>
Rationale	Even if under the current SORA implementation the visual pollution is not contemplated, as operations get closer to urban areas, visual pollution shall be part of the decision criterium to accept an operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Other Risks Calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0650
Title	Privacy impact service
Requirement	A SORA Tool shall enhance the checking by studying the potential privacy impact of the operation.
Status	<In Progress>

Rationale	Even if under the current SORA implementation, the privacy impact is not contemplated, as operations get closer to urban areas, noise shall be part of the decision criterium to accept an operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Other Risks Calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0660
Title	Emissions impact service
Requirement	A SORA Tool shall enhance the checking by studying the potential emissions impact of the operation.
Status	<In Progress>
Rationale	Even if under the current SORA implementation, the emissions impact is not contemplated, as operations get closer to urban areas, emissions shall be part of the decision criterium to accept an operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Other Risks Calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0670
Title	Economic impact service
Requirement	A SORA Tool shall enhance the checking by studying the potential economic impact of a fall in the operation.
Status	<In Progress>
Rationale	Even if under the current SORA implementation, the economic impact is not contemplated, as operations get closer to urban areas, economic impact shall be part of the decision criterium to accept an operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Other Risks Calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations

<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0680
Title	Security impact service
Requirement	A SORA Tool shall enhance the checking by studying the potential security impact of the operation.
Status	<In Progress>
Rationale	Even if under the current SORA implementation, the noise pollution is not contemplated, as operations get closer to urban areas, security impact shall be part of the decision criterium to accept an operation.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Other Risks Calculation
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Advanced Risk management service
<ALLOCATED_TO>	<Business function>	USSP Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0690
Title	NSA Automated authorisation

Requirement	A SORA Tool shall interface with the NSA to automatically obtain a SORA authorisation.
Status	<In Progress>
Rationale	For an advanced SORA tool, the integration with the NSA authorisation process would allow to reduce the cost of doing a SORA in U-space.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced SORA
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	USSP Operations / Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0700
Title	NSA validated method
Requirement	A SORA Tool shall be endorsed by the NSA to delegate the authorisation process.
Status	<In Progress>
Rationale	For an advanced SORA tool, the validation methodology should be certified as to assure a safe use of the airspace.
Category	<Performance>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced SORA
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider
<ALLOCATED_TO>	<Business function>	USSP Operations / Regulatory Operations
<ALLOCATED_TO>	<Role>	Aviation Security Expert
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

[REQ]

Identifier	REQ-SOL0520-FRD.0710
Title	Post Flight NSA compliance
Requirement	A SORA Tool shall store all authorised operations for potential validation that the procedure was followed.
Status	<In Progress>
Rationale	Since the volume of operations allowed would increase, it is imperative to store and manage all operations so that the safety of the U-space can be constantly monitored.
Category	<Operational>

[REQ Trace]

Relationship	Linked Element	Type Identifier
<SATISFIES>	<SESAR Solution>	0520
<ALLOCATED_TO>	<Functional block>	Advanced SORA
<ALLOCATED_TO>	<System>	4
<ALLOCATED_TO>	<Business service>	Operational Authorisation Evidence Provider

<ALLOCATED_TO>	<Business function>	USSP Operations / Regulatory Operations
<ALLOCATED_TO>	<Role>	USSP Supervisor
<ALLOCATED_TO>	<Sub-Operating Environment>	U-space

5 Assumptions

5.1 Common assumptions for SESAR solution 0520

Operational Assumptions

- **OA-1 – Progressive deployment of U-space:** The implementation of U-space is assumed to follow a progressive deployment path consistent with the European regulatory framework and the CORUS five Concept of Operations, encompassing both short-term and mid-term implementation horizons.
- **OA-2 – Availability of U-space services:** The U-space services considered in this document are assumed to be available according to the deployment horizon and operating environment under consideration. In particular, advanced strategic services and tactical conflict detection and resolution capabilities are assumed to become available in the mid-term horizon.
- **OA-3 – Representative operating environments:** The operational environments considered by the solution are assumed to be represented by the Class G and Terminal U-space sub-operating environments defined by the PEARL project, including both baseline and U-space-enabled scenarios. A buffer of 500 ft is assumed between the closest controlled airspace in the vertical dimension. Lateral buffers should also be defined to facilitate the activation of mitigation measures (e.g., DAR or TCD&R).
- **OA-4 – Progressive integration of manned aviation:** The progressive integration of electronically conspicuous manned aircraft into the U-space ecosystem is assumed, particularly in the mid-term horizon, enabling the provision of strategic and tactical services to both manned and unmanned traffic.
- **OA-5 – Collaborative nature of U-space operations:** The solution assumes a collaborative operational environment in which participating airspace users provide the information required for the provision of U-space services. Aircraft that are not electronically conspicuous or otherwise unable to participate in the U-space ecosystem are outside the scope of the solution, except where their presence is considered through operational constraints, airspace design measures or background traffic assumptions.
- **OA-6 – Normal and abnormal operating conditions:** The operational scenarios considered by the solution include both normal and abnormal operating conditions, recognising that the occurrence of hazards and the effectiveness of mitigation measures may differ between them. In the absence of more detailed information, the FTE and NSE values for normal operating conditions have been taken from Appendix III of [44]. Under abnormal operating conditions, both FTE and NSE are conservatively assumed to be twice their corresponding normal-condition values.

Safety Assumptions

- **SA-1 – U-space services provide measurable risk mitigation:** U-space services are assumed to provide measurable risk reduction that can be quantified and incorporated into risk assessments addressing mid-air collision hazards.
- **SA-2 – Risk-based decision making:** Decisions related to airspace designation, operational constraints and service performance requirements are assumed to be based on quantified risk assessments and comparison against applicable Target Levels of Safety (TLS).

- **SA-3 – Continued applicability of SORA:** The SORA methodology is assumed to remain the primary framework supporting operational risk assessments for UAS operations in the Specific category, with the proposed risk models complementing and extending its capabilities.

Performance Assumptions

- **PA-1 – Availability of supporting data:** The accuracy of the proposed risk models is assumed to depend on the availability of sufficiently accurate, representative and timely risk-driving data, including traffic, operational, environmental and population-related information.
- **PA-2 – Derivation of risk-based performance requirements:** The proposed risk models are assumed to enable the derivation of quantitative performance requirements for U-space services and associated CNS enablers based on their contribution to risk reduction.
- **PA-3 – Relationship between service performance and risk:** A measurable relationship is assumed to exist between the performance delivered by U-space services and the resulting level of operational risk, enabling the assessment of alternative service configurations and mitigation strategies.
- **PA-4 – Capacity benefits of advanced services:** Advanced U-space services are assumed to enable the safe accommodation of higher traffic densities and more complex operations while maintaining compliance with the applicable Target Levels of Safety.

5.2 Assumptions for the SORA SW Tool

General assumptions for the SORA SW Tool

The following assumptions are considered in the definition of Functional Requirements of the SW Tool integrating the SORA Operational Authorisation for UAS operations and the provision of U-space services:

- The SORA Tool addresses UAS operations in the Specific Category, as classified by Implementing Regulation (EU) 2019/947.
- UAS operations take place in a U-space airspace, in accordance with Implementing Regulation (EU) 2021/664.
- UAS operations in the Specific category demand and Operational Authorisation provided by EASA (SAIL IV or above) or by the National Supervisory Agency (up to SAIL III).
- Every specific flight for an UAS operation will require a Flight Authorisation provided by a U-space Service Provider.

Specific assumptions for SORA calculation Function

- EASA provides a drone database with all the UAS model approved in Europe for operation in different SAIL Levels and with different mitigations (M2, etc.).
- EASA or the NSA have approved online sources of static population density data.

Specific assumptions for SORA checking Function

- NSA provide access to the register of Operational Authorisations for every UAS operator.
- EASA or the NSA have approved online sources of dynamic population density data.

6 References

6.1 Applicable documents

This FRD complies with the requirements set out in the following documents:

[Project and programme management](#)

- [1] 101167187 U-AGREE Grant Agreement.
- [2] SESAR 3 JU Project Handbook – Programme Execution Framework, 11 April 2022, Ed. 1.0.

6.2 Reference documents

- [3] European Commission, Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems.
- [4] European Commission, Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft.
- [5] Easy Access Rules for Unmanned Aircraft Systems, EASA April 2024.
- [6] JARUS guidelines on Specific Operations Risk Assessment (SORA) Version 2.5, JARUS May 2024
- [7] JARUS guidelines on SORA Annex F - Theoretical Basis for Ground Risk Classification and Mitigation, JARUS May 2024
- [8] JARUS guidelines on SORA Annex G - Theoretical Basis for the Air Risk Model, JARUS (in preparation)
- [9] European Commission, Commission Implementing Regulation (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space.