

Mälardalen University  
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Project Course in Dependable Systems  
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## Flight Safety Assessment

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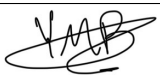
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## DOCUMENT APPROVAL

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Andrea Haglund	Chief Engineer	1.1	2025-12-05	
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# Glossary

- ARC**  
initial Air Risk Class. 3, 4
- iGRC**  
intrinsic Ground Risk Class. 3, 4
- SAIL**  
Specific Assurance and Integrity Level. 4
- SORA**  
JARUS guidelines on Specific Operations Risk Assessment (SORA). SORA is a guideline for creating UAVs. 3
- TMPR**  
Tactical Mitigation Performance Requirement. 4
- UAV**  
Unmanned Aerial Vehicle. 3

# 1 Introduction

The activities described in this document are based on SORA, which is a drone-specific standard. As a result, the conclusions of the following analysis apply only to drones that share the same dimensions and specifications as the example drone. If, at any point in the project, the drone used as the agent differs from the current drone type, the process must be updated along with all related goals and requirements.

## 1.1 Purpose

This document presents the results of all safety activities conducted in accordance with SORA. These results will be used to identify safety goals and safety hazards, most of which are specific to the selected drone type.

## 1.2 Related Documents

Document ID	Document Title
SM-01	Safety Management Plan [1]
SORA	JARUS guidelines on Specific Operations Risk Assessment [2]

Table 1: Related documents

# 2 Initial Ground Risk Class

Intrinsic UAS Ground Risk Class	3
Max population	< 5 per km <sup>2</sup>
UAV size	3.17 m
UAV max speed	15 m/s

Table 2: iGRC results

The measurements come from the example drone seen in [3]. The Unmanned Aerial Vehicle (UAV) size is determined by the distance between the propeller tips that are farthest apart. The UAVs ground risk class is 3, derived from the table in section 4.2.3 of sora main body. This class only applies in designated areas. This means that the system may not be used in more populated areas without additional mitigation.

# 3 Initial Air Risk Class

Max height	122 m
Max sensor height	20 m
Air Traffic height	150 m +

Table 3: Important heights for ARC

**Air Risk Class:** ARC-a.

The UAVs will operate in atypical airspace such as rural forests, mountains or deserts. According to SORA all UAVs operating in these areas are ARC-a.

**Operational height:** 15 - 20 m. The operational height is decided based on the sensors maximum operational range.

**Travel height:** 25 - 40 m. The travel height represents the height above ground agents shall use when travelling from one area to another.

**Protocol:**

The protocol shall state that each agent shall stay within the designated altitude for its current task. If the

agent leaves the designated altitude range, it must adjust its altitude to continue its task. The agents shall also never exceed 50 m above ground to ensure a buffer zone from air traffic. This will create a 100 m buffer zone, as the legal lowest limit for aircraft in rural areas is 150 m above ground according to Commission Implementing Regulation (EU) No 923/2012, section 5, (f) [4].

## 4 TMPR & Mitigation

Since the UAVs have a classification of ARC-a there is no additional mitigation needed. If any changes occur to the intended use area or the agent dimensions, information about the Tactical Mitigation Performance Requirement (TMPR) can be found in SORA.

## 5 SAIL Determination

The Specific Assurance and Integrity Level (SAIL) value is determined using ARC and iGRC. These values are used in a table found in SORA.

- ARC: ARC-a.
- IGRC: 3.

This gives a SAIL of II.

## 6 Determination of Containment Requirement

**Containment Robustness Level:** Low

### 6.1 Containment Requirements

Operational volume is defined as the search area plus 50 m in each direction taken from the 1:1 principle. The operational volume varies depending on where the search is taking place, it may however never contain areas with a population greater than 5 per km<sup>2</sup>.

- The probability of the failure condition “UA leaving the operational volume” shall be less than  $10^{-3}$ /Flight Hour (FH) [2].
- When the UA leaves the operational volume, an immediate end of the flight must be initiated through a combination of procedures/processes and/or available technical means.
- The Ground Risk Buffer must at least adhere to the 1:1 principle.

# References

- [1] E. Målqvist, *Safety Management Plan*, Intelligent Replanning Drone Swarm, Oct. 4 2025, Version 1.0.
- [2] Joint Authorities for Rulemaking on Unmanned Systems (JARUS), *JARUS guidelines on Specific Operations Risk Assessment (SORA)*, JAR-DEL-SRM-SORA-MB-2.5, May 2024, Accessed: Sep. 30, 2025. [Online]. Available: [https://jarus-rpas.org/wp-content/uploads/2024/06/SORA-v2.5-Main-Body-Release-JAR\\_doc\\_25.pdf](https://jarus-rpas.org/wp-content/uploads/2024/06/SORA-v2.5-Main-Body-Release-JAR_doc_25.pdf)
- [3] Harris Aerial, “H6hl brochure,” [https://harrisaerial.com/wp-content/uploads/2025/09/H6HL\\_brochure\\_final\\_2025.pdf](https://harrisaerial.com/wp-content/uploads/2025/09/H6HL_brochure_final_2025.pdf), Sep. 2025, online; accessed: Nov. 3, 2025.
- [4] European Commission, “Commission implementing regulation (eu) no 923/2012 of 26 september 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending implementing regulation (eu) no 1035/2011 and regulations (ec) no 1265/2007, (ec) no 1794/2006, (ec) no 730/2006, (ec) no 1033/2006 and (eu) no 255/2010,” European Commission, Tech. Rep., Sep. 2012, standardised European Rules of the Air (SERA); see SERA.3105 and SERA.5005(f) for minimum height requirements. [Online]. Available: [https://eur-lex.europa.eu/eli/reg\\_impl/2012/923/oj/eng](https://eur-lex.europa.eu/eli/reg_impl/2012/923/oj/eng)