

# **EUROCONTROL Specification for Surveillance Data Exchange**

## **ASTERIX Part 29 Category 129 UAS Identification Reports**

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This document specifies the contents of ASTERIX Category 129 reports used for the transmission of UAS Identification Reports.			
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## **DOCUMENT APPROVAL**

This document has been approved by the ASTERIX Maintenance Group (AMG).

For management approval of the complete set of ASTERIX documentation refer to Part 1.

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## **1. INTRODUCTION**

### **1.1 Scope of ASTERIX Category 129**

This document describes the application of ASTERIX to Unmanned Aircraft Systems (UAS) Identification messages. They are used to transmit an identification code for the UAS together with its position.

This document defines the data out of Category 129.

## **2. REFERENCES**

### **2.1 General**

The following Documents and Standards contain provisions which, through references in this text, constitute provisions of this EUROCONTROL Standard Document.

At the time of publication of this EUROCONTROL Standard Document, the editions indicated for the referenced documents and standards were valid.

Any revision of the referenced ICAO Documents shall be immediately taken into account to revise this EUROCONTROL Standard Document.

Revisions of the other referenced documents shall not form part of the provisions of this EUROCONTROL Standard Document until they are formally reviewed and incorporated into this EUROCONTROL Standard Document.

In the case of a conflict between the requirements of this EUROCONTROL Standard Document and the contents of the other referenced documents, this EUROCONTROL Standard Document shall take precedence.

### **2.2 Reference Documents**

- 1) EUROCONTROL Specification SPEC-0149, edition 2.4, 24 October 2016  
“EUROCONTROL Specification for Surveillance Data Exchange – Part 1 All Purpose Structured EUROCONTROL Surveillance Information Exchange – ASTERIX”.



### 3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

#### 3.1 Definitions

For the purposes of this EUROCONTROL Document, the following definitions shall apply:

<b>Catalogue of Data Items:</b>	List of all the possible Data Items of each Data Category describing the Data Items by their reference, structure, size and units (where applicable).
<b>Data Category:</b>	Classification of the data in order to permit inter alia an easy identification.
<b>Data Field:</b>	Physical implementation for the purpose of communication of a Data Item, it is associated with a unique Field Reference Number and is the smallest unit of transmitted information.
<b>Data Item:</b>	The smallest unit of information in each Data Category.
<b>Record:</b>	A collection of transmitted Data Fields of the same category preceded by a Field Specification field, signalling the presence/absence of the various Data Fields.
<b>User Application Profile:</b>	The mechanism for assigning Data Items to Data Fields, and containing all necessary information which needs to be standardised for the successful encoding and decoding of the reports.

### 3.2 Acronyms and Abbreviations

For the purposes of this EUROCONTROL Document, the following shall apply:

°	Degree (angle)
<b>AGL</b>	Above Ground Level
<b>AMG</b>	ASTERIX Maintenance Group
<b>ASTERIX</b>	All Purpose <b>S</b> TRuctured EUROCONTROL su <b>R</b> veillance In <b>F</b> ormation <b>E</b> Xchange
<b>CAT</b>	Data Category
<b>FRN</b>	Field Reference Number
<b>FSPEC</b>	Field Specification
<b>FX</b>	Field Extension Indicator
<b>ICAO</b>	International Civil Aviation Organization
<b>LEN</b>	Length Indicator
<b>LSB</b>	Least Significant Bit
<b>RE</b>	Reserved Expansion Indicator
<b>REP</b>	Field Repetition Indicator
<b>s</b>	second, unit of time
<b>SAC</b>	System Area Code
<b>SIC</b>	System Identification Code
<b>SP</b>	Special Purpose Indicator
<b>UAP</b>	User Application Profile (see Definitions )
<b>UAS</b>	Unmanned Aircraft Systems
<b>UTC</b>	Co-ordinated Universal Time
<b>WGS-84</b>	World Geodetic System 1984

## 4. GENERAL PRINCIPLES

### 4.1 General

ASTERIX Category 129, UAS Identification Reports, defines a message structure allowing transmitting the identification of a UAS as well as the aircraft's current position. This data is required in order to establish the basic principles of UTM (UAS Traffic Management) which shall enable the safe integration of UAS into non-segregated airspace.

### 4.2 Time Management

Time-stamping shall comply with ICAO Annex 5.

### 4.3 Unused Bits in Data Items

Decoders of ASTERIX data shall never assume and rely on specific settings of spare or unused bits. However in order to improve the readability of binary dumps of ASTERIX records, it is recommended to set all Spare bits to zero.

### 4.4 User Application Profile and Data Records

A single User Application Profile (UAP) is defined and shall be used for UAS Identification records.

The composition of ASTERIX records of Category 129 shall follow the rules as described in Edition 2.2 (or later) of Part 1 of the ASTERIX documentation, chapter 4.3.2.5.

Data records shall have the following layout.

CAT = 129	LEN	FSPEC	Data Item	Data Item	Data Item
-----------	-----	-------	-----------	-----------	-----------

where:

- Data Category (CAT) = 129, is a one-octet field indicating that the record contains information defined for Service Prediction Reports;
- Length Indicator (LEN) is a two-octet field indicating the total length in octets of the record, including the CAT and LEN fields;
- FSPEC is the Field Specification.

Note: Blocking of multiple records sharing a single CAT and LEN field pair is not supported for Category 129 records.

### 4.5 Composition of Records

Records shall be composed of Data Items assembled in the order defined by the Field Reference Number (FRN) in the associated UAP.

When sent, items shall always be transmitted in a record with the corresponding FSPEC Bits set to one.

## 5. LAYOUT OF REPORTS

### 5.1 Standard Data Items

The standardised Data Items which shall be used for the transmission of Service Prediction records are defined in Table 1 and described in the following pages.

**Table 1 - Data Items of Category 129**

<b>Data Item Reference Number</b>	<b>Description</b>	<b>Resolution</b>
I129/010	Data Source Identification	N.A.
I129/015	Data Destination Identification	N.A.
I129/020	UAS Manufacturer Identifier	N.A.
I129/030	UAS Model Identifier	N.A.
I129/040	UAS Serial Number	N.A.
I129/050	UAS Office Registration Country	N.A.
I129/070	Time of Day	1/128 s
I129/080	Position in WGS-84 Coordinates	2 cm
I129/090	Altitude above Mean Sea Level	0.1 m
I129/100	Altitude above Ground Level	0.1 m
I129/110	GNSS Signal Accuracy	1m
I129/120	Operational Risk Levels	N.A.

## 5.2 Description of Standard Data Items

### 5.2.1 Data Item I129/010, Data Source Identification

**Definition:** Identification of the station generating the ASTERIX record.

**Format:** Two-octet fixed length Data Item.

**Structure:**

Octet no. 1								Octet no. 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
SAC								SIC							

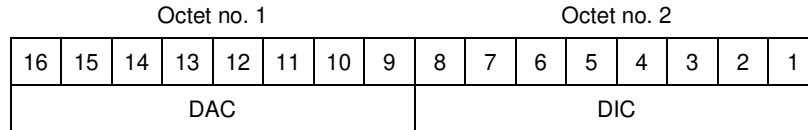
bits-16/9 (SAC) System Area Code

bits 8/1 (SIC) System Identification Code

**Notes:** For the airborne to ground transmission of category 129 messages it is recommended to set the SAC and SIC to "00/00".

For the ground to ground transmission of category 129 messages the allocation of SAC and SIC will be performed in line with chapter 6.4 of ASTERIX Part 1.

**Encoding Rule :** This item shall be present in every ASTERIX record.

**5.2.2 Data Item I129/015, Data Destination Identification****Definition:** Identification of the station to which the ASTERIX record is routed.**Format:** Two-octet fixed length Data Item.**Structure:**

bits-16/9 (DAC) Destination Area Code

bits 8/1 (DIC) Destination Identification Code

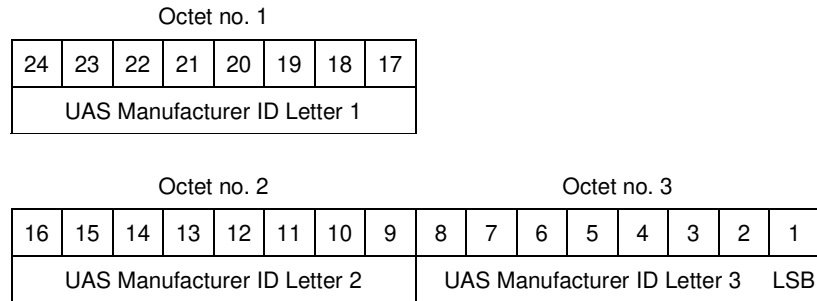
**Encoding Rule :** This item is optional.

### 5.2.3 Data Item I129/020, UAS Manufacturer Identifier

**Definition:** UAS Manufacturer Identifier in ASCII Characters

**Format:** Three-octet fixed length Data Item.

**Structure**



bits-24/17      ASCII Character 1 of the UAS Manufacturer ID

bits-19/9      ASCII Character 2 of the UAS Manufacturer ID

bits-8/1      ASCII Character 3 of the UAS Manufacturer ID

**Notes:** The UAS Manufacturer Identifier will be allocated by the organisation responsible for the management of the national UAS Identification scheme as identified in data item I129/050.

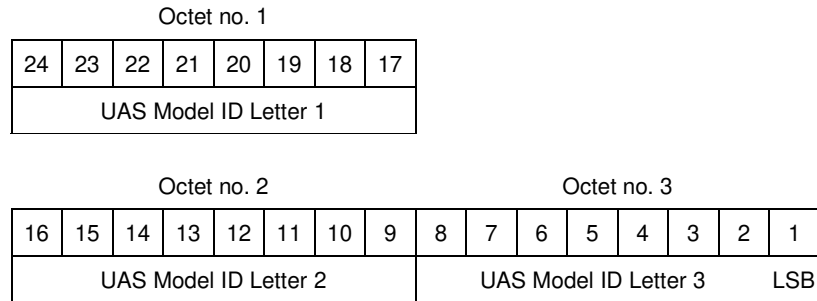
**Encoding Rule :** This item is optional. Although a UAS Identification scheme **shall** be provided in each Category 129 message, flexibility is given to implement other identification schemes in future by making this data item optional.

#### 5.2.4 Data Item I129/030, UAS Model Identifier

**Definition:** UAS Model Identifier in ASCII Characters

**Format:** Three-octet fixed length Data Item.

**Structure**



bits-24/17      ASCII Character 1 of the UAS Model ID

bits-16/9      ASCII Character 2 of the UAS Model ID

bits-8/1      ASCII Character 3 of the UAS Model ID

**Notes:** The UAS Model identifier will be allocated by the UAS manufacturer. The model ID has to be unique amongst all models of a manufacturer.

**Encoding Rule :** This item is optional. Although a UAS Identification scheme **shall** be provided in each Category 129 message, flexibility is given to implement other identification schemes in future by making this data item optional.

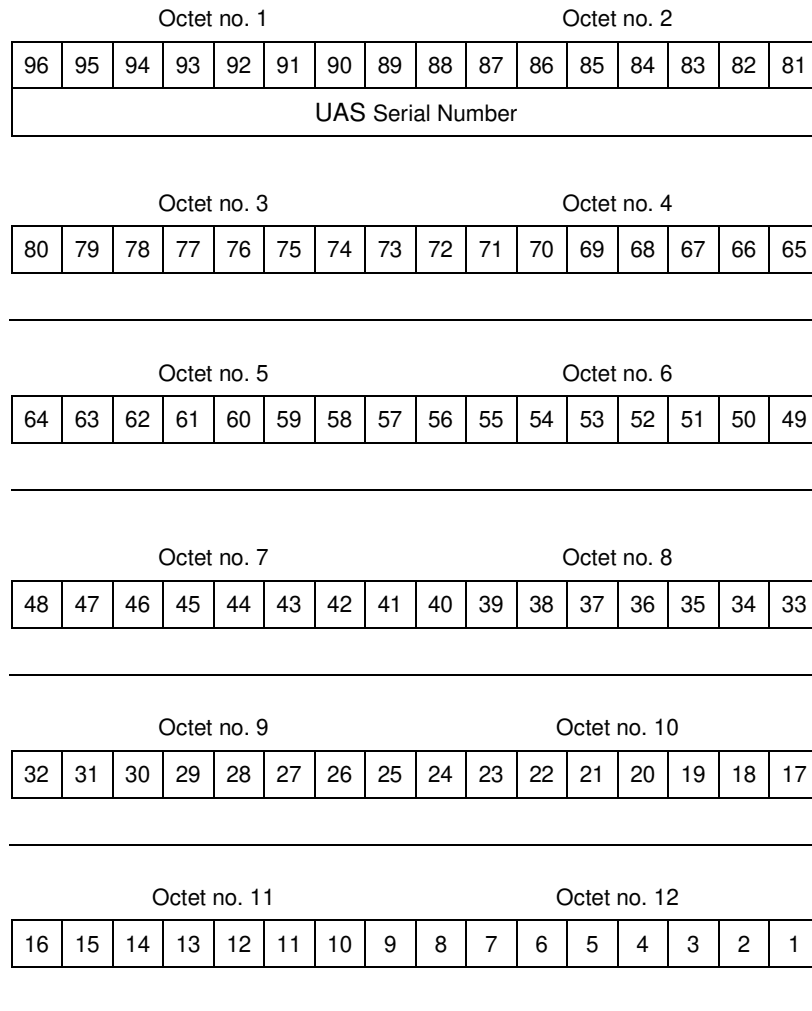


### 5.2.5 Data Item I129/040, UAS Serial Number

**Definition:** Serial Number of the UAS

**Format:** Twelve-octet fixed length Data Item.

**Structure**



bits-96/1 UAS Serial Number as allocated by the UAS manufacturer.

**Encoding Rule :** This item is optional. Although a UAS Identification scheme **shall** be provided in each Category 129 message, flexibility is given to implement other identification schemes in future by making this data item optional.

**5.2.6 Data Item I129/050, UAS Office Registration Country**

**Definition:** Country in which the “UAS Manufacturer Identifier”, Data Item I129/020, has been assigned.

**Format:** Two-octet fixed length Data Item.

**Structure:**

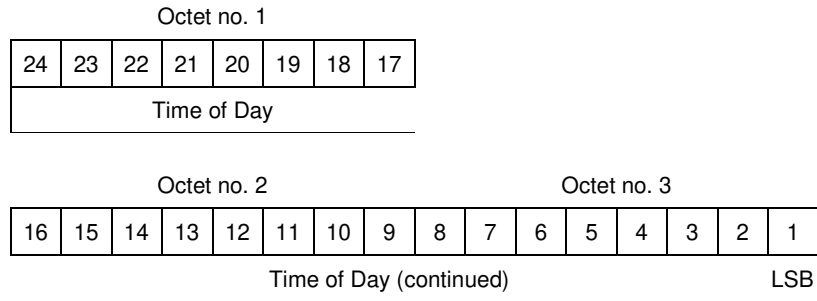
Octet no. 1								Octet no. 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
ORC Letter 1								ORC Letter 2							

bits-16/9      ASCII Character 1 of the Office Registration Country

bits-8/1      ASCII Character 2 of the Office Registration Country

**Note:** The Country Code **shall** follow ISO 3166-1 Alpha 2.

**Encoding Rule :** This item shall be present in every ASTERIX record.

**5.2.7 Data Item I129/070, Time of Day****Definition:** UTC time of transmission of this ASTERIX message.**Format:** Three-octet fixed length Data Item.**Structure**

bits-24/1      (TOD)      Time of Day (UTC) at which the ASTERIX message was transmitted  
 LSB =  $2^{-7}$  s = 1/128 s

**Note:** The TOD value is reset to zero at every midnight UTC.**Encoding Rule :** This item shall be present in every ASTERIX record.

### 5.2.8 Data Item I129/080, Position in WGS-84 Coordinates

**Definition :** Position in WGS-84 Co-ordinates.

**Format :** Eight-octet fixed length Data Item.

**Structure:**

Octet no. 1								Octet no. 2							
64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
Latitude in WGS – 84															

Octet no. 3								Octet no. 4							
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Latitude in WGS – 84														LSB	

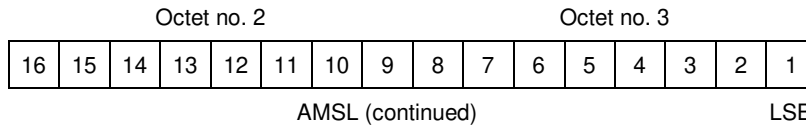
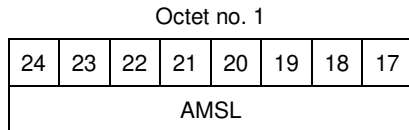
Octet no. 5								Octet no. 6							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Longitude in WGS – 84															

Octet no. 7								Octet no. 8							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Longitude in WGS – 84														LSB	

bits-64/33 (Latitude) In WGS.84 in two's complement.  
 Range  $-90 \leq \text{latitude} \leq 90$  deg.  
 LSB =  $180/2^{30}$  degrees.  
 =  $1.6764 * 10^{-07}$  degrees.  
 This corresponds to a resolution of at least 2 centimeters.

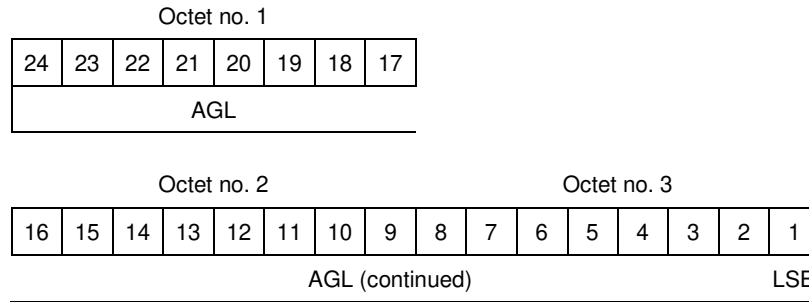
bits-32/1 (Longitude) In WGS.84 in two's complement.  
 Range  $-180 \leq \text{longitude} < 180$  deg.  
 LSB =  $180/2^{30}$  degrees  
 =  $1.6764 * 10^{-07}$  degrees.  
 This corresponds to a resolution of at least 2 centimeters.

**Encoding Rule :** This item shall be present in every ASTERIX record.

**5.2.9 Data Item I129/090, Altitude above Mean Sea Level****Definition:** Altitude above Mean Sea Level (AMSL).**Format:** Three-octet fixed length Data Item.**Structure**

bits-24/1      (AMSL)      Altitude above Mean Sea Level  
 LSB = 0.1 m

**Note:** Negative values (indicating an altitude below MSL) are encoded in Two's Complement.**Encoding Rule :** This item is optional. Either data item I129/090 or data item I129/100 **shall** be present in each ASTERIX record. Both data items **may** be present.

**5.2.10 Data Item I129/100, Altitude above Ground Level****Definition:** Altitude above Ground Level (AGL).**Format:** Three-octet fixed length Data Item.**Structure**

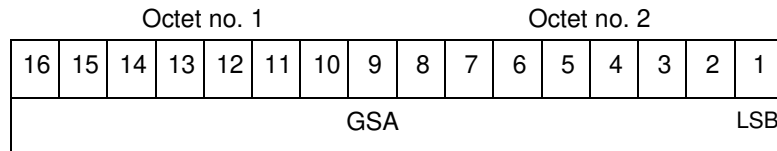
bits-24/1      (AGL)              Altitude above Ground Level  
LSB = 0.1 m

**Encoding Rule :** This item is optional. Either data item I129/090 or data item I129/100 **shall** be present in each ASTERIX record. Both data items **may** be present.

**5.2.11 Data Item I129/110, GNSS Signal Accuracy**

**Definition:** Accuracy of the signal of the Global Navigation Satellite System (GNSS) used for determination of the UAS horizontal position, based on the circular error probability (50% CEP).

**Format:** Two-octet fixed length Data Item.

**Structure:**

bits-16/1 (GSS)GNSS Signal Accuracy  
LSB = 1m

**Note:** a value of 0x0000 means “unknown or more than 255 m”.

**Encoding Rule :** This item is optional.

### 5.2.12 Data Item I129/120, Operational Risk Levels

**Definition:** Risk level of the UAS Operation following the “Specific Operations Risk Assessment (SORA)” methodology defined by JARUS and according to the “Introduction of a regulatory framework for the operation of unmanned aircraft” by EASA.

**Format:** Three-octet fixed length Data Item.

**Structure**

Octet no. 1							
8	7	6	5	4	3	2	1
UCC		ARC		AEC			

bits-8/7	UCC		UAS Certification Category
		= 0	Unknown
		= 1	Open Category
		= 2	Specific Category
		= 3	Certified Category

bits-6/5	ARC		Air Risk Category
		= 0	ARC = 1
		= 1	ARC = 2
		= 2	ARC = 3
		= 3	ARC = 4

bits-4/1	AEC		Airspace Encounter Category
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**Note:** The definition of ‘Air Risk Category’ and the ‘Airspace Encounter Category’ is contained in Annex A to this specification.

At the time of publication of this edition of the specification, this classification was still under development by EASA. Therefore a change in the classification scheme is possible and a re-classification in future editions may be required.

**Encoding Rule :** This item is optional.



### 5.3 Transmission of UAS Identification Reports

#### 5.3.1 User Application Profile for Category 129

The User Application Profile (UAP) of Table 3 shall be used for the transmission of Service Prediction reports.

**Table 2 – UAP for Service Prediction Reports**

FRN	Data Item	Information	Length
1	I129/010	Data Source Identification	2
2	I129/015	Data Destination Identification	2
3	I129/020	UAS Manufacturer Identifier	3
4	I129/030	UAS Model Identifier	3
5	I129/040	UAS Serial Number	12
6	I129/050	UAS Office Registration Country	2
7	I129/070	Time of Day	3
FX	-	Field Extension Indicator	-
8	I129/080	Position in WGS-84 Coordinates	8
9	I129/090	Altitude above Mean Sea Level	3
10	I129/100	Altitude above Ground Level	3
11	I129/110	GNSS Signal Accuracy	2
12	I129/120	Operational Risk Levels	1
13	SP	Special Purpose Field	1+
14	-	Not Used	-
FX	-	Not Used	-

**Notes:**

1. The first column indicates the Field Reference Number (FRN) associated to each Data Item used in the UAP
2. The fourth column gives the format and the length of each item, a stand-alone figure indicates the octet-count of a fixed-length Data Item, 1+ indicates a variable-length Data Item comprising a first part of 1 octet followed by n-octet extensions as necessary.

## ANNEX A. OPERATIONAL RISK LEVELS

This Annex contains the definition of the 'Air Risk Category' and the 'Airspace Encounter Category' as used in data item I129/120 'Operational Risk Levels'.

At the time of publication of this edition of the specification, this classification was still under development by EASA. Therefore a change in the classification scheme is possible and a re-classification in future editions may be required.

### Air Risk Categories:

1. **Air Risk Category 1:** describes an airspace where the risk of collision between a UAS and manned aircraft is acceptably safe without adding any collision mitigation. Requirements of ICAO Annex 2 section 3.2 ("See and Avoid"), SERA 3201, or 14 CFR 91.113 are not fulfilled and compliance with those requirements needs to be demonstrated to the Competent Authority.
2. **Air Risk Category 2:** describes an airspace where the risk of collision between a UAS and manned aircraft is very low. This ARC requires some sort of collision mitigation but the level and performance of the mitigation measures will be low.
3. **Air Risk Category 3:** describes an airspace where the risk of collision between a UAS and Manned aircraft is low to moderate.

### Airspace Encounter Categories

Airspace Encounter Categories (AEC)	Code	Operational Airspace
-	0	AEC unknown
<b>1</b>	1	Ops within Class A, B, C, D, E, or F Non-Airport Env. above 500 ft AGL
<b>2</b>	2	Ops within an Airport Environment above 500ft AGL
<b>3</b>	3	Ops within Class G airspace above 500ft AGL within Mode C Veil/TMZ
<b>4</b>	4	Ops within Class G airspace above 500ft AGL over Urban population
<b>5</b>	5	Ops in Class G airspace above 500ft AGL over Rural population
<b>6</b>	6	Ops within Class A, B, C, D, E, or F Non-Airport Env. below 500 ft AGL
<b>7</b>	7	Ops within an Airport Environment below 500ft AGL
<b>8</b>	8	Ops within Class G airspace below 500ft AGL within Mode C Veil/TMZ
<b>9</b>	9	Ops within Class G airspace below 500ft AGL over Urban population
<b>10</b>	10	Ops within Class G airspace below 500ft AGL over Rural population
<b>11</b>	11	Ops in airspace above FL600
<b>12</b>	12	Ops in atypical airspace

-	13	Reserved, do not use
-	14	Reserved, do not use
-	15	Not airborne