EUROPEAN ORGANISATION FOR THE SAFETY OF
AIR NAVIGATION

EUROCONTROL

EUROCONTROL STANDARD DOCUMENT

FOR

SURVEILLANCE DATA EXCHANGE

Part 12 : Category 021

ADS-B Reports

SUR.ET1.ST05.2000-STD-12-01

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Abstract

This document describes the application of ASTERIX to ADS-B.

Keywords

ASTERIX Category 21 ADS-B Reports

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The following table identifies all management authorities who have successively approved the present issue of this document.

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DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION	DATE	REASON FOR CHANGE	SECTIONS PAGES AFFECTED
0.10	Dec. 1999	Creation of Eurocontrol document	ALL
0.11	Mar. 2000	Modifications in items Creation of UAP	ALL
0.12	Feb. 2001	Modifications in items and UAP	ALL
0.13	Jun. 2001	Modifications in items and UAP	ALL
0.14	Sep. 2001	Modifications in items and UAP	ALL
0.15	Nov. 2001	Modifications in items and UAP	ALL
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0.17	Jan. 2002	Modifications in items and UAP	ALL
0.18	Feb. 2002	Modifications in items and UAP	ALL
0.19	Oct. 2002	Modifications in items • I021/110 • I021/148 • I021/152 • I021/155 Modification of the UAP	 5.2.9 5.2.14 5.2.17 5.2.18 5.3
0.20	Dec. 2002	Addition of “Encoding rules” Modification of I021/040 Modification of I021/110 Suppression of items I021/035 and I021/037 Modification of the UAP	All 5.2.5 5.2.9 5.3
0.21	March 2003	Modification of the title Modification of I021/140	 5.2.11
0.22	August 2003	Editorial modification in layout of reports	5.1
0.23	Nov. 2003	Addition of ICAO Annex 10 Vol I Part I as Reference Document Addition of one bit (DTI) in item 021/210 Editorial modifications	2.2 5.2.24
0.24	Oct. 2004	Modification of the format of item I021/130 to increase the resolution of the position in WGS-84 format	5.2.10

0.25	Mar. 2005	Document Identification Sheet updated	Page ii
		Signature Page updated	Page iii
		Correction of length for item I021/040 in table 2 – ADS-B reports UAP	5.3
		Definition Item 021/140 updated	5.2.11
0.26	27 June 2005	Item I021/070 Mode 3/A added	5.2.6
		Item I021/131 Signal Amplitude added	5.2.12
0.27	October 2007	Change proposals from WG51-SG4 integrated	Almost all
		Document completely restructured	
0.28	January 2008	Editorial changes throughout document	Numerous
		Error Conditions in I021/040 defined	5.2.6
		New item I021/161 Track ID	5.2.31
		New item I021/400 Receiver ID	5.2.41
0.29	March 2008	Internal Edition, once accepted, 0.29a will become 0.29	
0.29a	March 2008	Status changed to Draft	All
		Results EUROCAE WG51-SG4 meeting:	
		I021/008: encoding rule updated plus editorial	5.2.1
		I021/016: LSB and layout modified, encoding rule updated	5.2.4
		I021/040: Modified following EUROCAE WG51	5.2.6
		I021/161: Typo in heading corrected	5.2.31
		I021/200: Encoding rule modified	5.2.34
		I021/250: Editorial in encoding rule corrected	5.2.38
		I021/295 (Data Ages) added	5.2.41
		Input from Austrocontrol:	
		I021/016 Test Target Reference removed	5.2.4
		I021/040 restructured, notes added	5.2.6
		I021/161 Re-Numbering indication added	5.2.31
1.0P	April 2008	Update following RDE-TF #41:	
		Item I021/161: RN bit moved to cat 023	5.2.31
		Item I021/295: Note 2 added	5.2.41
		Items I021/148, I021/165: note added “not available in 1090 MHz ES”	5.2.24 5.2.25 5.2.26 5.2.32
		Item I021/230: Note added	5.2.37
		Status changed to “Proposed Issue”	
1.0	August 2008	List of Abbreviations corrected	3.2
		Item I021/015: Note added	5.2.3
		Item I021/040, second extension: note added	5.2.6
		Category corrected in Items 250 and 260	5.2.38 5.2.39
		Note 6 in I021/110 corrected	5.2.17
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1.1	September 2008	Editorial update	

1.2	November 2008	List of reference documents updated Encoding rule and notes to I021/016 updated Notes in I021/040 updated Note in I021/130 updated Note in I021/131 updated Note in I021/260 updated Description/Note updated in I021/271 Table 2 updated	2.2 5.2.4 5.2.6 5.2.18 5.2.19 5.2.39 5.2.40 5.3
1.3	March 2009	Alignment with ADS-B Terminology	All
1.4	July 2009	Numerous editorial clarifications for consistency Meaning of “Full Second Indication” clarified Meaning of “Range Exceeded” clarified	5.2.11/5.2.13 5.2.26/5.2.28 5.2.29/5.2.30
1.5	September 2010	Signature Page updated Note added to item I021/250	iii 5.2.38
1.6	October 2010	Reference document [6] corrected Reference in item I021/170 corrected	Page 2 5.2.33
1.7	December 2010	Error condition IPC added in item I021/040	5.2.6
1.8	January 2011	Note in items I021/071 and I021/072 updated	5.2.8 5.2.9
2.0	March 2011	Internal version for cooperation with SESAR Project 15.4.5	General update
2.1	May 2011	Signature Page updated Alignment with the SPI-IR Inclusion of ED-102A/DO-260B (“version 2”) modifications The changes, although substantial, have been performed in a way that backwards compatibility is ensured. Note added to I021/040, 2nd ext., bit6	iii General update 5.2.6

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1 INTRODUCTION

1.1 Scope

1.1.1 This document describes the structure for the transmission of ADS-B reports.

1.1.2 This document defines the data out of Category 021.

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 Standard 000-1-92. Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents. 1992.
2. EUROCONTROL Standard SUR.ET1.ST05.2000-STD-01-01. All Purpose STructured Eurocontrol suRveillance Information Exchange - ASTERIX, edition 1.29 February 2002.
3. EUROCONTROL Document SUR.ET1.ST05.2000-STD-16-1 – ASTERIX Category 023 “CNS/ATM Ground Station Service Reports”.
4. RTCA/DO-242A, Minimum Aviation System Performance Standards for ADS-B, June 25, 2002.
5. SUR/ET3/ST06.3220/001, Automatic Dependent Surveillance Requirements, edition 0.8 November 2000.
6. ICAO Annex 10, Vol. IV.
7. ICAO Annex 5
8. RTCA DO-260 “Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance – Broadcast (ADS-B)” / EUROCAE ED-102
9. RTCA DO-260A“Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)”
10. ICAO SARPS for ACAS in ICAO Annex 10, Volume IV, Chapter 4
11. EUROCAE ED-102A / RTCA DO-260B

3 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1 Definitions

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

3.1.1	**Catalogue of Data Items:**	List of all the possible Data Items of each Data Category describing the Data Items by their reference, structure, size and units (where applicable).
3.1.2	**Data Block:**	Unit of information seen by the application as a discrete entity by its contents. A Data Block contains one or more Record(s) containing data of the same category.
3.1.3	**Data Category:**	Classification of the data in order to permit inter alia an easy identification.
3.1.4	**Data Field:**	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.
3.1.5	**Data Item:**	The smallest unit of information in each Data Category.
3.1.6	**Record:**	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.
3.1.7	**User Application Profile:**	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.
3.1.8	**Version**	In the scope of this document, “version” refers to the MOPS version as defined in data item I021/210, bits 6/4 Version Number.

3.2 Acronyms and Abbreviations

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

°	Degree (angle)
ADS-B	Automatic Dependent Surveillance - Broadcast
ASTERIX	**A**ll Purpose **ST**ructured **E**urocontrol su**R**veillance **I**nformation E**X**change
CAT	Data Category
CPR	Compact Position Reporting
EATM	European Air Traffic Management
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
ICAO	International Civil Aviation Organization
LDPJ	Local Decoding Position Jump
LEN	Length Indicator
LSB	Least Significant Bit
PSR	Primary Surveillance Radar
RDE-TF	suRveillance Data Exchange Task Force
RE	Reserved Expansion Indicator
REP	Field Repetition Indicator
s	second, unit of time
SAC	System Area Code
SDPS	Surveillance Data Processing System
SIC	System Identification Code
SP	Special Purpose Indicator
SSR	Secondary Surveillance Radar
STFRDE	Surveillance Task Force on Radar Data Exchange
SURT	Surveillance Team (EATM)
UAP	User Application Profile (see Definitions)
UTC	Co-ordinated Universal Time
WGS-84	World Geodetic System 84

4 GENERAL PRINCIPLES

4.1 General

This document describes the application of ASTERIX to ADS-B target reports.

4.2 Time Management

The time-stamping shall comply with ICAO Annex 5 [Ref. 7].

With ADS-B information on time can be provided by two different instances: the aircraft or the Ground Station (GS).

If the avionics of the aircraft are synchronised to a high precision time-source (such as GPS), it is able to downlink the position and velocity information synchronised to a precise moment in time, the “Time of Applicability”. In this case, items I021/071 (Time of Applicability for Position) or I021/072 (Time of Applicability for Velocity) shall be used to transmit the time-stamp for the respective information.

If the avionics are not synchronised to a high precision time-source, the information downlinked from the aircraft is not synchronised in time. In this case, the only precise time available is the time of reception of the respective message in the GS. The GS will indicate this by using items I021/073 (Time of Message Reception of Position) or I021/075 (Time of Message Reception of Velocity) to time-stamp the respective data-items.

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 Blocks

4.4.1 A single User Application Profile (UAP) is defined and shall be used for ADS-B reports.

4.4.2 Data Blocks shall have the following layout.

CAT = 021	**LEN**	**FSPEC**	Items of the first record		**FSPEC**	Items of the last record

where:

- Data Category (CAT) = 021, is a one-octet field indicating that the Data Block contains ADS-B reports;
- Length Indicator (LEN) is a two-octet field indicating the total length in octets of the Data Block, including the CAT and LEN fields;
- FSPEC is the Field Specification.

4.5 Composition of reports

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

4.5.2 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 ADS-B reports are defined in Table 1 and described in the following pages.

Table 1 - Data Items of Category 021

Data Item Reference Number	Description	Resolution
I021/008	Aircraft Operational Status	N.A.
I021/010	Data Source Identification	N.A.
I021/015	Service Identification	N.A.
I021/016	Service Management	N.A.
I021/020	Emitter Category	N.A.
I021/040	Target Report Descriptor	N.A.
I021/070	Mode 3/A Code	N.A.
I021/071	Time of Applicability for Position	1/128 s
I021/072	Time of Applicability for Velocity	1/128 s
I021/073	Time of Message Reception for Position	1/128 s
I021/074	Time of Message Reception for Position – High Precision	2^{-30} s
I021/075	Time of Message Reception for Velocity	1/128 s
I021/076	Time of Message Reception for Velocity – High Precision	2^{-30} s
I021/077	Time of Report Transmission	1/128 s
I021/080	Target Address	N.A.
I021/090	Quality Indicators	N.A.
I021/110	Trajectory Intent	N.A.
I021/130	Position in WGS-84 co-ordinates	$180/2^{23}$ °
I021/131	Position in WGS-84 co-ordinates, high resolution	$180/2^{30}$ °
I021/132	Message Amplitude	1 dBm
I021/140	Geometric Height	6.25 ft
I021/145	Flight Level	¼ FL
I021/146	Selected Altitude	25 ft
I021/148	Final State Selected Altitude	25 ft
I021/150	Air Speed	N.A.
I021/151	True Air Speed	1kt
I021/152	Magnetic Heading	$360/2^{16}$ °
I021/155	Barometric Vertical Rate	6.25 ft / min
I021/157	Geometric Vertical Rate	6.25 ft / min
I021/160	Airborne Ground Vector	N.A.
I021/161	Track Number	N.A.
I021/165	Track Angle Rate	1/32 °/s
I021/170	Target Identification	N.A.
I021/200	Target Status	N.A.
I021/210	MOPS Version	N.A.
I021/220	Met Information	N.A.
I021/230	Roll Angle	0.01 deg
I021/250	Mode S MB Data	N.A.
I021/260	ACAS Resolution Advisory Report	N.A.
I021/271	Surface Capabilities and Characteristics	N.A.
I021/295	Data Ages	N.A.
I021/400	Receiver ID	N.A.

5.2 Description of Standard Data Items

5.2.1 Data Item I021/008, Aircraft Operational Status

Definition: Identification of the operational services available in the aircraft while airborne.

Format: One-octet fixed length Data Item.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
RA	TC		TS	ARV	CDTI/A	Not TCAS	SA

bit-8 (RA) TCAS Resolution Advisory active
=0 TCAS II or ACAS RA not active
=1 TCAS RA active

bits-7/6 (TC) Target Trajectory Change Report Capability
= 0 no capability for Trajectory Change Reports
= 1 support for TC+0 reports only
= 2 support for multiple TC reports
= 3 reserved

bit-5 (TS) Target State Report Capability
=0 no capability to support Target State Reports
=1 capable of supporting target State Reports

bit-4 (ARV) Air-Referenced Velocity Report Capability
=0 no capability to generate ARV-reports
=1 capable of generate ARV-reports

bit-3 (CDTI/A) Cockpit Display of Traffic Information airborne
=0 CDTI not operational
=1 CDTI operational

bit-2 (not TCAS) : TCAS System Status
= 0 TCAS operational
= 1 TCAS not operational

bit-1 (SA) : Single Antenna
= 0 Antenna Diversity
= 1 Single Antenna only

NOTE - Additional Aircraft Status Information is available in the Reserved Expansion Field of Category 021.

Encoding Rule : This item is optional. It shall be sent only if at least one bit is set to 1.

5.2.2 Data Item I021/010, Data Source Identification

Definition : Identification of the ADS-B station providing information.
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

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

NOTE - The up-to-date list of SACs is published on the Eurocontrol Web Site (http://www.eurocontrol.int/asterix/public/standard_page/sac_list.html) .

5.2.3 Data Item I021/015, Service Identification

Definition : Identification of the service provided to one or more users.

Format : One-Octet fixed length data item.

Structure:

Octet no. 1							
8	7	6	5	4	3	2	1
Service Identification							

bits 8/1	Service Identification

NOTE - The service identification is allocated by the system.

NOTE - The service identification is also available in item I023/015 [Ref. 3].

Encoding Rule :
This item is optional.

5.2.4 Data Item I021/016, Service Management

Definition: Identification of services offered by a ground station (identified by a SIC code).

Format: One-octet fixed length Data Item.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
RP							LSB

Bits-8/1 (RP) : Report Period
LSB = 0.5 s

= 0: Data driven mode
Range 0 … 127.5 seconds, a value of 127.5 indicates 127.5 seconds or above

Encoding Rule :

This item is optional. It shall be sent periodically and each time a value change occurs.

NOTE - This item contains the same information as item I023/101 in ASTERIX category 023 [Ref. 3]. Since not all service users receive category 023 data, this information has to be conveyed in category 021 as well.

NOTE - If this item is due to be sent according to the encoding rule above, it shall be sent with the next target report

5.2.5 Data Item I021/020, Emitter Category

Definition : Characteristics of the originating ADS-B unit.
Format : One-Octet fixed length data item.
Structure:

Octet no. 1

8	7	6	5	4	3	2	1
ECAT							

bits-8/1 (ECAT) Emitter Category

0 = No ADS-B Emitter Category Information
1 = light aircraft <= 15500 lbs
2 = 15500 lbs < small aircraft <75000 lbs
3 = 75000 lbs < medium a/c < 300000 lbs
4 = High Vortex Large
5 = 300000 lbs <= heavy aircraft
6 = highly manoeuvrable (5g acceleration capability) and high speed (>400 knots cruise)
7 to 9 = reserved
10 = rotocraft
11 = glider / sailplane
12 = lighter-than-air
13 = unmanned aerial vehicle
14 = space / transatmospheric vehicle
15 = ultralight / handglider / paraglider
16 = parachutist / skydiver
17 to 19 = reserved
20 = surface emergency vehicle
21 = surface service vehicle
22 = fixed ground or tethered obstruction
23 = cluster obstacle
24 = line obstacle

Encoding Rule :
This Item is optional.

5.2.6 Data Item I021/040, Target Report Descriptor

Definition: Type and characteristics of the data as transmitted by a system.

Format: Variable Length Data Item, comprising a primary subfield of one octet, followed by one-octet extensions as necessary.

Structure of Primary Subfield

Octet no. 1

8	7	6	5	4	3	2	1
ATP			ARC		RC	RAB	FX

bits-8/6 (ATP) Address Type
= 0 24-Bit ICAO address
= 1 Duplicate address
= 2 Surface vehicle address
= 3 Anonymous address
= 4-7 Reserved for future use

bits-5/4 (ARC) Altitude Reporting Capability
= 0 25 ft
= 1 100 ft
= 2 Unknown
= 3 Invalid

bit-3 (RC) Range Check
= 0 Default
= 1 Range Check passed, CPR Validation pending

bit-2 (RAB) Report Type
= 0 Report from target transponder
= 1 Report from field monitor (fixed transponder)

bit-1 (FX) Field Extension
= 0 End of item
= 1 Extension into first extension

NOTES Bit 3 indicates that the position reported by the target is within a credible range from the ground station. The range check is followed by the CPR validation to ensure that global and local position decoding both indicate valid position information. Bit 3=1 indicates that the range check was done, but the CPR validation is not yet completed.
Once CPR validation is completed, Bit 3 will be reset to 0.

Structure of I021/040 - First Extension

Octet no. 1

8	7	6	5	4	3	2	1
DCR	GBS	SIM	TST	SAA	CL		FX

bit-8 (DCR) Differential Correction
= 0 No differential correction (ADS-B)
= 1 Differential correction (ADS-B)

bit-7 (GBS) Ground Bit Setting
= 0 Ground Bit not set
= 1 Ground Bit set

bit-6 (SIM) Simulated Target
= 0 Actual target report
= 1 Simulated target report

bit-5 (TST) Test Target
= 0 Default
= 1 Test Target

bit-4 (SAA) Selected Altitude Available
= 0 Equipment capable to provide Selected Altitude
= 1 Equipment not capable to provide Selected Altitude

bits-3/2 (CL) Confidence Level
= 0 Report valid
= 1 Report suspect
= 2 No information
= 3 Reserved for future use

bit-1 (FX) Field Extension
= 0 End of item
= 1 Extension into second extension

Structure of I021/040 - Second Extension : Error Conditions

Octet no. 1

8	7	6	5	4	3	2	1
0	0	IPC	NOGO	CPR	LDPJ	RCF	FX

Bits-8/7 :	(spare)		Spare bits, set to “0”
Bit-6 :	(IPC)		Independent Position Check
		= 0	default (see note)
		= 1	Independent Position Check failed
Bit-5 :	(NOGO)		No-go Bit Status
		= 0	NOGO-bit not set
		= 1	NOGO-bit set
Bit-4 :	(CPR)		Compact Position Reporting
		= 0	CPR Validation correct
		= 1	CPR Validation failed
Bit-3 :	(LDPJ)		Local Decoding Position Jump
		= 0	LDPJ not detected
		= 1	LDPJ detected
Bit-2 :	(RCF)		Range Check
		= 0	default
		= 1	Range Check failed
Bit-1	(FX)		Field Extension
		= 0	end of data item
		= 1	extension into third extension

NOTES The second extension signals the reasons for which the report has been indicated as suspect (indication Confidence Level (CL) in the first extension).

NOTES Bit 2 indicates that the Range Check failed, i.e. the target is reported outside the credible range for the Ground Station. For operational users such a target will be suppressed. In services used for monitoring the Ground Station, the target will be transmitted with bit 2 indicating the fault condition.

NOTES Bit 6, if set to 1, indicates that the position reported by the target was validated by an independent means and a discrepancy was detected. If no independent position check is implemented, the default value “0” is to be used.

NOTES Bit 5 represents the setting of the GO/NOGO-bit as defined in item I023/100 of category 023 [Ref. 3].

Encoding Rule :

This Item shall be present in every ASTERIX record. The extensions shall be sent only if at least one bit is set to 1.

5.2.7 Data Item I021/070, Mode 3/A Code in Octal Representation

Definition: Mode-3/A code converted into octal representation.

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
0	0	0	0	A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1

bits-16/13	Spare bits set to 0
bits-12/1	Mode-3/A reply in octal representation

Encoding Rule : This item is optional.

5.2.8 Data Item I021/071, Time of Applicability for Position

Definition : Time of applicability of the reported position, in the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:

Octet no. 1

24	23	22	21	20	19	18	17
Time of							

Octet no. 2 Octet no. 3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Applicability of Position															LSB

bit-1 (LSB) = 2^{-7} s = 1/128 s

Encoding Rule :

This Item is optional.

Either item I021/071 or item I021/073 shall be available in a category 021 report conveying position information.

NOTE - The time of applicability value is reset to zero at every midnight.

NOTE - The time of applicability indicates the exact time at which the position transmitted in the target report is valid.

5.2.9 Data Item I021/072, Time of Applicability for Velocity

Definition : Time of applicability (measurement) of the reported velocity, in the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:

Octet no. 1

24	23	22	21	20	19	18	17
Time of							

Octet no. 2 Octet no. 3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Applicability of Velocity															LSB

bit-1 (LSB) = 2^{-7} s = 1/128 s

Encoding Rule :

This Item is optional.

Either item I021/072 or item I021/075 shall be available in a category 021 report conveying velocity information.

NOTE - The time of the applicability value is reset to zero at every midnight.

NOTE - The time of applicability indicates the exact time at which the velocity information transmitted in the target report is valid.

NOTE - This item will not be available in some ADS-B technologies.

5.2.10 Data Item I021/073, Time of Message Reception for Position

Definition : Time of reception of the latest position squitter in the Ground Station, in the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:

Octet no. 1

24	23	22	21	20	19	18	17
Time of							

Octet no. 2 Octet no. 3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Message Reception of Position															LSB

bit-1 (LSB) = 2^{-7} s = 1/128 s

Encoding Rule :

This Item is optional.

Either item I021/071 or item I021/073 shall be available in a category 021 report conveying position information.

NOTE - The time of message reception value is reset to zero at every midnight.

5.2.11 Data Item I021/074, Time of Message Reception of Position–High Precision

Definition : Time at which the latest ADS-B position information was received by the ground station, expressed as fraction of the second of the UTC Time.

Format : Four-Octet fixed length data item.

Structure:

Octet no. 1 Octet no. 2

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
FSI		Time of													

Octet no. 3 Octet no. 4

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Message Reception of Position – high precision															LSB

Bits 32 - 31 (FSI) Full Second Indication

Bits 32-31	Meaning
11	Reserved
10	TOMRp whole seconds = (I021/073) Whole seconds – 1
01	TOMRp whole seconds = (I021/073) Whole seconds + 1
00	TOMRp whole seconds = (I021/073) Whole seconds

Bit 30 - 1 Fractional part of the time of message reception for position in the ground station.

Bit 1 (LSB) $=2^{-30}$ s ≈ 0.9313 ns

Encoding Rule :

This Item is optional.

It shall only be transmitted together with item I021/073 “Time of Message Reception of Position”.

5.2.12 Data Item I021/075, Time of Message Reception for Velocity

Definition : Time of reception of the latest velocity squitter in the Ground Station, in the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:

Octet no. 1

24	23	22	21	20	19	18	17
Time of							

Octet no. 2 Octet no. 3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Message Reception of Velocity															LSB

bit-1 (LSB) = 2^{-7} s = 1/128 s

Encoding Rule :

This Item is optional.

Either item I021/072 or item I021/075 shall be available in a category 021 report conveying velocity information.

NOTE - The time of message reception value is reset to zero at every midnight.

5.2.13 Data Item I021/076, Time of Message Reception of Velocity–High Precision

Definition : Time at which the latest ADS-B velocity information was received by the ground station, expressed as fraction of the second of the UTC Time.

Format : Four-Octet fixed length data item.

Structure:

Octet no. 1 Octet no. 2

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
FSI		Time of													

Octet no. 3 Octet no. 4

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Message Reception of Velocity – high precision															LSB

Bits 32 - 31 (FSI) Full Second Indication

Bits 32-31	Meaning
11	Reserved
10	TOMRv whole seconds = (I021/075) Whole seconds – 1
01	TOMRv whole seconds = (I021/075) Whole seconds + 1
00	TOMRv whole seconds = (I021/075) Whole seconds

Bit 30 - 1 Fractional part of the time of message reception for velocity in the ground station.

Bit 1 (LSB) =2^{-30} s ≈ 0.9313 ns

Encoding Rule :

This Item is optional.

It shall only be transmitted together with item I021/075 “Time of Message Reception of Velocity”.

5.2.14 Data Item I021/077, Time of ASTERIX Report Transmission

Definition : Time of the transmission of the ASTERIX category 021 report in the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:

Octet no. 1

24	23	22	21	20	19	18	17
Time							

Octet no. 2 Octet no. 3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Of ASTERIX Report Transmission															LSB

bit-1 (LSB) = 2^{-7} s = 1/128 s

Encoding Rule :

This Item is optional.

NOTE - The time of ASTERIX report transmission value is reset to zero at every midnight.

5.2.15 Data Item I021/080, Target Address

Definition: Target address (emitter identifier) assigned uniquely to each target.

Format: Three-octet fixed length Data Item.

Structure:

Octet no. 1							
24	23	22	21	20	19	18	17
Target							

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

bits-24/1 24-Bits address, A23 to A0

Encoding Rule :

This Item shall be present in every ASTERIX record.

5.2.16 Data Item I021/090, Quality Indicators

Definition : ADS-B quality indicators transmitted by a/c according to MOPS version.

Format : Variable Length Data Item, comprising a primary subfield of one-octet, followed by one-octet extensions as necessary.

NOTE - Apart from the “PIC” item, all items are defined as per the respective link technology protocol version (“MOPS version”, see I021/210).

Structure of Primary Subfield:

Octet no. 1

8	7	6	5	4	3	2	1
NUCr or NACv			NUC$_p$ or NIC				FX

Bits-8/6 : "Navigation Uncertainty Category for velocity" NUCr or the “Navigation Accuracy Category for Velocity” NACv

Bits-5/2 : "Navigation Uncertainty Category for Position" NUCp or “Navigation Integrity Category “NIC”.

Bit-1	(FX)	Field Extension
	= 0	end of data item
	= 1	extension into first extension

NOTE - The primary subfield is kept for backwards compatibility reasons. Version 2 NIC-values shall be mapped accordingly.
This is required to ensure that downstream systems, which are not capable of interpreting extensions 2 and 3 (because they use an ASTERIX edition earlier than 2.0) still get the required information

Structure of first extension : Navigation Accuracy Category for Position.

Octet no. 1

8	7	6	5	4	3	2	1
NIC_{BARO}	SIL		NAC_p				FX

Bit-8 : "Navigation Integrity Category for Barometric Altitude"

Bits-7/6 : "Surveillance (version 1) or Source (version 2) Integrity Level"

Bits-5/2 : "Navigation Accuracy Category for Position"

Bit-1 (FX) Field Extension
= 0 end of data item
= 1 extension into next extension

NOTE - “Version 1” or “Version 2” refers to the MOPS version as defined in data item I021/210, bits 6/4

Structure of second extension : Position Quality Indicators.

Octet no. 1

8	7	6	5	4	3	2	1
0	0	SIL	SDA		GVA		FX

Bits-8/7 : Spare bits, set to “0”

Bit-6 : (SIL) SIL-Supplement
= 0: measured per flight-hour
= 1: measured per sample

Bits-5/4 : (SDA) Horizontal Position System Design Assurance Level (as defined in version 2)

Bits-3/2 : (GVA) Geometric Altitude Accuracy

Bit-1 (FX) Field Extension
= 0: end of data item
= 1: extension into next extension

NOTES “Version 2” refers to the MOPS version as defined in data item I021/210, bits 6/4

Structure of third extension : Position Quality Indicators.

Octet no. 1

8	7	6	5	4	3	2	1
PIC				0	0	0	FX

Bits-8/6 :	(PIC)	Position Integrity Category
Bits-4/2 :		Spare bits, set to “0”
Bit-1	(FX)	Field Extension
	= 0	end of data item
	= 1	extension into next extension

For the value of “PIC”, the following conversion table shall be used:

PIC	Integrity Containment Bound	NUCp ED102/DO260	NIC (+ suppl.) DO260A	NIC (+ suppl.’s) ED102A/DO260B
15	not defined			
14	< 0.004 NM	9	11	11
13	< 0.013 NM	8	10	10
12	< 0.04 NM		9	9
11	< 0.1 NM	7	8	8
10	< 0.2 NM	6	7	7
9	< 0.3 NM	-	-	6 (+ 0/1)
8	< 0.5 NM	5	6 (+ 0)	6 (+ 0/0)
7	< 0.6 NM	-	6 (+ 1)	6 (+ 1/1)
6	< 1.0 NM	4	5	5
5	< 2.0 NM	3	4	4
4	< 4.0 NM	-	3	3
3	< 8.0 NM	-	2	2
2	< 10.0 NM	2	-	-
1	< 20.0 NM	1	1	1
0	No integrity (or > 20.0 NM)	0	0	0

NOTE - PIC=0 is defined for completeness only. In this case the third extension shall not be generated.

Encoding Rule :

This item shall be present in every ASTERIX record. Extensions are sent only if at least 1 bit is set to “1”.

5.2.17 Data Item I021/110, Trajectory Intent

Definition : Reports indicating the 4D intended trajectory of the aircraft.

Format : Compound Data Item, comprising a primary subfield of one octet, followed by the indicated subfields.

Structure of Primary Subfields :

Octet no. 1							
8	7	6	5	4	3	2	1
TIS	TID	0	0	0	0	0	FX

bit-8	(TIS)	Trajectory Intent Status		
		= 0	Absence of Subfield #1	
		= 1	Presence of Subfield #1	
bit-7	(TID)	Trajectory Intent Data		
		= 0	Absence of Subfield #2	
		= 1	Presence of Subfield #2	
bit-6/2	Spare bits set to 0			
bit-1	(FX)	Field Extension		
		= 0	End of Data Item	
		= 1	Extension into next extension	

Structure of I021/110 - Subfield #1 :

Trajectory Intent Status

Octet no. 1							
8	7	6	5	4	3	2	1
NAV	NVB	0	0	0	0	0	FX

bit-8	(NAV)	= 0	Trajectory Intent Data is available for this aircraft
		= 1	Trajectory Intent Data is not available for this aircraft
bit-7	(NVB)	= 0	Trajectory Intent Data is valid
		= 1	Trajectory Intent Data is not valid
bits-6/2	Spare bits set to zero		
bit-1	(FX)	Field Extension	
		= 0	End of Data Item
		= 1	Extension into next extension

Structure of I021/110 - Subfield #2:

Trajectory Intent Data

Format: Repetitive Data Item starting with a one-octet Field Repetition Indicator (REP) followed by at least one Trajectory Intent Point comprising fifteen octets.

Octet no. 1

128	127	126	125	124	123	122	121
REP							

Octet no. 2

120	119	118	117	116	115	114	113
TCA	NC	TCP number					

Octet no. 3 Octet no. 4

112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97
Altitude															LSB

Octet no. 5 Octet no. 6

96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81
Latitude in WGS - 84															

Octet no. 7 Octet no. 8

80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65
							LSB								

Octet no. 9 Octet no. 10

64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
Longitude in WGS - 84															LSB

Octet no. 11 Octet no. 12

48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Point Type				TD		TRA	TOA	TOV							

Octet no. 13 Octet no. 14

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
TOV															LSB

Octet no. 15 Octet no. 16

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
TTR															LSB

bits-128/121	(REP)	Repetition Factor
bit-120	(TCA)	= 0 TCP number available = 1 TCP number not available
bit-119	(NC)	= 0 TCP compliance = 1 TCP non-compliance
bits-118/113	(TCP Number)	Trajectory Change Point number
bits-112/97	(Altitude)	Altitude in two's complement form LSB= 10ft -1500 ft <= altitude <= 150000 ft
bits-96/73	(Latitude)	In WGS.84 in two's complement. -90 <= latitude <= 90 deg. LSB = $180/2^{23}$ deg. = approx.$2.145767*10^{-05}$ deg.
bits-72/49	(Longitude)	In WGS.84 in two's complement. -180 <= longitude < 180 LSB = $180/2^{23}$ deg. = approx.$2.145767*10^{-05}$ deg.
bits-48/45	Point Type	= 0 Unknown = 1 Fly by waypoint (LT) = 2 Fly over waypoint (LT) = 3 Hold pattern (LT) = 4 Procedure hold (LT) = 5 Procedure turn (LT) = 6 RF leg (LT) = 7 Top of climb (VT) = 8 Top of descent (VT) = 9 Start of level (VT) = 10 Cross-over altitude (VT) = 11 Transition altitude (VT)
bits-44/43	(TD)	= 00 N/A = 01 Turn right = 10 Turn left = 11 No turn
bit-42	(TRA)	Turn Radius Availabilty = 0 TTR not available = 1 TTR available
bit-41	(TOA)	= 0 TOV available = 1 TOV not available
bits-40/17	(TOV)	Time Over Point LSB = 1 second
bits-16/1	(TTR)	TCP Turn radius LSB = 0.01 Nm 0 <= TTR <= 655.35 Nm

Encoding Rule:

This Item is optional.

NOTES

1. NC is set to one when the aircraft will not fly the path described by the TCP data.
2. TCP numbers start from zero.
3. LT = Lateral Type
4. VT = Vertical Type
5. TOV gives the estimated time before reaching the point. It is defined as the absolute time from midnight.
6. TOV is meaningful only if TOA is set to 1.

5.2.18 Data Item I021/130, Position in WGS-84 Co-ordinates

Definition : Position in WGS-84 Co-ordinates.
Format : Six-octet fixed length Data Item.
Structure:

Octet no. 1								Octet no. 2							
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Latitude in WGS - 84															

Octet no. 3								Octet no. 4							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
							LSB								

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

bits-48/25	(Latitude)	In WGS.84 in two's complement. Range -90 <= latitude <= 90 deg. LSB = 180/2^{23} degrees. = 2.145767 * 10^{-05} degrees. This corresponds to a resolution of at least 2.4 meters
bits-24/1	(Longitude)	In WGS.84 in two's complement. Range -180 <= longitude < 180 deg. LSB = 180/2^{23} degrees. = 2.145767 * 10^{-05} degrees. This corresponds to a resolution of at least 2.4 meters.

Encoding Rule :

This Item is optional. If a position in WGS.84 coordinates is transmitted, either I021/130 or I021/131 shall be sent.

NOTE - Positive longitude indicates East. Positive latitude indicates North.

5.2.19 Data Item I021/131, High-Resolution Position in WGS-84 Co-ordinates

Definition : Position in WGS-84 Co-ordinates in high resolution.
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 <= latitude <= 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 <= 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 is optional. If a position in WGS.84 coordinates is transmitted, either I021/130 or I021/131 shall be sent.

NOTE - Positive longitude indicates East. Positive latitude indicates North.

5.2.20 Data Item I021/132, Message Amplitude

Definition : Amplitude, in dBm, of ADS-B messages received by the ground station, coded in two's complement.

Format : One-Octet fixed length data item.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
MAM							

bits-8/1	(MAM)	Message Amplitude LSB = 1 dBm

NOTE - The value gives the amplitude of the latest received squitter.

Encoding Rule :
This Item is optional.

5.2.21 Data Item I021/140, Geometric Height

Definition : Minimum height from a plane tangent to the earth's ellipsoid, defined by WGS-84, in two's complement form.

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
Geometric Height (GH)															LSB

bit 16/1	-1500 ft <= Geometric Height <= 150000 ft (LSB) = 6.25 ft

Encoding Rule :
This Item is optional.

NOTES

1. LSB is required to be less than 10 ft by ICAO.
2. A value of '0111111111111111' indicates that the aircraft transmits a "greater than" indication.

5.2.22 Data Item I021/145, Flight Level

Definition : Flight Level from barometric measurements, not QNH corrected, in two's complement form.

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
Flight Level															LSB

bit 16/1 -15 FL <= Flight Level <= 1500 FL
(LSB) = 1/4 FL

Encoding Rule :

This Item is optional.

5.2.23 Data Item I021/146, Selected Altitude

Definition : The Selected Altitude as provided by the avionics and corresponding either to the MCP/FCU Selected Altitude (the ATC cleared altitude entered by the flight crew into the avionics) or to the FMS Selected Altitude.

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
SAS	Source		Altitude												LSB

bit-16	(SAS)	Source Availability = 0 No source information provided = 1 Source Information provided
bit-15/14	(Source)	= 00 Unknown = 01 Aircraft Altitude (Holding Altitude) = 10 MCP/FCU Selected Altitude = 11 FMS Selected Altitude
bits- 13/1	(Altitude)	Altitude in two’s complement form LSB=25ft -1300ft <= Altitude <= 100000ft

Encoding Rule :

This Item is optional.

NOTE - The Selected Altitude provided in this field is not necessarily the “Target Altitude” as defined by ICAO.

NOTE - The value of “Source” (bits 15/14) indicating “unknown” or “Aircraft Altitude” is kept for backward compatibility as these indications are not provided by “version 2” systems as defined by data item I021/210, bits 6/4.

NOTE - Vertical mode indications supporting the determination of the nature of the Selected Altitude are provided in the Reserved Expansion Field in the subfield NAV.

5.2.24 Data Item I021/148, Final State Selected Altitude

Definition : The vertical intent value that corresponds with the ATC cleared altitude, as derived from the Altitude Control Panel (MCP/FCU).

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
MV	AH	AM	Altitude												LSB

bit-16	(MV)	Manage Vertical Mode = 0 Not active or unknown = 1 Active
bit-15	(AH)	Altitude Hold Mode = 0 Not active or unknown = 1 Active
bit-14	(AM)	Approach Mode = 0 Not active or unknown = 1 Active
bits- 13/1	(Altitude)	Altitude in in two’s complement form LSB=25ft -1300ft <= Altitude <= 100000ft

Encoding Rule :

This Item is optional.

NOTE - This item is kept for backward compatibility but shall not be used for “version 2” ADS-B systems (as defined by data item I021/210, bits 6/4) for which item 146 will be used to forward the MCP/FCU or the FMS selected altitude information. For “version 2” ADS-B systems, the vertical mode indications will be provided through the Reserved Expansion Field in the subfield NAV .

5.2.25 Data Item I021/150, Air Speed

Definition : Calculated Air Speed (Element of Air Vector).
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
IM	Air Speed														LSB

bit-16 (IM) = 0 Air Speed = IAS
= 1 Air Speed = Mach

bits-15/1 Air Speed (IAS or Mach)
if IAS, LSB = 2^{-14} NM/s
if Mach, LSB = 0.001

Encoding Rule :
This Item is optional.

5.2.26 Data Item I021/151 True Airspeed

Definition : True Air Speed.
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
RE	True Air Speed														LSB

bit-16 (RE) "Range Exceeded" Indicator
= 0 Value in defined range
= 1 Value exceeds defined range

bits-15/1 True Air Speed
(LSB) = 1 knot

NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the True Air Speed contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual value is greater than the value contained in the field.

Encoding Rule :
This Item is optional.

5.2.27 Data Item I021/152, Magnetic Heading

Definition : Magnetic Heading (Element of Air Vector).
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
Magnetic Heading															LSB

bits-16/1 Magnetic Heading
(LSB) = $360^\circ / 2^{16}$ (approx. 0.0055°)

Encoding Rule :
This Item is optional.

NOTE - True North Heading is defined in the Reserved Expansion Field in the subfield TNH.

5.2.28 Data Item I021/155, Barometric Vertical Rate

Definition : Barometric Vertical Rate, in two’s complement form.
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
RE	Barometric Vertical Rate														LSB

bit-16 (RE) “Range Exceeded” Indicator
= 0 Value in defined range
= 1 Value exceeds defined range

bits-15/1 Barometric Vertical Rate
(LSB) = 6.25 feet/minute

NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the Barometric Vertical Rate contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual value is greater than the value contained in the field.

Encoding Rule :
This Item is optional.

5.2.29 Data Item I021/157, Geometric Vertical Rate

Definition : Geometric Vertical Rate, in two’s complement form, with reference to WGS-84.

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
RE	Geometric Vertical Rate														LSB

bit-16 (RE) “Range Exceeded” Indicator
= 0 Value in defined range
= 1 Value exceeds defined range

bits-15/1 Geometric Vertical Rate
(LSB) = 6.25 feet/minute

NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the Geometric Vertical Rate contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual value is greater than the value contained in the field.

Encoding Rule :
This Item is optional.

5.2.30 Data Item I021/160, Airborne Ground Vector

Definition : Ground Speed and Track Angle elements of Airborne Ground Vector.

Format : Four-Octet fixed length data item.

Structure:

Octet no. 1 Octet no. 2

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
RE	Ground Speed														LSB

Octet no. 3 Octet no. 4

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Track Angle															LSB

bit-16 (RE) “Range Exceeded” Indicator
= 0 Value in defined range
= 1 Value exceeds defined range

bits-31/17 Ground Speed referenced to WGS-84
(LSB) = 2^{-14} NM/s ≅ 0.22 kt
0 ≤ Ground Speed < 2 NM/s

bits-16/1 Track Angle clockwise reference to “True North”
(LSB) = 360°/ 2^{16} (approx. 0.0055°)

NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the Ground Speed contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual value is greater than the value contained in the field.

NOTE - The Surface Ground Vector format is defined in the Reserved Expansion Field in the subfield SGV.

Encoding Rule :

This Item is optional.

5.2.31 Data Item I021/161, Track Number

Definition: An integer value representing a unique reference to a track record within a particular track file.

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
0	0	0	0	TRACK NUMBER(0…4095)											

bits-16/13 Spare bits set to zero
bits-12/1 Track number

Encoding Rule : This item is optional.

5.2.32 Data Item I021/165, Track Angle Rate

Definition : Rate of Turn, in two's complement form.
Format : 2-Byte 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
0	0	0	0	0	0	TAR									LSB

bits-16/11 Spare bits set to zero

bits-10/1 (TAR) Track Angle Rate
(LSB) = 1/32 °/s
Maximum value = 16 °/s

Encoding Rule :
This Item is optional.

NOTES

1. A positive value represents a right turn, whereas a negative value represents a left turn.
2. "Maximum value" means Maximum value or above.
3. This item will not be transmitted for the technology "1090 MHz Extended Squitter".

5.2.33 Data Item I021/170, Target Identification

Definition: Target (aircraft or vehicle) identification in 8 characters, as reported by the target.

Format: Six-octet fixed length Data Item.

Structure:

Octet no. 1								Octet no. 2							
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Character 1						Character 2						Character 3			

Octet no. 3								Octet no. 4							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
		Character 4						Character 5							

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

bits-48/1 Characters 1-8 (coded on 6 Bits each) defining target identification when flight plan is available or the registration marking when no flight plan is available. Coding rules are provided in [6] Section 3.1.2.9.1.2 and Table 3-9.

Encoding Rule :
This Item is optional.

5.2.34 Data Item I021/200, Target Status

Definition : Status of the target
Format : One-octet fixed length Data Item
Structure:

Octet no. 1

8	7	6	5	4	3	2	1
ICF	LNAV	0	PS			SS	

bit-8 (ICF) Intent Change Flag (see Note)
=0 No intent change active
=1 Intent change flag raised

bit-7 (LNAV) LNAV Mode
=0 LNAV Mode engaged
=1 LNAV Mode not engaged

bit-6 Spare bit, set to “0”

bits-5/3 (PS) Priority Status
= 0 No emergency / not reported
= 1 General emergency
= 2 Lifeguard / medical emergency
= 3 Minimum fuel
= 4 No communications
= 5 Unlawful interference
= 6 “Downed” Aircraft

bits-2/1 (SS) Surveillance Status
= 0 No condition reported
= 1 Permanent Alert (Emergency condition)
= 2 Temporary Alert (change in Mode 3/A Code other than emergency)
= 3 SPI set

NOTE - Bit-8 (ICF), when set to “1” indicates that new information is available in the Mode S GICB registers 40, 41 or 42.

Encoding Rule :
This Item is optional.

5.2.35 Data Item I021/210, MOPS Version

Definition : Identification of the MOPS version used by a/c to supply ADS-B information.

Format : One-octet fixed length Data Item

Structure :

Octet no. 1

8	7	6	5	4	3	2	1
0	VNS	VN			LTT		

Bit-8 Spare bit set to 0

Bit-7 (VNS) : Version Not Supported
= 0 The MOPS Version is supported by the GS
= 1 The MOPS Version is not supported by the GS

Bits-6/4 (VN) : Version Number
This sub-field shall contain a value describing the MOPS used by each aircraft.

Currently defined for 1090 ES (LTT=2):
= 0 ED102/DO-260 [Ref. 8]
= 1 DO-260A [Ref. 9]
= 2 ED102A/DO-260B [Ref. 11]

The versions of other link technologies are assumed to be in line with the 1090 ES MOPS versions and the corresponding MASPS versions.

Bits-3/1 (LTT) : Link Technology Type
= 0 Other
= 1 UAT
= 2 1090 ES
= 3 VDL 4
= 4-7 Not assigned

NOTE - Bit 7 (VNS) when set to 1 indicates that the aircraft transmits a MOPS Version indication that is not supported by the Ground Station. However, since MOPS versions are supposed to be backwards compatible, the GS has attempted to interpret the message and achieved a credible result. The fact that the MOPS version received is not supported by the GS is submitted as additional information to subsequent processing systems.

Encoding Rule :

This item is optional.

5.2.36 Data Item I021/220, Met Information

Definition : Meteorological information.

Format : Compound data item consisting of a one byte primary sub-field, followed by up to four fixed length data fields.

Structure of Primary Subfield:

Octet no. 1

8	7	6	5	4	3	2	1
WS	WD	TMP	TRB	0	0	0	FX

bit-8 (WS) Wind Speed
= 0 Absence of Subfield #1
= 1 Presence of Subfield #1

bit-7 (WD) Wind Direction
= 0 Absence of Subfield #2
= 1 Presence of Subfield #2

bit-6 (TMP) Temperature
= 0 Absence of Subfield #3
= 1 Presence of Subfield #3

bit-5 (TRB) Turbulence
= 0 Absence of Subfield #4
= 1 Presence of Subfield #4

bits-4/2 Spare bits set to zero

bit-1 FX Extension indicator
= 0 no extension
= 1 extension

Structure of I021/220 - Subfield #1:
Wind Speed

Octet no. 1								Octet no. 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Wind Speed															LSB

bits-8/1 Wind Speed
(LSB) = 1 knot
0 <= Wind Speed <= 300

Structure of I021/220 - Subfield #2:
Wind Direction

Octet no. 1								Octet no. 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Wind Direction															LSB

bits-16/1 Wind Direction
(LSB) = 1 degree
1 <= Wind Direction <= 360

Structure of I021/220 - Subfield #3:
Temperature

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

bits-16/1 Temperature in degrees celsius, in two's complement form
(LSB) = 0.25 ℃
-100 ℃ <= Temperature <= 100 ℃

Structure of I021/220 - Subfield #4:
Turbulence

Octet no. 1							
8	7	6	5	4	3	2	1
Turbulence							

bits-8/1 Turbulence
Integer between 0 and 15 inclusive

Encoding Rule :
This Item is optional.

5.2.37 Data Item I021/230, Roll Angle

Definition : The roll angle, in two’s complement form, of an aircraft executing a turn.

Format : A two byte 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
Roll Angle															LSB

bits-16/1 Roll Angle
(LSB) = 0.01 degree
-180 <= Roll Angle <= 180

NOTE - Negative Value indicates “Left Wing Down”.

NOTE - Resolution provided by the technology “1090 MHz Extended Squitter” is 1 degree.

Encoding Rule :

This Item is optional.

5.2.38 Data Item I021/250, Mode S MB Data

Definition: Mode S Comm B data as extracted from the aircraft transponder.

Format: Repetitive Data Item starting with a one-octet Field Repetition Indicator (REP) followed by at least one BDS message comprising one seven octet BDS register and one octet BDS code.

Structure:

Octet no. 1

72	71	70	69	68	67	66	65
REP							

Octet no. 2 Octet no. 3

64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
MSB									MB						

Octet no. 4 Octet no. 5

48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
									DATA						

Octet no. 6 Octet no. 7

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Octet no. 8 Octet no. 9

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
							LSB	BDS1				BDS2			

bits-72/65	(REP)	Repetition factor
bits-64/9	(MB Data)	56-bit message conveying Mode S Comm B message data
bits-8/5	(BDS1)	Comm B Data Buffer Store 1 Address
bits-4/1	(BDS2)	Comm B Data Buffer Store 2 Address

Encoding Rule:

This item shall be present in every ASTERIX record provided BDS data has been extracted in the last reporting period.

NOTES

1. For the transmission of BDS20, item 170 **should be** used.
2. For the transmission of BDS30, item 260 is used.

5.2.39 Data Item I021/260, ACAS Resolution Advisory Report

Definition: Currently active Resolution Advisory (RA), if any, generated by the ACAS associated with the transponder transmitting the RA message and threat identity data.

Format: Seven-octet fixed length Data Item.

Structure:

Octet no. 1								Octet no. 2							
56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
TYP					STYP			ARA							

Octet no. 3								Octet no. 4							
40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
ARA (ctd.)						RAC				RAT	MTE	TTI		TID	

Octet no. 5								Octet no. 6							
24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
TID (ctd.)															

Octet 7							
8	7	6	5	4	3	2	1
TID (ctd.)							

bits-56/52	(TYP)	Message Type (= 28 for 1090 ES, version 2)
bits-51/49	(STYP)	Message Sub-type (= 2 for 1090 ES, version 2)
bits-48/35	(ARA)	Active Resolution Advisories
bits-34/31	(RAC)	RAC (RA Complement) Record
bit-30	(RAT)	RA Terminated
bit-29	(MTE)	Multiple Threat Encounter
bits-28/27	(TTI)	Threat Type Indicator
bits-26/1	(TID)	Threat Identity Data

Encoding Rule:

This item shall be present when a Resolution Advisory is active.

NOTE - Version denotes the MOPS version as defined in I021/210, bits 6/4

NOTE - This data items copies the value of BDS register 6,2 for message type 28, subtype 2

NOTE - The “TYP” and “STYP” items are implementation (i.e. link technology) dependent.

NOTE - Refer to ICAO Annex 10 SARPs for detailed explanations [Ref. 10].

5.2.40 Data Item I021/271, Surface Capabilities and Characteristics

Definition : Operational capabilities of the aircraft while on the ground.

Format : Variable Length Data Item, comprising a primary subfield of one-octet, followed by an one-octet extensions if necessary.

Structure of Primary Subfield: Surface Capabilites

Octet no. 1

8	7	6	5	4	3	2	1
0	0	POA	CDTI/S	B2 low	RAS	IDENT	FX

bits-8/7		Spare bits set to zero	
bit-6	(POA)	Position Offset Applied	
		= 0	Position transmitted is not ADS-B position reference point
		= 1	Position transmitted is the ADS-B position reference point
bit-5	(CDTI/S)	Cockpit Display of Traffic Information Surface	
		= 0	CDTI not operational
		= 1	CDTI operational
bit-4	(B2 low)	Class B2 transmit power less than 70 Watts	
		= 0	≥ 70 Watts
		= 1	< 70 Watts
bit-3	(RAS)	Receiving ATC Services	
		= 0	Aircraft not receiving ATC-services
		= 1	Aircraft receiving ATC services
bit-2	(IDENT)	Setting of “IDENT”-switch	
		= 0	IDENT switch not active
		= 1	IDENT switch active
bit-1	FX	Extension indicator	
		= 0	no extension
		= 1	extension into first extension

Structure of I021/271 first extension : Length / Width of Aircraft

Octet no. 1

8	7	6	5	4	3	2	1
0	0	0	0	L + W			

bits-8/5 Spare bits set to zero

bits-4/1 Length and width of the aircraft

NOTE - The length and width of the aircraft are encoded according to the following table

Version 1 message		ASTERIX encoding	Version 2 Message	
Length (meters)	**Width (meters)**		**Length (meters)**	**Width (meters)**
L < 15	W < 11.5	0	L < 15	W < 11.5
	W < 23	1		W < 23
L < 25	W < 28.5	2	L < 25	W < 28.5
	W < 34	3		W < 34
L < 35	W < 33	4	L < 35	W < 33
	W < 38	5		W < 38
L < 45	W < 39.5	6	L < 45	W < 39.5
	W < 45	7		W < 45
L < 55	W < 45	8	L < 55	W < 45
	W < 52	9		W < 52
L < 65	W < 59.5	10	L < 65	W < 59.5
	W < 67	11		W < 67
L < 75	W < 72.5	12	L < 75	W < 72.5
	W < 80	13		W < 80
L < 85	W < 80	14	L < 85	W < 80
	W > 80	15	L>85	or W > 80

NOTE - Version 2 (as defined in I021/210, bits 6/4) data technology protocols encode “No Data or Unknown” with value 0. In this case data item I021/271, first extension is not generated.

Encoding Rule :
This item is optional.

NOTE - This data item is a variant of the “Extended length data field” as described in ASTERIX part1. The LSB in the first extension is not used as FX-bit.

5.2.41 Data Item I021/295, Data Ages

Definition : Ages of the data provided.

Format : Compound Data Item, comprising a primary subfield of up to five octets, followed by the indicated subfields.

Structure of Primary Subfield:

Octet no. 1

32	31	30	29	28	27	26	25
AOS	TRD	M3A	QI	TI	MAM	GH	FX

Octet no. 2

24	23	22	21	20	19	18	17
FL	ISA	FSA	AS	TAS	MH	BVR	FX

Octet no. 3

16	15	14	13	12	11	10	9
GVR	GV	TAR	TI	TS	MET	ROA	FX

Octet no. 4

8	7	6	5	4	3	2	1
ARA	SCC	0	0	0	0	0	FX

bit-32 (AOS) Subfield #1: Aircraft Operational Status age
= 0 Absence of Subfield #1
= 1 Presence of Subfield #1

bit-31 (TRD) Subfield #2: Target Report Descriptor age
= 0 Absence of Subfield #2
= 1 Presence of Subfield #2

bit-30 (M3A) Subfield #3: Mode 3/A Code age
= 0 Absence of Subfield #3
= 1 Presence of Subfield #3

bit-29 (QI) Subfield #4: Quality Indicators age
= 0 Absence of Subfield #4
= 1 Presence of Subfield #4

bit-28 (TI) Subfield #5: Trajectory Intent age
= 0 Absence of Subfield #5
= 1 Presence of Subfield #5

bit-27 (MAM) Subfield #6: Message Amplitude age
= 0 Absence of Subfield #6
= 1 Presence of Subfield #6

bit-26 (GH) Subfield #7: Geometric Height age
= 0 Absence of Subfield #7
= 1 Presence of Subfield #7

bit-25	FX	Extension indicator = 0 no extension = 1 extension
bit-24	(FL)	Subfield #8: Flight Level age = 0 Absence of Subfield #8 = 1 Presence of Subfield #8
bit-23	(ISA)	Subfield #9: Intermediate State Selected Altitude age = 0 Absence of Subfield #9 = 1 Presence of Subfield #9
bit-22	(FSA)	Subfield #10: Final State Selected Altitude age = 0 Absence of Subfield #10 = 1 Presence of Subfield #10
bit-21	(AS)	Subfield #11: Air Speed age = 0 Absence of Subfield #11 = 1 Presence of Subfield #11
bit-20	(TAS)	Subfield #12: True Air Speed age = 0 Absence of Subfield #12 = 1 Presence of Subfield #12
bit-19	(MH)	Subfield #13: Magnetic Heading age = 0 Absence of Subfield #13 = 1 Presence of Subfield #13
bit-18	(BVR)	Subfield #14: Barometric Vertical Rate age = 0 Absence of Subfield #14 = 1 Presence of Subfield #14
bit-17	FX	Extension indicator = 0 no extension = 1 extension
bit-16	(GVR)	Subfield #15: Geometric Vertical Rate age = 0 Absence of Subfield #15 = 1 Presence of Subfield #15
bit-15	(GV)	Subfield #16: Ground Vector age = 0 Absence of Subfield #16 = 1 Presence of Subfield #16
bit-14	(TAR)	Subfield #17: Track Angle Rate age = 0 Absence of Subfield #17 = 1 Presence of Subfield #17
bit-13	(TI)	Subfield #18: Target Identification age = 0 Absence of Subfield #18 = 1 Presence of Subfield #18
bit-12	(TS)	Subfield #19: Target Status age = 0 Absence of Subfield #19 = 1 Presence of Subfield #19
bit-11	(MET)	Subfield #20: Met Information age = 0 Absence of Subfield #20 = 1 Presence of Subfield #20
bit-10	(ROA)	Subfield #21: Roll Angle age = 0 Absence of Subfield #21 = 1 Presence of Subfield #21

bit-9	FX	Extension indicator = 0 no extension = 1 extension
bit-8	(ARA)	Subfield #22: ACAS Resolution Advisory age = 0 Absence of Subfield #22 = 1 Presence of Subfield #22
bit-7	(SCC)	Subfield #23: Surface Capabilities and Characteristics age = 0 Absence of Subfield #23 = 1 Presence of Subfield #23
bits-6/2		spare bits set to zero
bit-1	FX	Extension indicator = 0 no extension = 1 extension

Structure of I021/295 - Subfield # 1:

Aircraft Operational Status Age

Octet no. 1

8	7	6	5	4	3	2	1
AOS							LSB

bits-8/1	(AOS)	Age of the latest received information transmitted in item I021/008.
bit-1	(LSB)	= 0.1 s Maximum value =25.5 s

Structure of I021/295 - Subfield # 2:

Target Report Descriptor Age

Octet no. 1

8	7	6	5	4	3	2	1
TRD							LSB

bits-8/1	(TRD)	Age of the last update of the Target Report Descriptor, item I021/040
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 3:

Mode 3/A Age

Octet no. 1

8	7	6	5	4	3	2	1
M3A							LSB

bits-8/1	(M3A)	Age of the last update of the Mode 3/A Code, item I021/070
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 4:

Quality Indicators Age

Octet no. 1

8	7	6	5	4	3	2	1
QI							LSB

bits-8/1	(QI)	Age of the latest information received to update the Quality Indicators, item I021/090
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 5:

Trajectory Intent Age

Octet no. 1

8	7	6	5	4	3	2	1
			TI				LSB

bits-8/1	(TI)	Age of the last update of the Trajectory Intent information updating item I021/110
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 6:

Message Amplitude Age

Octet no. 1

8	7	6	5	4	3	2	1
			MAM				LSB

bits-8/1	(MAM)	Age of the latest measurement of the message amplitude, item I021/132
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 7

Geometric Height Age

Octet no. 1

8	7	6	5	4	3	2	1
			GH				LSB

bits-8/1	(GH)	Age of the information contained in item 021/140
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 8

Flight Level age

Octet no. 1

8	7	6	5	4	3	2	1
FL							LSB

bits-8/1	(FL)	Age of the Flight Level information in item I021/145
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 9:

Intermediate State Selected Altitude Age

Octet no. 1

8	7	6	5	4	3	2	1
ISA							LSB

bits-8/1	(ISA)	Age of the Intermediate State Selected Altitude in item I021/146
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 10

Final State Selected Altitude Age

Octet no. 1

8	7	6	5	4	3	2	1
FSA							LSB

bits-8/1	(FSA)	Age of the Final State Selected Altitude in item I021/148
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 11:

Air Speed Age

Octet no. 1

8	7	6	5	4	3	2	1
AS							LSB

bits-8/1	(AS)	Age of the Air Speed contained in item I021/150
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 12:

True Air Speed Age

Octet no. 1

8	7	6	5	4	3	2	1
TAS							LSB

bits-8/1	(TAS)	Age of the value for the True Air Speed in item I021/151
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 13:

Magnetic Heading Age

Octet no. 1

8	7	6	5	4	3	2	1
MH							LSB

bits-8/1	(MH)	Age of the value for the Magnetic Heading in item I021/152
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 14:

Barometric Vertical Rate Age

Octet no. 1

8	7	6	5	4	3	2	1
BVR							LSB

bits-8/1	(BVR)	Age of the Barometric Vertical Rate contained in I021/155
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 15:

Geometric Vertical Rate Age

Octet no. 1

8	7	6	5	4	3	2	1
GVR							LSB

bits-8/1	(GVR)	Age of the Geometric Vertical Rate in item I021/157
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 16:

Ground Vector Age

Octet no. 1

8	7	6	5	4	3	2	1
GV							LSB

bits-8/1	(GV)	Age of the Ground Vector in item I021/160
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 17:

Track Angle Rate Age

Octet no. 1

8	7	6	5	4	3	2	1
TAR							LSB

bits-8/1	(TAR)	Age of item I021/165 Track Angle Rate
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 18:

Target Identification Age

Octet no. 1

8	7	6	5	4	3	2	1
			TI				LSB

bits-8/1	(TI)	Age of the Target Identification in item I021/170
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 19:

Target Status Age

Octet no. 1

8	7	6	5	4	3	2	1
			TS				LSB

bits-8/1	(TS)	Age of the Target Status as contained in item I021/200
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 20:

Met Information Age

Octet no. 1

8	7	6	5	4	3	2	1
			MET				LSB

bits-8/1	(MET)	Age of the Meteorological data contained in I021/220
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 21:

Roll Angle Age

Octet no. 1

8	7	6	5	4	3	2	1
ROA							LSB

bits-8/1	(ROA)	Age of the Roll Angle value as in item I021/230
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 22:

ACAS Resolution Advisory Age

Octet no. 1

8	7	6	5	4	3	2	1
ARA							LSB

bits-8/1	(ARA)	Age of the latest update of an active ACAS Resolution Advisory
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 23:

Surface Capabilities and Characteristics Age

Octet no. 1

8	7	6	5	4	3	2	1
SCC							LSB

bits-8/1	(SCC)	Age of the latest information received on the surface capabilities and characteristics of the respective target
bit-1	(LSB)	= 0.1 s Maximum value = 25.5 s

NOTE - In all the subfields, the age is the time delay since the latest update received from the target.

NOTE - In all the subfields, the maximum value indicates “maximum value or above”.

Encoding Rule :

This Item is optional.

5.2.42 Data Item I021/400, Receiver ID

Definition : Designator of Ground Station in Distributed System.
Format : One-octet fixed length Data Item.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
RID							

bits-8/1 (RID) Receiver ID

Encoding Rule :
This Item is optional.

5.3 User Application Profile for Category 021

The following User Application Profile shall be used for the transmission of ADS-B reports.

Table 2 – ADS-B Reports UAP

FRN	Data Item	Information	Length
1	**I021/010**	Data Source Identification	**2**
2	**I021/040**	Target Report Descriptor	**1+**
3	**I021/161**	Track Number	**2**
4	**I021/015**	Service Identification	**1**
5	**I021/071**	Time of Applicability for Position	**3**
6	**I021/130**	Position in WGS-84 co-ordinates	**6**
7	**I021/131**	Position in WGS-84 co-ordinates, high res.	**8**
FX	**-**	Field extension indicator	**-**
8	**I021/072**	Time of Applicability for Velocity	**3**
9	**I021/150**	Air Speed	**2**
10	**I021/151**	True Air Speed	**2**
11	**I021/080**	Target Address	**3**
12	**I021/073**	Time of Message Reception of Position	**3**
13	**I021/074**	Time of Message Reception of Position-High Precision	**4**
14	**I021/075**	Time of Message Reception of Velocity	**3**
FX	**-**	Field extension indicator	**-**
15	**I021/076**	Time of Message Reception of Velocity-High Precision	**4**
16	**I021/140**	Geometric Height	**2**
17	**I021/090**	Quality Indicators	**1+**
18	**I021/210**	MOPS Version	**1**
19	**I021/070**	Mode 3/A Code	**2**
20	**I021/230**	Roll Angle	**2**
21	**I021/145**	Flight Level	**2**
FX	**-**	Field extension indicator	**-**
22	**I021/152**	Magnetic Heading	**2**
23	**I021/200**	Target Status	**1**
24	**I021/155**	Barometric Vertical Rate	**2**
25	**I021/157**	Geometric Vertical Rate	**2**
26	**I021/160**	Airborne Ground Vector	**4**
27	**I021/165**	Track Angle Rate	**2**
28	**I021/077**	Time of Report Transmission	**3**
FX	**-**	Field extension indicator	**-**

FRN	Data Item	Information	Length
29	**I021/170**	Target Identification	**6**
30	**I021/020**	Emitter Category	**1**
31	**I021/220**	Met Information	**1+**
32	**I021/146**	Selected Altitude	**2**
33	**I021/148**	Final State Selected Altitude	**2**
34	**I021/110**	Trajectory Intent	**1+**
35	**I021/016**	Service Management	**1**
FX	**-**	Field extension indicator	**-**
36	**I021/008**	Aircraft Operational Status	**1**
37	**I021/271**	Surface Capabilities and Characteristics	**1+**
38	**I021/132**	Message Amplitude	**1**
39	**I021/250**	Mode S MB Data	**1+N*8**
40	**I021/260**	ACAS Resolution Advisory Report	**7**
41	**I021/400**	Receiver ID	**1**
42	**I021/295**	Data Ages	**1+**
FX	**-**	Field extension indicator	**-**
43	**-**	Not Used	**-**
44	**-**	Not Used	**-**
45	**-**	Not Used	**-**
46	**-**	Not Used	**-**
47	**-**	Not Used	**-**
48	**RE**	Reserved Expansion Field	**1+**
49	**SP**	Special Purpose Field	**1+**
FX	**-**	Field extension indicator	**-**

In the above table

- the first column indicates the Field Reference Number (FRN) associated to each Data Item used in the UAP;
- 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-octets extensions as necessary.