EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION



EUROCONTROL STANDARD DOCUMENT

FOR

SURVEILLANCE DATA EXCHANGE

Part 8: Category 011

Transmission of A-SMGCS Data

SUR.ET1.ST05.2000-STD-08-01

Edition : 0.17
Edition Date : December 2001
Status : Working Draft
Class : General Public

DOCUMENT IDENTIFICATION SHEET

DOCUMENT DESCRIPTION											
Document Title											
Radar Data Exchange - Part 8											
Transmission of A-SMGCS Data											
EWP DELIVERABLE RE	FERENCE NUMBER										
PROGRAMME RE	FERENCE INDEX	EDITION:	EDITION:								
SUR.ET1.ST05.	2000-STD-08-01	EDITION DATE :	December 2001								
	Λ1	ostract									
This document describes			of A-SMGCS	data.							
A 014000		ywords									
A-SMGCS Data Item	ASTERIX Category 11	Target Reports UAP									
CONTACT PERSON :	C. Leclerc	TEL: 3355	UNIT :	DIS/COM							
DOCUMENT STATUS AND TYPE											

Released Issue		•							
ELECTRONIC BACKUP									
INTERNAL REFERENCE NAME: Asterix - Part 8									
HOST SYSTEM		MEDIA	SOFTWARE(S)						
Microsoft Windows	Ту	pe : Hard disk							
	Me	edia Identification :							

CATEGORY

 \checkmark

Executive Task

Specialist Task

Lower Layer Task

CLASSIFICATION

 \checkmark

General Public

EATMP

Restricted

STATUS

 $\overline{\mathbf{V}}$

Working Draft

Proposed Issue

Draft

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	June 1999	Creation of document	ALL
0.11	September 1999	Modifications in General Principles, items, and UAP.	ALL
0.12	February 2000	Modifications in General Principles, items, and UAP.	ALL
0.13	March 2000	Modifications in General Principles, items, and UAP.	ALL
0.14	October 2000	Modifications in General Principles, items, and UAP.	ALL
0.15	February 2001	Modifications in items and UAP.	ALL
0.16	April 2001	Modifications in items and UAP.	ALL
0.17	December 2001	Editorial Corrections.	ALL

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1. INTRODUCTION

1.1 Scope

- **1.1.1** This document describes the message structure for the transmission of A-SMGCS:
 - surveillance and flight plan data,
 - alerts,
 - manual attachment / detachment of flight plan to track,
 - flight plan data update,
 - holdbar status.

NOTE: From edition 0.20 of Part 9, Category 062 has been extended to include A-SMGCS data.

1.1.2 A-SMGCS data are out of Category 011.

2. REFERENCES

2.1 General

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

At the time of publication of this Eurocontrol 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 Document.

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

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

2.2 Reference Documents

- 1. Eurocontrol Standard 000-1-92. Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents. 1992.
- 2. Eurocontrol Standard SUR.ET1.ST05.2000-STD-01-01. All Purpose Structured Eurocontrol Surveillance Information Exchange ASTERIX. Edition 1.28, Working Draft, December 2001.

3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1	Definitions	
	For the purposes or apply:	f this Eurocontrol Document, the following definitions shall
3.1.1	Calculated Item:	A piece of information (e.g. the position of a target) derived from the raw sensor information through an intermediate processing such as transformation of co-ordinates, tracking, code conversion, etc.
3.1.2	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).
3.1.3	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.
3.1.4	Data Category:	Classification of the data in order to permit inter alia an easy identification.
3.1.5	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.
3.1.6	Data Item:	The smallest unit of information in each Data Category.
3.1.7	Measured Item:	A piece of information (e.g. the position of a target) derived from the sensor information and transmitted without any smoothing.
3.1.8	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
3.1.9	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)

A-SMGCS Advanced Surface Movement Ground Control System

ASTERIX All Purpose STructured Eurocontrol suRveillance Information

EXchange

CAT Data Category

EATMP European Air Traffic Management Programme

FL Flight Level, unit of altitude (expressed in 100's of feet)

FRN Field Reference Number

FSPEC Field Specification

FX Field Extension Indicator

ICAO International Civil Aviation Organization

kt knot = NM/hour, unit of speed

LEN Length Indicator
LSB Least Significant Bit

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

SIC System Identification Code
SMR Surface Movement Radar
SMS Surface Movement System
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

WGS 84 World Geodetic System 84

4. GENERAL PRINCIPLES

4.1 General

The transmission of A-SMGCS data shall require the transmission of seven types of messages:

- target reports, flight plan data and basic alerts,
- manual attachment of flight plan to track,
- manual detachment of flight plan to track,
- insertion of flight plan data,
- suppression of flight plan data,
- modification of flight plan data,
- holdbar status.

4.2 Time Management

4.2.1 Definition

The time stamp shall be consistent with the reported target position.

4.2.2 Requirements for Time Stamping

The timestamping shall comply with ICAO Annex 5.

4.3 Projection Systems and Geographical Co-ordinates

When the exported calculated position is expressed in a 2D Cartesian coordinate 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).

All tracker derived information elements, shall be a consistent set of values, expressed in the same co-ordinate reference system (state vector components and the corresponding elements of the track quality vector).

4.4 Addressing

Data Source Identifier and Message Type shall be sent 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

- 4.5.1 A single User Application Profile (UAP) is defined and shall be used for both target reports and service messages.
- **4.5.2** Data Blocks shall have the following layout.

first record last record

where:

- Data Category (CAT) = 011, is a one-octet field indicating that the Data Block contains A-SMGCS 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

- 4.6.1 Messages shall be composed of Data Items assembled in the order defined by the Field Reference Number (FRN) in the associated UAP.
- **4.6.2** 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 A-SMGCS data are defined in Table 1 and described in the following pages.

Table 1 - Standard Data Items of Category 011

Data Item Ref. No.	Description	Resolution
1011/000	Message Type	N.A.
1011/010	Data Source Identifier	N.A.
1011/015	Service Identification	N.A.
1011/041	Position in WGS-84 Co-ordinates	180°/2 ³¹
1011/042	Calculated Position in Cartesian Co-ordinates	1 m
1011/060	Mode-3/A Code in Octal Representation	N.A.
1011/090	Measured Flight Level	1/4 FL
1011/092	Calculated Track Geometric Altitude	6.25 ft
1011/093	Calculated Track Barometric Altitude	¼ FL
1011/140	Time of Track Information	1/128 s
1011/161	Track Number	N.A.
1011/170	Track Status	N.A.
1011/202	Calculated Track Velocity in Cartesian Coord.	0.25 m/s
1011/210	Calculated Acceleration	0.25 m/s ²
1011/215	Calculated Rate of Climb/Descent	6.25 ft/min
1011/245	Target Identification	N.A.
1011/270	Target Size & Orientation	Length/Width: 1 m
		Orient.: 360°/128
1011/290	System Track Update Ages	N.A.
1011/300	Vehicle Fleet Identification	N.A.
1011/310	Pre-programmed Message	N.A.
1011/380	Mode S / ADS-B Related Data	N.A.
1011/390	Flight Plan Related Data	N.A.
1011/430	Phase of Flight	N.A.
1011/500	Estimated Accuracies	N.A.
1011/600	Alert Messages	N.A.
1011/605	Tracks in Alert	N.A.
1011/610	Holdbar Status	N.A.

5.2 Description of Standard Data Items

5.2.1 Data Item I011/000, Message Type

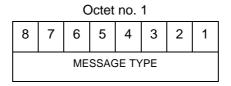
Definition: This Data Item allows for a more convenient handling of the

messages at the receiver side by further defining the type of

transaction.

Format: One-octet fixed length Data Item.

Structure:



bits-8/1

Message Type

NOTES

- In application where transactions of various types are exchanged, the Message Type Data Item facilitates the proper message handling at the receiver side.
- 2. All Message Type values are reserved for common standard use.
- 3. The following set of Message Types are standardised for category 011 records:
 - 1. Target reports, flight plan data and basic alerts
 - 2. Manual attachment of flight plan to track
 - 3. Manual detachment of flight plan to track
 - 4. Insertion of flight plan data
 - 5. Suppression of flight plan data
 - 6. Modification of flight plan data
 - 7. Holdbar status

5.2.2 Data Item I011/010, Data Source Identifier

Definition: Identification of the system from which the data are received.

Format: Two-octet fixed length Data Item.

Structure:

Octet no. 1									C	ctet	no.	2			
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	SAC = 00						SIC								

bits-16/9 (SAC) System Area Code fixed to zero

bits-8/1 (SIC) System Identification Code

NOTE: The SAC is fixed to zero to indicate a data flow local to the airport.

5.2.3 Data Item I011/015, Service Identification

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

Format : One-Octet fixed length data item.

Structure:

Octet no. 1

8 7 6 5 4 3 2 1

Service Identification

Bits-8/1 Service Identification

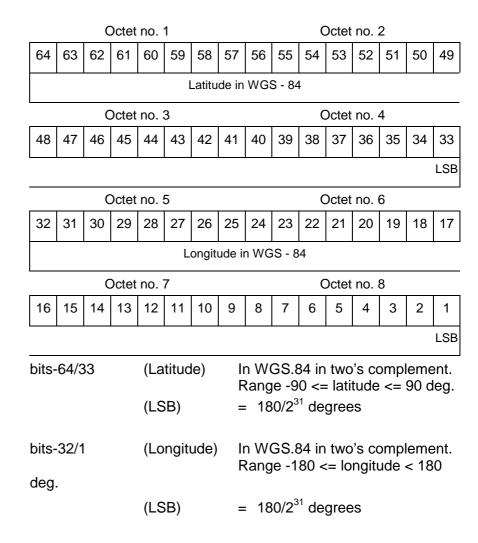
NOTE - the service identification is allocated by the A-SMGCS

5.2.4 Data Item I011/041, Position in WGS-84 Co-ordinates

Definition: Position of a target in WGS-84 Co-ordinates.

Format: Eight-octet fixed length Data Item

Structure:



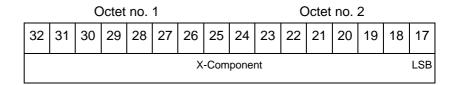
5.2.5 Data Item I011/042, Calculated Position in Cartesian Co-ordinates

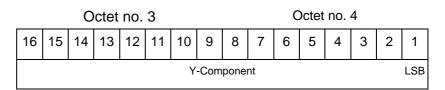
Definition: Calculated position of a target in Cartesian co-ordinates

(two's complement form).

Format: Four-octet fixed length Data Item .

Structure:





bit-17 (LSB) = 1m, max.range = ± 32768 m, approx. ± 17.7 NM

bit-1 (LSB) = 1m, max.range = ± 32768 m, approx. ± 17.7 NM

5.2.6 Data Item I011/060, Mode-3/A Code in Octal Representation

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

Format: Two-octet fixed length Data Item.

Structure:

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

bits-16/13 Spare bits set to 0

bits-12/1 Mode-3/A reply in octal

representation

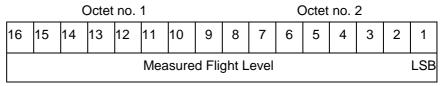
5.2.7 Data Item I011/090, Measured Flight Level

Definition: Last valid and credible flight level used to update the track, in

two's complement representation.

Format: Two-octet fixed length Data Item.

Structure:



Bits- 16/1 Measured Flight Level

(LSB) = 1/4 FL Vmin = -12 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.

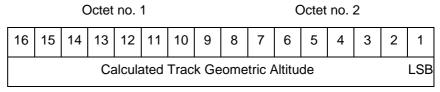
5.2.8 Data Item I011/092, Calculated Track Geometric Altitude

Definition: Calculated geometric vertical distance above mean sea level,

not related to barometric pressure.

Format : Two-Octet fixed length data item.

Structure:



Bits-16/1 Calculated Track Geometric Altitude.

(LSB) = 6.25 ft Vmin = -1500 ft Vmax = 150000 ft

NOTE: The source of altitude is identified in bits (SRC) of item I011/170 Track Status.

5.2.9 Data Item I011/093, Calculated Track Barometric Altitude

Definition: Calculated Barometric Altitude of the track.

Format : Two-Octet fixed length data item.

Structure:

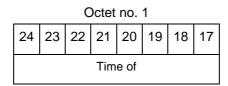
		(Octe	t no.	1			Octet no. 2							
16	15	14	13 12 11 10 9 8 7 6 5 4 3 2												
QNH	I	Calculated Track Barometric Altitude													LSB
Bit-16 (QNH) = 0 No QNH correction applied = 1 QNH correction applied															
Bits-15/1 Calculated Track (LSB) = 1/4 FL: Vmin = -15 FL Vmax = 1500 F											c Alt	itude	e		

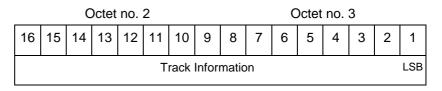
5.2.10 Data Item I011/140, Time of Track Information

Definition: Absolute time stamping expressed as UTC.

Format: Three-octet fixed length Data Item.

Structure:





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

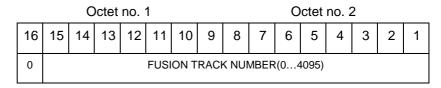
NOTE - The time of day value is reset to zero each day at midnight.

5.2.11 Data Item I011/161, Track Number

Definition: Identification of a fusion track (single track number)

Format: Two-octet fixed length Data Item.

Structure:



bit-16 Spare bit set to zero. bits-12/1 Fusion Track Number.

5.2.12 Data Item I011/170, 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:

8	7	6	5	4	3	2	1			
MON	GBS	MRH		SRC		CNF	FX			
bit 8	}			(MC	ON)		=	0 1	Multisensor track Monosensor track	
bit 7	•			(GBS)				0	Transponder Ground bit not set or unknown	
							=	1	Transponder Ground bit set	
bit 6	;			(MI	RH)				Most Reliable Height	
							=	0	Barometric altitude (Mode C) more reliable	
							=	1	Geometric altitude more reliable	
bits	bits 5/3				RC)		= = = = =	000 001 010 011 100 101 110	Source of height for 1011/092 no source GPS 3D radar triangulation height from coverage speed look-up table default height multilateration	
bit 2	<u>)</u>		(CNF) =			=	4 = 4 -4 -4 -4			
bit 1	bit 1				() =		=	0 1	end of data item extension into first extent	

Structure of First Extent:

		C	Octet	no.					
8	7	6	5	4	3	2	1		
SIM	TSE	TSB	FRI/	FOE	ME	MI	FX		
bit-8	3			(SI	M)		=	0 1	Actual track Simulated track
bit 7	•			(TS	SE)		=	0	default value track service end (i.e. last message transmitted to the user for the track).
bit 6	;			(TS	SB)		=	0	default value track service begin (i.e. first message transmitted to the user for the track)
bit 5	5/4			(FF	RI/FC	DE)	=	00 01 10 11	No Mode 4 interrogation Friendly target Unknown target No reply
bit 3	}			(MI	≣)		=	4	default value Military Emergency present in the last report received from a sensor capable of decoding this data
bit 2				(MI)		=	0	default value Military Identification present in the last report received from a sensor capable of decoding this data
bit 1				(FX	() =			0	End of data item Extension into second
									extent

Structure of Second Extent :

		О	ctet	no.	1					
8	7	6	5	4	3	2	1			
AMA S	SPI C	ST	FPC	AFF	0	0	FX			
bit 8				(AN	ЛА)		=		0	track not resulting from amalgamation process track resulting from amalgamation process
bit 7				(SF	PI)		=		0	default value SPI present in the last report received from a sensor capable of decoding this data
bit 6				(CS	ST)		=		0	default value Age of the last received track update is higher than system dependent threshold (coasting)
bit-5				(FF	PC)		=		0	Not flight-plan correlated Flight plan correlated
bit-4				(AF	F)		=		0	default value ADS-B data inconsistent with other surveillance information
bits 3/	/2						S	pa	are bi	ts set to zero

= 0

End of data item

Extension into next extent

(FX)

bit 1

Structure of Third Extent:

		C	Octet	no.	1					
8	7	6	5	4	3	2	1			
0	PSR	SSR	MDS	ADS	SUC	AAC	FX			
bit-8	3			spa	are b					
bit 7	,			(PS	SR)		=		0	Default value Age of the last received PSR track update is higher than system dependent threshold
bit 6	5			(SS	SR)		=		0	Default value Age of the last received SSR track update is higher than system dependent threshold
bit-5	5			(MI	OS)		=		0	Default value Age of the last received Mode S track update is higher than system dependent threshold
bit 4	ļ			OS)		=	:	0	Default value Age of the last received ADS track update is higher than system dependent threshold	
bit-3	3			(SU	JC)		=	•	0	Default value Special Used Code (Mode A codes to be defined in the system to mark a track with special interest)
bit-2	2			(AA	AC)		=		0	Default value Assigned Mode A Code Conflict (same individual Mode A Code assigned to another track)
bit 1				(FX	() =				0 1	End of data item Extension into next extent

NOTE: Track type and coasting can also be derived from I011/290 System Track Update Ages

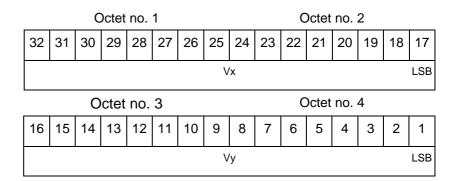
5.2.13 Data Item I011/202, Calculated Track Velocity in Cartesian Co-ordinates

Definition: Calculated track velocity expressed in Cartesian co-

ordinates.

Format: Four-octet fixed length Data Item .

Structure:



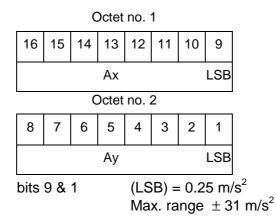
bit-17 & 1 (LSB) =
$$0.25 \text{ m/s}$$
,
Max.range = $\pm 8192 \text{m/s}$

5.2.14 Data Item I011/210, Calculated Acceleration

Definition: Calculated Acceleration of the target, in two's complement form.

Format: Two-Octet fixed length data item.

Structure:



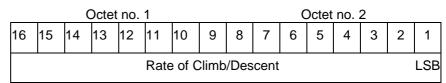
5.2.15 Data Item I011/215, Calculated Rate Of Climb/Descent

Definition: Calculated rate of Climb/Descent of an aircraft, in two's

complement form.

Format : Two-Octet fixed length data item.

Structure:



bit 1 (LSB) = 6.25 feet/minute Max. range ± 204800 feet/minute

5.2.16 Data Item I011/245, 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													
S	TI	0	0	0	0	0	0							

		C	Octet	no. 3	3							
48 47 46 45	44 43	42	41	40	39	38	37	36	35	34	33	
MSB Character	1			Char	acte	r 2			Character 3			
						•						
Octe	t no.	no. 5										
32 31 30 29	28 27	26	25	24	23	22	21	20	19	18	17	
	Characte	r 4			•	Chai	acter	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		Char	Character 7 Character 8 LS								LSB	
bits-56/55 (S	STI) = 00		lsign Ispor		gistr	ation	down	linke	ed fro	m		
	= 01	Call	Isign	not c	down	linke	d fron	n trai	nspoi	nder		
	= 10	Reg	gistra	tion r	not d	ownli	inked	from	n tran	spor	nder	
bits-54/49		Spare bits set to zero										
bits-48/1		Characters 1-8 (coded on 6 bits each) defining										

target identification.

5.2.17 Data Item I011/270, 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:

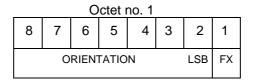
	Octet no. 1												
8	8 7 6 5 4 3 2												
		LEN	GTH			LSB	FX						

bit-2 (LSB) = 1 m

bit-1 (FX) = 0 End of Data Item

= 1 Extension into first extent

Structure of First Extent:



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

bit-1 (FX) = 0 End of Data Item

= 1 Extension into next extent

Structure of Second Extent:

bit-2 (LSB) = 1 m

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

NOTE: The orientation gives the direction which the aircraft nose is pointing, relative to the Geographical North.

5.2.18 Data Item I011/290, System Track Update Ages

Definition: Ages of the last plot/local track, or the last *valid* mode-A/mode-

C, used to update the system track.

Format : Compound Data Item, comprising a primary subfield of two

octets, followed by up to twelve subfields.

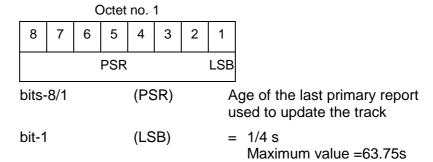
Structure of Primary Subfield:

(Octet no. 1	Octet no. 2									
16 15 14	13 12 11 10	9 8 7 6 5 4 3 2 1									
PSR SSR MDA	MFL MDS ADS ADB	FX MD1 MD2 LOP TRK MUL 0 0 FX									
bit-16	(PSR)	PSR age = 0 Absence of Subfield #1 = 1 Presence of Subfield #1									
bit-15	(SSR)	SSR age = 0 Absence of Subfield #2 = 1 Presence of Subfield #2									
bit-14	(MDA)	Mode A age = 0 Absence of Subfield #3 = 1 Presence of Subfield #3									
bit-13	(MFL)	Measured Flight Level age = 0 Absence of Subfield #4 = 1 Presence of Subfield #4									
bit-12	(MDS)	Mode S age = 0 Absence of Subfield #5 = 1 Presence of Subfield #5									
bit-11	(ADS)	ADS age = 0 Absence of Subfield #6 = 1 Presence of Subfield #6									
bit-10	(ADB)	ADS-B age = 0 Absence of Subfield #7 = 1 Presence of Subfield #7									
bit-9	FX	Extension indicator = 0 no extension = 1 extension									
bit-8	(MD1)	Mode 1 age = 0 Absence of Subfield #8 = 1 Presence of Subfield #8									
bit-7	(MD2)	Mode 2 age = 0 Absence of Subfield #9 = 1 Presence of Subfield #9									
bit-6	(LOP)	Loop age = 0 Absence of Subfield #10 = 1 Presence of Subfield #10									
bit-5	(TRK)	Track age = 0 Absence of Subfield #11 = 1 Presence of Subfield #11									

bit-4	(MUL)	Multilateration age = 0 Absence of Subfield #12 = 1 Presence of Subfield #12
bits-3/2	(spare)	Spare bits set to zero
bit-1	FX	Extension indicator = 0 no extension = 1 extension

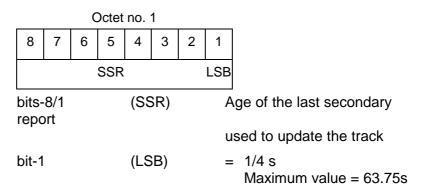
Structure of Subfield # 1:

PSR Age



Structure of Subfield # 2:

SSR Age



Structure of Subfield # 3:

Mode A Age

			C	Octet	no.	1			
	8	7	6	5	4	3	2	1	
				MDA	Į.			LSB	
bits-8/1 (MDA)									age of the last valid Mode A eport used to update the track
	bit-1				(LS	SB)		=	1/4 s Maximum value = 63.75s

Structure of Subfield # 4:

Measured Flight Level Age



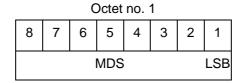
oits-8/1 (MFL) Age of the last valid and credible Mode C used to update the track

bit-1 (LSB) = 1/4 s

Maximum value = 63.75s

Structure of Subfield # 5:

Mode S Age



bits-8/1 (MDS) Age of the last Mode S report used to update the track

bit-1 (LSB) = 1/4 s

Maximum value = 63.75s

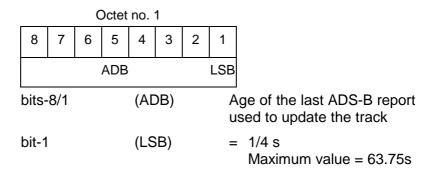
Structure of Subfield # 6:

ADS Age

		(Octe	t no.	1			Octet no. 2								
16	15	14	13	12	11	10	9	8	8 7 6 5 4 3 2 1							
														LSB		
bits	bits-8/1 (ADS)						Age of the last ADS report used to update the track									
bit-	bit-1 (LSB)								4 s ax. v 4 ho			638:	3.75	s		

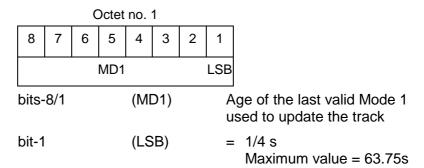
Structure of Subfield #7:

ADS-B Age



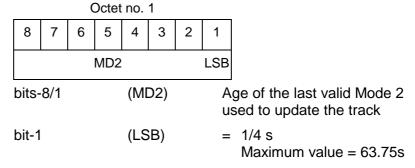
Structure of Subfield #8:

Mode 1 Age



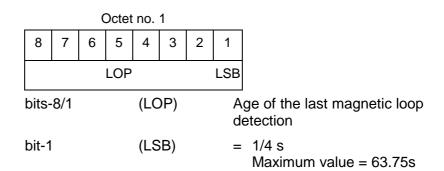
Structure of Subfield #9:

Mode 2 Age



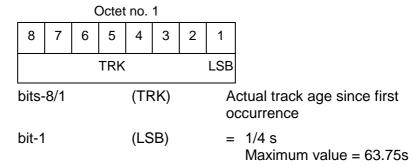
Structure of Subfield # 10:

Loop Age



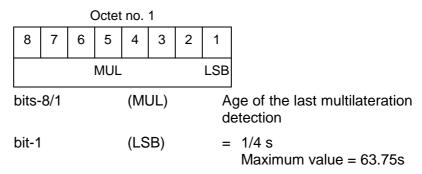
Structure of Subfield # 11:

Track Age



Structure of Subfield # 12:

Multilateration Age



NOTE - The ages are counted from Data Item I011/140, Time Of Track Information, using the following formula:

Age = Time of track information - Time of last (valid) update

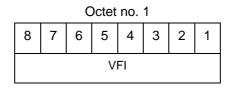
If the computed age is greater than the maximum value or if the data has never been received, then the corresponding subfield is not sent.

5.2.19 Data Item I011/300, Vehicle Fleet Identification

Definition: Vehicle fleet identification number.

Format: One octet fixed length Data Item.

Structure:



Bits 8-1 (VFI)

- = 0 Flyco (follow me)
- = 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 Unknown

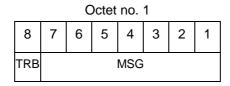
5.2.20 Data Item I011/310, Pre-programmed Message

Definition: Number related to a pre-programmed message that can be

transmitted by a vehicle.

Format: One octet fixed length Data Item.

Structure:



Bit-8 (TRB) = 0 Default = 1 In Trouble

Bits 7-1 (MSG) = 1 Towing aircraft

= 2 "Follow me" operation

= 3 Runway check

= 4 Emergency operation (fire, medical...)

= 5 Work in progress (maintenance, birds scarer, sweepers...)

5.2.21 Data Item I011/380, Mode-S / ADS-B Related Data

Definition: Data specific to Mode-S / ADS-B.

Format : Compound Data Item, comprising a primary subfield of two

octets, followed by up to 11 subfields.

Structure of Primary Subfield:

field:									
		(Octet	no.	1			-	
16	15	14	13	12	11	10	9		
MB	ADR	0	СОМ	0	0	0	FX		
		(Octet	no. 2	2	•		1	
8	7	6	5	4	3	2	1		
ACT	EMC	0	ATC	0	0	0	FX		
bit-1	6		(MB)			Mod = 0 = 1)	IB data Absence of Subfield #1 Presence of Subfield #1
bit-1	5		(ADF	₹))	ddress Absence of Subfield #2 Presence of Subfield #2
bit-1	4		k	oit se	et to	zer	o (su	ıbfield	#3 never sent)
bit-1	3		(COI	M)			ability	cations / ACAS and Flight Status Absence of Subfield #4 Presence of Subfield #4
bits-	12/1	0	k	oits s	set to	o ze	ro (s	ubfield	ds #8 to #7 never sent)
bit-9)		F	ŦX			Exte = 0 = 1		indicator no extension extension
bit-8	3		(ACT	Γ)		Airc = 0 = 1)	erived Aircraft Type Absence of Subfield #8 Presence of Subfield #8
bit-7	•		(EMO	C)		Emi = 0 = 1)	ategory Absence of Subfield #9 Presence of Subfield #9
bit-6	6		k	oit se	et to	zer	o (su	ıbfield	#10 never sent)
bit-5	5		(ATC)		Ava = 0 = 1)	Technologies Absence of Subfield#11 Presence of Subfield#11
bit-4	1/2		(spa	re)		Spa	re bits	set to zero
bit-1			F	- X			= 0		indicator no extension

= 1

extension

Structure of Subfield # 1:

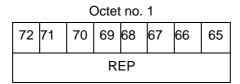
MODE S MB DATA

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:



		(Octet	no.	2					(Octet	no.	3		
64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
MSB															

			(Octet	no.	4					(Octet	no.	5		
	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
ļ							MB	Data	(56 l	oits)						

		(Octet	no.	6					(Octe	t no.7	7		
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

		(Octe	t no.	8						Octet	no.	9		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
							LSB		BD	S 1			BD	S 2	

bits 72/65 (REP) Repetition factor

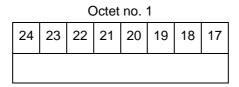
bits 64/9 (MB data) 56 bit message conveying Mode S B message data

bits 8/5 (BDS1) Comm B data Buffer Store 1 Address

bits 4/1 (BDS2) Comm B data Buffer Store 2 Address

Structure of Subfield # 2:

Aircraft Address



		(Octe	no.	2					C	Octet	no.	3		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
				Air	craft	Addr	ess								

bits 24/1 24 bits Aircraft address, A23 to A0

Subfield # 3: Never Sent

Structure of Subfield # 4:

Communications/ACAS Capability and Flight Status

7

8

AC

		C	Octet	no.	1					(Octet	no. 2	2		
24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
	24 23 22 21 20 19 18 COM STAT					0	SSC	ARC	AIC	B1A		B1	IB		

Octet no. 3 6 5 4 3 2 1 MN DC 0

bits-24/22 (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 7Not assigned

bits-21/18	(STAT)	 = 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 = 6 General Emergency = 7 Lifeguard / medical
		= 8 Minimum fuel= 9 No communications
		= 9 No communications = 10 Unlawful interference
bit-17	Spare bit	set to zero
bit-16	(SSC)	Specific service capability = 0 No = 1 Yes
bit-15	(ARC)	Altitude reporting capability = 0 100 ft resolution = 1 25 ft resolution
bit-14	(AIC)	Aircraft identification capability = 0 No = 1 Yes
bit 13	(B1A)	BDS 1,0 bit 16
bits 12/9	(B1B)	BDS 1,0 bits 37/40
bit-8	(AC)	ACAS operational = 0 No = 1 Yes
bit-7	(MN)	Multiple navigational aids operating = 0 No = 1 Yes
bit-6	(DC)	Differential correction = 0 Yes = 1 No
bits-5/1	Spare bit	s set to zero

Subfield # 5: Never Sent Subfield # 6: Never Sent Subfield # 7: Never Sent

Structure of Subfield #8:

Aircraft Derived Aircraft Type

				Oc	tet r	าด. 1	l				0	ctet	no.	2		
Ī	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
			C	hara	cter	1					С	hara	cter	2		

		0	ctet	no.	3					0	ctet	no.	4		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
		C	hara	cter	3					CI	nara	cter	4		

NOTE: Each one of the four bytes composing the type of an aircraft contains an ASCII Character (upper-case alphanumeric characters with trailing spaces).

Structure of Subfield #9:

Emitter Category

Octet no. 1 6 5 4 3 2 1 ECAT

Bits-8/1 (ECAT)

8

7

1 = light aircraft <= 7000 kg

2 = reserved

3 = 7000 kg < medium aircraft < 136000 kg

4 = reserved

5 = 136000 kg <= heavy aircraft

6 = highly manoeuvrable (5g acceleration capability) and high speed (>400 knots cruise)

7 to 9 = reserved

10 = rotocraft

11 = glider / sailplane

12 = lighter-than-air

13 = unmanned aerial vehicle

14 = space / transatmospheric vehicle

15 = ultralight / handglider / paraglider

16 = parachutist / skydiver

17 to 19 = reserved

20 = surface emergency vehicle

21 = surface service vehicle

22 = fixed ground or tethered obstruction

23 to 24 = reserved

Subfield # 10: Never Sent

Structure of Subfield # 11:

Available Technologies

Octet no. 1

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

bit-8 (VDL) = 0 VDL Mode 4 available

= 1 VDL Mode 4 not available

bit-7 (MDS) = 0 Mode S available

= 1 Mode S not available

bit-6 (UAT) = 0 UAT available

= 1 UAT not available

bits-5/1 spare bits set to zero

5.2.22 Data Item I011/390, Flight Plan Related Data

Definition: All flight plan related information.

Format: Compound Data Item, comprising a primary subfield of two

octets, followed by up to fourteen subfields.

Structure of Primary Subfield:

Octet no. 1

	15						
TAG	CSN	IFI	FCT	TAC	WTC	DEP	FX

Octet no. 2

8	7	6	5	4	3	2	1
DST	RDS	CFL	CTL	TOD	AST	STS	FX

DST RDS CFL	CTL TOD AST STS	FX
bit-16	(TAG)	FPPS Identification Tag = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-15	(CSN)	Callsign = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-14	(IFI)	IFPS_FLIGHT_ID = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-13	(FCT)	Flight Category = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-12	(TAC)	Type of Aircraft = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-11	(WTC)	Wake Turbulence Category = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-10	(DEP)	Departure Airport = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-9	FX	Extension indicator = 0 no extension = 1 extension

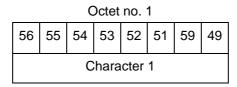
bit-8	(DST)	Destination Airport = 0 Absence of Subfield #8 = 1 Presence of Subfield #8
bit-7	(RDS)	Runway Designation = 0 Absence of Subfield #9 = 1 Presence of Subfield #9
bit-6	(CFL)	Current Cleared Flight Level = 0 Absence of Subfield #10 = 1 Presence of Subfield #10
bit-5	(CTL)	Current Control Position = 0 Absence of Subfield #11 = 1 Presence of Subfield #11
bit-4	(TOD)	Time of Departure = 0 Absence of Subfield #12 = 1 Presence of Subfield #12
bit-3	(AST)	Aircraft Stand = 0 Absence of Subfield #13 = 1 Presence of Subfield #13
bit-2	(STS)	Stand Status = 0 Absence of Subfield #14 = 1 Presence of Subfield #14
bit-1	FX	Extension indicator = 0 no extension = 1 extension

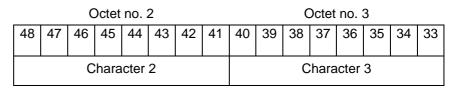
Structure of Subfield # 1: FPPS Identification Tag

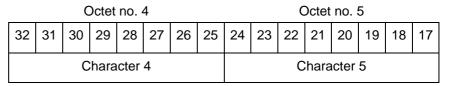
		(Octet	no.	1					C	Octet	no.	2		
16	16 15 14 13 12 11 10 SAC								7	6	5	4	3	2	1
	•		SIC												
bits 16/9 (SAC)							S	System Area Code							
bits 8/1 (SIC)					System Identity Code										

Structure of Subfield # 2:

Callsign







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

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Structure of Subfield # 3: IFPS_FLIGHT_ID

		C	Octet	no.	1					(Octet	no.	2		
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
T۱	/P	0	0	0	NBR										

		(Octet	no.	3					C	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

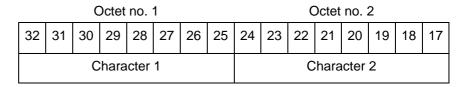
Bits-27/1 (NBR) Number from 0 to 99 999 999

Structure of Subfield # 4: Flight Category

Octet no. 1

		`	, 0.00	110.					
8	7	6	5	4	3	2	1		
GAT	/OAT	FR1	FR2	RV	SM	HPR	0		
bits				(GAT/OAT) (FR1/FR2)				00 01 10 11	Unknown General Air Traffic Operational Air Traffic Not applicable
	bits 6/5 Rules			(FR	(1/F	KZ)	= = = =	01 10	Instrument Flight Visual Flight rules Not applicable Controlled Visual Flight Rules
bits	bits 4/3			(R\	/SM)	= = = =	10	Unknown Approved Exempt Not Approved
bit 2	bit 2			(HF	PR)		=	0 1	Normal Priority Flight High Priority Flight
bit 1	bit 1				are l	oit se	et to	zero	

Structure of Subfield # 5: Type of Aircraft

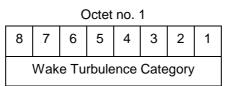


	Octet no. 3 6 15 14 13 12 11 10									(Octet	no.	4		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Character 3										С	hara	cter	4		

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 the ICAO Document 4444.

Structure of Subfield # 6: Wake Turbulence Category

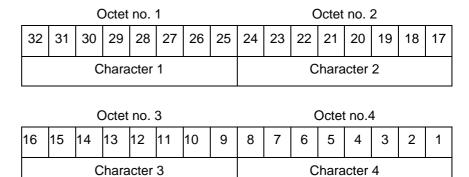


bits 8/1

Wake Turbulence Category is an ASCII character code which may have the following values:

L = Light M = Medium H = Heavy

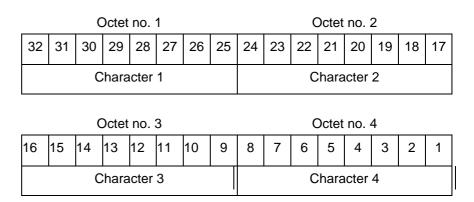
Structure of Subfield # 7: Departure Airport



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.

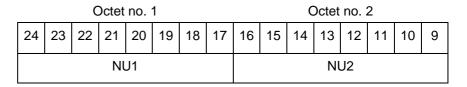
Structure of Subfield # 8 Destination Airport

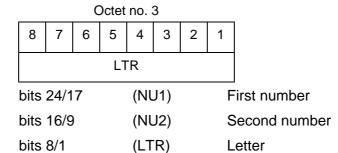


NOTES

- 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

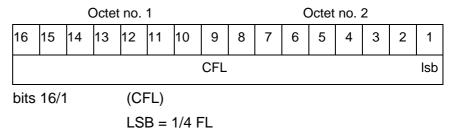




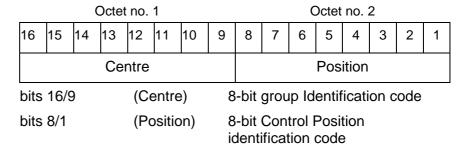
NOTES

- 1. NU1, NU2 and LTR each contain an ASCII character (upper-case alphabetic).
- 2. For details refer to ICAO Annex 14, chapter 5.

Structure of Subfield # 10: Current Cleared Flight Level



Structure of Subfield # 11: Current Control Position



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

Structure of Subfield # 12: Time of Departure

	C	Octet	no.	1					
39	38	37	36	35	34	33			
REP									

		C	Octet	no.	2		
32	31	30	29	28	27	26	25
		TYP		DA	λY	0	

		C	Octet	no.	3					(Octet	no.	4		
24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
0	0	0	HOR				LSB	0	0	MIN				LSB	

Octet no. 5													
8	7	6	5	4	3	2	1						
AVS	0		SEC										

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

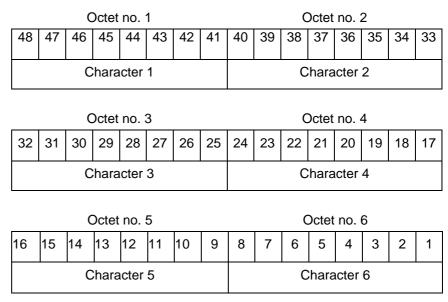
= 10 Tomorrow

bits-25/22 spare bits set to zero

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

NOTE - Estimated times are derived from flight plan systems. Predicted times are derived by the fusion system, based on surveillance data.

Structure of Subfield # 13: Aircraft Stand



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

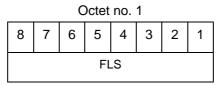
		C	Octet	no.	1						
8	7	6	5	4	3	2	1				
EMP		AVL		0	0	0	0				
bits-	8/7		(EN	IP)	=	01		oty upied nown			
bits-	6/5		(AV	'L)		01	Available Not available Unknown				

5.2.23 Data Item I011/430, Phase of Flight

Definition: Current phase of the flight.

Format: One-octet fixed length Data Item.

Structure:



Bits 8-1 (FLS) = 0unknown = 1 on stand = 2 taxiing for departure = 3 taxiing for arrival runway for departure = 4 runway for arrival = 5 hold for departure = 6 = 7 hold for arrival push back = 8 = 9 on finals

5.2.24 Data Item I011/500, Estimated Accuracies

Definition: Overview of all important accuracies (standard deviations) **Format:** Compound Data Item, comprising a primary subfield of one

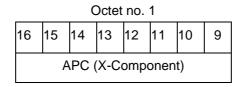
octets, followed by subfields of predefined length.

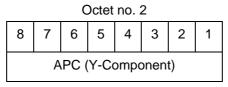
Structure of Primary Subfield:

Octet no. 1

8	7	6	5	4	3	2	1						
APC	APW	ATH	AVC	ARC	AAC	0	FX						
bit 8	}			(AF	PC)		F =	Estimated Accuracy Of Track Position (Cartesian) = 0 Absence of subfield #1 = 1 Presence of subfield #1					
bit 7	•			(AF	PW)		Estimated Accuracy Of Track Position (WGS-84) = 0 Absence of subfield #2 = 1 Presence of subfield #2						
bit 6	3			(AT	[⊺] H)		F =	Estimated Accuracy Of Track Height = 0 Absence of subfield #3 = 1 Presence of subfield #3					
bit 5	5			(A\	/C)			Estimated Accuracy Of Track Velocity (Cartesian) 0 Absence of subfield #4 1 Presence of subfield #4					
bit 4	ļ			(AF	RC)		Estimated Accuracy Of Rat Climb / Descent = 0 Absence of subfield # = 1 Presence of subfield #						
bit 3 (AAC) Estimated Accuracy Of Acceleration (Cartesian) = 0 Absence of subfield #6 = 1 Presence of subfield #6								Acceleration (Cartesian)					
bit 2	<u>)</u>						5	Spare bit set to 0					
bit 1				(FX	()			0 End of Primary Subfield1 Extension into next Octet					

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





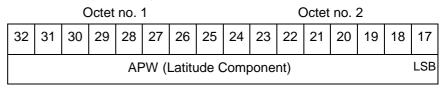
bits 16-1 (APC) Estimated accuracy

of the calculated position

(Cartesian).

bits 9 and 1 (LSB) = 0.25 m

Structure of Subfield #2: Estimated Accuracy Of Track Position (WGS-84)



		(Octe	t 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		

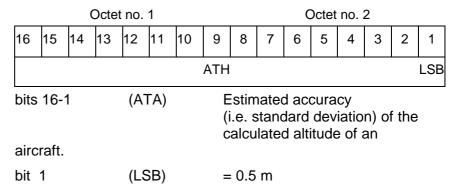
bits 32-1 (APW) Estimated accuracy

(i.e. standard deviation) of the calculated position of an aircraft expressed in WGS-84.

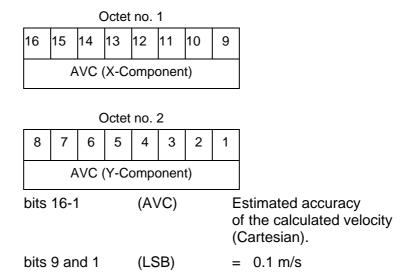
bits 17 and 1 (LSB) 180/2³¹ degrees =

approx. 8.3819 * 10⁻⁰⁸ degrees.

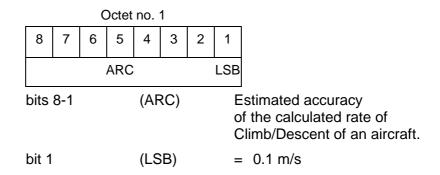
Structure of Subfield #3: Estimated Accuracy Of Height



Structure of Subfield #4: Estimated Accuracy Of Track Velocity (Cartesian)

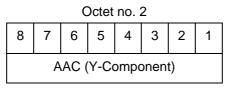


Structure of Subfield #5: Estimated Accuracy Of Rate Of Climb/Descent



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

Octet no. 1 13 12 9 16 15 14 11 10 AAC (X-Component)



bits 16-1 (AAC) Estimated accuracy

of the calculated acceleration

(Cartesian).

 $= 0.01 \text{ m/s}^2$ bits 9 and 1 (LSB)

5.2.25 Data Item I011/600, Alert Messages

Definition: Alert involving the targets indicated in I011/605.

Format: Three-octet fixed length Data Item.

Structure:

Octet no. 1 23 22 21 20 19 17 24 18 SVR 0 0 0 0 0 ACK

		C	Octet	no.	2			Octet no. 3							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	Alert Type									Α	lert N	lumbe	er		

Bit-24 (ACK) 0 = Alert acknowledged

1 = Alert not acknowledged

Bits-23/22 (SVR) 00 = End of alert

01 = Pre-alarm

10 = Severe alert

Bits-16/9 Alert Type

Bits-8/1 Alert Number

5.2.26 Data Item I011/605, Tracks in Alert

Definition: List of track numbers of the targets concerned by the alert

described in I011/600.

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

Indicator (REP) followed by two-octet track numbers.

Structure:

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

	Octet no. 2										Octet no. 3					
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
0	0	0	0		FUSION TRACK NUMBER (04095)											

Bits-24/17 (REP) Repetition Factor Bits-12/1 Fusion Track Number

5.2.27 Data Item I011/610, Holdbar Status

Definition: Status of up to sixteen banks of twelve indicators.

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

Indicator (REP) followed by two-octet banks/indicators.

Structure:

	Octet no. 2									Octet no. 3						
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
BKN 11 12 13 14								15	16	17	18	19	110	111	l12	

Bits-24/17 (REP) Repetition Factor

Bits-16/13 Bank Number

Bits-12/1 (Ii) 0 = Indicator i off1 = Indicator i on

NOTE: This item is included as a temporary solution

5.3 Standard User Application Profile

5.3.1 The following UAP shown in Table 3 shall be used for the transmission of A-SMGCS messages :

FRN	Data Item	Information	Length in
	item		Octets
1 2 3 4 5 6 7 FX	I011/010 I011/000 I011/015 I011/140 I011/041 I011/042 I011/202	Data Source Identifier Message Type Service Identification Time of Track Information Position in WGS-84 Co-ordinates Calculated Position in Cartesian Co-ordinates Calculated Track Velocity in Cartesian coord. Field Extension Indicator	2 1 1 3 8 4 4
8 9 10 11 12 13 14 FX	I011/210 I011/060 I011/245 I011/380 I011/161 I011/170 I011/290	Calculated Acceleration Mode-3/A Code in octal representation Target Identification Mode-S / ADS-B Related Data Track Number Track Status System Track Update Ages Field Extension Indicator	2 7 1+1+ 2 1+1+ 1+1+
15 16 17 18 19 20 21 FX	I011/430 I011/090 I011/093 I011/092 I011/215 I011/270 I011/390	Phase of Flight Measured Flight Level Calculated Track Barometric Altitude Calculated Track Geometric Altitude Calculated Rate of Climb/Descent Target Size & Orientation Flight Plan Related Data Field Extension Indicator	1 2 2 2 2 1+ 1+1+
22 23 24 25 26 27 28 FX	I011/300 I011/310 I011/500 I011/600 I011/605 I011/610 SP -	Vehicle Fleet Identification Pre-programmed Message Estimated Accuracies Alert Messages Tracks in Alert Holdbar Status Special Purpose Field Field Extension Indicator	1 1+1+ 3 1+2N 1+2N 1+
29 30 31 32 33 34 35 FX	RE - - - - -	Reserved Expansion Field Spare Spare Spare Spare Spare Spare Spare Spare Field Extension Indicator	1+ - - - - -

where:

- the first column indicates the 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 oneoctet followed by n-octets extents as necessary.

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