

EUROCONTROL Specification for Surveillance Data Exchange ASTERIX

Part 12 Category 021 ADS-B Target Reports

Edition: 2.6

Edition date: 21 December 2021

Reference nr: EUROCONTROL-SPEC-0149-12





EUROCONTROL Specification for Surveillance Data Exchange

ASTERIX Part 12 Category 21 ADS-B Target Reports

NOTE: This edition is NOT backwards compatible to category 021 edition 2.1 or earlier

DOCUMENT IDENTIFIER: EUROCONTROL-SPEC-0149-12

Edition Number: 2.6

Edition Date : 21/12/2021

Status : Released

Intended for : General Public

Category : EUROCONTROL Specification

Unit

DECMA/PCS/SCS/STAN

DOCUMENT CHARACTERISTICS

TITLE **EUROCONTROL Specification for Surveillance Data Exchange – ASTERIX Part 12** Category 21: ADS-B Target Reports **Publications Reference:** SPEC-0149-12 ISBN Number: 978-2-87497-028-3 **Document Identifier Edition Number:** 2.6 EUROCONTROL-SPEC-0149-12 21/12/2021 **Edition Date: Abstract** This document specifies the contents of ASTERIX Category 021 messages used for the transmission of ADS-B Target Reports. ADS-B Versions 0, 1 and 2 are covered in full by the Specification. This Specification contains a partial implementation of ADS-B Version 3. Most modifications for the implementation of ADS-B Version 3 have been performed in the Reserved Expansion Field (REF). To make use of these modifications it is recommended also to implement the REF (Edition 1.5). Keywords SIC Messages SAC Data Exchange Data Category Data Field Data Block Data Item UAP **ASTERIX** ADS-B

STATUS, AUDIENCE AND ACCESSIBILITY								
Status Intended for Accessible via								
Working Draft		General Public		Intranet				
Draft		EUROCONTROL		Extranet				
Proposed Issue		Restricted		Internet (www.eurocontrol.int)	\checkmark			
Released Issue	$\overline{\checkmark}$							

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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.

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
0.16	Dec. 2001	Addition of paragraph 4.4Editorial corrections	ALL
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 • 1021/110 • 1021/148 • 1021/152 • 1021/155 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

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0.24	Oct. 2004	Modification of the format of item I021/130 to increase the resolution of the position in WGS-84	5.2.10
0.25	Mar. 2005	format Document Identification Sheet updated Signature Page updated Correction of length for item I021/040 in table 2 – ADS-B reports UAP	Page ii Page iii 5.3
		Definition Item 021/140 updated	5.2.11
0.26	27 June 2005	Item I021/070 Mode 3/A added Item I021/131 Signal Amplitude added	5.2.6 5.2.12
0.27	October 2007	Change proposals from WG51-SG4 integrated Document completely restructured	Almost all
0.28	January 2008	Editorial changes throughout document Error Conditions in I021/040 defined New item I021/161 Track ID New item I021/400 Receiver ID	Numerous 5.2.6 5.2.31 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 Results EUROCAE WG51-SG4 meeting: I021/008: encoding rule updated plus editorial I021/016: LSB and layout modified, encoding rule updated	All 5.2.1 5.2.4
		I021/040: Modified following EUROCAE WG51 I021/161: Typo in heading corrected I021/200: Encoding rule modified I021/250: Editorial in encoding rule corrected I021/295 (Data Ages) added Input from Austrocontrol:	5.2.6 5.2.31 5.2.34 5.2.38 5.2.41
		I021/016 Test Target Reference removed I021/040 restructured, notes added I021/161 Re-Numbering indication added	5.2.4 5.2.6 5.2.31
1.0P	April 2008	Update following RDE-TF #41: Item I021/161: RN bit moved to cat 023 Item I021/295: Note 2 added Items I021/148, I021/165: note added "not available in 1090 MHz ES"	5.2.31 5.2.41 5.2.24 5.2.25 5.2.26 5.2.32
		Item I021/230: Note added Status changed to "Proposed Issue"	5.2.37
1.0	August 2008	List of Abbreviations corrected Item I021/015: Note added Item I021/040, second extension: note added Category corrected in Items 250 and 260	3.2 5.2.3 5.2.6 5.2.38 5.2.39

		Note 6 in I021/110 corrected	5.2.17
		Editorial "clean-up"	
4.4		Status changed to "Released Issue"	
1.1	September 2008	Editorial update	
1.2	November	List of reference documents updated	2.2
	2008	Encoding rule and notes to I021/016 updated Notes in I021/040 updated	5.2.4 5.2.6
		Note in I021/130 updated	5.2.18
		Note in I021/131 updated	5.2.19
		Note in I021/260 updated	5.2.39
		Description/Note updated in I021/271	5.2.40
		Table 2 updated	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	5.2.11/5.2.13
		Meaning of "Range Exceeded" clarified	5.2.26/5.2.28 5.2.29/5.2.30
1.5	September	Signature Page updated	5.2.29/5.2.30 iii
1.5	2010	Note added to item I021/250	5.2.38
1.6	October 2010	Reference document [6] corrected	Page 2
		Reference in item I021/170 corrected	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	iii
		Alignment with the SPI-IR	General
		Inclusion of ED-102A/DO-260B ("Version 2")	update
		modifications	
		The changes, although substantial, have been	
		performed in a way that backwards compatibility is ensured.	
		Note added to I021/040, 2 nd ext., bit6	5.2.6
2.2	June 2014	Migration to EUROCONTROL Specification	All
		Abbreviation for SIL Supplement modified (ambiguity with SIL)	5.2.16
		Typo in I021/090, 3 rd extension corrected	5.2.16
		PIC Table in I021/090 clarified	5.2.16
		Correction of Definition of RE-bit in I021/160	5.2.30
		Military Emergency added to I021/200	5.2.34 5.2.36
		Typo in I021/220 SF #1 corrected Typo in I021/260 corrected (BDS6,1 i.o. BDS6,2)	5.2.36 5.2.39
		1 170 11 102 11200 001100100 (0000,1 1.0. 0000,2)	5.2.40

		Structure of I021/271 corrected (NOT	
		Backwards compatible to previous editions)	
2.3	January 2015	"Lookup List" indication added to I021/040	5.2.6
2.4	June 2015	Chapter 4.2 "Time Management" updated Encoding Rule for I021/071 updated Encoding Rule for I021/072 updated Encoding Rule for I021/073 updated Encoding Rule for I021/075 updated	4.2 5.2.8 5.2.9 5.2.10 5.2.11
2.5	February 2021	List of References updated Link to ASTERIX Website updated Note added to Data Item I021/040 primary SF Note added to Data Item I021/080 Reference updated in I021/170 Note updated in I021/200 MOPS Version Number 3 added to I021/210 (see Note in 0) Correction of Format in I021/295	2.2 5.2.2 5.2.6 5.2.15 5.2.33 5.2.34 5.2.35
2.6P	December 2021	This Specification contains a partial implementation of ADS-B Version 3. Most modifications for the implementation of ADS-B Version 3 have been performed in the Reserved Expansion Field (REF). To make use of these modifications it is recommended also to implement the REF (Edition 1.5).	1.1 3.2 4.1 4.2 5.2.5 5.2.6 5.2.16 5.2.34 5.2.35 5.2.40
2.6	December 2021	Bit Correction Values added Inconsistency in PIC table clarified LSB corrected in I021/130 LSB corrected in I021/131 Note added to LNAV in I021/200 Note added to I021/260 Name of I021/295 SF#9 updated	5.2.6 5.2.16 5.2.18 5.2.19 5.2.34 5.2.39 5.2.41

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1 INTRODUCTION

1.1 Scope

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

ADS-B Versions 0, 1 and 2 are covered in full by the Specification. This Specification contains a partial implementation of ADS-B Version 3. Most modifications for the implementation of ADS-B Version 3 have been performed in the Reserved Expansion Field (REF). To make use of these modifications it is required also to implement the REF (Edition 1.5).

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 SUR.ET1.ST05.2000-STD-01-01. "All Purpose Structured EUROCONTROL Surveillance Information Exchange ASTERIX". Edition 3.1, Released Issue, November 2021.
- 2. EUROCONTROL Document SUR.ET1.ST05.2000-STD-16-1 ASTERIX Category 023 "CNS/ATM Ground Station Service Reports".
- 3. RTCA/DO-242A, Minimum Aviation System Performance Standards for ADS-B, June 25, 2002.
- 4. SUR/ET3/ST06.3220/001, Automatic Dependent Surveillance Requirements, Edition 0.8 November 2000.
- 5. ICAO Annex 10, Vol. IV.
- 6. ICAO Annex 5
- 7. ICAO SARPS for ACAS in ICAO Annex 10, Volume IV, Chapter 4
- 8. EUROCAE ED-102 / RTCA DO-260 "Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance Broadcast (ADS-B)" (ADS-B Version 0)
- 9. RTCA DO-260A"Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance Broadcast (ADS-B) and Traffic Information Services Broadcast (TIS-B)" (ADS-B Version 1)
- EUROCAE ED-102A / RTCA DO-260B "Minimum Operational Performance Standard (MOPS) for 1090 MHz Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B)". (ADS-B Version 2)
- 11. EUROCAE ED-102B / RTCA DO-260C "Minimum Operational Performance Standard (MOPS) for 1090 MHz Extended Squitter

- Automatic Dependent Surveillance Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B)". (ADS-B Version 3).
- 12. EUROCAE ED-129() "Technical Specification for a 1090 MHz Extended Squitter ADS-B Ground System".
- 13. EUROCAE ED-275 / RTCA DO-386 "MOPS for Airborne Collision avoidance System Xu (ACAS Xu)".
- 14. EUROCAE ED-73F / RTCA DO-181F "MOPS for Secondary Surveillance Radar Mode S Transponders"

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:

o Degree (angle)

ADS-B Automatic Dependent Surveillance – Broadcast

AMG ASTERIX Maintenance Group

ASTERIX All Purpose **ST**ructured **E**urocontrol su**R**veillance Information

EXchange

CAS Collision Avoidance System

CAT Data Category

CF Control Field – as defined in Ref [11] Table 2-7

CPR Compact Position Reporting

DAA Detect and Avoid (Used in REF only)

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

MOPS Minimum Operational Performance Standard

OCM Operational Coordination Message (Used in REF only)

PSR Primary Surveillance Radar

RE Reserved Expansion Indicator
REP Field Repetition Indicator

RWC Remain Well Clear (Used in REF only)

s second, unit of time SAC System Area Code

SDPS Surveillance Data Processing System

SICSystem Identification CodeSPSpecial Purpose IndicatorSSRSecondary Surveillance Radar

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. ADS-B Versions 0, 1 and 2 are covered in full by the Specification. This Specification contains a partial implementation of ADS-B Version 3. Most modifications for the implementation of ADS-B Version 3 have been performed in the Reserved Expansion Field (REF). To make use of these modifications it is required also to implement the REF (Edition 1.5).

4.2 Time Management

The time-stamping shall comply with ICAO Annex 5 [Ref. 6].

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

Until and including ADS-B Version 2 the avionics of the aircraft were capable to be synchronised to a high precision time-source (such as GPS). In this case the aircraft is capable 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.

The GS may provide both items I021/071 **and** I021/073 (for position) or I021/072 **and** I021/075 (for velocity) in the same ASTERIX record.

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

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

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

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

Table 1 - Data Items of Category 021

Data Item	Data Item						
Reference	Description	Resolution					
Number							
1021/008	Aircraft Operational Status	N.A.					
1021/010	Data Source Identification	N.A.					
1021/015	Service Identification	N.A.					
1021/016	Service Management	N.A.					
1021/020	Emitter Category	N.A.					
1021/040	Target Report Descriptor	N.A.					
1021/070	Mode 3/A Code	N.A.					
1021/071	Time of Applicability for Position	1/128 s					
1021/072	Time of Applicability for Velocity	1/128 s					
1021/073	Time of Message Reception for Position	1/128 s					
1021/074	Time of Message Reception for Position – High Precision	2- ³⁰ s					
1021/075	Time of Message Reception for Velocity	1/128 s					
1021/076	Time of Message Reception for Velocity – High Precision	2- ³⁰ s					
1021/077	Time of Report Transmission	1/128 s					
1021/080	Target Address	N.A.					
1021/090	Quality Indicators	N.A.					
1021/110	Trajectory Intent	N.A.					
1021/130	Position in WGS-84 co-ordinates	180/2 ²³ °					
1021/131	Position in WGS-84 co-ordinates, high resolution	180/2 ³⁰ °					
1021/132	Message Amplitude	1 dBm					
1021/140	Geometric Height	6.25 ft					
1021/145	Flight Level	1⁄4 FL					
1021/146	Selected Altitude	25 ft					
1021/148	Final State Selected Altitude	25 ft					
1021/150	Air Speed	N.A.					
1021/151	True Air Speed	1kt					
1021/152	Magnetic Heading	360/2 ¹⁶ °					
1021/155	Barometric Vertical Rate	6.25 ft / min					
1021/157	Geometric Vertical Rate	6.25 ft / min					
1021/160	Airborne Ground Vector	N.A.					
1021/161	Track Number	N.A.					
1021/165	Track Angle Rate	1/32 °/s					
1021/170	Target Identification	N.A.					
1021/200	Target Status	N.A.					
1021/210	MOPS Version	N.A.					
1021/220	Met Information	N.A.					
1021/230	Roll Angle	0.01 deg					
1021/250	Mode S MB Data	N.A.					
1021/260	ACAS Resolution Advisory Report	N.A.					
1021/271	Surface Capabilities and Characteristics	N.A.					
1021/295	Data Ages	N.A.					
1021/400	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	7 6	5	4		3	2	1	
RA	TC	TS	AR∖	/	CDTI/A	Not TCAS	SA	
	bit-8	3	(RA) =0 =1	TC		tion Advisory CAS RA not a ve		
	-7/6	(TC) = 0 = 1 = 2 = 3	Target Trajectory Change Report Capability no capability for Trajectory Change Reports support for TC+0 reports only support for multiple TC reports reserved					
bit-5			(TS) =0 =1	Target State Report Capability no capability to support Target State Reports capable of supporting target State Reports				
bit-4			(ARV) =0 =1	no	capability t	d Velocity Re o generate A nerate ARV-r	RV-rep	
	3	(CDTI/ =0 =1	ĆE	Cockpit Dis OTI not ope OTI operatio	ational	Inforn	nation airborne	
	2	(not T0 = 0 = 1	CAS): TCAS System Status TCAS operational TCAS not operational					
		(SA): = 0 = 1	An	ngle Antenn tenna Dive ngle Antenn	rsity			

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

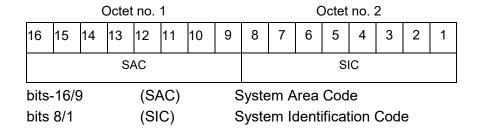
Encoding Rule : This item is optional. It shall be sent only if at least one bit is set to 1.

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:



Encoding Rule:

This Item shall be present in every ASTERIX record.

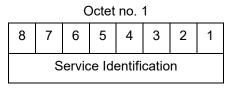
NOTE - The up-to-date list of SACs is published on the EUROCONTROL ASTERIX Web Site (http://www.eurocontrol.int/asterix).

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:



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. 2].

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. 2]. 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

Values 4, 6, 13, 14, and 16 are available for ADS-B Versions 0, 1, and 2 only. For the purpose of Avionics Monitoring, the values 4, 6, 13, 14 and 16 shall also be sent if received from a Version 3 ADS-B System.

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	4 3 2		1
	ATP		AF	RC	RC	RAB	FX

bits-8/6	(ATP)	= 0 = 1 = 2 = 3 = 4-7	Address Type (see Note below) 24-Bit ICAO address Duplicate address Surface vehicle address Anonymous address Reserved for future use
bits-5/4	(ARC)	= 0 = 1 = 2 = 3	Altitude Reporting Capability 25 ft 100 ft Unknown Invalid
bit-3	(RC)	= 0 = 1	Range Check Default Range Check passed, CPR Validation pending
bit-2	(RAB)	= 0 = 1	Report Type Report from target transponder Report from field monitor (fixed transponder)
bit-1	(FX) Fiel	d Extensi = 0 = 1	ion End of item 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.

NOTES

Bits 8/6 (ATP): values 0, 2 and 3 depend on the value of the Control Field (CF) in the Downlink Format 18 Message as defined in the ADS-B MOPS (EUROCAE ED-102B/RTCA DO-260C, Ref [11] Table 2-7).

CF=0 denotes a 24-bit ICAO address and shall be encoded with ATP=0.

CF=1 denotes "another kind of address for the transmitting ADS-B participant: a self assigned "anonymous" address, a ground vehicle address, or a surface obstruction address".

Thus, from the downlinked information it is not possible to distinguish between a "Surface Vehicle Address – ATP=2" or an "Anonymous Address – ATP=3".

Therefore how CF=1 in the received 1090 MHz Extended Squitter is encoded in ATP **shall** be described in the ICD of the ASTERIX system.

It should be noted, however, that EUROCAE Document ED-129B (the "Technical Specification for a 1090MHz Extended Squitter ADS-B Ground System", Ref. [12]) requires ATP to be set to "3" if CF=1. Therefore it is recommended that a value of CF=1 received in the Extended Squitter **should** be encoded as ATP=3.

NOTES

Additional Capabilities for ADS-B Version 3 systems as defined in EUROCAE ED-102B/RTCA DO-260C (Ref. [11]) have been defined in the Reserved Expansion Field (Edition 1.5), Data Item STA.

Structure of I021/040 - First Extension

Octet no. 1

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

Differential Correction bit-8 (DCR) = 0No differential correction (ADS-B) = 1 Differential correction (ADS-B) **Ground Bit Setting** bit-7 (GBS) = 0Ground Bit not set = 1 Ground Bit set Simulated Target bit-6 (SIM) = 0Actual target report = 1 Simulated target report **Test Target** bit-5 (TST) Default = 0**Test Target** = 1 Selected Altitude Available bit-4 (SAA) = 0Equipment capable to provide Selected Altitude = 1 Equipment not capable to provide Selected Altitude bits-3/2 (CL) Confidence Level = 0Report valid = 1 Report suspect = 2 No information = 3 Reserved for future use bit-1 (FX) Field Extension = 0End of item = 1 Extension into next extension

Structure of I021/040 - Second Extension: Error Conditions

Octet no. 1

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

Bit-8: Spare bit, set to "0" (spare)

Bit-7: (LLC) List Lookup Check

= 0 default

= 1 Target is suspect (see note)

Bit-6: **Independent Position Check** (IPC)

= 0 default (see note)

= 1 Independent Position Check failed

No-go Bit Status Bit-5: (NOGO)

= 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 next extension

NOTES Except for Bit 5 (NOGO), 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 7, if set to 1, indicates that a lookup in a Black-list/White-list

identified that the target may be suspect

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

1023/100 of Category 023 [Ref. 2].

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.

Structure of I021/040 - Third Extension

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

bits-8/2 (TBC)

bit-8 (TBC#EP)

Element Populated Bit

= 0 Element not populated

= 1 Element populated

Value

bit-1 (FX)

Field Extension

= 0 End of item

= 1 Extension into next extension

NOTES

Bits 7/2 contain the total number of bit corrections applied to all Extended Squitter Messages used for the composition of this Category 021 Target Report (regardless of the ages of the Extended Squitter messages). More details on the techniques applied for error correction can be found in EUROCAE ED-102B/RTCA DO-260C [11], Appendix I "Extended Squitter Enhanced Reception Techniques".

Structure of I021/040 - Fourth Extension

Octet no. 1								
8	7	6	5	4	3	2	1	
MBC							FX	

bits-8/2 bit-8	(MBC) (MBC#EP)	Maximum Bits Corrected Element Populated Bit = 0 Element not populated = 1 Element populated
bits-7/2	(MBC#VAL)	Value
bit-1	(FX)	Field Extension = 0 End of item

= 1 Extension into next extension

NOTES

Bits 7/2 contain the maximum number of bit corrections applied to a single Extended Squitter Message used for the composition of this Category 021 Target Report (regardless of the ages of the Extended Squitter messages). More details on the techniques applied for error correction can be found in EUROCAE ED-102B/RTCA DO-260C [11], Appendix I "Extended Squitter Enhanced Reception Techniques".

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.

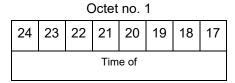
5.2.8 Data Item I021/071, Time of Applicability for Position

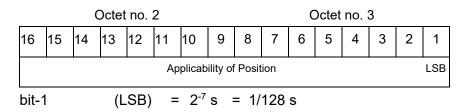
Definition: Time of applicability of the reported position, in the form of

elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:





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.

If the target avionics is synchronised to a high precision time-source (if the T-Bit = 1), I021/071 shall be transmitted.

Both items I021/071 and I021/073 may be transmitted in the same ASTERIX record.

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.

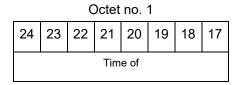
5.2.9 Data Item I021/072, Time of Applicability for Velocity

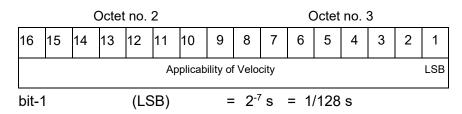
Definition: Time of applicability (measurement) of the reported velocity, in

the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:





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.

If the target avionics is synchronised to a high precision time-source (if the T-Bit = 1), I021/072 shall be transmitted if available in the ADS-B technology applied.

Both items I021/072 and I021/075 may be transmitted in the same ASTERIX record.

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

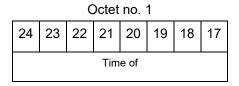
Definition: Time of reception of the latest position squitter in the Ground

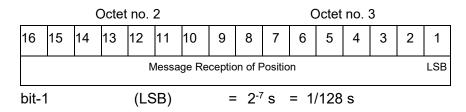
Station, in the form of elapsed time since last midnight,

expressed as UTC.

Format : Structure:

Three-Octet fixed length data item.





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.

If the target avionics is not synchronised to a high precision time-source (if the T-Bit = 0), I021/073 shall be transmitted.

Both items I021/071 and I021/073 may be transmitted in the same ASTERIX record.

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

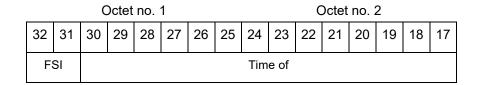
Definition: Time at which the latest ADS-B position information was received

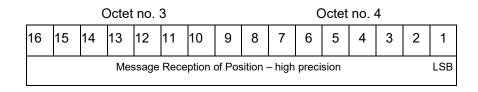
by the ground station, expressed as fraction of the second of the

UTC Time.

Format : Structure:

Four-Octet fixed length data item.





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

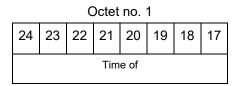
Definition: Time of reception of the latest velocity squitter in the Ground

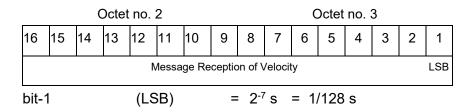
Station, in the form of elapsed time since last midnight,

expressed as UTC.

Format : Thro

Three-Octet fixed length data item.





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.

If the target avionics is not synchronised to a high precision time-source (if the T-Bit = 0), 1021/075 shall be transmitted.

Both items I021/072 and I021/075 may be transmitted in the same ASTERIX record.

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

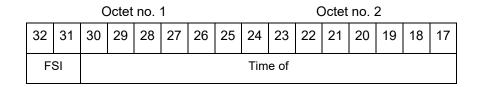
Definition: Time at which the latest ADS-B velocity information was received

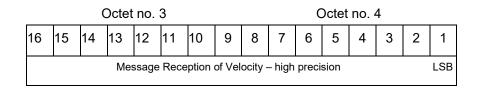
by the ground station, expressed as fraction of the second of the

UTC Time.

Format : Structure:

Four-Octet fixed length data item.





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".

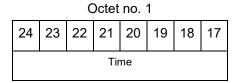
5.2.14 Data Item I021/077, Time of ASTERIX Report Transmission

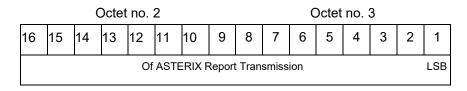
Definition: Time of the transmission of the ASTERIX category 021 report in

the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:





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

Format: Three-octet fixed length Data Item.

Structure:

Octet no. 1



	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-Bit address, A23 to A0

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

NOTE - The type of address encoded in Data Item I021/080 is transmitted in the ATP indication in the Primary Subfield of Data Item I021/040.

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

1021/210).

Structure of Primary Subfield:

Octet no. 1											
8	8 7 6 5 4 3 2										
NUC	Cr or N	IACv	١	<u> </u>	FX						

Bits-8/6 : (NUCr or NACv) Navigation Uncertainty Category for

velocity (NUCr) or the Navigation Accuracy Category for Velocity

(NACv)

Bits-5/2: (NUC_p or NIC) Navigation Uncertainty Category for

Position (NUCp) or Navigation

Integrity Category (NIC).

Bit-1 (FX) Field Extension

= 0: end of data item

= 1: extension into next extension

NOTE - The primary subfield is kept for backwards compatibility reasons.

NIC-values of MOPS Version 2 or higher 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											
NICBARO	S	IL		NA	C_p		FΧ				

Bit-8: (NIC_{BARO}) Navigation Integrity Category for

Barometric Altitude (as defined in

Version 1 and Version 2)

Bits-7/6: (SIL) Surveillance (Version 1) or Source

(Version 2 or higher) Integrity Level

Bits-5/2: (NAC_p) Navigation Accuracy Category for

Position

Bit-1 (FX) Field Extension

= 0 end of data item

= 1 extension into next extension

NOTE - "Version X" refers to the MOPS version as defined in data item I021/210/VN

Structure of second extension : Position Quality Indicators.

Octet no. 1

8	7	6	5	4	3	2	1
0	0	SILS	SE)A	G١	/A	FX

Bits-8/7: (Spare) Spare Bites, set to 0

Bit-6: (SILS) 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 or higher)

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 or higher" refers to the MOPS version as defined in data item I021/210/VN, bits 6/4.

Structure of third extension : Position Quality Indicators.

Octet no. 1

8	7	6	5	4	3	2	1
	P	IC		0	0	0	FX

Bits-8/5: (PIC) Position Integrity Category

Bits-4/2: (Spare) 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. A) DO260A	1	(+ sup A, B, C ion 2 a	;)	NIC suppl. D Version 3 (see Note)		
				NIC	A/B	A/C	NIC	D	
15			not defined						
14	< 0.004 NM	9	11	11	-	-	11	3	
13	< 0.013 NM	8	10	10	-	-	10	2	
12	< 0.04 NM		9	9	-	-	9	1	
11	< 0.1 NM	7	8	8	-	-	8	0	
10	< 0.2 NM	6 (airborne)	7	7	-	-	7	0	
9	< 0.3 NM	-	-	6	0/1	1/0	6	-	
8	< 0.5 NM	5	6 (+ 0)	6	0/0	-	6	-	
7	< 0.6 NM	-	6 (+ 1)	6	1/1	0/1	6	3	
6	< 1.0 NM	4	5	5	-	-	5	2	
5	< 2.0 NM	3	4	4	-	-	4	1	
4	< 4.0 NM	-	3	3	-	-	3	-	
3	< 8.0 NM	-	2	2	-	-	2	-	
2	< 10.0 NM	2	-	-	-	-	-	-	
1	< 20.0 NM	1	1	1	-	-	1	-	
0	No integrity (or > 20.0 NM)	0, 6 (surface)	0	0	-	-	0	0	

- **NOTE** "Version 2 or higher" refers to the MOPS version as defined in data item I021/210/VN, bits 6/4
- **NOTE -** PIC=0 is defined for completeness only. In this case the third extension shall not be generated.
- For Version 2 or higher PIC values of 7 and 9, the NIC supplements NOTE for airborne messages (NIC supplements A/B) and surface messages (NIC supplements A/C) are For Version 2 or higher PIC=8, the NIC supplements A/B for airborne messages listed. For DO-260A PIC values of 7 and 8, the NIC supplement for messages shown is in The aircraft air-ground status, and hence message type (airborne or surface), is derived from the GBS-bit in I021/040, 1st extension.
- NOTE NUCp of 6 has a different meaning for airborne and surface messages. For airborne messages (Extended Squitter Type Code 12) it is mapped to a PIC=10, for surface messages (Extended Squitter Type Code 8) it is mapped to a PIC=0.
- NOTE NIC Supplement D has only been defined for ADS-B Version 3 as in EUROCAE ED-102B/RTCA DO-260C (Ref. [11]), Chapter 2.2.3.2.6.1.16. It is transmitted in Squitter Messages with Format Type Codes 20, 21, and 22.

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	8 7 6 5 4 3 2 1											
NAV	AV 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.

		C	Octet	no.	1										
128	127	126	125	124	123	122	121								
			RE	ΕP											
		C	Octet	no. 2	2										
120	119	118	117	116	115	114	113								
TCA	NC		Т	CP n	umbe	er									
		C	Octet	no. 🤅	3					C	Octet	no. 4	4		
112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97
						Д	ltitud	е							LSB
		C	Octet	no. s	5					C	Octet	no. (6		
96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81
					Į	atitu	de in	WGS	S – 84	1					
	Octet no. 7									C	Octet	no. 8	8		
80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65
							LSB								
		C	Octet	no. 9	9					0	ctet	no. 1	0		
64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
					Lon	gitude	e in V	VGS -	- 84						LSB
		0	ctet	no. 1	1					0	ctet	no. 1	2		
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
	Point	Туре)	Т	D	TRA	TOA				TC	ΟV			
		0	ctet	no. 1	3					0	ctet	no. 1	4		
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	TC														LSB
		0	ctet	no. 1	5					0	ctet	no. 1	6		
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	 Unknown Fly by waypoint (LT) Fly over waypoint (LT) Hold pattern (LT) Hold pattern (LT) Procedure hold (LT) Procedure turn (LT) RF leg (LT) Top of climb (VT) Top of descent (VT) Start of level (VT) Cross-over altitude (VT) 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.

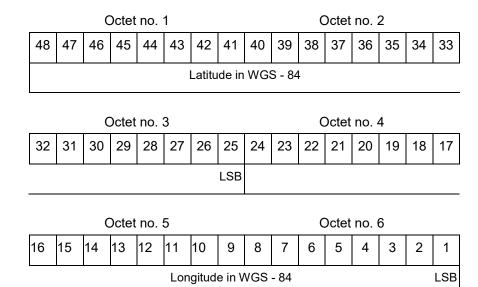
NOTES

- 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:



bits-48/25 (Latitude)

In WGS.84 in two's complement.

Range -90 <= latitude <= 90 deg.

LSB = $180/2^{23}$ degrees.

 $\approx 2.14576721191406 * 10^{-05}$ 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.

 $\approx 2.14576721191406 * 10^{-05}$ 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.

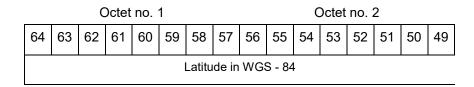
NOTE -Positive longitude indicates East. Positive latitude indicates North.

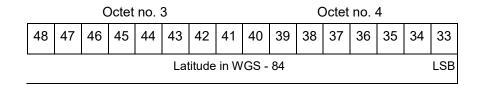
5.2.19 Data Item I021/131, High-Resolution Position in WGS-84 Co-ordinates

Definition: Position in WGS-84 Co-ordinates in high resolution.

Format : Eight-octet fixed length Data Item.

Structure:





Octet no. 5									Octet no. 6							
32 31 30 29 28 27 26 25							24	23	22	21	20	19	18	17		
Longitude in WG										4	l .	l .				

		(Octe	t no.	7						Octet	no.	8		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
					Lor	gitud	e in V	VGS	- 84						LSB

bits-64/33 (Latitude) In WGS.84 in two's complement.

Range -90 <= latitude <= 90 deg.

LSB = $180/2^{30}$ degrees.

 $\approx 1.6763806343078 * 10^{-07}$ 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

 $\approx 1.6763806343078 * 10^{-07}$ 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.

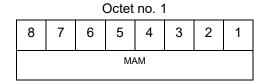
5.2.20 Data Item I021/132, Message Amplitude

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:



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

Encoding Rule: This Item is optional.

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

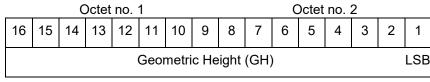
5.2.21 Data Item I021/140, Geometric Height

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:



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.

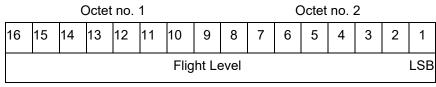
5.2.22 Data Item I021/145, Flight Level

Definition: Flight Level from barometric measurements, not QNH corrected,

in two's complement form.

Format : Two-Octet fixed length data item.

Structure:



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	t no.	1						Octet	no.	2		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
SAS	Sou	ırce						Altit	ude						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 or higher" 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.

Octet no. 2

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.

Octet no. 1

Structure:

	16	15	14	13	12	11	10	တ	8	7	6	5	4	3	2	1
	MV	АН	AM						Altit	ude						LSB
bit-16		(MV	')	:	=	0	Vert Not Activ	activ			now	/n				
bit-15		(AH)	:	=	0	Hold Not Activ	activ		unk	now	/n				
bit-14		(AM	l)	:	=	0	h Mot Not Activ	activ	e or	unk	now	/n				
bits- 13	3/1	(Alti	tude	e) /	Αltitu	LS	n in B=2: 300ft	5ft		·						

Encoding Rule : This Item is optional.

NOTE - This item is kept for backward compatibility but shall not be used for "Version 2 or higher" ADS-B systems (as defined by data item 1021/210, bits 6/4) for which item 146 will be used to forward the MCP/FCU or the FMS selected altitude information. For "Version 2 or higher" ADS-B systems, the vertical mode indications will be provided through the Reserved Expansion Field in the subfield NAV

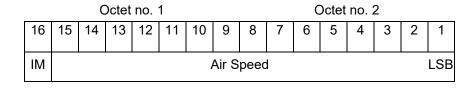
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5.2.25 Data Item I021/150, Air Speed

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

Format : Two-Octet fixed length data item.

Structure:



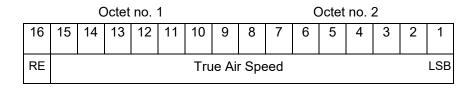
Encoding Rule: This Item is optional.

5.2.26 Data Item I021/151 True Airspeed

Definition: True Air Speed.

Format : Two-Octet fixed length data item.

Structure:



bit-16 (RE) "Range Exceeded" Indicator

= 0 Value in defined range

= 1 Value exceeds defined range

Encoding Rule: This Item is optional.

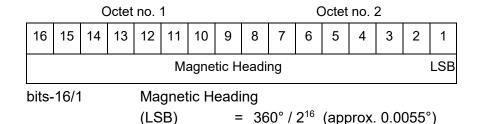
NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the True Air Speed contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual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

5.2.27 Data Item I021/152, Magnetic Heading

Definition: Magnetic Heading (Element of Air Vector).

Format : Two-Octet fixed length data item.

Structure:



Encoding Rule: This Item is optional.

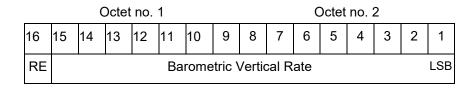
NOTE - True North Heading is defined in the Reserved Expansion Field in the subfield TNH.

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:



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

Encoding Rule :This Item is optional.

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.

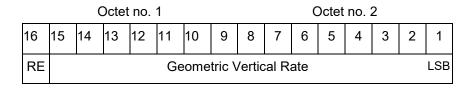
5.2.29 Data Item I021/157, Geometric Vertical Rate

Definition: Geometric Vertical Rate, in two's complement form, with

reference to WGS-84.

Format : Two-Octet fixed length data item.

Structure:



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

Encoding Rule: This Item is optional.

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.

5.2.30 Data Item I021/160, Airborne Ground Vector

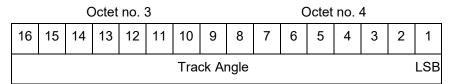
Definition: Ground Speed and Track Angle elements of Airborne Ground

Vector.

Format : Four-Octet fixed length data item.

Structure:

		C	Octet	no.	1					(Octet	no. 2	2		
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
RE						Gr	ound	l Spe	ed						LSB



bit-32 (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) = $360^{\circ} / 2^{16}$ (approx. 0.0055°)

Encoding Rule: This Item is optional.

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.

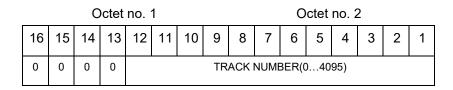
5.2.31 Data Item I021/161, Track Number

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:



bits-16/13 Spare bits set to zero

bits-12/1 Track number

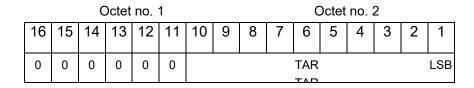
Encoding Rule : This item is optional.

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:



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	2					
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
	I	Chai	racte	er 1				Chai	acte	r 2			Cha	aract	ter 3

				Octe	et no	. 3						Octe	et no	. 4		
Ī	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
					Cha	racte	er 4				Chai	racte	er 5			

			Octe	et no	. 5						Oct	et no	. 6		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
С	hara	cter	6			Chai	racte	er 7				Cha	racte	er 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 [5] Section 3.1.2.9.1.2 and Table 3-8.

Encoding Rule: This Item is optional.

5.2.34 Data Item I021/200, Target Status

Definition: Status of the target

One-octet fixed length Data Item Format:

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
ICF	LNAV	ME		PS		S	S

bit-8 (ICF) Intent Change Flag (see Note 1)

> No intent change active =0

=1 Intent change flag raised

bit-7 (LNAV) LNAV Mode (see Note 2)

> =0 LNAV Mode engaged

LNAV Mode not engaged =1

bit-6 (ME) =0 No military emergency

> Military emergency =1

bits-5/3 (PS) Priority Status (see Note 3)

No emergency / not reported

= 1 General emergency

= 2 Lifeguard / medical emergency

= 3 Minimum fuel

= 4 No communications

Unlawful interference = 5

"Downed" Aircraft = 6

bits-2/1 (SS) Surveillance Status

> = 0No condition reported

Permanent Alert (Emergency = 1 condition)

= 2 Temporary Alert (change in Mode 3/A Code other than emergency)

= 3 SPI set

Encoding Rule: This Item is optional.

NOTES 1: Bit-8 (ICF), when set to "1" indicates that new information is available in the BDS Registers 40, 41 or 42. As of MOPS Version 3 (see I021/210) as defined in EUROCAE ED-102B/RTCA DO-260C [11] this flag is no longer used and **shall** be set to "0".

NOTES

2: The logic for setting the LNAV indication is reversed compared to the definition of the LNAV indication in EUROCAE ED-102()/RTCA DO-260(). Whether or not this bit is actively set is indicated in the setting of the "Status of the MCP/FCO Mode Bits" defined in EUROCAE ED-102B/RTCA DO-260C (Ref. [11] chapter 2.2.3.2.7.1.3.11) and in the Reserved Expansion Field of Category 021, item I021/REF/NAV/MFM. If MFM#VAL is set to 0, LNAV **shall** be set to 1.

NOTES

3: Bits 5/3 (PS) have been redefined in Version 3 ADS-B systems as defined in EUROCAE ED-102B/RTCA DO-260C (Ref. [11]). For Version 3 ADS-B systems (see I021/210 - VN) the Priority Status **shall** be encoded in the Reserved Expansion Field, Item STA, Primary Subfield Bits 6/5.

However, since values have been re-defined in ADS-B Version 3, mapping is required to ensure that information is not lost. This mapping **shall** be done according to the following table:

ADS-B Version 3 (PS3)	ADS-Version < 3 (1021/200 - PS)
0 (No Emergency/not reported)	0 (No Emergency/not reported)
1 (General emergency)	1 (General emergency)
2 (UAS/RPAS Lost Link)	4 (No communication)
3 (Minimum fuel)	3 (Minimum fuel)
4 (No communication)	4 (No communication)
5 (Unlawful interference)	5 (Unlawful interference)
6 (Aircraft in distress - automatic activation)	1 (General emergency)
7 (Aircraft in distress – manual activation)	1 (General emergency)

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:

		Oc	tet r	าด. 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

= 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. 10]

= 3 ED-102B/DO-260C [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

Encoding Rule: This item is optional.

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.
- NOTE In Bits 6/4 (VN) the possibility has been added to indicate an Extended Squitter received from a "Version 3" ADS-B System conforming to EUROCAE ED-102B/RTCA DO-260C Ref. [11]. This edition of the Category 021 Specification has been extended to partially process additional data contained in Version 3 Extended Squitters. Thus, systems in line with this specification can benefit from the changes applied.
- NOTE ADS-B Versions 0, 1 and 2 are covered in full by the specification. This document contains a partial implementation of ADS-B Version 3. Most modifications for the implementation of ADS-B Version 3 have been performed in the Reserved Expansion Field (REF). To make use of these modifications it is required also to implement the REF (Edition 1.5).

5.2.36 Data Item I021/220, Met Information

Definition: Meteorological information.

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

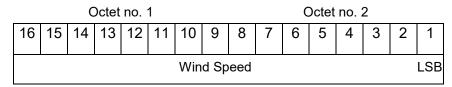
Structure of **Primary Subfield:**

\sim	1			. 1
		ГΑТ	no.	1

WS WD TMP TRB 0 0	0	FX

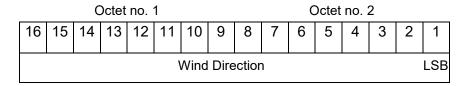
bit-8	(WS)	= 0 = 1	Wind Speed Absence of Subfield #1 Presence of Subfield #1			
bit-7	(WD)	= 0 = 1	Wind Direction Absence of Subfield #2 Presence of Subfield #2			
bit-6	(TMP)	= 0 = 1	Temperature Absence of Subfield #3 Presence of Subfield #3			
bit-5	(TRB)	= 0 = 1	Turbulence Absence of Subfield #4 Presence of Subfield #4			
bits-4/2		Spare	bits set to zero			
bit-1	FX	= 0	4			

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



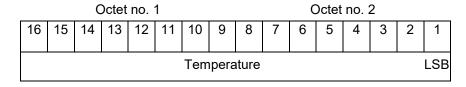
bits-16/1 Wind Speed (LSB) = 1 knot $0 \le \text{Wind Speed} \le 300$

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



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

Structure of I021/220 - Subfield #3: Temperature



bits-16/1 Temperature in degrees Celsius, in two's complement form

(LSB) = 0.25 °C

-100 °C <= Temperature <= 100 °C

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.

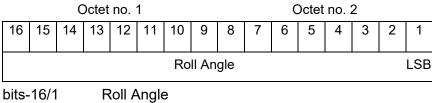
5.2.37 Data Item I021/230, Roll Angle

Definition: The roll angle, in two's complement form, of an aircraft executing

a turn.

Format : A two byte fixed length data item.

Structure:



-180 <= Roll Angle <= 180

oits-16/1 Roll Angle (LSB) = 0.01 degree

Encoding Rule: This Item is optional.

NOTE - Negative Value indicates "Left Wing Down".

NOTE - Resolution provided by the technology "1090 MHz Extended

Squitter" is 1 degree.

5.2.38 Data Item I021/250, BDS Register Data

Definition: BDS Register Data as extracted from the aircraft

transponder.

Format: Repetitive Data Item starting with a one-octet Field Repetition

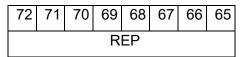
Indicator (REP) followed by at least one BDS Register

comprising one seven octet BDS Register Data and one octet

BDS code.

Structure:

Octet no. 1



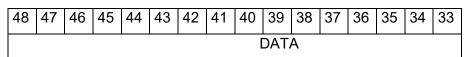
Octet no. 2

Octet no. 3

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

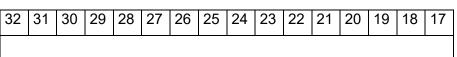
Octet no. 4

Octet no. 5



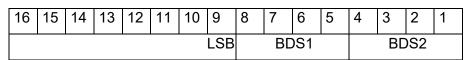
Octet no. 6

Octet no. 7



Octet no. 8

Octet no. 9



bits-72/65

(REP)

Repetition factor

bits-64/9

(BDSDATA)

56-bit message conveying

BDS Register Data

bits-8/5	(BDS1)	BDS Register Address 1
hits-4/1	(BDS2)	BDS Register Address 2

Encoding Rule:

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

NOTES

- 1. For the transmission of Register 08₁₆ (as defined in EUROCAE ED-102B/RTCA DO-260C [11] Figure A-13), Data Item I021/170 **should be** used.
- 2. For the transmission of the information contained in Format Type Code 28, Subtype Code 2 (as defined in [11] Figure A-16 "1090 ES TCAS RA Broadcast"), Data Item I021/260 **shall** be used.
- 3. This Data Item may be used to transmit (in bits 64/9) the contents of the 1090 MHz Extended Squitter messages as received from the aircraft. The detailed contents of the Extended Squitter messages can be found in EUROCAE ED-102B/RTCA DO-260C [11] Appendix A. It should be noted that this data is not encoded in ASTERIX but in the original Squitter format.

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	5 5	4	53	52	51	50	49	48	47	46	45	44	43	42	41
		T)	ΥP	1		,	STYI	Р				Al	RA			

Octet no. 3 Octet no. 4

40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
		ARA	(ctd.))			R	AC		RA T	MT E	Т	TI	Т	ID

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 or higher)
bits-51/49	(STYP)	Message Sub-type (= 2 for 1090 ES, Version 2 or higher)
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 2 or higher" denotes the MOPS version as defined in I021/210, bits 6/4
- **NOTE** This data items copies the value of BDS Register 6,1 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. 5].
- NOTE Collision Avoidance System ACAS Xu (as defined in EUROCAE ED-275/RTCA DO-386 [13]) uses two BDS Registers to transmit the Resolution Advisory (BDS Register 3,0 and BDS Register 3,1). While BDS Register 3,0 is transmitted by ADS-B (in Message Type Code 28, Subtype Code 2), BDS Register 3,1 is not transmitted as part of the ADS-B TCAS RA Broadcast (confirm EUROCAE ED-275/RTCA DO-386 [13] chapter 2.2.3.8.3.2.10).

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 Capabilities

			Octet	no. 1			
8	7	6	5	4	3	2	1
	-					_	·
0	0	POA	CDTI/S	B2	RAS	IDENT	FX
				low			

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				
	L+	· W		0	0	0	FX				

bits-8/5 Length and width of the aircraft

bits-4/2 Spare bits, set to 0

bit-1 FX Extension indicator

= 0 no extension

= 1 extension into first extension

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

Version 1	message	ASTERIX		2 or higher essage
Length (meters)	Width (meters)	encoding	Length (meters)	Width (meters)
L < 15	W < 11.5	0	L < 15	W < 11.5
L < 13	W < 23	1	L < 13	W < 23
L < 25	W < 28.5	2	L < 25	W < 28.5
L < 23	W < 34	3	L < 23	W < 34
L < 35	W < 33	4	L < 35	W < 33
L < 33	W < 38	5	L < 33	W < 38
L < 45	W < 39.5	6	L < 45	W < 39.5
L / 43	W < 45	7	L < 43	W < 45
L < 55	W < 45	8	L < 55	W < 45
L < 33	W < 52	9	L < 33	W < 52
L < 65	W < 59.5	10	L < 65	W < 59.5
L < 03	W < 67	11	L < 03	W < 67
L < 75	W < 72.5	12	L < 75	W < 72.5
L < /3	W < 80	13	L < /3	W < 80
L < 85	W < 80	14	L < 85	W < 80
L ~ 63	W > 80	15	L>85	or $W > 80$

NOTE - Version 2 or higher (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.

NOTE - As of edition 2.2 the structure of this data item has been changed. Edition 2.2 is not backwards compatible with previous editions

Encoding Rule : This item is optional.

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 four

octets, followed by the indicated subfields.

Structure of Primary Subfield:

		С	ctet	no. 1	1		
32	31	30	29	28	27	26	25
AOS	TRD	МЗА	QI	TI	MAM	GH	FX
		С	ctet	no. 2	2		
24	23	22	21	20	19	18	17
FL	SAL	FSA	AS	TAS	MH	BVR	FX
		С	ctet	no. 3	3		
16	15	14	13	12	11	10	9
GVR	GV	TAR	TI	TS	MET	ROA	FX
		С	ctet	no. 4	1		
8	7	6	5	4	3	2	1
ARA	SCC	0	0	0	0	0	FX
	u l			<u> </u>			

bit-32	(AOS)	Subfield #1:	Aircra = 0 = 1	aft Operational Status age Absence of Subfield #1 Presence of Subfield #1
bit-31	(TRD)		Targe = 0 = 1	et Report Descriptor age Absence of Subfield #2 Presence of Subfield #2
bit-30	(M3A)		= 0	e 3/A Code age Absence of Subfield #3 Presence of Subfield #3
bit-29	(QI)			ity Indicators age Absence of Subfield #4 Presence of Subfield #4
bit-28	(TI)		Traje = 0 = 1	ctory Intent age Absence of Subfield #5 Presence of Subfield #5
bit-27	(MAM)		Mess = 0 = 1	sage Amplitude age Absence of Subfield #6 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.)	= 1 extension
bit-24	(FL)	Subfield #8: Flight Level age = 0 Absence of Subfield #8
		= 1 Presence of Subfield #8
bit-23	(SAL)	Subfield #9: 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	(46)	
DIL-Z I	(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
DIC-17		= 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

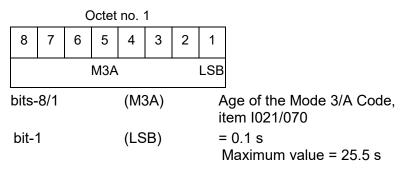
Octet no. 1

	8	7	6	5	4	3	2	1	
			l	AOS)			LSB	
bits-8/1 (AOS)					(AC	OS)			age of the information ransmitted in item I021/008.
	bit-	1			(LS	B)			0.1 s Maximum value =25.5 s

Structure of I021/295 - Subfield # 2: Target Report Descriptor Age

Octet no. 1 5 4 3 8 6 2 1 **TRD** LSB bits-8/1 Age of the Target Report (TRD) Descriptor, item I021/040 bit-1 (LSB) = 0.1 sMaximum value = 25.5 s

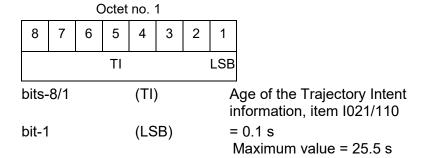
Structure of I021/295 - Subfield # 3: Mode 3/A Age



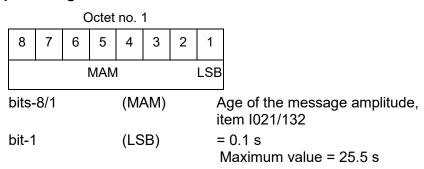
Structure of I021/295 - Subfield # 4: Quality Indicators Age

			Octet	no.	1			
8	7	6	5	4	3	2	1	
			QI				LSB	
bits-	8/1			(QI)			Age of the Quality Indicators, em 1021/090
bit-1				(LS	B)			: 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 5: Trajectory Intent Age



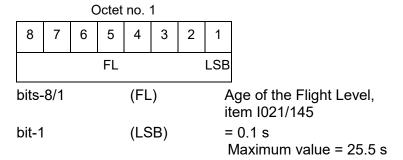
Structure of I021/295 - Subfield # 6: Message Amplitude Age



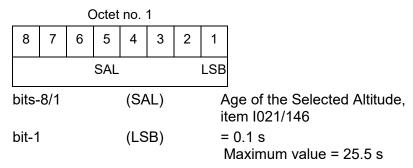
Structure of I021/295 - Subfield # 7 Geometric Height Age

		C	Octet	no.	1			
8	7	6	5	4	3	2	1	
			GH				LSB	
bits-8/1 (GH)								age of the Geometric Height, em 021/140
bit-1 (LSB)				B)			: 0.1 s Maximum value = 25 5 s	

Structure of I021/295 - Subfield # 8 Flight Level age



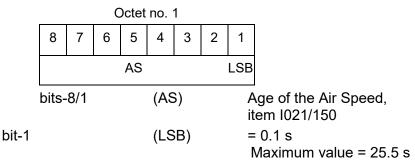
Structure of I021/295 - Subfield # 9: Selected Altitude Age



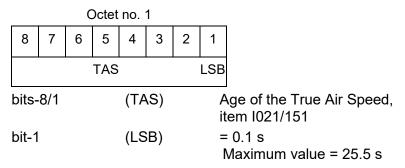
Structure of I021/295 - Subfield # 10 Final State Selected Altitude Age

		(Octet	no.	1			
8	7	6	5	4	3	2	1	
FSA LS								
bits-8/1 (FSA)								age of the Final State Selected
bit-1		(LSB)						: 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 11: Air Speed Age



Structure of I021/295 - Subfield # 12: True Air Speed Age



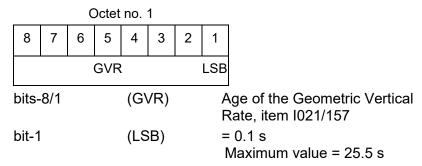
Structure of I021/295 - Subfield # 13: Magnetic Heading Age

			Octet	no.	1			
8	7	6	5	4	3	2	1	
			МН				LSB	
bits-8/1 (MH)								age of the Magnetic Heading, em I021/152
bit-1 (LSB)				B)			: 0.1 s Maximum value = 25.5 s	

Structure of I021/295 - Subfield # 14: Barometric Vertical Rate Age

Octet no. 1 5 4 2 8 6 3 1 **BVR** LSB bits-8/1 (BVR) Age of the Barometric Vertical Rate, item 1021/155 bit-1 (LSB) = 0.1 sMaximum value = 25.5 s

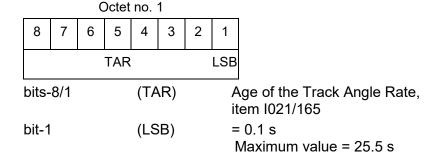
Structure of I021/295 - Subfield # 15: Geometric Vertical Rate Age



Structure of I021/295 - Subfield # 16: Ground Vector Age

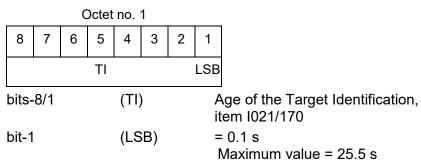
			(Octet	no.				
8		7	6	5	4	3	2	1	
				GV				LSB	
bit	bits-8/1 (GV)								age of the Ground Vector, tem 1021/160
bit-	bit-1 (LSB)							=	: 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 17: Track Angle Rate Age



Structure of I021/295 - Subfield # 18:

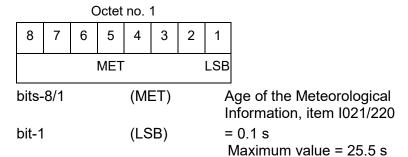
Target Identification Age



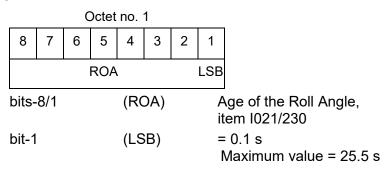
Structure of I021/295 - Subfield # 19: Target Status Age

		C	Octet	no.				
8	7	6	5	4	3	2	1	
			TS				LSB	
bits-8/1 (TS)								age of the Target Status, em I021/200
bit-1 (LSB)								: 0.1 s Maximum value = 25.5 s

Structure of I021/295 - Subfield # 20: Met Information Age



Structure of I021/295 - Subfield # 21: Roll Angle Age



Structure of I021/295 - Subfield # 22: ACAS Resolution Advisory Age

		(octet	no.	I							
8	7	6	5	4	3	2	1					
			ARA				LSB					
bits-8/1 (ARA)							а	age of the latest update of an active ACAS Resolution advisory, item I021/260				
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	s-8/1			(SC	CC)		s	age of the information on the urface capabilities and haracteristics of the respective arget, item I021/271
	bit-1 (LSB) Maximum value = 25.5 s							: 0.1 s

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

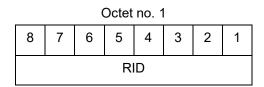
Encoding Rule : This Item is optional.

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:



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	1021/010	Data Source Identification	2
2	1021/040	Target Report Descriptor	1+
3	1021/161	Track Number	2
4	1021/015	Service Identification	1
5	1021/071	Time of Applicability for Position	3
6	1021/130	Position in WGS-84 co-ordinates	6
7	1021/131	Position in WGS-84 co-ordinates, high res.	8
FX	-	Field extension indicator	-
8	1021/072	Time of Applicability for Velocity	3
9	1021/150	Air Speed	2
10	1021/151	True Air Speed	2
11	1021/080	Target Address	3
12	1021/073	Time of Message Reception of Position	3
13	1021/074	Time of Message Reception of Position-High	4
	102 1/074	Precision	
14	1021/075	Time of Message Reception of Velocity	3
FX	-	Field extension indicator	-
15	1021/076	Time of Message Reception of Velocity-High	4
	102 1/07 0	Precision	
16	1021/140	Geometric Height	2
17	1021/090	Quality Indicators	1+
18	1021/210	MOPS Version	1
19	1021/070	Mode 3/A Code	2
20	1021/230	Roll Angle	2
21	1021/145	Flight Level	2
FX	-	Field extension indicator	-
22	1021/152	Magnetic Heading	2
23	1021/200	Target Status	1
24	1021/155	Barometric Vertical Rate	2
25	1021/157	Geometric Vertical Rate	2
26	1021/160	Airborne Ground Vector	4
27	1021/165	Track Angle Rate	2
28	1021/077	Time of Report Transmission	3
FX	-	Field extension indicator	-

FRN	Data Item	Information	Length
29	1021/170	Target Identification	6
30	1021/020	Emitter Category	1
31	1021/220	Met Information	1+
32	1021/146	Selected Altitude	2
33	1021/148	Final State Selected Altitude	2
34	1021/110	Trajectory Intent	1+
35	1021/016	Service Management	1
FX	-	Field extension indicator	-
36	1021/008	Aircraft Operational Status	1
37	1021/271	Surface Capabilities and Characteristics	1+
38	1021/132	Message Amplitude	1
39	1021/250	Mode S MB Data	1+N*8
40	1021/260	ACAS Resolution Advisory Report	7
41	1021/400	Receiver ID	1
42	1021/295	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.



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