



SLOVENSKI STANDARD

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Aeronavtika - Letalski sistemi brez posadke - 003. del: Zahteve glede geozavedanja

Aerospace series - Unmanned Aircraft Systems - Part 003: Geo-awareness requirements

Luft- und Raumfahrt - Unbemannte Luftfahrzeugsysteme - Teil 003: Anforderungen an das Geo-Sensibilisierungssystem

Série aérospatiale - Aéronefs télépilotes - Partie 003 : Exigences de géovigilance

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ICS:

49.020	Letala in vesoljska vozila na splošno	Aircraft and space vehicles in general
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English Version

**Aerospace series - Unmanned Aircraft Systems - Part 003:
Geo-awareness requirements**

Série aérospatiale - Aéronefs télépilotes - Partie 003 :
Exigences de géovigilance

Luft- und Raumfahrt - Unbemannte
Luftfahrzeugsysteme - Teil 003: Anforderungen an das
Geo-Sensibilisierungssystem

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ASD-STAN.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 4709-003:2020) has been prepared by the Aerospace and Defence Industries Association of Europe — Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this document has received the approval of the National Associations and the Official Services of the member countries of ASD-STAN, prior to its presentation to CEN.

This document is currently submitted to the ASD-STAN National Domain Ballot in parallel to the CEN Enquiry.

This document was originally reviewed by the Domain Technical Coordinator of ASD-STAN's Autonomous flying Domain.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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Introduction

The Commission Delegated Regulation (EU)2019/945 was published in March 2019. It applies on unmanned aircraft intended for use in the 'open' category, and on third-country operators of unmanned aircraft systems.

This document gives all Economic Operators (such as manufacturers, importers and distributors and their trade associations as well as bodies involved in the conformity assessment procedures) a viable way to prove compliance with the requirements laid out in the Delegated Act on unmanned aircraft.

Many organizations are involved in developing a range of general technical standards for electrical safety, EMC, environmental and a range of other standards to be applied to specific applications. For UAS the picture is complex but an acceptable means of compliance can be completed with existing technical standards and the use of electrical components that are intended to be incorporated into equipment and for which a risk assessment can be undertaken.

Based on its risk assessment, it is the manufacturer's responsibility to determine if the risk is acceptable. The acceptable level of a product's risk is determined in compliance with the safety objectives defined in the Delegated Act on unmanned aircraft.

The end user of this document assumes all responsibility for the safe application of the test methods. All relevant safety/quality procedures should be considered. Special consideration should be made when operating the UAS for evaluations. All local, state, federal, and country laws should be considered when operating UAS.

No patent applies to the requirement defined in this document.

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1 Scope

1.1 Applicability

This document provides means of compliance of the function “Geo-awareness” specified in Parts 2 to 4 of the Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft intended for use in the “open” category, and on third-country operators of unmanned aircraft systems and its annex.

The Geo-awareness is specified in Part 2 – articles (13) and (14) for Class 1 UASs, in Part 3 – articles (15) and (16) for Class 2 UASs and in Part 4 – articles (10) and (11) for Class 3 UASs.

This document specifies the minimum performance expected from this Geo-awareness function, without prescribing its design and implementation as far as possible.

Compliance with this document is recommended as one means of assuring that the Function will perform its intended sub-functions satisfactorily under all conditions normally encountered in routine aeronautical operation.

NOTE In the rest of the document, we will use “Function” to mean the object of this specification, and equipment to identify the entity implementing this Function in whatever form.

1.2 General description of the Geo-awareness function

Geo-awareness means a function that, based on the UAS Geographical data provided by Member States (as specified in the Commission Implementing Regulation (EU) 2019-947-article 15), detects a potential breach of airspace limitations and alerts the remote pilots so that they can take effective immediate and action to prevent that breach.

The Geo-awareness function manages only the following conditions:

- Horizontal and vertical boundaries of UGZ;
- Time applicability of the UGZ;
- Optional: notification or authorization required by UGZ.

Other conditions defined in the Commission Implementing Regulation (EU) 2019-947-article 15-1 are not expressed yet by Member States and will not be treated in this version of the document.

Optionally a function of automatic alteration of the trajectory can complete the function Geo-awareness by preventing the UA to penetrate a restricted zone (UAS geographical zone) by engaging an adequate manoeuvre without any pilot action. The overall function is called “Geofencing”.

The function can be realized as a set of hardware and/or software components inside the UAS, in the remote pilot station and/or on board the UA itself, which are fed by data about the applicable UAS geographical zones for the requested zone of operation, provided by a ground service called in our document “UAS geographical zone data service”.

The document is structured as follows:

- Clauses 1 to 3 of this document provide information required to understand the need for the Function characteristics and tests defined in the remaining clauses. It describes typical Function applications and operational objectives and is the basis for the performance criteria stated in Clause 4 to Clause 5. Definitions essential to proper understanding of this document are provided in Clause 3.
- Clause 4 contains general design requirements.

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- Clause 5 contains the requirements for the Geo-awareness function, defining performance under standard operating conditions.
- Clause 6 contains the requirements for the Automatic Geofencing function, defining performance under standard operating conditions.
- Clause 7 describes recommended test procedures for demonstrating compliance with Clause 5 and Clause 6.

Operational performance standards for functions or components that refer to equipment capabilities that exceed the stated minimum requirements are identified as optional features. Performance requirements and associated test procedures should be developed for these optional features.

1.3 Assumptions

It is assumed that the UAS is operated in compliance with the requirements defined in the Commission Implementing Regulation (EU) 2019-947– Annex Part A, especially UAS.OPEN.050 (5) and UAS.OPEN.060 (1)(b) concerning the use of up-to-date UGZ data before flight.

It is assumed that the UA is operated in compliance with the conditions defined in the Commission Implementing Regulation (EU) 2019-947– article 4 (condition for Open category of UAS operations).

It is assumed that the update of UAS geographical zones is not required during the flight.

It is assumed that the quality of the UGZ data provided and received by the UAS are verified for validity against the required data model.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

prEN 4709-001:2019, Aerospace series — Unmanned Aircraft systems — Part 1: Product requirements and verification ¹⁾

3 Terms, definitions, symbols, and abbreviated terms

For the purposes of this document the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1**Acceptable Means of Compliance****AMC**

non-binding standards adopted by EASA to illustrate means to establish compliance with the Basic Regulation and its Implementing Rules

¹⁾ Published as ASD-STAN Standard at the date of publication of this document by AeroSpace and Defence industries Association of Europe — Standardization (ASD-STAN), <http://www.asd-stan.org/>.

3.2**advisory alert**

alert for conditions that require awareness and may require subsequent response by the UAS remote pilot

3.3**automatic flight**

flight following pre-programmed instructions, loaded in the unmanned aircraft (UA) flight control system that the UA executes

3.4**caution alert**

alert for conditions that require immediate awareness and subsequent response by the UAS remote pilot

3.5**command unit**

see Remote Pilot Station

3.6**Direct Remote Identification****DRI**

system that ensures the local broadcast of information about an unmanned aircraft in operation, including the marking of the unmanned aircraft, so that this information can be obtained without physical access to the unmanned aircraft

3.7**equipment to control unmanned aircraft remotely**

instrument, equipment, mechanism, apparatus, appurtenance, software or accessory that is necessary for the safe operation of a UA, other than a part, and which is not carried on board that UA

3.8**geographical information distributor**

entity responsible for providing data to the end-user (may not be the originator of the data) (consistent with U-Space Service Provider USSP)

3.9**Global Navigation Satellite System****GNSS**

positioning system based on one or several satellite constellations

3.10**Remote Pilot****RP**

natural person responsible for safely conducting the flight of a UA by operating its flight controls, either manually or semi-manually or, when the UA flies automatically, by monitoring its course and remaining able to intervene and change its course at any time

3.11**Remote Pilot Station****RPS**

component of the UAS containing the equipment used to control the UA

prEN 4709-003:2020 (E)**3.12****return home**

fail safe system that upon loss of data link will direct the UA back to predefined home position

3.13**Unmanned aircraft****UA**

aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board

3.14**Unmanned Aircraft System****UAS**

UA and its associated elements which are operated with no pilot on board

3.15**UAS Geographical Zone****UGZ**

Geographical zone defined in 3D, including attributes defining the applicability and conditions of restriction of flight

3.16**UAS Operator**

legal or natural person who operates or intends to operate one or more UAS

3.17**UGZ Data Service**

Data distribution Service to which an UAS operator can connect to access to geographical zones applying to the geo-awareness function

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3.18**UGZ Data Service**

Data distribution Service to which an UAS operator can connect to access to geographical zones applying to the geo-awareness function

3.19**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

3.20**Warning Alert**

alert for conditions that require immediate awareness and immediate response by the UAS remote pilot

4 General Design Requirements**4.1 Intended function**

The equipment implementing the Geo-awareness Function shall perform its intended sub-function(s), as defined by the manufacturer.

4.2 Effects of tests

Unless otherwise stated, the design of the equipment shall be such that, during and after the application of the specified tests, no condition exists which would be detrimental to the subsequent performance of the equipment.

4.3 Functional interfaces

The protocol to get the UAS geographical zone data as input to the Geo-awareness function, the associated data format, the expected characteristics and properties of these data shall be compliant to the data model and specification of services described in the Acceptable Means of Compliance²⁾.

4.4 Reliability, availability, and integrity

No reliability or availability requirements are set on the Geo-awareness function.

4.5 Maintainability

No requirement is set on the maintainability of the Geo-awareness function.

4.6 Software and hardware management design

No requirement is set on the software and /or hardware design assurance.

5 Requirements for the Geo-awareness function

5.1 Alerting on imminent Breach of Restriction

5.1.1 General

The Geo-awareness function shall provide the remote pilot with a warning alert when a potential or actual breach of UAS geographical zones is detected, either in horizontal plane or vertical axis.

The alert should be provided by one or several of the following means, e.g.:

- Aural signal;
- Visual light on the Command Station;
- Visual message on the Command Station;
- Depiction of the potential point of conflict with the UGZ;
- Vibration to the pilot on the command unit.

The Geo-awareness function should provide the remote pilot with a geographical depiction of the current horizontal and vertical UA position and the UAS geographical zones, to enable the pilot to understand the situation and anticipate manoeuvres.

The Geo-awareness function shall be able to manage any UAS geographical zone as described in the data format (see 5.3), with the following limits in size [200 m², 1 000 000 km²] and horizontal shape [concave parts or capes with sharp angles not less than 10°, convex parts or bays with sharp angles not less than 10°].

²⁾ Related to Commission Implementing Regulation (EU) 2019-947.

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If more than one restriction or condition is set at the same position, the Geo-awareness function shall consider the most restrictive one, in term of penetration and data capture prohibition.

Information messages associated to multiple zones shall be displayed simultaneously, in a clear manner regarding the priority of messages.

As the geographical zone data (typically restrictions) are time-related, a caution alert shall be provided to the remote pilot when the current location is to become forbidden soon and will have to be exited.

- This caution alert should be provided soon enough to enable exit or allow safe landing before active restriction of the UGZ;
- It is also recommended to have an advisory alert before this last one (either 10 minutes or five times the caution anticipation time).

5.1.2 Management of Notification and Authorization

NOTE At the present time, no automatic notification or authorization management is in place or standardized.

In case of trend to enter into a UGZ subject to notification (to a given authority as defined in the UGZ data), such information shall be provided to the pilot. If not already done, it's the pilots' responsibility to send a notification. In case of impossibility to send the notification, the entry shall be considered as prohibited.

In case of trend entering a UGZ subject to Authorization (by a given authority as defined in the UGZ data), such information shall be provided to the pilot. It is the responsibility of the pilot to know if the authorization is already obtained. Till the authorization is not granted, the entry should be considered by the pilot as prohibited.

As the process of notification or authorization may not be automatic (not in place at this time) the UAS manufacturer shall allow the RP withdrawing/inhibiting the alarm by declaring that the operator has the permit to fly in this UGZ. This declaration will disable the Geo-awareness function for the given UGZ for the current flight. All such inhibitions shall be reset at the end of the flight.

The action of declaring the "permit to enter" (Notification/authorization) shall be recorded in the flight log (time of the confirmation, identification of the UGZ)

5.2 Time/Threshold to Alert

The time or threshold to alert shall be defined by the manufacturer in order to assist the RP in its task to prevent the UA from penetrating into the UGZ.

Margin on limits for the time or threshold to alert (meaning additional distance to the UGZ border) shall be included, either by setting default margins or according to data available from the UAS.

Guidelines are provided in Annex A for the design of the alert and its margins.

5.3 Loading

The Geo-awareness function shall load the data defining the UAS geographical zones provided by authoritative sources using methods and/or services which meet the applicable regulations, using the data model and interface specification defined in the AMC&GM to Commission Implementing Regulation (EU) 2019-947.

Data with degraded integrity (data loaded not consistent with data emitted by the UGZ data distributor) shall not be used and considered not loaded.

The data model defines which data are mandatory or optional, and what format/values of attributes shall be expected.