

EUROCONTROL STANDARD DOCUMENT

FOR

SURVEILLANCE DATA EXCHANGE

Part 9 : Category 062

SDPS Track Messages

SUR.ET1.ST05.2000-STD-09-01

Edition	:	1.0
Edition Date	:	March 2004
Status	:	Proposed Issue
Class	:	General Public

DOCUMENT IDENTIFICATION SHEET

DOCUMENT DESCRIPTION

Document Title

Surveillance Data Exchange - Part 9

SDPS Track Messages

EWP DELIVERABLE REFERENCE NUMBER

PROGRAMME REFERENCE INDEX

SUR.ET1.ST05.2000-STD-09-01

EDITION :

1.0

EDITION DATE :

March 2004

Abstract

This document describes the application of ASTERIX to the transmission of System Track Data.

Keywords

ASTERIX

Category 62

System Track Data

Track Information Service

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DOCUMENT STATUS AND TYPE

STATUS	CATEGORY	CLASSIFICATION
Working Draft <input type="checkbox"/>	Executive Task <input type="checkbox"/>	General Public <input checked="" type="checkbox"/>
Draft <input type="checkbox"/>	Specialist Task <input type="checkbox"/>	EATMP <input type="checkbox"/>
Proposed Issue <input checked="" type="checkbox"/>	Lower Layer Task <input checked="" type="checkbox"/>	Restricted <input type="checkbox"/>
Released Issue <input type="checkbox"/>		

ELECTRONIC BACKUP

INTERNAL REFERENCE NAME :

HOST SYSTEM	MEDIA	SOFTWARE(S)
Microsoft Windows	Type : Hard disk	
	Media Identification :	

DOCUMENT APPROVAL

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

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DOCUMENT CHANGE RECORD

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

EDITION	DATE	REASON FOR CHANGE	SECTIONS PAGES AFFECTED
0.10	Dec. 1998	Creation of Eurocontrol document	ALL
0.11	Mar. 1999	Numerous changes in items and encoding rules	ALL
0.12	Jun. 1999	<ul style="list-style-type: none"> • Definitions added • General principles added • Encoding rules table added • Changes in items 	3 4 5.2 5.3
0.13	Dec. 1999	<ul style="list-style-type: none"> • Encoding rules suppressed • Changes in items 	5.2 5.3
0.14	Feb. 2000	<ul style="list-style-type: none"> • Changes in items 	5.2
0.15	Jun. 2000	<ul style="list-style-type: none"> • Changes in items 	5.2
0.17	Nov. 2000	<ul style="list-style-type: none"> • Changes in items 	5.2
0.18	Mar. 2001	<ul style="list-style-type: none"> • Changes in items 	5.2
0.19	Jun. 2001	<ul style="list-style-type: none"> • Changes in items 	5.2
0.20	Sep. 2001	<ul style="list-style-type: none"> • Changes in items • Addition of A-SMGCS data 	5.2 ALL
0.21	Oct. 2001	<ul style="list-style-type: none"> • Changes in items 	5.2
0.22	Dec. 2001	<ul style="list-style-type: none"> • Changes in items 	5.2
0.23	Jan. 2002	<ul style="list-style-type: none"> • Changes in items 	5.2
0.24	Mar. 2002	<ul style="list-style-type: none"> • Changes in items 	5.2
0.25	Aug. 2002	<ul style="list-style-type: none"> • Deletion of items : I062/000, I062/600, I062/605, I062/610 • Creation of items : I062/101, I062/106 • Modification of I062/080 • Modification of I062/390 • Modification of UAP 	4.1, 5.1, 5.2 5.1, 5.2 5.2.6 5.2.27 5.3

0.26	Oct. 2002	Re-integration of I062/180 Switch of number between I062/100 and I062/101 Switch of number between I062/105 and I062/106 Modification in I062/110 Modification in I062/290 Creation of I062/295 Modification in I062/380 Modification in I062/500 Re-organization of UAP	5.2.16 5.2.7 & 5.2.8 5.2.9 & 5.2.10 5.2.11 5.2.23 5.2.24 5.2.27 5.2.29 5.3
0.27	Dec. 2002	Modification of I062/290 Modification of I062/295 Modification of I062/380 Modification of I062/100 – Suppression of I062/101 Modification of I062/105 – Suppression of I062/106 Suppression of I062/180 Re-organization of UAP •	5.2.20 5.2.21 5.2.24 5.2.7 5.2.8 5.3
0.28	March 2003	Modification of title Creation of Items I062/101 and I062/106 Modification of I062/110 • Modification of I062/510	5.2.8, 5.2.10 5.2.11 5.2.29
0.29	Sept 2003	<ul style="list-style-type: none"> • Addition of two new data items to contain Mode S BDSs and Mode S BDS ages. • Splitting I062/380 IAS/Mach sub-fields into two separate sub-fields. • Changing the range of I062/380 sub-field 5, and 16 to match Mode S BDS definitions. • Adding additional subfields to item 380 and 295 to explicitly include contents of Mode S BDS 4,0 (Selected Vertical Intention) • Removal of the low resolution position items (101 and 106). • Slight reformatting of I062/380 subfield 10 to match cat 48 encoding of STAT. • Slight reformatting of I062/380 subfield 16 to match I021/165 encoding. 	5.2.24 / 5.2.25 5.2.26 5.2.26 5.2.21 / 5.2.26 5.2.26 5.2.26

0.30	Nov. 2003	<ul style="list-style-type: none"> • Addition of ICAO Annex 14 as reference document • Modification of format of I062/350 and I062/360 • Correction of coding the extension indicator of primary subfield of I062/110 • Editorial modifications 	<p style="text-align: center;">2.2</p> <p style="text-align: center;">5.2.24 / 5.2.25 5.2.9</p>
1.0	March 2004	<ul style="list-style-type: none"> • Modification of the reference to ICAO Annex 10 • Encoding rules defined for all the items • Suppression of I062/350 and I062/360 • Note added in I062/245 • Suppression of subfields included in I062/380 and I062/295 to include BDS 4.0 data (information already present elsewhere) • Two new subfields added in I062/390 • Modification of I062/060 • Modification of I062/080 	

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1. INTRODUCTION

1.1 Scope

1.1.1 This document describes the message structure for the transmission of System Track Data to a user.

1.1.2 This document defines the data out of Category 062.

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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 Radar Information Exchange - ASTERIX, edition 1.29 February 2002
3. ICAO Annex 10, Vol.IV Amendment 77
4. ICAO Document 4444
5. ICAO Annex 14

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3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1 Definitions

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

- 3.1.1 Amalgamation:** Amalgamation is the process by which tracks from co-operating systems are merged to form an 'amalgamated' track. It is used to smooth any possible differences between the tracks to allow the same amalgamated track information to be served to the users of both systems.
- 3.1.2 Calculated Item:** A piece of information (e.g. the position of a target) derived from raw information through an intermediate processing such as transformation of co-ordinates, tracking, code conversion, etc.
- 3.1.3 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).
- 3.1.4 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.
- 3.1.5 Data Category:** Classification of the data in order to permit inter alia an easy identification.
- 3.1.6 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.
- 3.1.7 Data Item:** The smallest unit of information in each Data Category.
- 3.1.8 Measured Item:** A piece of information (e.g. the position of a target) directly derived from raw information and transmitted without any smoothing.
- 3.1.9 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

- 3.1.10 State vector:** A vector describing the state of an object, e.g. position, speed, acceleration...
- 3.1.11 Track:** Time sequence of state vectors of an object estimated by some real time filtering technique using surveillance data as input.
- 3.1.12 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
A-SMGCS	Advanced Surface Movement Ground Control System
ASTERIX	All Purpose ST ructured Eurocontrol su R veillance Information EX change
CAT	Data Category
EATMP	European Air Traffic Management Programme
FCU	Flight Control Unit
FL	Flight Level, unit of altitude (expressed in 100's of feet)
FMS	Flight <u>Management</u> System
FPPS	Flight Plan Processing System
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
GNSS	Global Navigation Satellite System
ICAO	International Civil Aviation Organization
kt	knot = NM/hour, unit of speed
LEN	Length Indicator
LSB	Least Significant Bit
MCP	Mode Control Panel
NM	Nautical Mile, unit of distance (1852 metres)
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
SPI	Special Position Identification
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
VDL	VHF Data Link
WGS-84	World Geodetic System 84

4. GENERAL PRINCIPLES

4.1 General

The transmission of System Track Data shall require the transmission of one type of message, i.e. target reports and flight plan data

4.2 Time Management

The time-stamping shall comply with ICAO Annex 5.

4.3 Projection Systems and Geographical Co-ordinates

4.3.1 Measured Position

The *measured* position is transmitted bias-corrected.

4.3.2 Calculated Position

When the exported calculated position is expressed in a 2D Cartesian co-ordinate system, a projection is performed on a plane tangential to the WGS-84 Ellipsoid at the location of the reference point. The Y-axis points to the geographical north at that position. The X-axis is perpendicular to the Y-axis and points to the east. The X, Y co-ordinates are calculated using a suitable projection technique for the final 3D to 2D conversion (e.g. a stereographical projection). It is slant range corrected, the source of altitude being indicated in I062/080 Track Status, Octet 1, bits-5/3 (SRC).

4.4 Mandatory Items

Data Source Identifier and Service Identification shall be present in every record.

4.5 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.

4.6 User Application Profile and Data Blocks

4.6.1 A single User Application Profile (UAP) is defined and shall be used for System Track Data messages.

4.6.2 Data Blocks shall have the following layout.

CAT = 062	LEN	FSPEC	Items of the first record	FSPEC	Items of the last record
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where:

- Data Category (CAT) = 062, is a one-octet field indicating that the Data Block contains System Track Data;
- 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.

4.7 Composition of messages

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

4.7.2 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 System Track Data are defined in Table 1 and described in the following pages. The column "Encoding rules" indicates what items are mandatory (M) or optional (O) in a record of ASTERIX Cat 062.

Table 1 - Data Items of Category 062

Data Item Reference Number	Description	Resolution	Encoding Rules
I062/010	Data Source Identifier	N.A.	M
I062/015	Service Identification	N.A.	O
I062/040	Track Number	N.A.	M
I062/060	Track Mode 3/A Code	N.A.	O
I062/070	Time Of Track Information	1/128 s	M
I062/080	Track Status	N.A.	M
I062/100	Calculated Track Position (Cartesian)	0.5 m	O
I062/105	Calculated Track Position (WGS-84)	180/2 ²⁵ °	O
I062/110	Mode 5 Data reports & Extended Mode 1 Code	N.A.	O
I062/120	Track Mode 2 Code	N.A.	O
I062/130	Calculated Track Geometric Altitude	6.25 ft	O
I062/135	Calculated Track Barometric Altitude	1/4 FL	O
I062/136	Measured Flight Level	1/4 FL	O
I062/185	Calculated Track Velocity (Cartesian)	0.25 m/s	O
I062/200	Mode Of Movement	N.A.	O
I062/210	Calculated Acceleration (Cartesian)	0.25 m/s ²	O
I062/220	Calculated Rate Of Climb/Descent	6.25 ft/min	O
I062/245	Target Identification	N.A.	O
I062/270	Target Size & Orientation	Length/Width:1 m Orient.: 360°/128	O
I062/290	System Track Update Ages	N.A.	O
I062/295	Track Data Ages	N.A.	O
I062/300	Vehicle Fleet Identification	N.A.	O
I062/340	Measured Information	N.A.	O
I062/380	Mode-S / ADS-B Related Data	N.A.	O
I062/390	Flight Plan Related Data	N.A.	O
I062/500	Estimated Accuracies	N.A.	O
I062/510	Composed Track Number	N.A.	O

NOTE: N.A. = Not Applicable

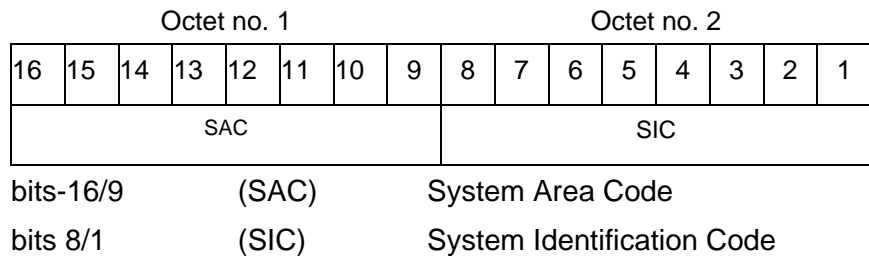
5.2 Description of Standard Data Items

5.2.1 Data Item I062/010, Data Source Identifier

Definition : Identification of the system sending the data

Format : Two-octet fixed length Data Item

Structure:



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

Encoding Rule :

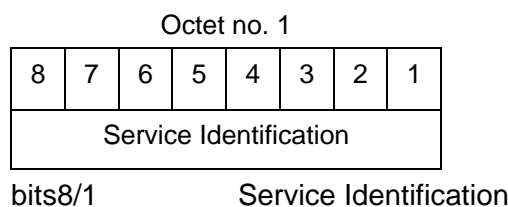
This Item shall be present in every ASTERIX record

5.2.2 Data Item I062/015, Service Identification

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

Format : One-Octet fixed length data item.

Structure:



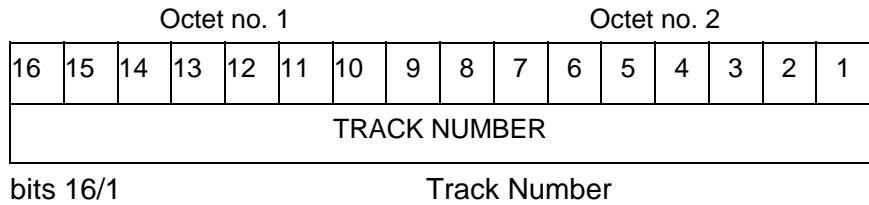
NOTE - the service identification is allocated by the system

Encoding Rule :

This Item is optional

5.2.3 Data Item I062/040, Track Number

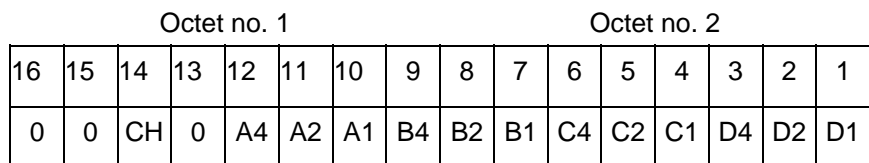
Definition : Identification of a track
Format : Two-Octet fixed length data item
Structure:



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

5.2.4 Data Item I062/060, Track Mode 3/A Code

Definition : Mode-3/A code converted into octal representation.
Format : Two-octet fixed length Data Item.
Structure:



bits-16/15	Spare bits set to 0
bit 14	(CH) Change in Mode 3/A
	= 0 No Change
	= 1 Mode 3/A has changed
bit-13	Spare bits set to 0
bits-12/1	Mode-3/A reply in octal representation

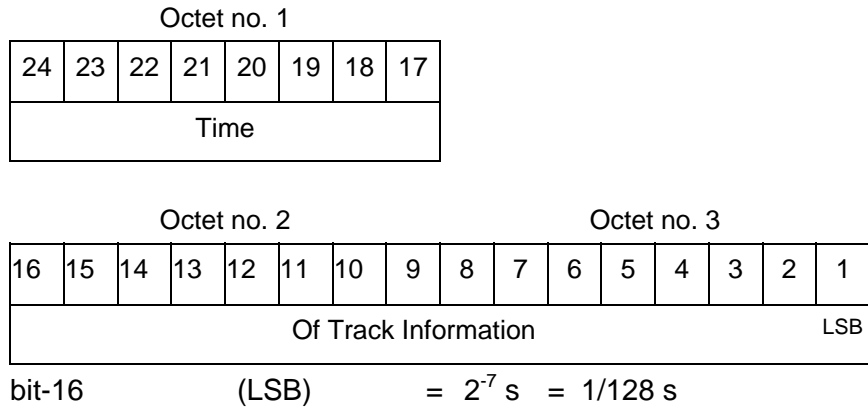
Encoding Rule :
 This Item is optional

5.2.5 Data Item I062/070, Time Of Track Information

Definition : Absolute time stamping of the information provided in the track message, in the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:

**NOTES**

1. This is the time of the track state vector.
2. The time is reset to zero at every midnight.

Encoding Rule :

This Item shall be present in every ASTERIX record

5.2.6 Data Item I062/080, Track Status

Definition : Status of a track.

Format : Variable length data item comprising a first part of one Octet, followed by 1-Octet extents as necessary.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
MON	SPI	MRH	SRC		CNF	FX	

bit 8		(MON)	= 0	Multisensor track
			= 1	Monosensor track
bit 7		(SPI)	= 0	default value
			= 1	SPI present in the last report received from a sensor capable of decoding this data
bit 6		(MRH)		Most Reliable Height
			= 0	Barometric altitude (Mode C) more reliable
			= 1	Geometric altitude more reliable
bits 5/3		(SRC)		Source of calculated track altitude for I062/130
			= 000	no source
			= 001	GNSS
			= 010	3D radar
			= 011	triangulation
			= 100	height from coverage
			= 101	speed look-up table
			= 110	default height
			= 111	multilateration
bit 2		(CNF) =	= 0	Confirmed track
			= 1	Tentative track
bit 1		(FX) =	= 0	end of data item
			= 1	extension into first extent

Encoding Rule :

This Item shall be present in every ASTERIX record

**Structure of
First Extent :**

Octet no. 1

8	7	6	5	4	3	2	1
SIM	TSE	TSB	FPC	AFF	STP	KOS	FX

bit-8	(SIM)	= 0	Actual track
		= 1	Simulated track
bit-7	(TSE)	= 0	default value
		= 1	last message transmitted to the user for the track
bit-6	(TSB)	= 0	default value
		= 1	first message transmitted to the user for the track
bit-5	(FPC)	= 0	Not flight-plan correlated
		= 1	Flight plan correlated
bit-4	(AFF)	= 0	default value
		= 1	ADS-B data inconsistent with other surveillance information
bit-3	(STP)	= 0	default value
		= 1	Slave Track Promotion
bit-2	(KOS)	= 0	Complementary service used
		= 1	Background service used
bit-1	(FX) =	= 0	End of data item
		= 1	Extension into next extent

**Structure of
Second Extent :**

Octet no. 1

8	7	6	5	4	3	2	1
AMA	MD4		ME	MI	MD5		FX

- bit 8 (AMA) = 0 track not resulting from amalgamation process
= 1 track resulting from amalgamation process
- bits 7/6 (MD4) = 00 No Mode 4 interrogation
= 01 Friendly target
= 10 Unknown target
= 11 No reply
- bit 5 (ME) = 0 default value
= 1 Military Emergency present in the last report received from a sensor capable of decoding this data
- bit 4 (MI) = 0 default value
= 1 Military Identification present in the last report received from a sensor capable of decoding this data
- bits 3/2 (MD5) = 00 No Mode 5 interrogation
= 01 Friendly target
= 10 Unknown target
= 11 No reply
- bit 1 (FX) = 0 End of data item
= 1 Extension into next extent

Structure of Third Extent :

Octet no. 1

8	7	6	5	4	3	2	1
CST	PSR	SSR	MDS	ADS	SUC	AAC	FX

- bit-8 (CST) = 0 Default value
= 1 Age of the last received track update is higher than system dependent threshold (coasting)
- bit 7 (PSR) = 0 Default value
= 1 Age of the last received PSR track update is higher than system dependent threshold
- bit 6 (SSR) = 0 Default value

		= 1	Age of the last received SSR track update is higher than system dependent threshold
bit-5	(MDS)	= 0	Default value
		= 1	Age of the last received Mode S track update is higher than system dependent threshold
bit 4	(ADS)	= 0	Default value
		= 1	Age of the last received ADS-B track update is higher than system dependent threshold
bit-3	(SUC)	= 0	Default value
		= 1	Special Used Code (Mode A codes to be defined in the system to mark a track with special interest)
bit-2	(AAC)	= 0	Default value
		= 1	Assigned Mode A Code Conflict (same discrete Mode A Code assigned to another track)
bit 1	(FX)	= 0	End of data item
		= 1	Extension into next extent

NOTES

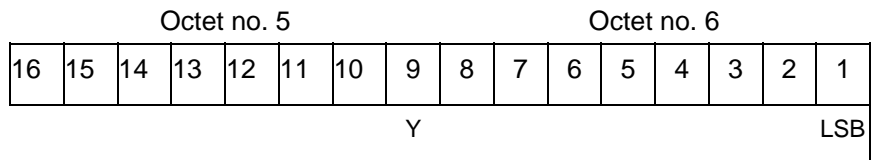
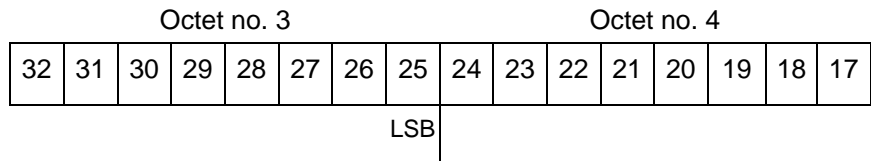
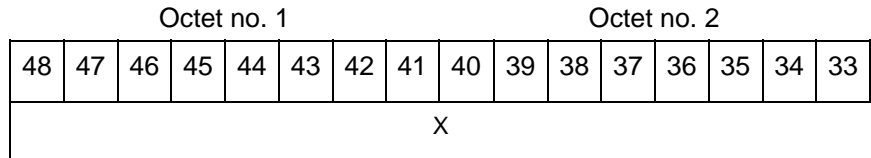
1. Track type and coasting can also be derived from I062/290 System Track Update Ages
2. If the system supports the technology, default value (0) means that the technology was used to produce the report
3. If the system does not support the technology, default value is meaningless.

5.2.7 Data Item I062/100, Calculated Track Position. (Cartesian)

Definition : Calculated position in Cartesian co-ordinates with a resolution of 0.5m, in two's complement form.

Format : Six-octet fixed length Data Item.

Structure:



bits 48/25		X
bit 25	(LSB)	= 0.5 m
bits 24/1		Y
bit 1	(LSB)	= 0.5 m

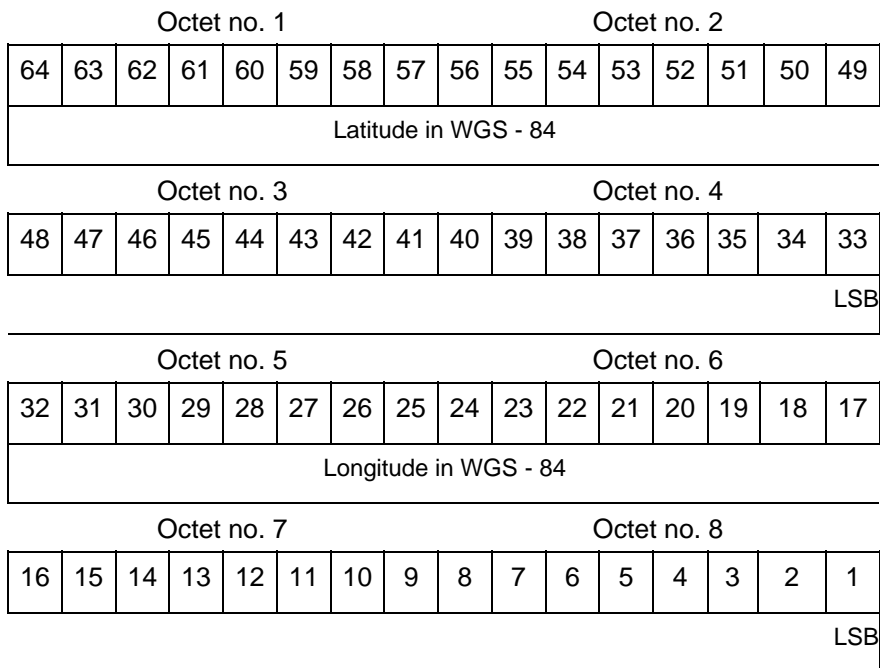
Encoding Rule :
This Item is optional

5.2.8 Data Item I062/105, Calculated Position In WGS-84 Co-ordinates

Definition : Calculated Position in WGS-84 Co-ordinates with a resolution of $180/2^{25}$ degrees

Format : Eight-octet fixed length Data Item

Structure:



bits-64/33	(Latitude)	In WGS.84 in two's complement. Range $-90 \leq \text{latitude} \leq 90$ deg.
	(LSB)	= $180/2^{25}$ degrees
bits-32/1	(Longitude)	In WGS.84 in two's complement. Range $-180 \leq \text{longitude} < 180$ deg.
	(LSB)	= $180/2^{25}$ degrees

NOTE - The LSB provides a resolution at least better than 0.6m.

Encoding Rule :
This Item is optional

5.2.9 Data Item I062/110, Mode 5 Data reports & Extended Mode 1 Code

Definition : Mode 5 Data reports & Extended Mode 1 Code

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

Structure of Primary Subfield:

Octet no. 1							
8	7	6	5	4	3	2	1
SUM	PMN	POS	GA	EM1	TOS	XP	FX

bit-8	(SUM)	Subfield #1: Mode 5 Summary = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-7	(PMN)	Subfield #2: Mode 5 PIN/ National Origin/Mission Code = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-6	(POS)	Subfield #3: Mode 5 Reported Position = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-5	(GA)	Subfield #4: Mode 5 GNSS-derived Altitude = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-4	(EM1)	Subfield #5: Extended Mode 1 Code in Octal Representation = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-3	(TOS)	Subfield #6: Time Offset for POS and GA. = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-2	(XP)	Subfield #: X Pulse Presence. = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-1	(FX)	Extension Indicator = 0 no extension = 1 extension

Encoding Rule :

This Item is optional

**Structure of Subfield #1:
Mode 5 Summary:**

Octet no. 1							
8	7	6	5	4	3	2	1
M5	ID	DA	M1	M2	M3	MC	X

bit-8	(M5)	= 0 No Mode 5 interrogation = 1 Mode 5 interrogation
bit-7	(ID)	= 0 No authenticated Mode 5 ID reply = 1 Authenticated Mode 5 ID reply
bit-6	(DA)	= 0 No authenticated Mode 5 Data reply or Report = 1 Authenticated Mode 5 Data reply or Report (i.e any valid Mode 5 reply type other than ID)
bit-5	(M1)	= 0 Mode 1 code not present or not from Mode 5 reply = 1 Mode 1 code from Mode 5 reply.
bit-4	(M2)	= 0 Mode 2 code not present or not from Mode 5 reply = 1 Mode 2 code from Mode 5 reply.
bit-3	(M3)	= 0 Mode 3 code not present or not from Mode 5 reply = 1 Mode 3 code from Mode 5 reply.
bit-2	(MC)	= 0 Mode C altitude not present or not from Mode 5 reply = 1 Mode C altitude from Mode 5 reply
bit-1	(X)	X-pulse from Mode 5 Data reply or Report. = 0 X-pulse set to zero or no authenticated Data reply or Report received. = 1 X-pulse set to one.

NOTES

1. The flags M2, M3, MC refer to the contents of data items I062/120, I062/060 and I062/135 respectively. The flag M1 refers to the contents of the Subfield #5 (Extended Mode 1 Code in Octal Representation).
2. If an authenticated Mode 5 reply is received with the Emergency bit set, then the Military Emergency bit (ME) in Data Item I062/080, Track Status, shall be set.

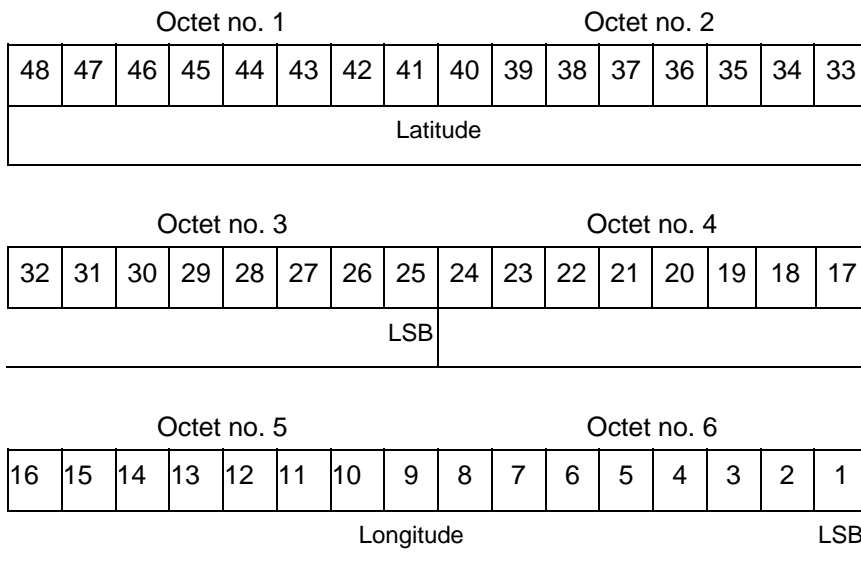
3. If an authenticated Mode 5 reply is received with the Identification of Position bit set, then the Special Position Identification bit (SPI) in Data Item I062/080, Track Status, shall be set.

**Structure of Subfield #2:
Mode 5 PIN /National Origin/ Mission Code**

Octet no. 1										Octet no. 2						
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	
0	0	PIN														
Octet no. 3								Octet no. 4								
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
0	0	0	NAT					0	0	MIS						

bits-32/31	(spare)	spare bits set to 0
bits-30/17	(PIN)	PIN Code
bits-16/14	(spare)	spare bits set to 0
bits-13/9(NAT)		National Origin
bits-8/7 (spare)		spare bits set to 0
bits-6/1 (MIS)		Mission Code

**Structure of Subfield #3:
Mode 5 Reported Position**



bits-48/25	(Latitude)	In WGS.84 in two's complement. Range $-90 \leq \text{latitude} \leq 90$ deg.
	(LSB)	= $180/2^{23}$ degrees
bits-24/1	(Longitude)	In WGS.84 in two's complement. Range $-180 \leq \text{longitude} < 180$ deg.
	(LSB)	= $180/2^{23}$ degrees

NOTE - The resolution implied by the LSB is better than the resolution with which Mode 5 position reports are transmitted from aircraft transponders using currently defined formats.

**Structure of Subfield #4:
Mode 5 GNSS-derived Altitude**

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

bit-16 (spare) spare bit set to 0

bit-15 (RES) Resolution with which the GNSS-derived Altitude (GA) is reported.
=0 GA reported in 100 ft increments,
=1 GA reported in 25 ft increments.

bits-14/1 (GA) GNSS-derived Altitude of target, expressed as height above WGS 84 ellipsoid.

NOTES

- GA is coded as a 14-bit two's complement binary number with an LSB of 25 ft. irrespective of the setting of RES.
- The minimum value of GA that can be reported is -1000 ft.

**Structure of Subfield #5:
Extended Mode 1 Code in Octal Representation**

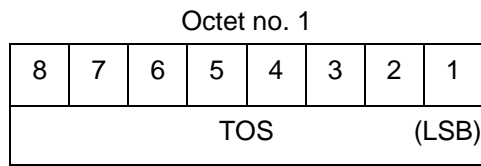
Octet 1								Octet 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
0	0	0	0	Extended Mode 1 Code											
				A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1

bit 16/13 Spare bits set to 0

bits-12/1 (EM1) Extended Mode 1 Code in octal representation

NOTE - If Subfield #1 is present, the M1 bit in Subfield #1 indicates whether the Extended Mode 1 Code is from a Mode 5 reply or a Mode 1 reply. If Subfield #1 is not present, the Extended Mode 1 Code is from a Mode 1 reply.

**Structure of Subfield #6:
Time Offset for POS and GA**



bits-8/1 (TOS)

Time Offset coded as a twos complement number with an LSB of 1/128 s. The time at which the Mode 5 Reported Position (Subfield #3) and Mode 5 GNSS-derived Altitude (Subfield #4) are valid is given by Time of Day (I048/140) plus Time Offset.

Note:

TOS shall be assumed to be zero if Subfield #6 is not present.

**Structure of Subfield #7:
X Pulse Presence**

Octet no. 1							
8	7	6	5	4	3	2	1
0	0	0	X5	XC	X3	X2	X1

bits-8/6 spare bits set to zero

bit-5 (X5) X-pulse from Mode 5 Data reply or Report.
= 0 X-pulse set to zero or no authenticated Data reply or Report received.
= 1 X-pulse set to one (present).

bit-4 (XC) X-pulse from Mode C reply
= 0 X-pulse set to zero or no Mode C reply
= 1 X-pulse set to one (present)

bit-3 (X3) X-pulse from Mode 3/A reply
= 0 X-pulse set to zero or no Mode 3/A reply
= 1 X-pulse set to one (present)

bit-2 (X2) X-pulse from Mode 2 reply
= 0 X-pulse set to zero or no Mode 2 reply
= 1 X-pulse set to one (present)

bit-1 (X1) X-pulse from Mode 1 reply
= 0 X-pulse set to zero or no Mode 1 reply
= 1 X-pulse set to one (present)

5.2.10 Data Item I062/120, Track Mode 2 Code

Definition : Mode 2 code associated to the track

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 zero

bits-12/1

Mode-2 code in octal representation

Encoding Rule :

This Item is optional

5.2.11 Data Item I062/130, Calculated Track Geometric Altitude

Definition : Minimum altitude, in two's complement form, from a plane tangent projected from the target position to the earth's ellipsoid, defined by 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
Altitude														LSB	

bits- 16/1

Altitude

(LSB)

= 6.25 ft

Vmin

= -1500 ft

Vmax

= 150000 ft

NOTES

1. LSB is required to be thinner than 10 ft by ICAO
2. The source of altitude is identified in bits (SRC) of item I062/080 Track Status

Encoding Rule :

This Item is optional

5.2.12 Data Item I062/135, Calculated Track Barometric Altitude

Definition : Calculated Barometric Altitude of the track, 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
QNH	Calculated Track Barometric Altitude														LSB

bit-16 (QNH) = 0 No QNH correction applied
= 1 QNH correction applied

bits-15/1 Calculated Track Barometric Altitude
(LSB) = 1/4 FL = 25 ft
Vmin = -15 FL
Vmax = 1500 FL

NOTE - ICAO specifies a range between -10 FL and 1267 FL for Mode C

Encoding Rule :

This Item is optional

5.2.13 Data Item I062/136, Measured Flight Level

Definition : Last valid and credible flight level used to update the track, in two's complement form,.

Structure: 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
Measured Flight Level															LSB

bits- 16/1 Measured Flight Level
(LSB) = 1/4 FL
Vmin = -15 FL
Vmax = 1500 FL

NOTES

1. The criteria to determine the credibility of the flight level are Tracker dependent.
2. Credible means: within reasonable range of change with respect to the previous detection.
3. ICAO specifies a range between -10 FL and 1267 FL for Mode C
4. This item includes the barometric altitude received from ADS-B

Encoding Rule :

This Item is optional

5.2.15 Data Item I062/200, Mode of Movement

Definition : Calculated Mode of Movement of a target.

Format : One-Octet fixed length data item.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
TRANS		LONG		VERT		0	0

bits 8/7 (TRANS) Transversal Acceleration :
 = 00 Constant Course
 = 01 Right Turn
 = 10 Left Turn
 = 11 Undetermined

bits 6/5 (LONG) Longitudinal Acceleration :
 = 00 Constant Groundspeed
 = 01 Increasing Groundspeed
 = 10 Decreasing Groundspeed
 = 11 Undetermined

bits 4/3 (VERT) Vertical Rate :
 = 00 Level
 = 01 Climb
 = 10 Descent
 = 11 Undetermined

bits 2/1 Spare bits set to zero

Encoding Rule :
This Item is optional

5.2.18 Data Item I062/245, Target Identification

Definition: Target (aircraft or vehicle) identification in 8 characters.

Format: Seven-octet fixed length Data Item.

Structure:

Octet no. 1																							
56	55	54	53	52	51	50	49																
STI	0	0	0	0	0	0	0																
Octet no. 2												Octet no. 3											
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33								
Character 1						Character 2						Character 3											
Octet no. 4												Octet no. 5											
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17								
Character 4						Character 5																	
Octet no. 6												Octet no. 7											
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1								
Character 6						Character 7						Character 8											

bits-56/55	(STI)	= 00	Callsign or registration downlinked from target
		= 01	Callsign not downlinked from target
		= 10	Registration not downlinked from target
		= 11	Invalid

bits-54/49 Spare bits set to zero

bits-48/1 Characters 1-8 (coded on 6 bits each) defining target identification

NOTES

1. For coding, see section 3.1.2.9 of [Ref.3]
2. As the Callsign of the target can already be transmitted (thanks to I062/380 Subfield #2 if downlinked from the aircraft or thanks to I062/390 Subfield #2 if the target is correlated to a flight plan), and in order to avoid confusion at end user's side, **this item SHALL not be used..**

Encoding Rule :

This Item is optional

5.2.19 Data Item I062/270, Target Size & Orientation

Definition: Target size defined as length and width of the detected target, and orientation.

Format: Variable length Data Item comprising a first part of one octet, followed by one-octet extents as necessary.

Structure of First Part:

Octet no. 1

8	7	6	5	4	3	2	1
LENGTH						LSB	FX

bit-2 (LSB) = 1 m

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

Structure of First Extent:

Octet no. 1

8	7	6	5	4	3	2	1
ORIENTATION						LSB	FX

bit-2 (LSB) = $360^\circ / 128 = \text{approx. } 2.81^\circ$

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

Structure of Second Extent:

Octet no. 1

8	7	6	5	4	3	2	1
WIDTH						LSB	FX

bit-2 (LSB) = 1 m

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

NOTES

1. The orientation gives the direction which the target nose is pointing to, relative to the Geographical North.
2. When the length only is sent, the largest dimension is provided.

Encoding Rule :

This Item is optional

5.2.20 Data Item I062/290, System Track Update Ages

Definition : Ages of the last plot/local track/target report update for each sensor type.

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

**Structure of
Primary Subfield:**

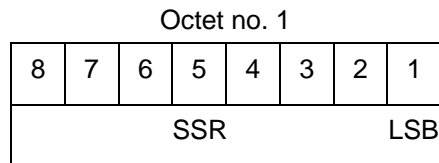
Octet no. 1

16	15	14	13	12	11	10	9
TRK	PSR	SSR	MDS	ADS	ES	VDL	FX

Octet no. 2

8	7	6	5	4	3	2	1
UAT	LOP	MLT	0	0	0	0	FX

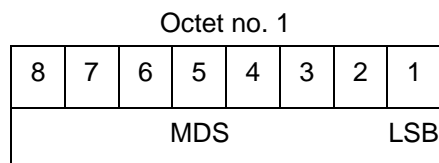
bit-16	(TRK)	Subfield #1: Track age = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-15	(PSR)	Subfield #2: PSR age = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-14	(SSR)	Subfield #3: SSR age = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-13	(MDS)	Subfield #4: Mode S age = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-12	(ADS)	Subfield #5: ADS-C age = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-11	(ES)	Subfield #6: ADS-B Extended Squitter age = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-10	(VDL)	Subfield #7: ADS-B VDL Mode 4 age = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-9	FX	Extension indicator = 0 no extension = 1 extension
bit-8	(UAT)	Subfield #8: ADS-B UAT age = 0 Absence of Subfield #8 = 1 Presence of Subfield #8

Structure of Subfield # 3:**SSR Age**

bits-8/1 (SSR)

Age of the last secondary
detection used to update the track

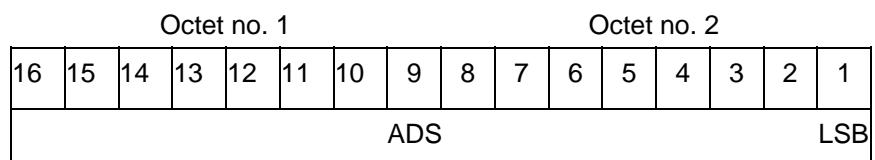
bit-1 (LSB)

= 1/4 s
Maximum value = 63.75s**Structure of Subfield # 4:****Mode S Age**

bits-8/1 (MDS)

Age of the last Mode S detection
used to update the track

bit-1 (LSB)

= 1/4 s
Maximum value = 63.75s**Structure of Subfield # 5:****ADS-C Age**

bits-8/1 (ADS)

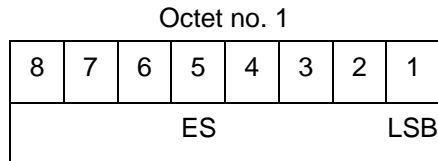
Age of the last ADS-C report
used to update the track

bit-1 (LSB)

= 1/4 s
Max. value = 16383.75s
(> 4 hours)

Structure of Subfield # 6:

ES Age

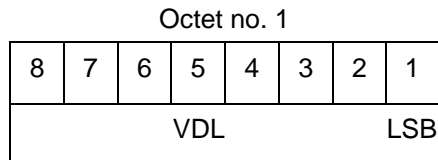


bits-8/1 (ES) Age of the last 1090 Extended Squitter ADS-B report used to update the track

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 7:

VDL Age

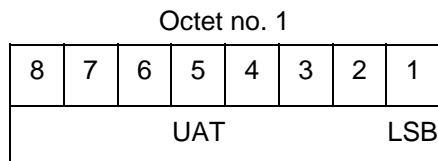


bits-8/1 (VDL) Age of the last VDL Mode 4 ADS-B report used to update the track

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

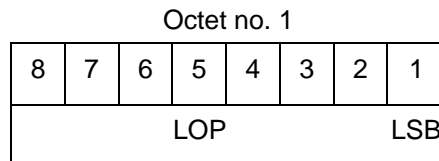
Structure of Subfield # 8:

UAT Age



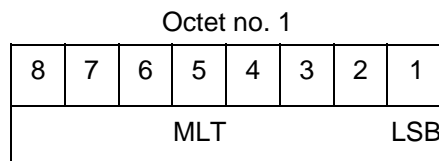
bits-8/1 (UAT) Age of the last UAT ADS-B report used to update the track

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 9:**Loop Age**

bits-8/1 (LOP) Age of the last magnetic loop detection

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 10:**Multilateration Age**

bits-8/1 (MLT) Age of the last MLT detection

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

NOTES

1. Except for Track Age, the ages are counted from Data Item I062/070, Time Of Track Information, using the following formula:

$$\text{Age} = \text{Time of track information} - \text{Time of last detection used to update the track}$$

2. The time of last detection is derived from monosensor category time of day
3. If the data has never been received, then the corresponding subfield is not sent.
4. Maximum value means maximum value or above.

Encoding Rule :

This Item is optional

5.2.21 Data Item I062/295, Track Data Ages

Definition : Ages of the data provided.

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

Structure of Primary Subfield:

Octet no. 1

40	39	38	37	36	35	34	33
MFL	MD1	MD2	MDA	MD4	MD5	MHG	FX

Octet no. 2

32	31	30	29	28	27	26	25
IAS	TAS	SAL	FSS	TID	COM	SAB	FX

Octet no. 3

24	23	22	21	20	19	18	17
ACS	BVR	GVR	RAN	TAR	TAN	GSP	FX

Octet no. 4

16	15	14	13	12	11	10	9
VUN	MET	EMC	POS	GAL	PUN	MB	FX

Octet no. 5

8	7	6	5	4	3	2	1
IAR	MAC	BPS	0	0	0	0	FX

bit-40	(MFL)	Subfield #1: Measured Flight Level age = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-39	(MD1)	Subfield #2: Mode 1 age = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-38	(MD2)	Subfield #3: Mode 2 age = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-37	(MDA)	Subfield #4: Mode 3/A age = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-36	(MD4)	Subfield #5: Mode 4 age = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-35	(MD5)	Subfield #6: Mode 5 age = 0 Absence of Subfield #6 = 1 Presence of Subfield #6

bit-34	(MHG)	Subfield #7: Magnetic Heading age = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-33	FX	Extension indicator = 0 no extension = 1 extension
bit-32	(IAS)	Subfield #8: Indicated Airspeed/Mach Nb age = 0 Absence of Subfield #8 = 1 Presence of Subfield #8
bit-31	(TAS)	Subfield #9: True Airspeed age = 0 Absence of Subfield #9 = 1 Presence of Subfield #9
bit-30	(SAL)	Subfield #10: Selected Altitude age = 0 Absence of Subfield #10 = 1 Presence of Subfield #10
bit-29	(FSS)	Subfield #11: Final State Selected Altitude age = 0 Absence of Subfield #11 = 1 Presence of Subfield #11
bit-28	(TID)	Subfield #12: Trajectory Intent Data age = 0 Absence of Subfield #12 = 1 Presence of Subfield #12
bit-27	(COM)	Subfield #13: Communications / ACAS Capability and Flight Status age = 0 Absence of Subfield #13 = 1 Presence of Subfield #13
bit-26	(SAB)	Subfield #14: Status Reported by ADS-B age = 0 Absence of Subfield #14 = 1 Presence of Subfield #14
bit-25	FX	Extension indicator = 0 no extension = 1 extension
bit-24	(ACS)	Subfield #15: ACAS Resolution Advisory Report age = 0 Absence of Subfield #15 = 1 Presence of Subfield #15
bit-23	(BVR)	Subfield #16: Barometric Vertical Rate age = 0 Absence of Subfield #16 = 1 Presence of Subfield #16
bit-22	(GVR)	Subfield #17: Geometric Vertical Rate age = 0 Absence of Subfield #17 = 1 Presence of Subfield #17
bit-21	(RAN)	Subfield #18: Roll Angle age = 0 Absence of Subfield #18 = 1 Presence of Subfield #18
bit-20	(TAR)	Subfield #19: Track Angle Rate age = 0 Absence of Subfield #19 = 1 Presence of Subfield #19

bit-19	(TAN)	Subfield #20: Track Angle age = 0 Absence of Subfield #20 = 1 Presence of Subfield #20
bit-18	(GSP)	Subfield #21: Ground Speed age = 0 Absence of Subfield #21 = 1 Presence of Subfield #21
bit-17	FX	Extension indicator = 0 no extension = 1 extension
bit-16	(VUN)	Subfield #22: Velocity Uncertainty age = 0 Absence of Subfield #22 = 1 Presence of Subfield #22
bit-15	(MET)	Subfield #23: Meteorological Data age = 0 Absence of Subfield #23 = 1 Presence of Subfield #23
bit-14	(EMC)	Subfield #24: Emitter Category age = 0 Absence of Subfield #24 = 1 Presence of Subfield #24
bit-13	(POS)	Subfield #25: Position Data age = 0 Absence of Subfield #25 = 1 Presence of Subfield #25
bit-12	(GAL)	Subfield #26: Geometric Altitude Data age = 0 Absence of Subfield #26 = 1 Presence of Subfield #26
bit-11	(PUN)	Subfield #27: Position Uncertainty Data age = 0 Absence of Subfield #27 = 1 Presence of Subfield #27
bit-10	(MB)	Subfield #28: Mode S MB Data age = 0 Absence of Subfield #28 = 1 Presence of Subfield #28
bit-9	FX	Extension indicator = 0 no extension = 1 extension
bit-8	(IAR)	Subfield #29: Indicated Airspeed Data age = 0 Absence of Subfield #29 = 1 Presence of Subfield #29
bit-7	(MAC)	Subfield #30: Mach Number Data age = 0 Absence of Subfield #30 = 1 Presence of Subfield #30
bit-6	(BPS)	Subfield #31: Barometric Pressure Setting Data age = 0 Absence of Subfield #31 = 1 Presence of Subfield #31
bit-5/2	spare bits set to zero	

bits-8/1	(MD2)	Age of the last valid and credible Mode 2 code used to update the track (I062/120)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 4:

Mode 3/A Age

Octet no. 1							
8	7	6	5	4	3	2	1
MDA						LSB	
bits-8/1	(MDA)	Age of the last valid and credible Mode 3/A code used to update the track (I062/060)					
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s					

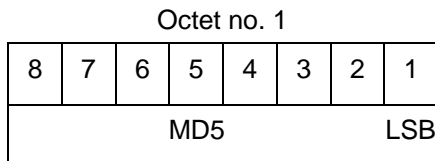
Structure of Subfield # 5:

Mode 4 Age

Octet no. 1							
8	7	6	5	4	3	2	1
MD4						LSB	
bits-8/1	(MD4)	Age of the last valid and credible Mode 4 code used to update the track					
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s					

Structure of Subfield # 6:

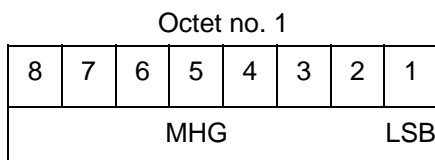
Mode 5 Age



bits-8/1	(MD5)	Age of the last valid and credible Mode 5 code used to update the track (I062/110)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 7

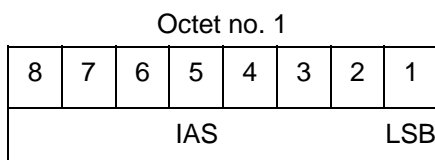
Magnetic Heading Age



bits-8/1	(MHG)	Age of the DAP "Magnetic Heading" in item 062/380 (Subfield #3)
bit-1	(LSB)	= 1/4 s Maximum value =63.75s

Structure of Subfield # 8

Indicated Airspeed / Mach Nb age

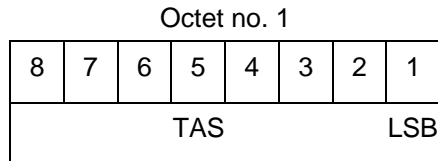


bits-8/1	(IAS)	Age of the DAP "Indicated Airspeed / Mach Number" in item 062/380 (Subfield #4)
bit-1	(LSB)	= 1/4 s Maximum value =63.75s

NOTE - Despite there are now two subfields (#29 and #30) reporting the ages of, respectively, the Indicated Airspeed track data and the Mach Number track data, this former subfield is kept free in order to prevent a full incompatibility with previous releases of ASTERIX Cat. 062 already implemented.

Structure of Subfield # 9:

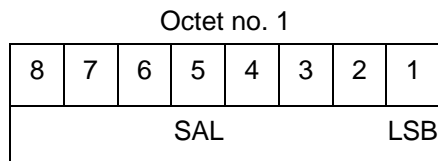
True Airspeed Age



bits-8/1	(TAS)	Age of the DAP "True Airspeed" in item 062/380 (Subfield #5)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 10

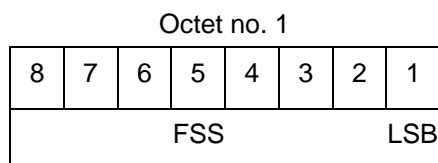
Selected Altitude Age



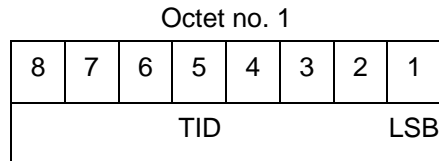
bits-8/1	(SAL)	Age of the DAP "Selected Altitude" in item 062/380 (Subfield #6)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 11:

Final State Selected Altitude Age

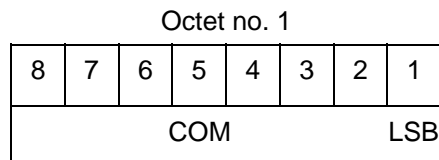


bits-8/1	(FSS)	Age of the DAP "Final State Selected Altitude" in item 062/380 (Subfield #7)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 12:**Trajectory Intent Age**

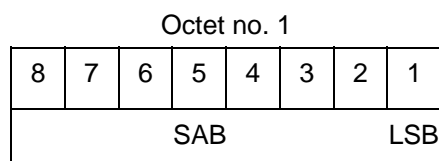
bits-8/1 (TID) Age of the DAP "Trajectory Intent" in item 062/380 (Subfield #8)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 13:**Communication/ACAS
Capability and Flight Status Age**

bits-8/1 (COM) Age of the DAP "Communication/ACAS Capability and Flight Status" in item 062/380 (Subfield #10)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

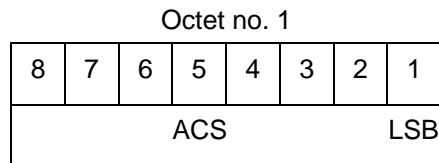
Structure of Subfield # 14:**Status Reported by ADS-B Age**

bits-8/1 (SAB) Age of the DAP "Status Reported by ADS-B" in item 062/380 (Subfield #11)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 15:

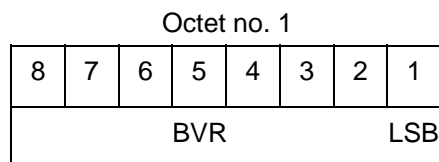
ACAS Resolution Advisory Report Age



bits-8/1	(ACS)	Age of the DAP "ACAS Resolution Advisory Report" in item 062/380 (Subfield #12)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 16:

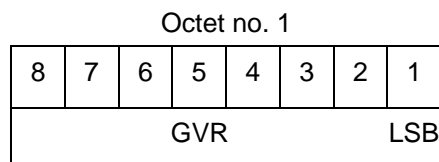
Barometric Vertical Rate Age



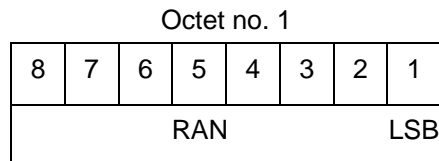
bits-8/1	(BVR)	Age of the DAP "Barometric Vertical Rate" in item 062/380 (Subfield #13)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 17:

Geometrical Vertical Rate Age

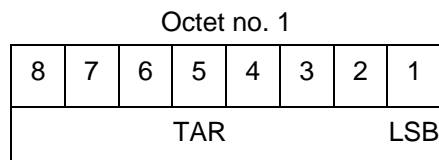


bits-8/1	(GVR)	Age of the DAP "Geometrical Vertical Rate" in item 062/380 (Subfield #14)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 18:**Roll Angle Age**

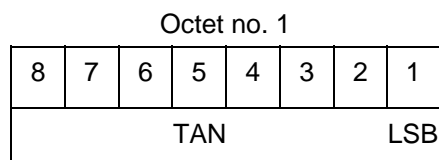
bits-8/1 (RAN) Age of the DAP "Roll Angle" in item 062/380 (Subfield #15)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 19:**Track Angle Rate Age**

bits-8/1 (TAR) Age of the DAP "Track Angle Rate" in item 062/380 (Subfield #16)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

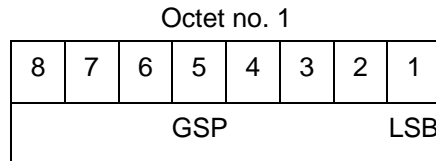
Structure of Subfield # 20:**Track Angle Age**

bits-8/1 (TAN) Age of the DAP "Track Angle" in item 062/380 (Subfield #17)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 21:

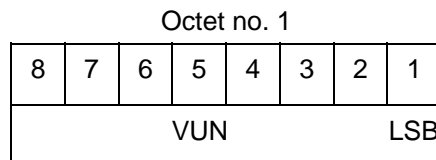
Ground Speed Age



bits-8/1	(GSP)	Age of the DAP "Ground Speed" in item 062/380 (Subfield #18)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 22:

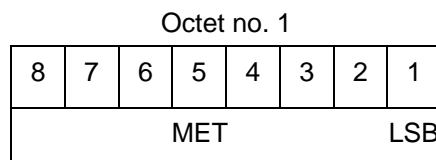
Velocity Uncertainty Age



bits-8/1	(VUN)	Age of the DAP "Velocity Uncertainty" in item 062/380 (Subfield #19)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 23:

Meteorological Data Age



bits-8/1	(MET)	Age of the DAP "Meteorological Data" in item 062/380 (Subfield #20)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 24:**Emitter Category Age**

Octet no. 1							
8	7	6	5	4	3	2	1
EMC						LSB	

bits-8/1 (EMC) Age of the DAP "Emitter Category" in item 062/380 (Subfield #21)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 25:**Position Age**

Octet no. 1							
8	7	6	5	4	3	2	1
POS						LSB	

bits-8/1 (POS) Age of the DAP "Position" in item 062/380 (Subfield #22)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 26:**Geometric Altitude Age**

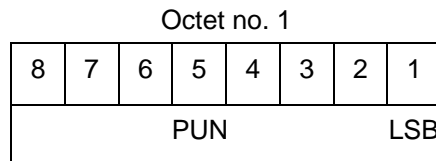
Octet no. 1							
8	7	6	5	4	3	2	1
GAL						LSB	

bits-8/1 (GAL) Age of the DAP "Geometric Altitude" in item 062/380 (Subfield #23)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 27:

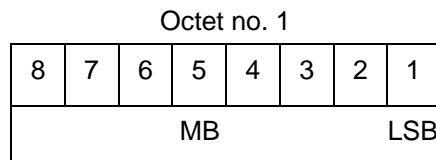
Position Uncertainty Age



bits-8/1	(PUN)	Age of the DAP "Position Uncertainty" in item 062/380 (Subfield #24)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 28:

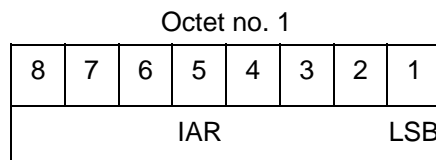
Mode S MB Data Age



bits-8/1	(MB)	Age of the DAP "Mode S MB Data" in item 062/380 (Subfield #25)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 29:

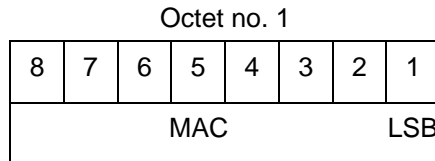
Indicated Airspeed Data Age



bits-8/1	(IAR)	Age of the DAP "Indicated Airspeed" in item 062/380 (Subfield #26)
bit-1	(LSB)	= 1/4 s Maximum value = 63.75s

Structure of Subfield # 30:

Mach Number Data Age

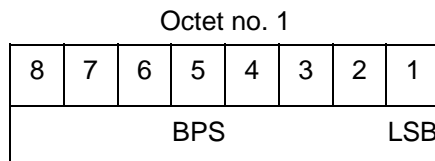


bits-8/1 (IAR) Age of the DAP "Mach Number" in item 062/380 (Subfield #27)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

Structure of Subfield # 31:

Barometric Pressure Setting Data Age



bits-8/1 (BPS) Age of the DAP "Barometric Pressure Setting" in item 062/380 (Subfield #28)

bit-1 (LSB) = 1/4 s
Maximum value = 63.75s

NOTE - In all the subfields, the age is the time delay since the value was measured

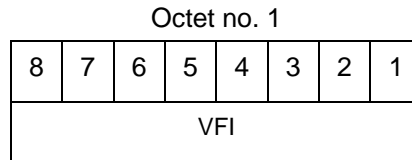
Encoding Rule :
This Item is optional

5.2.22 Data Item I062/300, Vehicle Fleet Identification

Definition: Vehicle fleet identification number.

Format: One octet fixed length Data Item.

Structure:



- bits 8-1 (VFI)
- = 0 Unknown
 - = 1 ATC equipment maintenance
 - = 2 Airport maintenance
 - = 3 Fire
 - = 4 Bird scarer
 - = 5 Snow plough
 - = 6 Runway sweeper
 - = 7 Emergency
 - = 8 Police
 - = 9 Bus
 - = 10 Tug (push/tow)
 - = 11 Grass cutter
 - = 12 Fuel
 - = 13 Baggage
 - = 14 Catering
 - = 15 Aircraft maintenance
 - = 16 Flyco (follow me)

Encoding Rule :
This Item is optional

5.2.23 Data Item I062/340, Measured Information

Definition : All measured data related to the last report used to update the track. These data are not used for ADS-B.

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

**Structure of
Primary Subfield:**

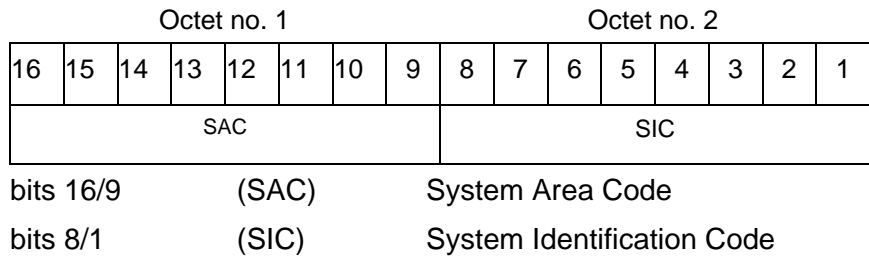
Octet no. 1

8	7	6	5	4	3	2	1
SID	POS	HEI	MDC	MDA	TYP	0	FX

bit-8	(SID)	Subfield #1: Sensor Identification = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-7	(POS)	Subfield #2: Measured Position = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-6	(HEI)	Subfield #3: Measured 3-D Height = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-5	(MDC)	Subfield #4: Last Measured Mode C code = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-4	(MDA)	Subfield #5: Last Measured Mode 3/A code = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-3	(TYP)	Subfield #6: Report Type = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-2	(spare)	Spare bit set to zero
bit-1	FX	Extension indicator = 0 no extension = 1 extension

Structure of Subfield # 1:

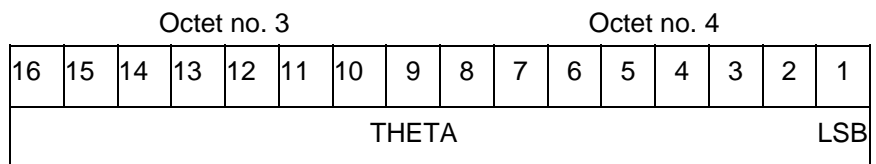
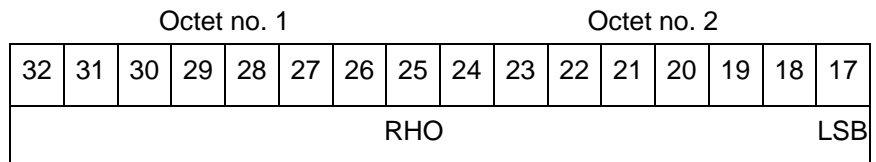
Sensor Identification



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

Structure of Subfield # 2:

Measured Position



bits 32/17 (RHO) Measured distance:
 bit 17 (LSB) = 1/256 NM
 Maximum value = 256 NM

bits 16/1 (THETA) Measured azimuth
 bit 1 (LSB) = $360^\circ / 2^{16} \cong 0.0055^\circ$

NOTE - The measured position is :

1. In case of a plot, the measured bias-corrected polar co-ordinates;
2. In case of a sensor local track, the measured bias-corrected polar co-ordinates of the plot associated to the track;
3. In case of a local track without detection, the extrapolated bias-corrected polar co-ordinates.

Structure of Subfield # 5:

Last Measured Mode 3/A Code

Octet no. 1								Octet no. 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
V	G	L	0	A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1

bit 16	(V)	= 0	Code Validated
		= 1	Code not Validated
bit 15	(G)	= 0	Default
		= 1	Garbled code
bit 14	(L)	= 0	MODE 3/A code as derived from the reply of the transponder,
		= 1	Smoothed MODE 3/A code as provided by a sensor local tracker.
bit 13			Spare bit set to zero
bits 12/1			Mode 3/A reply under the form of 4 digits in octal representation

NOTE - Smoothed MODE 3/A data (L = 1) will be used in case of absence of MODE 3/A code information in the plot or in case of difference between plot and sensor local track MODE 3/A code information.

Structure of Subfield # 6:
Report Type

Octet no. 1							
8	7	6	5	4	3	2	1
TYP			SIM	RAB	TST	0	0

bits-8/6	(TYP)	= 000	No detection
		= 001	Single PSR detection
		= 010	Single SSR detection
		= 011	SSR + PSR detection
		= 100	Single ModeS All-Call
		= 101	Single ModeS Roll-Call
		= 110	ModeS All-Call + PSR
		= 111	ModeS Roll-Call +PSR
bit-5	(SIM)	= 0	Actual target report
		= 1	Simulated target report
bit-4	(RAB)	= 0	Report from target transponder
		= 1	Report from field monitor (fixed transponder)
bit-3	(TST)	= 0	Real target report
		= 1	Test target report
bits-2/1			Spare bits set to zero

Encoding Rule :
This Item is optional

5.2.24 Data Item I062/380, Aircraft Derived Data

Definition : Data derived directly by the aircraft. This includes data transmitted via Mode-S and ADS-B.

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

**Structure of
Primary Subfield:**

Octet no. 1

32	31	30	29	28	27	26	25
ADR	ID	MHG	IAS	TAS	SAL	FSS	FX

Octet no. 2

24	23	22	21	20	19	18	17
TIS	TID	COM	SAB	ACS	BVR	GVR	FX

Octet no. 3

16	15	14	13	12	11	10	9
RAN	TAR	TAN	GSP	VUN	MET	EMC	FX

Octet no. 4

8	7	6	5	4	3	2	1
POS	GAL	PUN	MB	IAR	MAC	BPS	FX

bit-32	(ADR)	Subfield #1:Target Address = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-31	(ID)	Subfield #2:Target Identification = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-30	(MHG)	Subfield #3:Magnetic Heading = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-29	(IAS)	Subfield #4:Indicated Airspeed/ Mach Number = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-28	(TAS)	Subfield #5:True Airspeed = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-27	(SAL)	Subfield #6:Selected Altitude = 0 Absence of Subfield #6 = 1 Presence of Subfield #6

bit-26	(FSS)	Subfield #7: Final State Selected Altitude = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-25	FX	Extension indicator = 0 no extension = 1 extension
bit-24	(TIS)	Subfield #8: Trajectory Intent Status = 0 Absence of Subfield #8 = 1 Presence of Subfield #8
bit-23	(TID)	Subfield #9: Trajectory Intent Data = 0 Absence of Subfield #9 = 1 Presence of Subfield #9
bit-22	(COM)	Subfield #10: Communications / ACAS Capability and Flight Status = 0 Absence of Subfield #10 = 1 Presence of Subfield #10
bit-21	(SAB)	Subfield #11: Status reported by ADS-B = 0 Absence of Subfield #11 = 1 Presence of Subfield #11
bit-20	(ACS)	Subfield #12: ACAS Resolution Advisory Report = 0 Absence of Subfield #12 = 1 Presence of Subfield #12
bit-19	(BVR)	Subfield #13: Barometric Vertical Rate = 0 Absence of Subfield #13 = 1 Presence of Subfield #13
bit-18	(GVR)	Subfield #14: Geometric Vertical Rate = 0 Absence of Subfield #14 = 1 Presence of Subfield #14
bit-17	FX	Extension indicator = 0 no extension = 1 extension
bit-16	(RAN)	Subfield #15: Roll Angle = 0 Absence of Subfield #15 = 1 Presence of Subfield #15
bit-15	(TAR)	Subfield #16: Track Angle Rate = 0 Absence of Subfield #16 = 1 Presence of Subfield #16
bit-14	(TAN)	Subfield #17: Track Angle = 0 Absence of Subfield #17 = 1 Presence of Subfield #17
bit-13	(GSP)	Subfield #18: Ground Speed = 0 Absence of Subfield #18 = 1 Presence of Subfield #18

bit-12	(VUN)	Subfield #19: Velocity Uncertainty = 0 Absence of Subfield #19 = 1 Presence of Subfield #19
bit-11	(MET)	Subfield #20: Meteorological Data = 0 Absence of Subfield #20 = 1 Presence of Subfield #20
bit-10	(EMC)	Subfield #21: Emitter Category = 0 Absence of Subfield #21 = 1 Presence of Subfield #21
bit-9	FX	Extension indicator = 0 no extension = 1 extension
bit-8	(POS)	Subfield #22: Position Data = 0 Absence of Subfield #22 = 1 Presence of Subfield #22
bit-7	(GAL)	Subfield #23: Geometric Altitude Data = 0 Absence of Subfield #23 = 1 Presence of Subfield #23
bit-6	(PUN)	Subfield #24: Position Uncertainty Data = 0 Absence of Subfield #24 = 1 Presence of Subfield #24
bit-5	(MB)	Subfield #25: Mode S MB Data = 0 Absence of Subfield #25 = 1 Presence of Subfield #25
bit-4	(IAR)	Subfield #26: Indicated Airspeed = 0 Absence of Subfield #26 = 1 Presence of Subfield #26
bit-3	(MAC)	Subfield #27: Mach Number = 0 Absence of Subfield #27 = 1 Presence of Subfield #27
bit-2	(BPS)	Subfield #28: Barometric Pressure Setting. = 0 Absence of Subfield #28 = 1 Presence of Subfield #28
bit-1	FX	Extension indicator = 0 no extension = 1 extension

NOTE - Despite there are now two subfields (#26 and #27) reporting , respectively, the Indicated Airspeed track data and the Mach Number track data, the former subfield #4 (and its presence bit, bit-37) is kept in order to prevent a full incompatibility with previous releases of ASTERIX Cat. 062 already implemented.

Structure of Subfield # 1:

Target Address

Octet no. 1

24	23	22	21	20	19	18	17

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

bits 24/1

24 bits Target Address, A23 to A0

Structure of Subfield # 2:
Target Identification

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 3/1			

Octet no. 3								Octet no. 4							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Char 3/2		Character 4						Character 5						Char 6/1	

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

bits 48/1

Characters 1-8 (coded on 6 bits each) defining a target identification when flight plan is available or the registration marking when no flight plan is available.
Coding rules are provided in [3] Section 3.8.2.9

Structure of Subfield # 3:
Magnetic Heading

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

bits-16/1

Magnetic Heading
(LSB) = $360^\circ / 2^{16} = 0.0055^\circ$

Structure of Subfield # 4:

Indicated Airspeed / Mach No

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, LSB (Bit-1) = 2^{-14} NM/s
 = 1 Air Speed = Mach, LSB (Bit-1) = 0.001

bits-15/1 Air Speed (IAS or Mach)

NOTE - Despite there are now two subfields (#26 and #27) reporting, respectively, the Indicated Airspeed track data and the Mach Number track data, this former subfield is kept free in order to prevent a full incompatibility with previous releases of ASTERIX Cat. 062 already implemented.

Structure of Subfield # 5:

True Airspeed

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

$0 \leq \text{True Air Speed} \leq 2046$ knots

Structure of Subfield # 6:

Selected Altitude

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

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/MCP Selected Altitude
= 11 FMS Selected Altitude
- bits- 13/1 (Altitude) Altitude in two's complement form
LSB=25ft
-1300ft ≤ Altitude ≤ 100000ft

Structure of Subfield # 7:

Final State Selected Altitude

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

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
= 0 Not active
= 1 Active
- bit-14 (AM) Approach Mode
= 0 Not active
= 1 Active

bits- 13/1

(Altitude)

Altitude in two's complement form
LSB=25ft
 $-1300\text{ft} \leq \text{Altitude} \leq 100000\text{ft}$

Structure of Subfield #8 :
Trajectory Intent Status

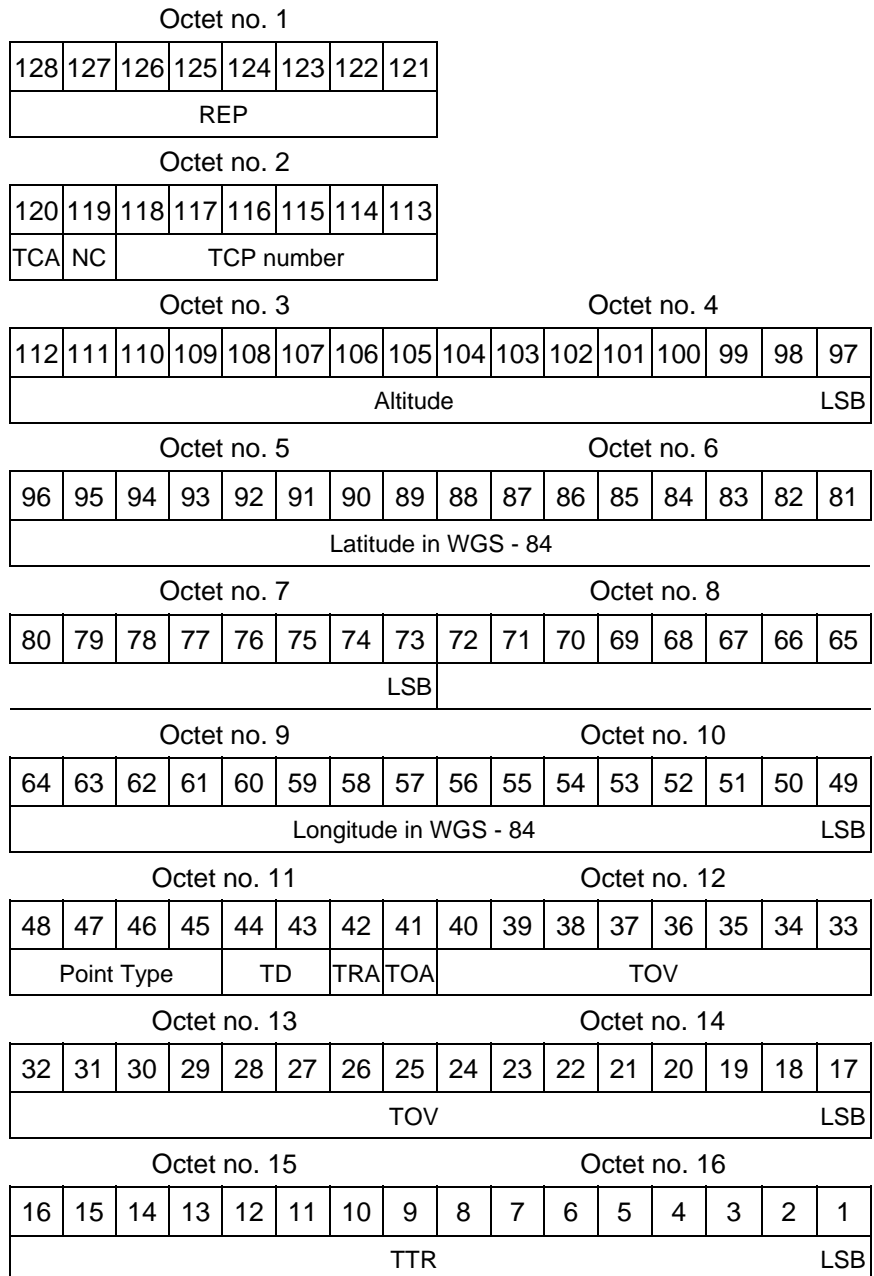
Octet no. 1							
8	7	6	5	4	3	2	1
NAV	NVB	0	0	0	0	0	FX

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 # 9:

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



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. 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 Availability = 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 ≤ 655.36 Nm

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

Structure of Subfield # 10:

Communications/ACAS Capability and Flight Status reported by Mode-S

Octet no. 1							Octet no. 2									
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
COM			STAT				0	0	SSC	ARC	AIC	B1A	B1B			

bits-16/14 (COM) Communications capability of the transponder
 = 0 No communications capability (surveillance only)
 = 1 Comm. A and Comm. B capability
 = 2 Comm. A, Comm. B and Uplink ELM
 = 3 Comm. A, Comm. B, Uplink ELM and Downlink ELM
 = 4 Level 5 Transponder capability
 5 to 7 Not assigned

bits-13/11 (STAT) Flight Status
 = 0 No alert, no SPI, aircraft airborne
 = 1 No alert, no SPI, aircraft on ground
 = 2 Alert, no SPI, aircraft airborne
 = 3 Alert, no SPI, aircraft on ground
 = 4 Alert, SPI, aircraft airborne or on ground
 = 5 No alert, SPI, aircraft airborne or on ground

bit-10/9 Spare bit set to zero

bit-8 (SSC) Specific service capability
 = 0 No
 = 1 Yes

bit-7 (ARC) Altitude reporting capability
 = 0 100 ft resolution
 = 1 25 ft resolution

bit-6 (AIC) Aircraft identification capability
 = 0 No
 = 1 Yes

bit 5 (B1A) BDS 1,0 bit 16

bits 4/1 (B1B) BDS 1,0 bits 37/40

Structure of Subfield # 11:**Status reported by ADS-B**

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		GBS	0	0	0	0	0	0	STAT		

- 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
- bit-10 (GBS) = 0 Transponder Ground Bit not set or unknown
= 1 Transponder Ground Bit set
- bits-9/4 spare bits set to zero
- bits-3/1 (STAT) Flight Status
= 0 No emergency
= 1 General emergency
= 2 Lifeguard / medical
= 3 Minimum fuel
= 4 No communications
= 5 Unlawful interference
= 7 Unknown

Structure of Subfield # 12:

ACAS Resolution Advisory Report

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

Format : Seven-octet fixed length Data Item.

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

Octet no. 3								Octet no. 4							
40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25

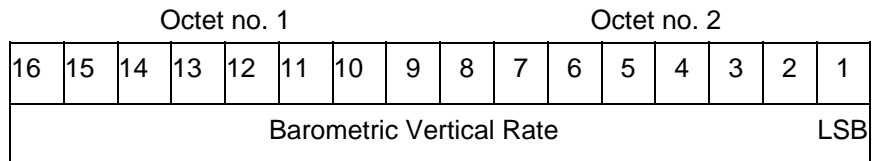
Octet no. 5								Octet no. 6							
24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9

Octet 7							
8	7	6	5	4	3	2	1

bits-56/1 (MB Data) 56-bit message conveying Mode S
Comm B message data of BDS
Register 3,0

NOTE - Refer to ICAO Draft SARPs for ACAS for detailed explanations.

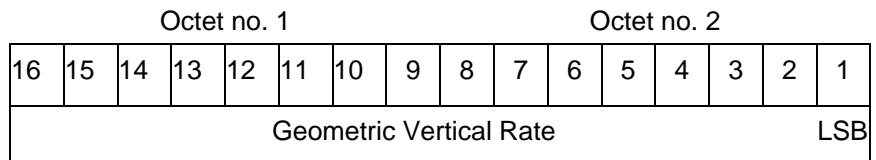
Structure of Subfield # 13:
Barometric Vertical Rate



bits-16/1 Barometric Vertical Rate in two's complement form

(LSB) = 6.25 feet/minute

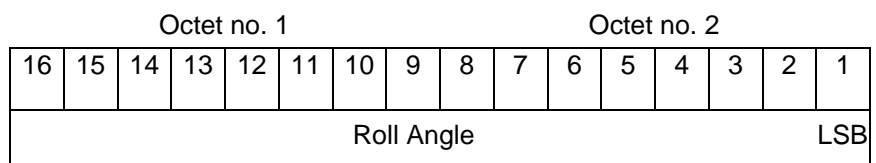
Structure of Subfield # 14:
Geometric Vertical Rate



bits-16/1 Geometric Vertical Rate in two's complement form

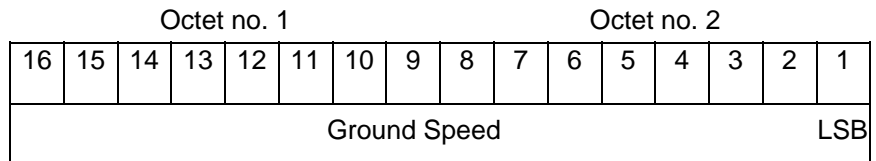
(LSB) = 6.25 feet/minute

Structure of Subfield # 15:
Roll Angle

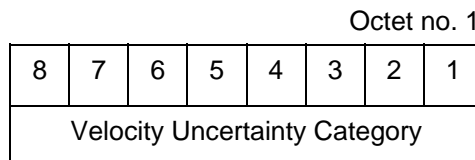


bits-16/1 Roll Angle in two's complement form

(LSB) = 0.01 degree
-180 ≤ Roll Angle ≤ 180

Structure of Subfield # 18:**Ground Speed**

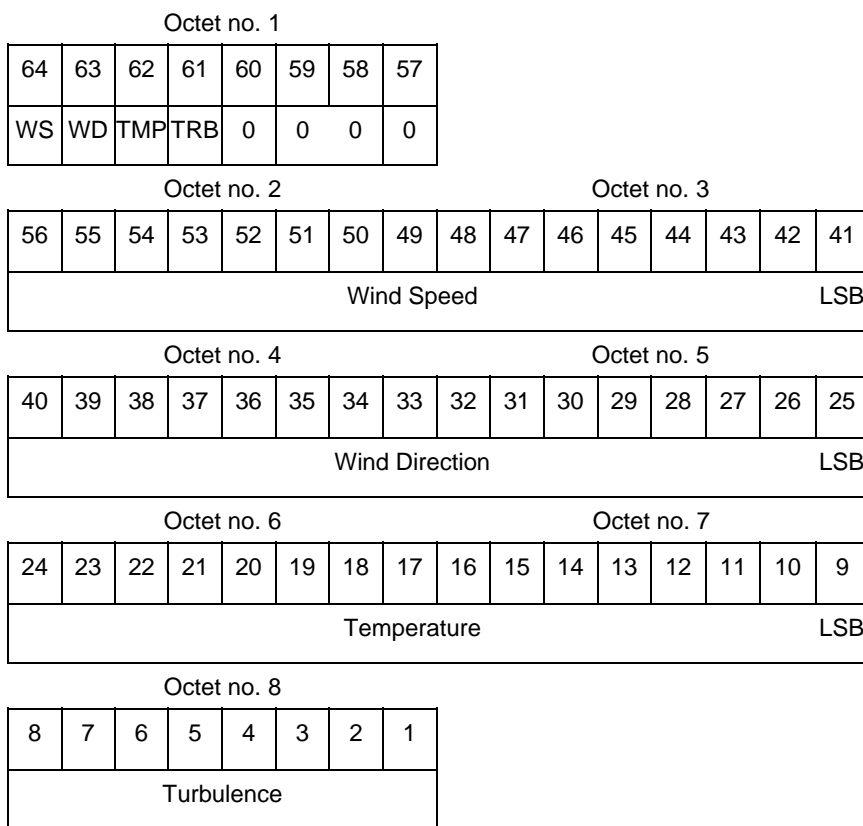
bits-16/1 Ground Speed in two's complement form
referenced to WGS84
(LSB) = 2^{-14} NM/s \cong 0.22 kt
 -2 NM/s \leq Ground Speed $<$ 2 NM/s

Structure of Subfield # 19:**Velocity Uncertainty**

NOTE - Velocity uncertainty category of the least accurate velocity component

Structure of Subfield # 20:

Met Data



bit-64	(WS)	= 0	Not valid Wind Speed
		= 1	Valid Wind Speed
bit-63	(WD	= 0	Not valid Wind Direction
		= 1	Valid Wind Speed
bit-62	(TMP)	= 0	Not valid Temperature
		= 1	Valid Temperature
bit-61	(TRB)	= 0	Not valid Turbulence
		= 1	Valid Turbulence
bits-60/57	(spare)	Spare Bits set to zero	
bits-56/41		Wind Speed	
		(LSB)	= 1 knot
		0 ≤ Wind Speed ≤ 300	
bits-40/25		Wind Direction	
		(LSB)	= 1 degree
		1 ≤ Wind Direction ≤ 360	
bits-24/9		Temperature in degrees celsius	
		(LSB)	= 0.25 °C
		-100 °C ≤ Temperature ≤ 100 °C	
bits-8/1		Turbulence	
		Integer between 0 and 15 inclusive	

Structure of Subfield # 21:**Emitter Category**

Octet no. 1

8	7	6	5	4	3	2	1
ECAT							

bits-8/1

(ECAT)

1 = light aircraft \leq 7000 kg

2 = reserved

3 = 7000 kg < medium aircraft < 136000 kg

4 = reserved

5 = 136000 kg \leq heavy aircraft6 = 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

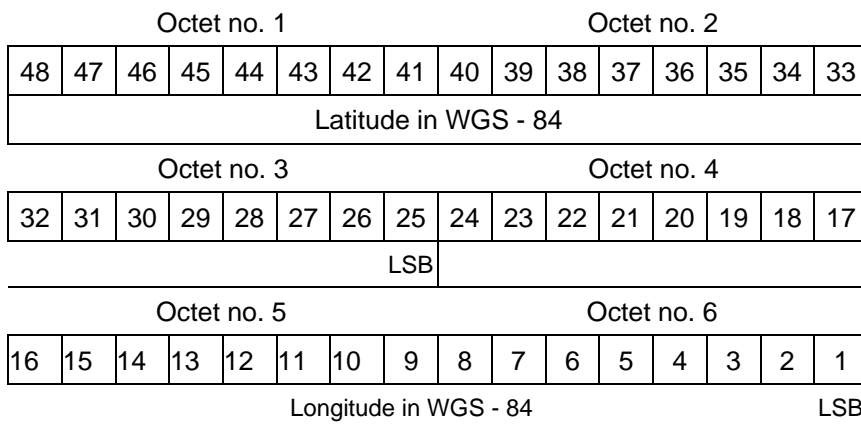
21 = surface service vehicle

22 = fixed ground or tethered obstruction

23 to 24 = reserved

Structure of Subfield # 22:

Position



bits-48/25 (Latitude) In WGS.84 in two's complement form.
Range $-90 \leq \text{latitude} \leq 90$ deg.
LSB = $180/2^{23}$ degrees
= $2.145767 * 10^{-05}$ degrees.

This corresponds to a resolution of at least 2.4 meters

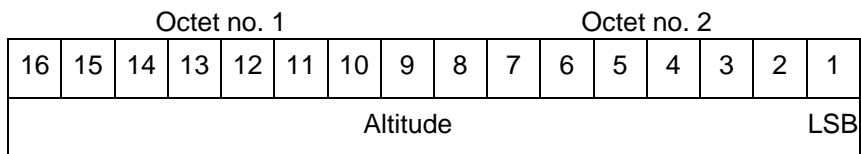
bits-24/1 (Longitude) In WGS.84 in two's complement form.
Range $-180 \leq \text{longitude} < 180$ deg.
LSB = $180/2^{23}$ degrees
= $2.145767 * 10^{-05}$ degrees.

This corresponds to a resolution of at least 2.4 meters.

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

Structure of Subfield # 23:

Geometric Altitude



bit 16/1 (Altitude) Altitude in two's complement form
 $-1500 \text{ ft} \leq \text{Altitude} \leq 150000 \text{ ft}$
(LSB) = 6.25 ft

NOTE - LSB is required to be thinner than 10 ft by ICAO

Structure of Subfield # 24:
Position Uncertainty

Octet no. 1

8	7	6	5	4	3	2	1
0	0	0	0	PUN			

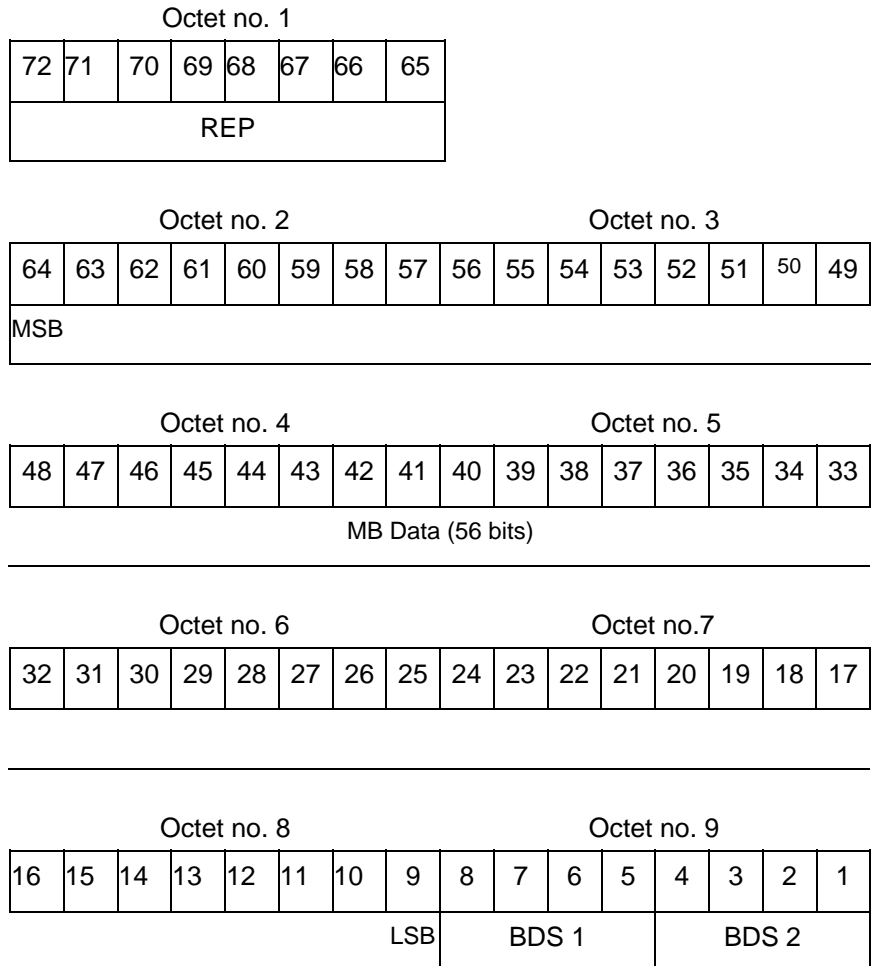
bits-8/5 Spare bits set to zero
bits-4/1 (PUN) Position Uncertainty

Structure of Subfield # 25:

MODE S MB DATA

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

Structure:

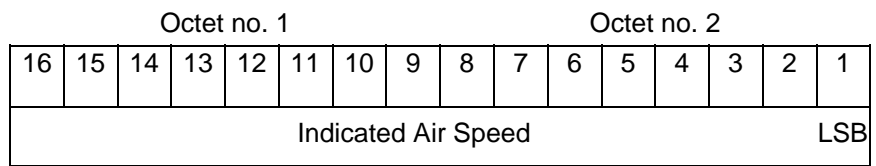


bits 72/65	(REP)	Repetition factor
bits 64/9	(MB data)	56 bit message conveying Mode S B message data
bits 8/5	(BDS1)	Comm B data Buffer Store 1 Address
bits 4/1	(BDS2)	Comm B data Buffer Store 2 Address

NOTE - Only DAPs that can not be encoded into other subfields of this item should be sent using subfield #25

Structure of Subfield # 26:

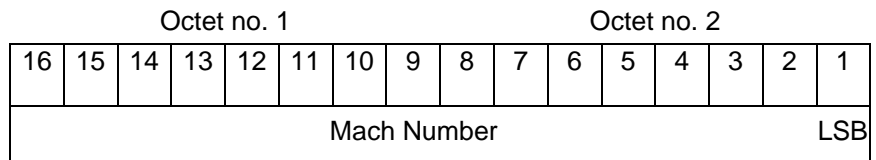
Indicated Airspeed



bit 16/1 $0 \text{ Kt} \leq \text{Indicated Airspeed} \leq 1100 \text{ Kt}$
(LSB) = 1 Kt

Structure of Subfield # 27

Mach Number



bit 16/1 $0 \leq \text{Mach Number} \leq 4.096$
(LSB) = Mach 0.008

Structure of Subfield # 28:

Barometric Pressure Setting (derived from Mode S BDS 4,0)

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	Barometric Pressure Setting											LSB

bit-16/13

bits- 12/1

(BPS)

Spare bits set to 0.

LSB=0.1mb

-0ft ≤ BPS ≤ 409.5 mb

NOTE - BPS is the barometric pressure setting of the aircraft minus 800 mb.

Encoding Rule :

This Item is optional

5.2.25 Data Item I062/390, Flight Plan Related Data

Definition : All flight plan related information, provided by ground-based systems.

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

**Structure of
Primary Subfield:**

Octet no. 1

24	23	22	21	20	19	18	17
TAG	CSN	IFI	FCT	TAC	WTC	DEP	FX

Octet no. 2

16	15	14	13	12	11	10	9
DST	RDS	CFL	CTL	TOD	AST	STS	FX

Octet no. 3

8	7	6	5	4	3	2	1
STD	STA	PEM	PEC	0	0	0	FX

bit-24	(TAG)	Subfield #1: FPPS Identification Tag = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-23	(CSN)	Subfield #2: Callsign = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-22	(IFI)	Subfield #3: IFPS_FLIGHT_ID = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-21	(FCT)	Subfield #4: Flight Category = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-20	(TAC)	Subfield #5: Type of Aircraft = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-19	(WTC)	Subfield #6: Wake Turbulence Category = 0 Absence of Subfield #6 = 1 Presence of Subfield #6

bit-18	(DEP)	Subfield #7: Departure Airport = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-17	FX	Extension indicator = 0 no extension = 1 extension
bit-16	(DST)	Subfield #8: Destination Airport = 0 Absence of Subfield #8 = 1 Presence of Subfield #8
bit-15	(RDS)	Subfield #9: Runway Designation = 0 Absence of Subfield #9 = 1 Presence of Subfield #9
bit-14	(CFL)	Subfield #10: Current Cleared Flight Level = 0 Absence of Subfield #10 = 1 Presence of Subfield #10
bit-13	(CTL)	Subfield #11: Current Control Position = 0 Absence of Subfield #11 = 1 Presence of Subfield #11
bit-12	(TOD)	Subfield #12: Time of Departure / Arrival = 0 Absence of Subfield #12 = 1 Presence of Subfield #12
bit-11	(AST)	Subfield #13: Aircraft Stand = 0 Absence of Subfield #13 = 1 Presence of Subfield #13
bit-10	(STS)	Subfield #14: Stand Status = 0 Absence of Subfield #14 = 1 Presence of Subfield #14
bit-9	FX	Extension indicator = 0 no extension = 1 extension
bit-8	(STD)	Subfield #15: Standard Instrument Departure = 0 Absence of Subfield #15 = 1 Presence of Subfield #15
bit-7	(STA)	Subfield #16: STandard Instrument ARrival = 0 Absence of Subfield #16 = 1 Presence of Subfield #16
bit-6	(PEM)	Subfield #17: Pre-emergency Mode 3/A code = 0 Absence of Subfield #17 = 1 Presence of Subfield #17
bit-5	(PEC)	Subfield #18: Pre-emergency Callsign = 0 Absence of Subfield #18 = 1 Presence of Subfield #18
bits-4/2		Spare bits set to zero

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

Structure of Subfield # 1:

FPPS Identification Tag

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 Identity Code							

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

Structure of Subfield # 2:

Callsign

Octet no. 1															
56	55	54	53	52	51	50	49								
Character 1															
Octet no. 2				Octet no. 3											
48	47	46	45	44	43	42	41	40	39	38	37	36	34	33	
Character 2								Character 3							
Octet no. 4				Octet no. 5											
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Character 4								Character 5							
Octet no. 6				Octet no. 7											
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Character 6								Character 7							

NOTE - Each one of the seven Octets contains an ASCII Character. The Callsign is always left adjusted. It contains up to seven upper-case alphanumeric characters, the remaining character positions (if any) are padded with space characters.

**Structure of Subfield # 3:
IFPS_FLIGHT_ID**

Octet no. 1								Octet no. 2							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
TYP		0	0	0	NBR										
Octet no. 3								Octet no. 4							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
LSB															

bits-32/31 (TYP) = 00 Plan Number
 = 01 Unit 1 internal flight number
 = 10 Unit 2 internal flight number
 = 11 Unit 3 internal flight number

bits-30/28 spare bits set to zero

bits-27/1 (NBR) Number from 0 to 99 999 999

**Structure of Subfield # 4:
Flight Category**

Octet no. 1							
8	7	6	5	4	3	2	1
GAT/OAT		FR1/FR2		RVSM		HPR	0

bits 8/7 (GAT/OAT) = 00 Unknown
 = 01 General Air Traffic
 = 10 Operational Air Traffic
 = 11 Not applicable

bits 6/5 (FR1/FR2) = 00 Instrument Flight Rules
 = 01 Visual Flight rules
 = 10 Not applicable
 = 11 Controlled Visual Flight Rules

bits 4/3 (RVSM) = 00 Unknown
 = 01 Approved
 = 10 Exempt
 = 11 Not Approved

bit 2 (HPR) = 0 Normal Priority Flight
 = 1 High Priority Flight

bit 1 Spare bit set to zero

**Structure of Subfield # 5:
Type of Aircraft**

Octet no. 1								Octet no. 2							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Character 1								Character 2							

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

NOTES

1. Each one of the four Octets composing the type of an aircraft contains an ASCII Character (upper-case alphabetic characters with trailing spaces).
2. The types of aircraft are defined in [Ref.4]

**Structure of Subfield # 6:
Wake Turbulence Category**

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

bits 8/1

Wake Turbulence Category is an ASCII character code which should be one of the following values

:

L = Light

M = Medium

H = Heavy

**Structure of Subfield # 7:
Departure Airport**

Octet no. 1								Octet no. 2							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Character 1								Character 2							

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

NOTES

1. Each one of the four Octets composing the name of an airport contains an ASCII Character (upper case alphabetic).
2. The Airport Names are indicated in the ICAO Location Indicators book.

**Structure of Subfield # 8
Destination Airport**

Octet no. 1								Octet no. 2							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Character 1								Character 2							

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

NOTES

1. Each one of the four Octets composing the name of an airport contains an ASCII Character (upper case alphabetic).
2. The Airport Names are indicated in the ICAO Location Indicators book.

**Structure of Subfield # 9:
Runway Designation**

Octet no. 1								Octet no. 2							
24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
NU1								NU2							

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

bits 24/17 (NU1) First number
bits 16/9 (NU2) Second number
bits 8/1 (LTR) Letter

NOTES

1. NU1, NU2 and LTR each contain an ASCII character
2. For details refer to.[5] Section 5

**Structure of Subfield # 10:
Current Cleared Flight Level**

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

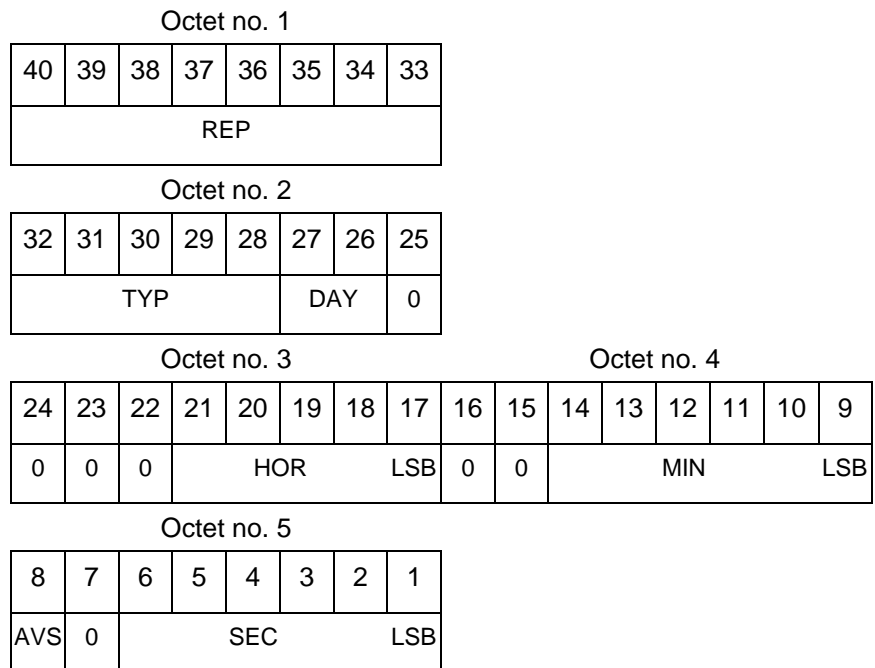
bits 16/1 (CFL)
LSB = 1/4 FL

**Structure of Subfield # 11:
Current Control Position**

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

bits 16/9 (Centre) 8-bit group Identification code
bits 8/1 (Position) 8-bit Control Position identification code

NOTE - The centre and the control position identification codes have to be defined between communication partners.

**Structure of Subfield # 12:
Time of Departure / Arrival**

- bits-40/33 (REP) Repetition Factor
- bits-32/28 (TYP) = 0 Scheduled off-block time
 = 1 Estimated off-block time
 = 2 Estimated take-off time
 = 3 Actual off-block time
 = 4 Predicted time at runway hold
 = 5 Actual time at runway hold
 = 6 Actual line-up time
 = 7 Actual take-off time
 = 8 Estimated time of arrival
 = 9 Predicted landing time
 = 10 Actual landing time
 = 11 Actual time off runway
 = 12 Predicted time to gate
 = 13 Actual on-block time
- bits-27/26 (DAY) = 00 Today
 = 01 Yesterday
 = 10 Tomorrow
 = 11 Invalid
- bits-25/22 spare bits set to zero

- bits-21/17 (HOR) Hours, from 0 to 23
- bits-16/15 spare bits set to zero
- bits-14/9 (MIN) Minutes, from 0 to 59
- bit-8 (AVS) = 0 Seconds available
= 1 Seconds not available
- bit-7 spare bits set to zero
- bits-6/1 (SEC) Seconds, from 0 to 59

NOTE - Estimated times are derived from flight plan systems. Predicted times are derived by the fusion system, based on surveillance data. For definitions, see [Ref.4]

**Structure of Subfield # 13:
Aircraft Stand**

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							

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

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

NOTE - Each one of the six Octets contains an ASCII Character. The Aircraft Stand identification is always left adjusted. It contains up to six upper-case alphanumeric characters, the remaining character positions (if any) are padded with space characters.

**Structure of Subfield # 14:
Stand Status**

Octet no. 1							
8	7	6	5	4	3	2	1
EMP		AVL		0	0	0	0

bits-8/7 (EMP) = 00 Empty
 = 01 Occupied
 = 10 Unknown
 = 11 Invalid

bits-6/5 (AVL) = 00 Available
 = 01 Not available
 = 10 Unknown
 = 11 Invalid

**Structure of Subfield # 15:
Standard Instrument Departure**

Octet no. 1							
56	55	54	53	52	51	50	49
Character 1							

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

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

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

NOTE - Each one of the seven Octets contains an ASCII Character. The SID is always left adjusted. It contains up to seven alphanumeric characters, the remaining character positions (if any) are padded with space characters.

Structure of Subfield # 16:
Standard Instrument Arrival

Octet no. 1							
56	55	54	53	52	51	50	49
Character 1							

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

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

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

NOTE - Each one of the seven Octets contains an ASCII Character. The STAR is always left adjusted. It contains up to seven alphanumeric characters, the remaining character positions (if any) are padded with space characters.

Encoding Rule :
This Item is optional

Structure of Subfield # 17:
Pre-Emergency Mode 3/A

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

bits-16/13

Spare bits set to 0

bit-13 (VA)

Validity

= 0 No valid Mode 3/A available

= 1 Valid Mode 3/A available

bits-12/1

Mode-3/A reply in octal
representation**NOTES**

1. This subfield is used only when the aircraft is transmitting an emergency Mode 3/A code
2. If VA = 0, the content of bits 12/1 is meaningless

**Structure of Subfield # 18:
Pre-Emergency Callsign**

Octet no. 1							
56	55	54	53	52	51	50	49
Character 1							

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

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

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

NOTES

1. Each one of the seven Octets contains an ASCII Character. The Callsign is always left adjusted. It contains up to seven upper-case alphanumeric characters, the remaining character positions (if any) are padded with space characters
2. This subfield is used only when an emergency Mode 3/A is associated with the track (I062/390 Subfield #17)

5.2.26 Data Item I062/500, Estimated Accuracies**Definition :** Overview of all important accuracies**Format :** Compound Data Item, comprising a primary subfield of up to two octets, followed by the indicated subfields.**Structure of****Primary Subfield:**

Octet no. 1							
16	15	14	13	12	11	10	9
APC	COV	APW	AGA	ABA	ATV	AA	FX

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

bit 16	(APC)	Subfield #1: Estimated Accuracy Of Track Position (Cartesian) = 0 Absence of subfield #1 = 1 Presence of subfield #1
bit 15	(COV)	Subfield #2: XY Covariance = 0 Absence of subfield #2 = 1 Presence of subfield #2
bit 14	(APW)	Subfield #3: Estimated Accuracy Of Track Position (WGS-84) = 0 Absence of subfield #3 = 1 Presence of subfield #3
bit 13	(AGA)	Subfield #4: Estimated Accuracy Of Calculated Track Geometric Altitude = 0 Absence of subfield #4 = 1 Presence of subfield #4
bit 12	(ABA)	Subfield #5: Estimated Accuracy Of Calculated Track Barometric Altitude = 0 Absence of subfield #5 = 1 Presence of subfield #5
bit 11	(ATV)	Subfield #6: Estimated Accuracy Of Track Velocity (Cartesian) = 0 Absence of subfield #6 = 1 Presence of subfield #6
bit 10	(AA)	Subfield #7: Estimated Accuracy Of Acceleration (Cartesian) = 0 Absence of subfield #7 = 1 Presence of subfield #7
bit 9	(FX)	= 0 no extension = 1 extension

- bits 8 (ARC) Subfield #8: Estimated Accuracy Of Rate Of Climb/Descent
= 0 Absence of subfield #8
= 1 Presence of subfield #8
- bits 7/2 Spare bits set to 0
- bit 1 (FX) = 0 no extension
= 1 extension

**Structure of Subfield # 1:
Estimated Accuracy Of Track Position (Cartesian)**

Octet no. 1										Octet no. 2					
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
APC (X-Component)														LSB	

Octet no. 3								Octet no. 4							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
APC (Y-Component)															LSB

- bits 32/1 (APC) Estimated accuracy (i.e. standard deviation) of the calculated position of a target expressed in Cartesian co-ordinates.
- bits 17 and 1 (LSB) = 0.5m

NOTE - Maximum value means maximum value or above.

**Structure of Subfield # 2:
XY covariance component**

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

- bits 16/1 XY Covariance in two's complement form
- bits 1 (LSB) = 0.5m

NOTE - The maximum value for the square root of the (unsigned) XY covariance component is 16.383 km.

**Structure of Subfield #3:
Estimated Accuracy Of Track Position (WGS-84)**

Octet no. 1										Octet no. 2					
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
APW (Latitude Component)														LSB	

Octet no. 3								Octet no. 4							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
APW (Longitude Component)															LSB

bits 32-1 (APW) Estimated accuracy (i.e. standard deviation) of the calculated position of a target expressed in WGS-84.

bits 17 and 1 (LSB) $180/2^{25}$ degrees

NOTE - Maximum value means maximum value or above.

**Structure of Subfield #4:
Estimated Accuracy Of Calculated Track Geometric Altitude**

Octet no. 1							
8	7	6	5	4	3	2	1
AGA							LSB

bits 8-1 (AGA) Estimated accuracy (i.e. standard deviation) of the calculated geometric altitude of a target.

bit 1 (LSB) = 6.25 ft

NOTE - Maximum value means maximum value or above.

**Structure of Subfield #5:
Estimated Accuracy Of Calculated Track Barometric Altitude**

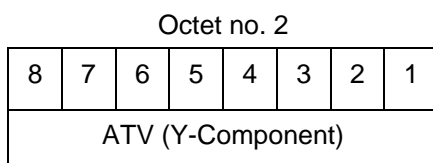
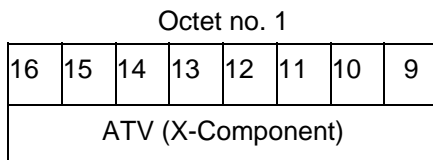
Octet no. 1							
8	7	6	5	4	3	2	1
ABA							LSB

bits 8-1 (ABA) Estimated accuracy (i.e. standard deviation) of the calculated barometric altitude of the track.

bit 1 (LSB) = 1/4 FL

NOTE - Maximum value means maximum value or above.

**Structure of Subfield #6:
Estimated Accuracy Of Track Velocity (Cartesian)**

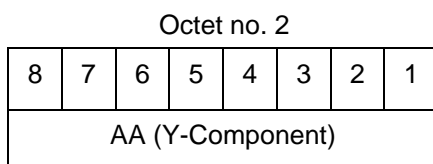
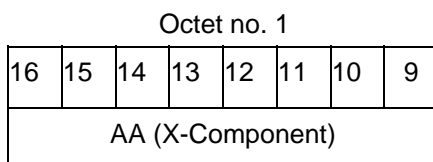


bits 16/1 (ATV) Estimated accuracy
(i.e. standard deviation) of the
calculated track velocity
in Cartesian co-ordinates.

bits 9 and 1 (LSB) = 0.25m/s

NOTE - Maximum value means maximum value or above.

**Structure of Subfield #7:
Estimated Accuracy Of Acceleration (Cartesian)**



bits 16/1 (AA) Estimated accuracy
(i.e. standard deviation) of the
calculated acceleration
in Cartesian co-ordinates.

bits 9 and 1 (LSB) = 0.25m/s²

NOTE - Maximum value means maximum value or above.

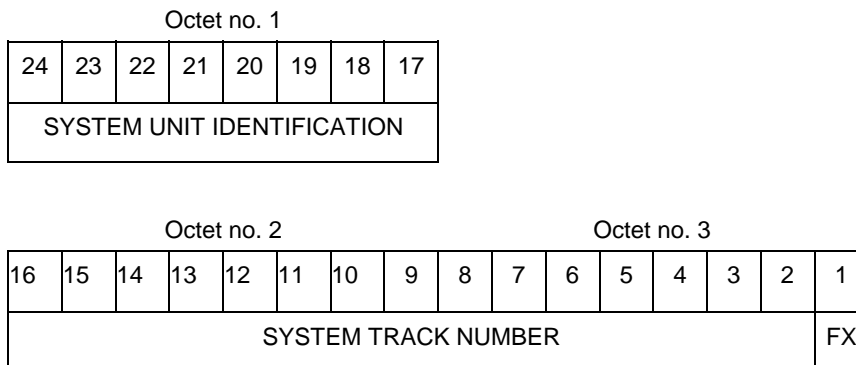
**Structure of Subfield #8:
Estimated Accuracy Of Rate Of Climb/Descent**

5.2.27 Data Item I062/510, Composed Track Number

Definition : Identification of a system track

Structure: Extendible data item, comprising a first part of three octets (Master Track Number), followed by three-octet extents (Slave Tracks Numbers).

Structure of First Part :

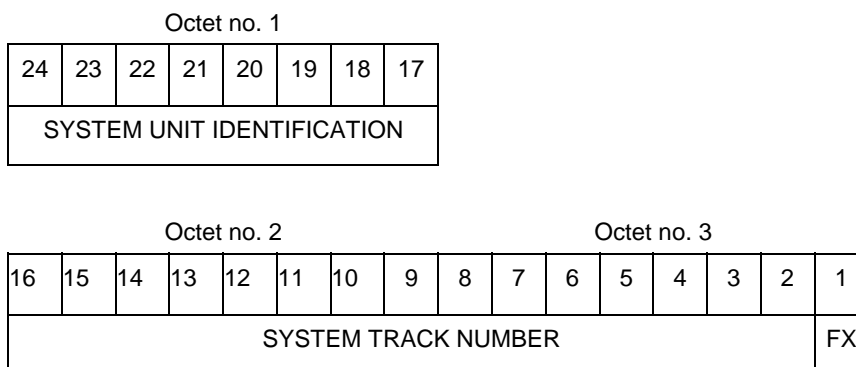


bits 24/17 (SYSTEM UNIT IDENTIFICATION)

bits 16/2 (SYSTEM TRACK NUMBER)

bit 1 (FX) = 0 end of data item
= 1 extension into next extent

Structure of next Extents :



bits 24/17 (SYSTEM UNIT IDENTIFICATION)

bits 16/2 (SYSTEM TRACK NUMBER)

bit 1 (FX) = 0 end of data item
= 1 extension into next extent

NOTE - The composed track number is used by co-operating units to uniquely identify a track. It consists of the unit identifier and system track number for each unit involved in the co-operation. The first unit identification identifies the unit that is responsible for the track amalgamation.

Encoding Rule :

This Item is optional

5.3 User Application Profile for Category 062

The following User Application Profile shall be used for the transmission of System Track Data.

Table 3 - Track Information UAP

FRN	Data Item	Information	Length
1	I062/010	Data Source Identifier	2
2	-	Spare	-
3	I062/015	Service Identification	1
4	I062/070	Time Of Track Information	3
5	I062/105	Calculated Track Position (WGS-84)	8
6	I062/100	Calculated Track Position (Cartesian)	6
7	I062/185	Calculated Track Velocity (Cartesian)	4
FX	-	Field extension indicator	-
8	I062/210	Calculated Acceleration (Cartesian)	2
9	I062/060	Track Mode 3/A Code	2
10	I062/245	Target Identification	7
11	I062/380	Aircraft Derived Data	1+
12	I062/040	Track Number	2
13	I062/080	Track Status	1+
14	I062/290	System Track Update Ages	1+
FX	-	Field extension indicator	-
15	I062/200	Mode of Movement	1
16	I062/295	Track Data Ages	1+
17	I062/136	Measured Flight Level	2
18	I062/130	Calculated Track Geometric Altitude	2
19	I062/135	Calculated Track Barometric Altitude	2
20	I062/220	Calculated Rate Of Climb/Descent	2
21	I062/390	Flight Plan Related Data	1+
FX	-	Field extension indicator	-
22	I062/270	Target Size & Orientation	1+
23	I062/300	Vehicle Fleet Identification	1
24	I062/110	Mode 5 Data reports & Extended Mode 1 Code	1+
25	I062/120	Track Mode 2 Code	2
26	I062/510	Composed Track Number	3+
27	I062/500	Estimated Accuracies	1+
28	I062/340	Measured Information	1+
FX	-	Field extension indicator	-
29	-	Spare	-
30	-	Spare	-
31	-	Spare	-
32	-	Spare	-
33	-	Spare	-
34	RE	Reserved Expansion Field	1+
35	SP	Reserved For Special Purpose Indicator	1+
FX	-	Field extension indicator	-

NOTE - The Field Reference Number #2 is kept free in order to prevent a full incompatibility with previous releases of ASTERIX Cat. 062 already implemented.

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.