



**Multi-GNSS Solutions for UAS Specific Category:  
An overview of ED-301**  
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# Multi-GNSS Solutions for UAS Specific Category: An overview of ED-301



- **SORA** (Specific Operations Risk Assessment): Evaluation of the risks to determine the acceptability of a proposed operation of UAS within the Specific category.
- Description of the Concept of Operations (**ConOps**).
- Analysis of the Ground Risk Class (**GRC**) and Air Risk Class (**ARC**)
- Determination of **SAIL** (Safety Assurance and Integrity Level): level of confidence that the UAS operation will remain under control
- Identify the defences within the operation (Operational Safety Objectives - **OSO**) and, based on the SAIL resulted, to determine the associated level of robustness (Low, Medium or High)

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## Guidelines objectives

- Guidance to UAS operators in the process of fulfilment the SORA in regards the use of GNSS for UAS navigation (OSO#13) in Low Risk operations (**SAIL I & II**) within the Specific Category
- Facilitate UAS operators in achieving the approval from the competent authority in regards to the inherent GNSS safety risks
- Support competent authority to gain confidence on the use of GNSS by UAS operators to conduct operations safely
- Introduce UAS operators, manufacturers and integrators in the particularities of GNSS and its use in UAS operations

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## Approach to guide UAS operators

- Establish the relation among SORA and GNSS (OSO#13)

| OSO number (in line with Annex E) |  | SAIL |    |     |    |   |    |
|-----------------------------------|--|------|----|-----|----|---|----|
|                                   |  | I    | II | III | IV | V | VI |
| OSO#13                            | External services supporting UAS operations are adequate for the operation | L    | L  | M   | H  | H | H  |

|                  | Low assurance  | Medium assurance  | High assurance    |
|------------------|----------------|-------------------|-------------------|
| Low integrity    | Low robustness | Low robustness    | Low robustness    |
| Medium integrity | Low robustness | Medium robustness | Medium robustness |
| High integrity   | Low robustness | Medium robustness | High robustness   |

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

| DETERIORATION OF EXTERNAL SYSTEMS SUPPORTING UAS OPERATION BEYOND THE CONTROL OF THE UAS |  | Level of assurance |        |      |
|--|--|--------------------|--------|------|
|  |  | Low                | Medium | High |

|   |          |  |  |   |
|---|----------|--|--|---|
| OSO #13<br>External services supporting UAS operations are adequate for the operation | Criteria | <p>The applicant declares that the requested level of performance for any externally provided service necessary for the safety of the flight is achieved (without evidence being necessarily available).</p> | <p>The applicant has supporting evidence that the required level of performance for any externally provided service required for safety of the flight can be achieved for the full duration of the mission.</p> <p>This may take the form of a service-level agreement (SLA) or any official commitment that prevails between a service provider and the applicant on the relevant aspects of the service (including quality, availability, responsibilities).</p> <p>The applicant has a means to monitor externally provided services which affect flight critical systems and take appropriate actions if real-time performance could lead to the loss of control of the operation.</p> | <p>Same as medium. In addition:</p> <p>(a) the evidence of the performance of an externally provided service is achieved through demonstrations; and</p> <p>(b) a competent third party validates the claimed level of integrity.</p> |
|   | Comments | N/A  | N/A  | N/A   |

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## Approach to guide UAS operators

- Detail and breakdown the criteria defined in the Integrity and Assurance (Low) Levels in OSO#13 being particularised to GNSS



OSO#13\_Integrity



OSO#13\_Assurance

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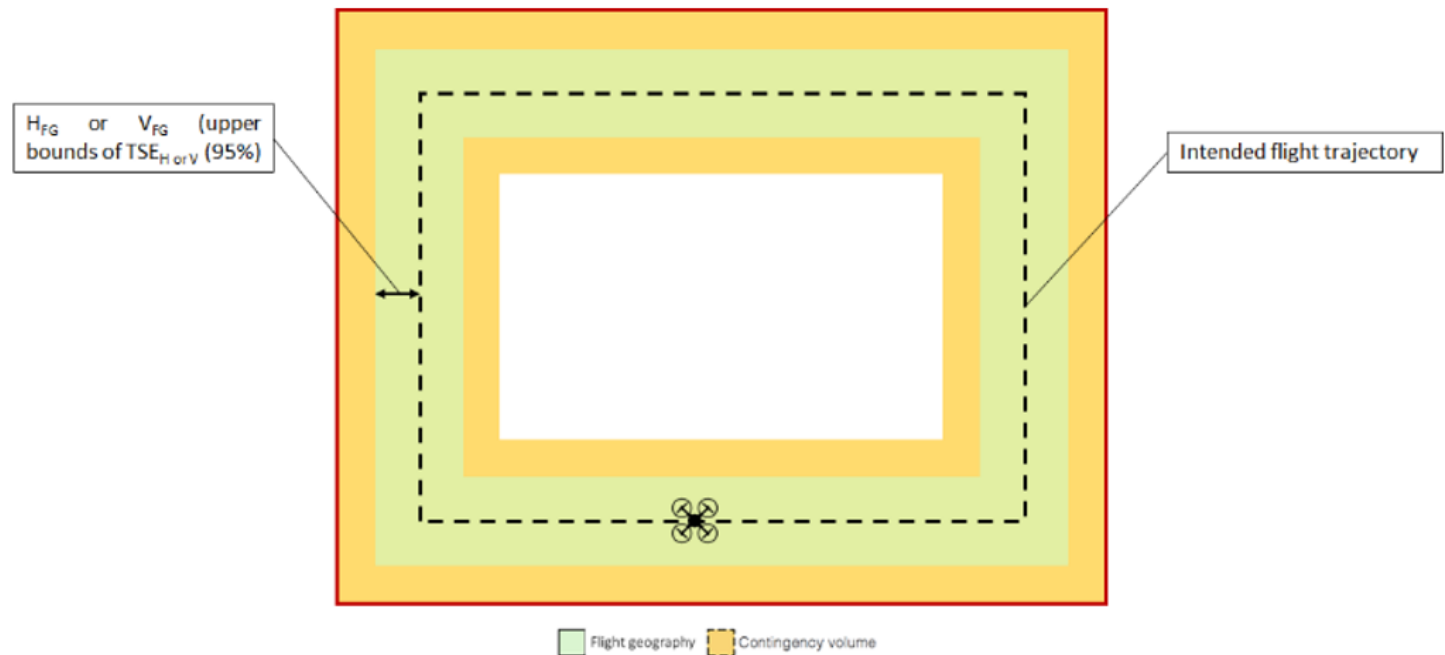
## Approach to guide UAS operators

- Support in the dimensioning of Operational Volume (FG + CV)

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## OPERATIONAL VOLUME: FLIGHT GEOGRAPHY DIMENSIONING



### Horizontal plane

$$H_{FG} = \text{Upper bound of } TSE_H(95\%) = 1.2 * \{ NSE_H(95\%) + FTE_H(95\%) \}$$

### Vertical component

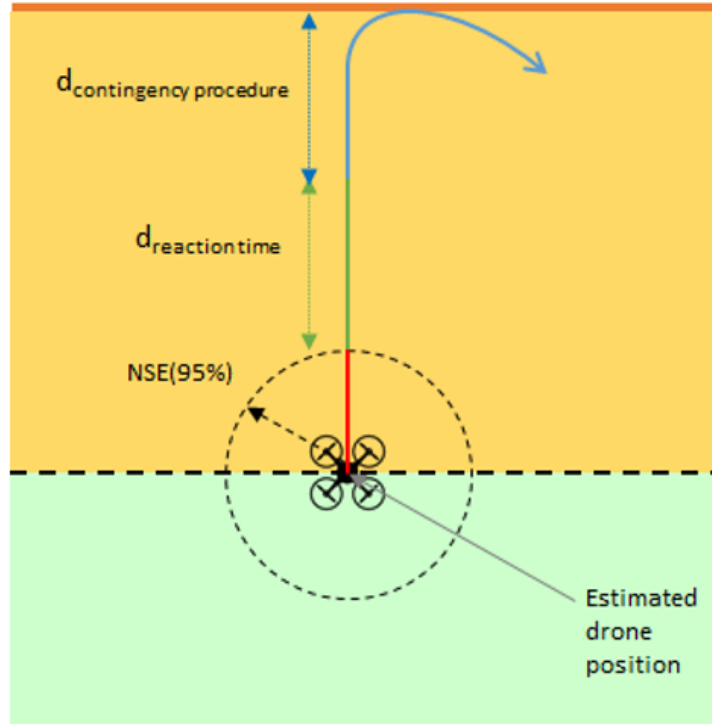
$$V_{FG} = \text{Upper bound of } TSE_V(95\%) = 1.2 * \{ NSE_H(95\%) + FTE_H(95\%) \}$$



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## OPERATIONAL VOLUME: CONTINGENCY VOLUME DIMENSIONING



Flight geography Contingency volume

### Horizontal plane

$$CV_H = NSE_H(95\%) + d_{reaction\ time} + d_{contingency\ procedure}$$

### Vertical component

$$CV_V = NSE_V(95\%) + d_{reaction\ time} + d_{contingency\ procedure}$$

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## Approach to guide UAS operators

- Recommendations to monitor and mitigate GNSS performance degradations
- Practical examples on how to apply the guidelines in EASA's STS-01 and STS-02 Standard Scenarios (Easy Access Rules for UAS (EU) 2019/947 and (EU) 2019/945)
- Complete description of the different GNSS constellations (global or regional), frequencies, services and performances

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## Next Steps

- Guidelines for Medium Risk Operations (SAIL III & IV):
  - Operational Scenarios
  - Threats on GNSS (based on scenarios)
  - Procedure to identify requirements to GNSS
  - Reference architectures of GNSS navigation solutions
  - GNSS Service provision needs
  - Requirements to fulfil OSO#13 for Medium Risk
- Expected publication in 2024

**Many thanks for your attention!**



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