SLOVENSKI STANDARD
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Aeronavtika - Letalski sistemi brez posadke - 002. del: Neposredna identifikacija na daljavo

Aerospace series - Unmanned Aircraft Systems - Part 002: Direct Remote identification

Luft- und Raumfahrt - Unbemannte Luftfahrzeugsysteme - Teil 002: Anforderungen an die direkte Fernidentifizierung

Série aérospatiale - Aéronefs télépilotés - Partie 002 : Exigences d'identification directe à distance

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Luft- und Raumfahrt - Unbemannte Luftfahrzeugsysteme - Teil 002: Anforderungen an die direkte Fernidentifizierung

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.

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

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Ref. No. prEN 4709-002:2020 E

Contents

Page

European foreword

This document (prEN 4709-002:2020) 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.

Introduction

EASA published the Commission Delegated Regulation (EU) 2019/945 of 12th March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems.

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.

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 of 12th, March 2019 find commonality in compliance methods.

It is the manufacturer's responsibility to determine, based on his risk assessment, whether the risk is acceptable. Regarding what is an acceptable level of risk for a product, this is determined by the compliance with the safety objectives defined in the Delegated Act of 12th, March 2019.

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

For repeatability, it is assumed that environmental conditions (temperature, wind, pressure, humidity) are recorded during any tests and it is further assumed tests conducted unless otherwise noted within the following conditions: Temperature – 18-28 °C, Pressure – Atmospheric from sea level up to 2 000 m, Humidity – 10-60 %, Wind Speed – Calm (less than 0,3 m/s or zero on the Beaufort Scale).

1 Scope

This document will provide means of compliance to cover the "Direct Remote Identification" system for UA of the "open Category". This document applies to Class 1 to Class 3 and Add-On.

The "direct remote identification" means a system that ensures the local broadcast of information about a UA in operation.

More specifically, this document will address drone capability to be identified during the whole duration of the flight, in real time and with no specific connectivity or ground infrastructure link, by existing mobile devices when within the broadcasting range. Such functionality, based on an open and documented transmission protocol (described in this document) and developed for security purposes and social acceptance, can be used by law enforcement people, critical infrastructure managers, and general public to get an instantaneous information on the drone flying around, providing various information such as UA identifier, UA navigation data and operational status, UAS Operator identifier and position as defined in the Delegated Regulation (EU) 2019/945.

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.

ETSI EN 301489-1, *ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility*

ETSI EN 301489-17, *ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility*

ETSI EN 300328, *Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

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/

3.1.1
Direct Remote Identification
DRI
system that ensures the local broadcast of information about a UA in operation, including the marking of the UA, so that this information can be obtained without physical access to the UA

3.1.2
UAS Operator Registration Number
identifier delivered by the National Aviation Authority, upon UAS operator eRegistration procedure

Note 1 to entry: In this document UAS Operator Registration Number is equivalent to UAS Operator ID, UAS Operator Registration ID

3.2 List of abbreviated terms

Add-on	A standalone Direct Remote ID broadcast device integrating a GNSS function, a barometric function, a communication function, being able to provide position, height, speed over ground, track clockwise with true north, of the UA, and the remote pilote position or it's take-off position.
AGL	Above Ground Level
ASD-STAN	Aerospace and Defence Industries Association of Europe - Standardization
DRI	Direct Remote ID
EASA	European Union Aviation Safety Agency
EC	European Commission
EMC	Electro-Magnetic Compliance
ft	feet
GCS	Ground Control Station
ID	Identification
IEC	International Electrotechnical Commission
ISO	Internation Organization for Standardization
kts	knots
NM	Nautical Miles
MS	Member State
RID	Remote ID Display
SDF	Service Discovery Frame
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
UTC	Coordinated Universal Time
UTM	UAS Traffic Management
UUID	Universally Unique Identifier based on IETF RFC4122
C0, C1, C2, C3, C4	Class 0 to Class 4 that the UA belongs to "Open" Category
C5, C6	Class 5 to Class 6 that the UA belongs to "Specific" Category
C2 link	Command and Control link between UA and the GCS
DRI	Direct Remote Identification
TU	Time Unit (1 TU = 1024 microsecond)

4 General design requirements

4.1 Privacy and personal data of remote pilots and drone operators

Following European Commission consultation to EDPS (European Data Protection Supervisor), EDPS delivered an opinion about the Communication from the Commission to the European Parliament and the Council on “A new era for aviation - Opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner”, the 26th of November 2014.

The EDPS recommends that the Commission encourages RPAS manufacturers to implement privacy by design and by default and data controllers to carry out data protection impact assessments where processing operations present specific risks to the rights and freedoms of data subjects (ie citizens) by virtue of their nature, scope or purposes. And to encourage measures that would facilitate identification of the controller of an RPAS. This last recommendation will be managed in the Delegated Regulation (EU) 2019/945, with the Direct Remote Identification feature requirement for UA and Add-on. The DRI data messages shall be then transmitted in plain text without encryption, such as the UA unique serial number, the UAS Operator Registration Number, the time-stamp, the position, the height, the speed, the direction, the emergency status of the UA, and the position of the remote pilot. As a consequence, this document does not cover the Remote Pilot/Operator privacy and data protection by design, and by default.

4.2 Conceptual overview

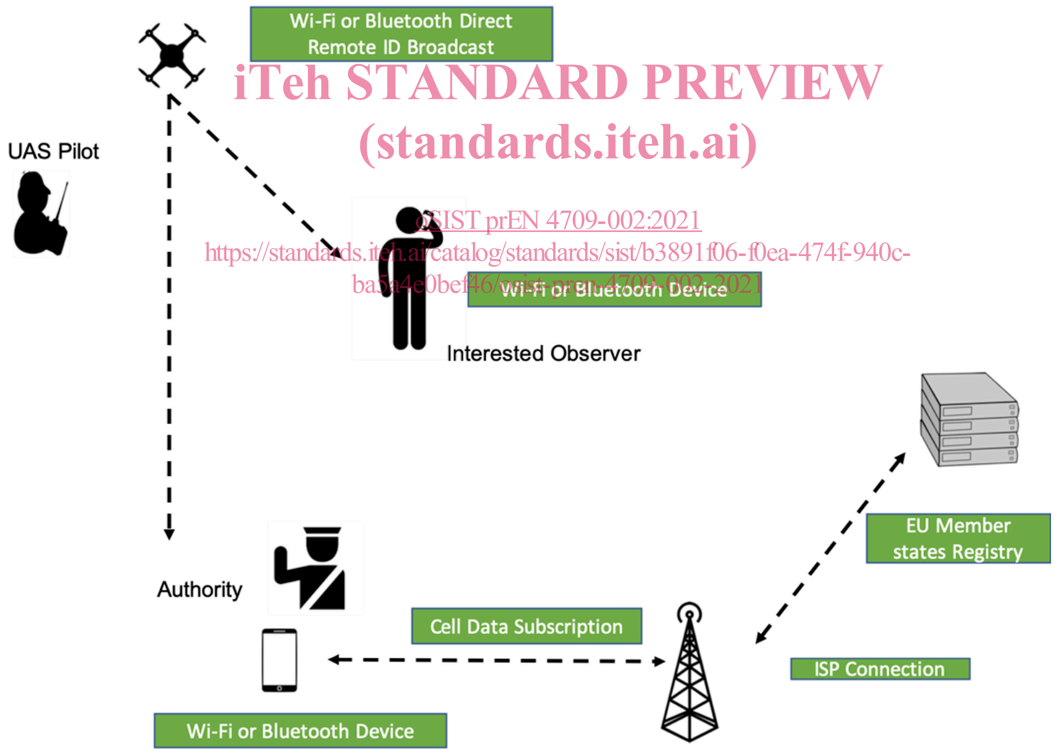

Figure 1 — DRI conceptual overview diagram

One or more UA are operating and broadcasting Direct Remote ID data. An interested observer wants to identify the UA.

The UA continuously broadcasts Remote ID data using one of the methods described in Clause 5. The UA is controlled locally by the Remote Pilot and has no interface with a U-Space service provider.

The interested observer accesses a Remote ID Display Application (RID App). This display application shows UA location and remote Pilot position or take-off position if not available, and a near-real-time trail of position reports on a map, and associated identification information when a particular UA is selected.

When the interested observer opens the Remote ID software on a receiver mobile device (such as smartphone), Remote ID data are acquired as follows:

1. The broadcast UA is transmitting its Remote ID advertisements continuously. The receiver mobile device (such as smartphone) uses its internal radios to listen for the advertisements from the UA, extract the Remote ID data, and show the location of the UA on the map and the position of the pilot, or the take-off position according to requirement matrix. As new position updates are received, the prior position reports become part of a near-real-time trail representing where the UA most recently flew.

2. The interested observer selects the UA symbols for the Broadcast UA on the map and views the corresponding ID information.

3. The interested observer closes the mobile application. After a period of time, the Remote ID software discards the information.

4.3 Mandatory information

The Direct Remote ID system shall broadcast locally the mandatory information listed below:

— The UAS operator registration number.

— The unique serial number of the UA (or exclusively the Add-on) compliant with standard ANSI/CTA-2063-A-2019.

— The time stamp, the geographical position of the UA and its height above the ground or its take-off point.

— The route course measured clockwise from true north and ground speed of the UA.

— The geographical position of the remote pilot, or if not available, the geographical position of the take-off point.

— The UAS emergency status for Class C1, C2, C3. Not required for Add-on.

The conformity to this requirement shall be proved per experiment method described in 6.2, “DRI Generic Test Procedure”.

4.4 Security of the DRI system

The Direct Remote Identification system shall reduce the ability of tampering the functionality of the direct remote identification system.

The Direct Remote Identification system is the on-board feature in the UA/Add-on that is formatting and transmitting over the air the DRI information to a compatible receiver mobile device.

The scope of this document does not include the receiver mobile device; thus, this security requirement does not apply to the receiver mobile device itself.

Specific considerations of this document regarding the security topic:

1. The UA and the Add-on come with a unique serial number; this number will be loaded at factory level and shall not be modified anymore afterwards. The protection of the unique serial number of the UA/Add-on shall be done by design. The serial number shall be stored in a secure memory area.

2. This document does not include the capability to store securely the UAS operator registration number.

3. This document does not include the capability to protect communication against user and/or malicious modification of sensors output values involved in DRI information computation (like GNSS, Barometer, Magnetometer, and Accelerometer…) and DRI radio-transmitter interface.

4. This document does not include the capability to protect against user and/or malicious software and hardware modification, the geographical position, the timestamp, the height, the take-off position, the speed, the route course, of the UA/Add-on.

5. This document does not include the capability to ensure DRI data integrity verification, the capability to ensure detection that the UA/Add-on's serial number is unique, when received by the Receiver Mobile Device. However, to provide such capabilities, a Digital Signature may be added to the DRI message.

6. This document does not include the capability to ensure DRI data received by the receiver mobile device are genuine and come from a UA/Add-on belonging to a registered UAS Operator, the capability to ensure detection of spoofing of the UAS Operator Registration Number. However, to provide such capabilities, a Digital Signature may be added to the DRI message.

The conformity to requirement "1." shall be proved per OEM's design documentation.

4.5 Upload of UAS operator registration number

UAS class C1, C2, C3 and the DRI Add-on shall have a direct remote identification that allows the upload of the UAS operator registration number and exclusively following the process provided by the registration system.

The DRI system shall not accept to upload an invalid UAS operator registration number.

a) As shown in Figure 2, the unique UAS operator registration number issued by the Member States should consist of 16 alphanumeric characters in total organized as the following:

   1) three first alphanumeric characters corresponding to the ISO 3166 Alpha-3 code of the MS of registration (upper case only); and

   2) twelve following characters randomly generated consisting of alphanumeric characters (lower cases only).

   3) one character corresponding to checksum generated in line with point (c).

b) MS should randomly generate additional three alphanumeric characters (lower cases only). They will be separated from the sixteen characters defined in (a) by a hyphen "-" (ASCII code DEC 45).

c) MS should generate a checksum by applying the Luhn mod-36 algorithm to the fifteen alphanumeric characters resulting from the concatenation in the following order of:

   1) the twelve last alphanumeric characters of the UAS operator registration number defined in (a)(2); and

   2) the three randomly "xyz" generated additional alphanumeric characters defined in (b)

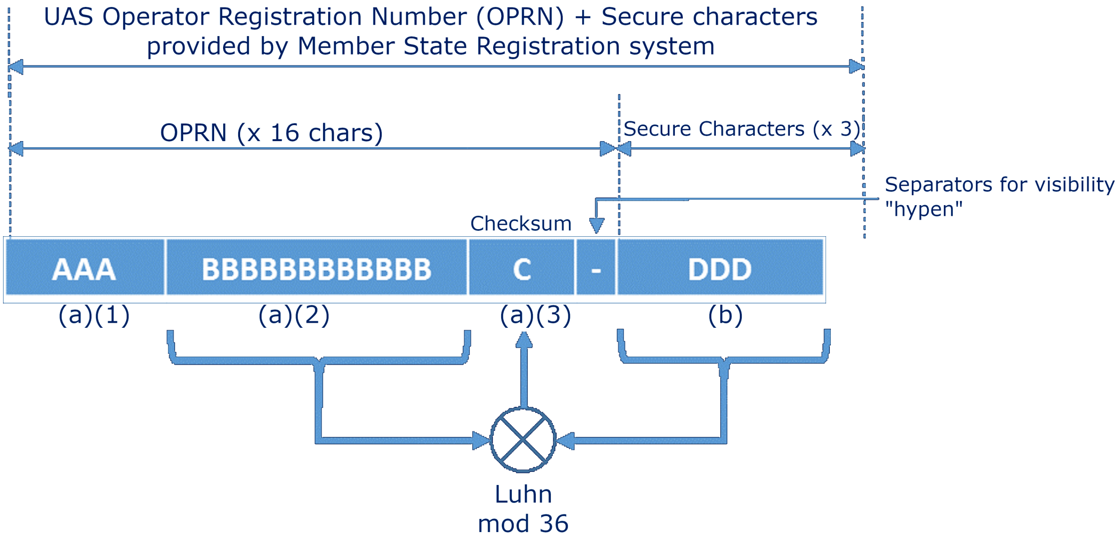

Figure 2 — UAS Operator Registration Number format

For the Luhn mod-36 algorithm, the mapping characters to code-points starts with the digits, then the lower-case letters as shown below:

Character	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*a*	*b*	*c*	*d*	*e*	*f*	*g*	*h*
Code-point	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Character	*i*	*j*	*k*	*l*	*m*	*n*	*o*	*p*	*q*	*r*	*s*	*t*	*u*	*v*	*w*	*x*	*y*	*z*
Code-point	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

An example of the UAS operator registration number is: "FIN87astrdge12k8" where:

- *'FIN' is the ISO 3166 Alpha-3 code of Finland,*
- *'87astrdge12k' are an example of the twelve (12) alphanumeric characters, as specified in (a)(2) in AMC1 Article 14(6) Registration of UAS operators and 'certified' UAS,*
- *'8' is the checksum value, i.e. the result of the application of the Luhn mod-36 algorithm to the 15 alphanumeric characters resulting from the concatenation of the 12 last alphanumeric characters of the UAS operator registration number defined in (a)(2) and the 3 randomly generated additional alphanumeric characters defined in (b) (i.e. 87astrdge12kxyz). Please note that the three alphanumeric characters corresponding to ISO 3166 Alpha-3 code, (in the example, the string "FIN"), are not used as a part of the checksum calculation, nor the hyphen character "-".*

An example of the full string point (e) of the AMC1 Article 14(6), to be provided by a Member State is 'FIN87astrdge12k8-xyz' where:

- *'FIN87astrdge12k8' is the UAS operator registration number*
- *'xyz' are an example of 3 randomly generated alphanumeric characters.*

'8' is the checksum provided value, to be verified during the UAS operator registration number upload procedure;

The UAS operator registration number information consists of the UAS Operator Registration Number (OPRN) the public part including a checksum character, and the three randomly generated Secure Characters, the private part. Both parts are delivered to the operator from the Member State registration system. The intention is that both parts are entered into the DRI System when uploading the operator registration number. The DRI System will use both parts to recalculate a checksum on its side and check the match.

However, the DRI System will only broadcast the public part (including the checksum). The private part is not stored in the UA and is not broadcast.

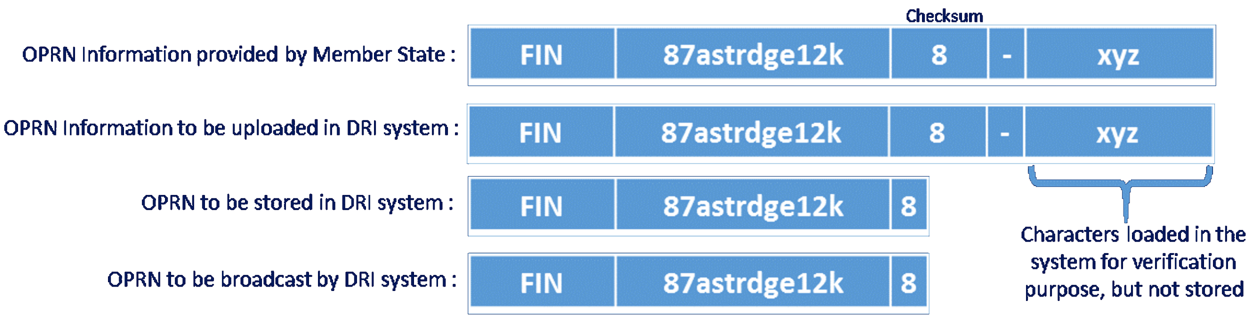

Figure 3 — UAS Operator Registration Number (OPRN) public and private parts

In the example used above, the public part is the string “FIN87astrdge12k8” and the private part is the string “xyz”.

Example of application of the Luhn mod-36 algorithm to the following 15 alphanumeric characters “87astrdge12kxyz”:

Character	8	7	a	s	t	r	d	g	e	1	2	k	**x**	**y**	**z**
Code-point	8	7	10	28	29	27	13	16	14	1	2	20	33	34	35
Double	16 (base 10) g (base 36)		20 (base 10) k (base 36)		58 (base 10) 1m (base 36)		26 (base 10) q (base 36)		28 (base 10) s (base 36)		4 (base 10) 4 (base 36)		66 (base 10) 1u (base 36)		70 (base 10) 1y (base 36)
Reduce	16	7	20	28	1+22	27	26	16	28	1	4	20	1+30	34	1+34
Sum of digits	16	7	20	28	23	27	26	16	28	1	4	20	31	34	35

Sum of digits = 16 + 7 + 20 + 28 + 23 + 27 + 26 + 16 + 28 + 1 + 4 + 20 + 31 + 34 + 35 = 316.

Thus 8 has to be added to 316 to get the number 324 so that 324 mod 36 = 0.

Result: checksum = 8

Another example of application of the Luhn mod-36 algorithm to the following 15 alphanumeric characters “13azertyuiopabc”:

Sum of digit = 2 + 3 + 20 + 35 + 28 + 27 + 23 + 34 + 25 + 18 + 13 + 25 + 20 + 11 + 24 = 308

Result: checksum = g

A dedicated Human Interface will be necessary to allow the user to enter in the system, the UAS operator registration number and the secure characters delivered by the member state at the registration phase.

For the Add-on, a specific application shall be provided to allow users to enter the UAS Operator ID, check the consistency of the number, and set it in the device.

Based on the example above, the diagram hereafter describes the procedure to be implemented by the UAS Direct Remote ID function or the Add-On:

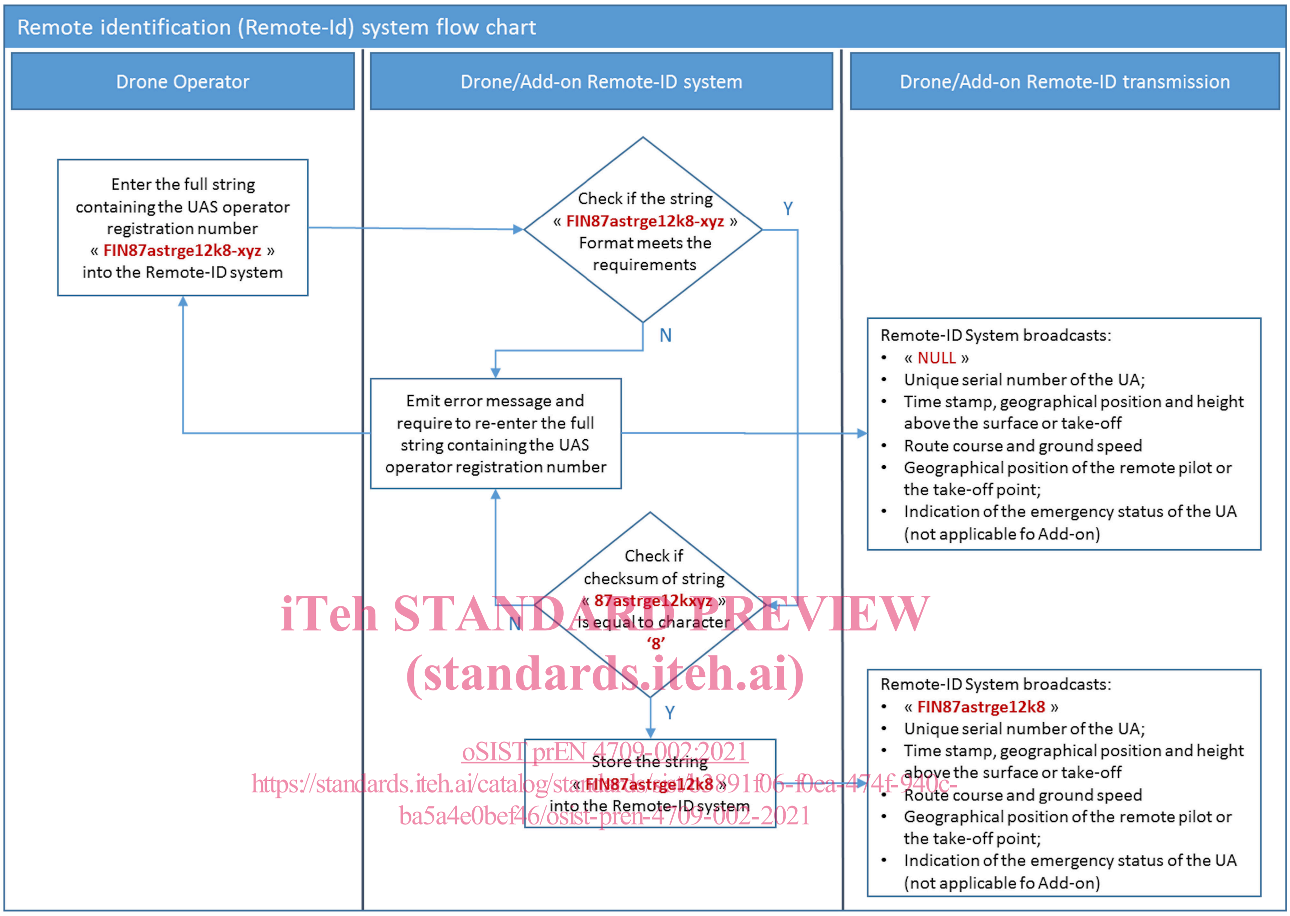

Figure 4 — UAS Operator Registration management flow

When an authority wishes to verify the broadcasted UAS operator registration number, the authority will have special access to the registration system for obtaining the private part. By recalculating the checksum over the public and the private part and comparing against the checksum that was broadcast from the UA, it will be possible to determine whether the broadcasted registration number is valid or not.

The conformity to this requirement shall be proved per experiment method described in 6.2 "DRI Generic Test Procedure".

4.6 Performance Requirements

This document covers the power emission, periodicity of data mission, and range.

However, as radio-transmitting equipment, DRI system shall comply with relevant standards on radio-transmitting equipment, such as: ETSI EN 301489-1, ETSI EN 301489-17, ETSI EN 300328. For output power emission, refer to 5.4. For emission directivity, refer to 5.5.

Direct Remote Identification information shall be received by existing mobile receiver device (such as smartphone).

Direct Remote Identification information shall be broadcasted periodically in real-time to the Mobile receiver device. For update rates, refer to 5.6.