EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

EUROCONTROL STANDARD DOCUMENT

FOR

SURVEILLANCE DATA EXCHANGE

Part 12 : Category 021

ADS-B Messages

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

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EUROPEAN AIR TRAFFIC MANAGEMENT PROGRAMME

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Abstract

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

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ASTERIX Category 21 ADS-B Messages

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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.

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0.23	Nov. 2003	Addition of ICAO Annex 10 Vol IV Amendment 77 as Reference Document Addition of one bit (DTI) in item 021/210 Editorial modifications	2.2 5.2.24

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Scope

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

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. Minimum Aviation System Performance Standards for ADS-B, RTCA/DO-242, February 19, 1998.
4. Automatic Dependent Surveillance Requirements
   SUR/ET3/ST06.3220/001, edition 0.8 November 2000.
5. ICAO Annex 10, Vol.IV Amendment 77 I

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 messages.

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 **Eurocontrol** su**R**veillance **I**nformation E**X**change
CAT	Data Category
EATMP	European Air Traffic Management Programme
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
ICAO	International Civil Aviation Organization
LEN	Length Indicator
LSB	Least Significant Bit
PSR	Primary Surveillance Radar
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 (EATMP)
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.

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 messages.

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 messages messages;
- 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 messages

4.5.1 Messages 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 MESSAGES

5.1 Standard Data Items

The standardised Data Items which shall be used for the transmission of ADS-B messages are defined in Table 1 and described in the following pages.

Table 1 - Data Items of Category 021

Data Item Reference Number	Description	Resolution
I021/010	Data Source Identification	N.A.
I021/020	Emitter Category	N.A.
I021/030	Time of Day	1/128 s
I021/032	Time of Day Accuracy	1/256 s
I021/040	Target Report Descriptor	N.A.
I021/080	Target Address	N.A.
I021/090	Figure of Merit	N.A.
I021/095	Velocity Accuracy	N.A.
I021/110	Trajectory Intent	N.A.
I021/130	Position in WGS-84 co-ordinates	$180/2^{23}$ °
I021/140	Geometric Altitude	6.25 ft
I021/145	Flight Level	¼ FL
I021/146	Intermediate State Selected Altitude	25 ft
I021/148	Final State Selected Altitude	25 ft
I021/150	Air Speed	N.A.
I021/151	True Air Speed	N.A.
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	Ground Vector	N.A.
I021/165	Rate of Turn	¼ °/s
I021/170	Target Identification	N.A.
I021/200	Target Status	N.A.
I021/210	Link Technology Indicator	N.A.
I021/220	Met Report	N.A.
I021/230	Roll Angle	0.01 deg

5.2 Description of Standard Data Items

5.2.1 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

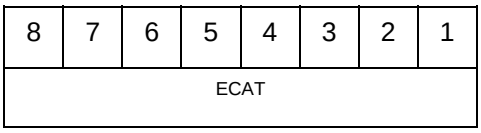
Encoding Rule :
This Item shall be present in every ASTERIX record

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

5.2.2 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



bits-8/1 (ECAT) Emitter Category

1 = light aircraft <= 7000 kg
2 = reserved
3 = 7000 kg < medium aircraft < 136000 kg
4 = reserved
5 = 136000 kg <= 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 to 24 = reserved

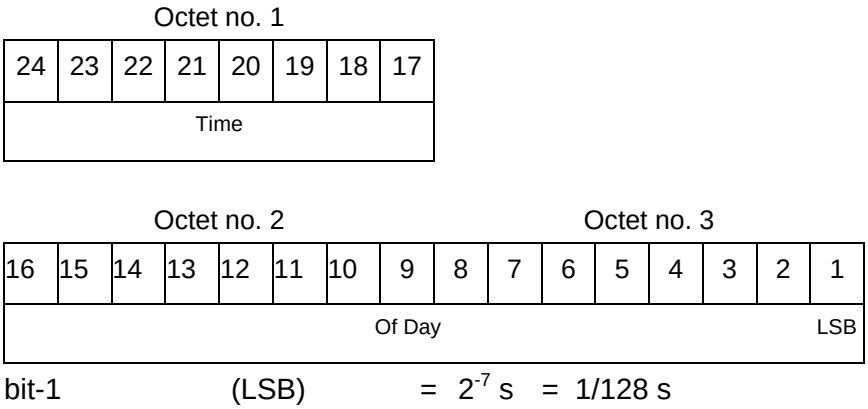
Encoding Rule :
This Item is optional

5.2.3 Data Item I021/030, Time of Day

Definition : Time of applicability (measurement) of the reported position, 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 shall be present in every ASTERIX record

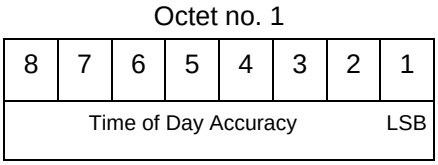
NOTE - The time of the day value is reset to zero at every midnight.

5.2.4 Data Item I021/032, Time of Day Accuracy

Definition : The maximum difference between the actual time of applicability of the reported position and the time reported in the Time of Day item (I021/030).

Format : One-Octet fixed length data item.

Structure:



bit-1 (LSB) = 2^{-8} s = 1/256 s

Encoding Rule :

This Item is optional

5.2.5 Data Item I021/040, Target Report Descriptor

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

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
DCR	GBS	SIM	TST	RAB	SAA	SPI	0	ATP			ARC		0	0	0

bit-16 (DCR) = 0 No differential correction (ADS-B)
= 1 Differential correction (ADS-B)

bit-15 (GBS) = 0 Ground Bit not set
= 1 Ground Bit set

bit-14 (SIM) = 0 Actual target report
= 1 Simulated target report

bit-13 (TST) = 0 Default
= 1 Test Target

bit-12 (RAB) = 0 Report from target transponder
= 1 Report from field monitor (fixed transponder)

bit-11 (SAA) = 0 Equipement not capable to provide Selected Altitude
= 1 Equipement capable to provide Selected Altitude

bit-10 (SPI) = 0 Absence of SPI
= 1 Special Position Identification

bit-9 Spare bit set to zero

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

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

Encoding Rule :

This Item shall be present in every ASTERIX record

5.2.6 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

5.2.7 Data Item I021/090, Figure of Merit

Definition : ADS figure of merit (FOM) provided by the aircraft avionics

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
AC		MN		DC		0	0	0	0	0	0	PA			

bits-16/15 (AC) 00 = unknown
01 = ACAS not operational
10 = ACAS operational
11 = invalid

bits-14/13 (MN) 00 = unknown
01 = Multiple navigational aids not operating
10 = Multiple navigational aids operating
11 = invalid

bits-12/11 (DC) 00 = unknown
01 = Differential correction
10 = No differential correction
11 = invalid

bits-10/5 Spare bits set to zero

bits-4/1 (PA) Position Accuracy

Encoding Rule :
This Item is optional

NOTE - bits-4/1 (PA) code the “Navigational Uncertainty Categories – Position” as described in the ADS-B MASPS [Ref. 3]

5.2.8 Data Item I021/095, Velocity Accuracy

Definition : Velocity uncertainty category of the least accurate velocity component

Format : One-octet fixed length Data Item

Structure:

Octet no. 1							
8	7	6	5	4	3	2	1
Velocity Uncertainty Category							

Encoding Rule :
This Item is optional

NOTE - bits-8/1 code the “Navigational Uncertainty Categories – Velocity” as described in the ADS-B MASPS [Ref. 3]

5.2.9 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) = 0 End of Data Item
= 1 Extension into next extent

Structure of 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)	= 0	End of Data Item
		= 1	Extension into next extent

Structure of 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

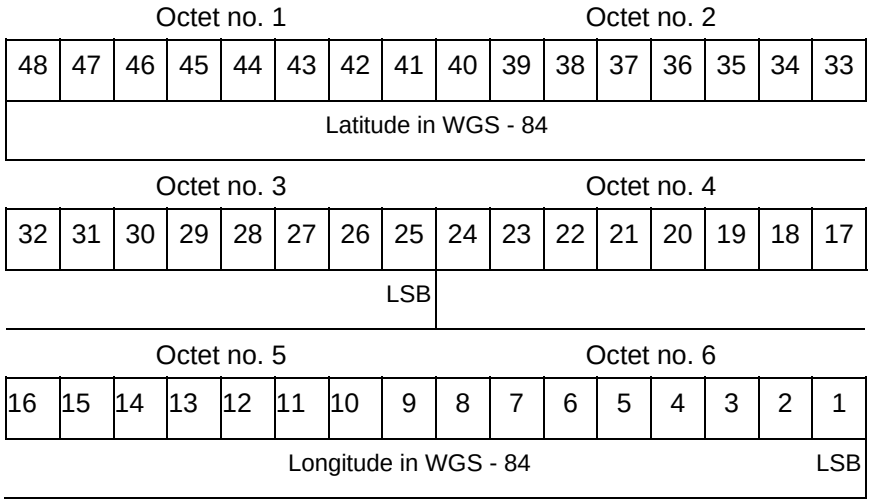
This Item is optional

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

5.2.10 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 = $2.145767 * 10^{-05}$ 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

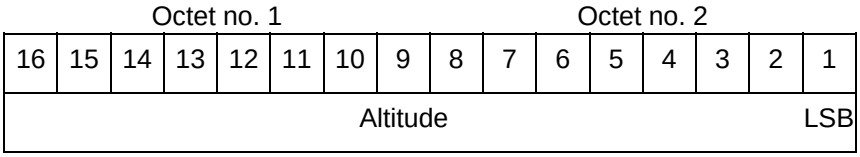
NOTE - Positive longitude indicates East. Positive latitude indicates North.

5.2.11 Data Item I021/140, Geometric Altitude

Definition : Minimum altitude 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 <= Altitude <= 150000 ft
(LSB) = 6.25 ft

Encoding Rule :
This Item is optional

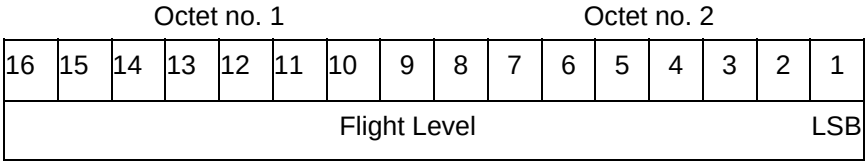
NOTES
1. LSB is required to be thinner than 10 ft by ICAO

5.2.12 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

5.2.13 Data Item I021/146, Intermediate State Selected Altitude

Definition : The short-term vertical intent as described by either the FMS selected altitude, the Altitude Control Panel Selected Altitude, or the current aircraft altitude according to the aircraft's mode of flight.

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)
= 0 No source information provided
= 1 Source Information provided

bit-15/14 (Source)
= 00 Unknown
= 01 Aircraft Altitude
= 10 FCU/MSP 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

5.2.14 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.

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
= 1 Active

bit-15 (AH) Altitude Hold Mode
= 0 Not active
= 1 Active

bit-14 (AM) Approach Mode
= 0 Not active

= 1 Active

bits- 13/1 (Altitude) Altitude in in two's complement form
LSB=25ft
-1300ft <= Altitude <= 100000ft

Encoding Rule :
This Item is optional

5.2.15 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

5.2.16 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
True Air Speed															LSB

bits-16/1 True Air Speed
(LSB) = 1 knot

Encoding Rule :
This Item is optional

5.2.17 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) = $360° / 2^{16} = 0.0055°$

Encoding Rule :
This Item is optional

5.2.18 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
Barometric Vertical Rate															LSB

bits-16/1 Barometric Vertical Rate
(LSB) = 6.25 feet/minute

Encoding Rule :
This Item is optional

5.2.19 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:

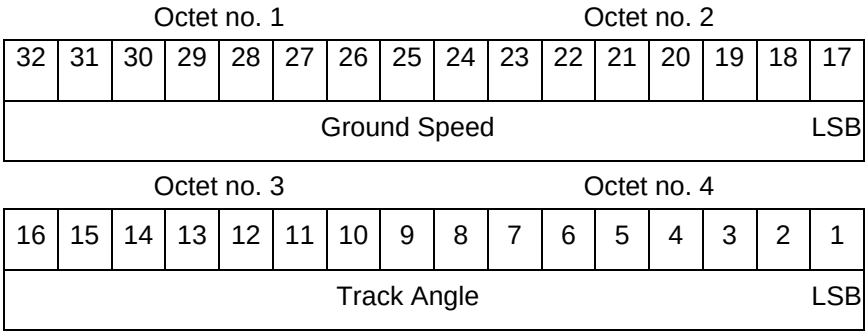
	Octet no. 1								Octet no. 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Geometric Vertical Rate															LSB

bits-16/1 Geometric Vertical Rate
(LSB) = 6.25 feet/minute

Encoding Rule :
This Item is optional

5.2.20 Data Item I021/160, Ground Vector

Definition : Ground Speed and Track Angle elements of Ground Vector.
Format : Four-Octet fixed length data item.
Structure:



bits-32/17 Ground Speed in two's complement form
referenced to WGS84
(LSB) = 2^{-14} NM/s ≅ 0.22 kt
-2 NM/s ≤ Ground Speed < 2 NM/s

bits-16/1 Track Angle
(LSB) = 360° / 2^{16} = approx. 0.0055°

Encoding Rule :
This Item is optional

5.2.21 Data Item I021/165, Rate Of Turn

Definition : Rate of Turn, in two's complement form.

Format : Variable length data item, comprising a first part of one-octet, followed by a one-octet extent as necessary.

Structure of First Part:

Octet no. 1

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

bits-8/7 (TI) Turn Indicator
00 = Not available
01 = Left
10 = Right
11 = Straight

bits-6/2 Spare bits set to zero

bit 1 (FX) = 0 End of Data Item
= 1 Extension into next extent

Structure of First Extent:

Octet no. 1

8	7	6	5	4	3	2	1
Rate of Turn						LSB	FX

bits-8/2 Rate of Turn
(LSB) = 2^{-2} °/s = 1/4 °/s
Maximum value = 15 °/s

bit 1 (FX) = 0 End of Data Item
= 1 Extension into next extent

Encoding Rule :
This Item is optional

NOTES
1. A positive value represents a right turn, whereas a negative value represents a left turn.
2. Value 15 means 15 °/s or above.

5.2.22 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 [5] Section 3.1.2.9

Encoding Rule :
This Item is optional

5.2.23 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
Target Status							

bits-8/1 Target Status
= 0 No emergency / not reported
= 1 General emergency
= 2 Lifeguard / medical
= 3 Minimum fuel
= 4 No communications
= 5 Unlawful interference

Encoding Rule :
This Item is optional

5.2.24 Data Item I021/210, Link Technology Indicator

Definition : Indication of which ADS link technology has been used to send the target report.

Format : One-octet fixed length Data Item

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
0	0	0	DTI	MDS	UAT	VDL	OTR

bits-8/6 Spare bits

bit-5 (DTI) Cockpit Display of Traffic Information
= 0 Unknown
= 1 Aircraft equiped with CDTI

bit-4 (MDS) Mode-S Extended Squitter
= 0 Not used
= 1 Used

bit-3 (UAT) UAT
= 0 Not used
= 1 Used

bit-2 (VDL) VDL Mode 4
= 0 Not used
= 1 Used

bit-1 (OTR) Other Technology
= 0 Not used
= 1 Used

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

5.2.25 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) = 0 Absence of Subfield #1
= 1 Presence of Subfield #1

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

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

bit-5 (TRB) = 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

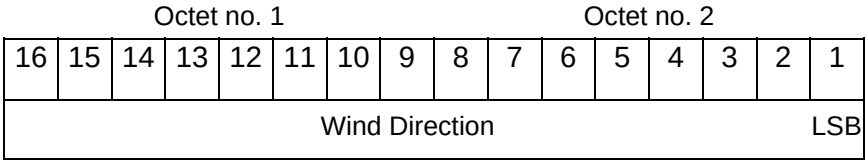
Structure of Subfield #1: Wind Speed

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

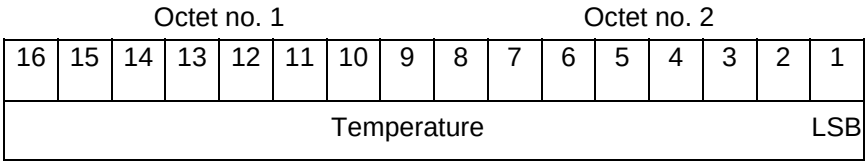
bits-8/1 Wind Speed
(LSB) = 1 knot
0 <= Wind Speed <= 300

Structure of Subfield #2:
Wind Direction



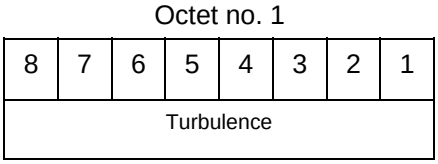
bits-8/1 Wind Direction
(LSB) = 1 degree
1 <= Wind Direction <= 360

Structure of 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 Subfield #4:
Turbulence



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

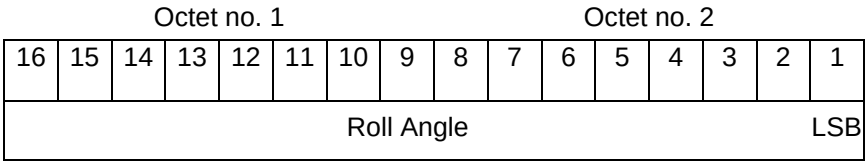
Encoding Rule :
This Item is optional

5.2.26 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:



bits-16/1 Roll Angle

(LSB) = 0.01 degree

-180 <= Roll Angle <= 180

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 messages.

Table 2 – ADS-B Messages UAP

FRN	Data Item	Information	Length
1	**I021/010**	Data Source Identification	**2**
2	**I021/040**	Target Report Descriptor	**1+**
3	**I021/030**	Time of Day	**3**
4	**I021/130**	Position in WGS-84 co-ordinates	**6**
5	**I021/080**	Target Address	**3**
6	**I021/140**	Geometric Altitude	**2**
7	**I021/090**	Figure of Merit	**2**
FX	**-**	Field extension indicator	**-**
8	**I021/210**	Link technology	**1**
9	**I021/230**	Roll Angle	**2**
10	**I021/145**	Flight Level	**2**
11	**I021/150**	Air Speed	**2**
12	**I021/151**	True Air Speed	**2**
13	**I021/152**	Magnetic Heading	**2**
14	**I021/155**	Barometric Vertical Rate	**2**
FX	**-**	Field extension indicator	**-**
15	**I021/157**	Geometric Vertical Rate	**2**
16	**I021/160**	Ground Vector	**4**
17	**I021/165**	Rate of Turn	**1+**
18	**I021/170**	Target Identification	**6**
19	**I021/095**	Velocity Accuracy	**1**
20	**I021/032**	Time of day accuracy	**1**
21	**I021/200**	Target Status	**1**
FX	**-**	Field extension indicator	**-**
22	**I021/020**	Emitter Category	**1**
23	**I021/220**	Met report	**1+**
24	**I021/146**	Intermediate State Selected Altitude	**2**
25	**I021/148**	Final State Selected Altitude	**2**
26	**I021/110**	Trajectory Intent	**1+N*15**
27	**-**	Spare bits set to zero	**-**
28	**-**	Spare bits set to zero	**-**
FX	**-**	Field extension indicator	**-**
29	**-**	Spare bits set to zero	**-**
30	**-**	Spare bits set to zero	**-**
31	**-**	Spare bits set to zero	**-**
32	**-**	Spare bits set to zero	**-**
33	**-**	Spare bits set to zero	**-**
34	**RE**	Reserved Expansion Field	**1+**
35	**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 extents as necessary.