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SURVEILLANCE DATA EXCHANGE

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Safety Net Messages

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Abstract

This document describes the application of ASTERIX to the transmission of messages originating from Safety Net Systems

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1. INTRODUCTION

1.1 Scope

This document describes the message structure for the transmission of messages from a Safety Net function.

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

2.2 Reference Documents

1. Eurocontrol Standard 000-1-92. Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents. 1992.
2. Eurocontrol Standard SUR.ET1.ST05.2000-STD-01-01. All Purpose Structured Eurocontrol Surveillance Information Exchange - ASTERIX. Edition 1.30, November, February 2007.
3. Operational Requirements Document for EATCHIP Phase III. ATM Added Functions. Volume 2: Safety Nets. Edition 2.0. EUROCONTROL, 25/01/1999. Document Number : OPR.ET1.ST04.DEL01.2.
4. ICAO Annex 10, Vol.IV Amendment 77
5. ICAO Annex 5

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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 Catalogue of Data Items:** List of all the possible Data Items of each Data Category describing the Data Items by their reference, structure, size and units (where applicable).
- 3.1.2 Data Block:** Unit of information seen by the application as a discrete entity by its contents. A Data Block contains one or more Record(s) containing data of the same Category.
- 3.1.3 Data Category:** Classification of the data in order to permit inter alia an easy identification.
- 3.1.4 Data Field:** Physical implementation for the purpose of communication of a Data Item, it is associated with a unique Field Reference Number and is the smallest unit of transmitted information.
- 3.1.5 Data Item:** The smallest unit of information in each Data Category.
- 3.1.6 Record:** A collection of transmitted Data Fields of the same Category preceded by a Field Specification field, signalling the presence/absence of the various Data Fields
- 3.1.7 User Application Profile:** The mechanism for assigning Data Items to Data Fields, and containing all necessary information which needs to be standardised for the successful encoding and decoding of the messages.
- 3.1.8 Transversal** The word "transversal" is used in this document as the contrary of "longitudinal"
- 3.1.9 Lateral** The word "lateral" is used in this document as the contrary of "vertical"
- 3.1.10 Time to Conflict** Remaining time until the prescribed separation minima (e.g. 3 NM or 5NM) will be actually violated
- 3.1.11 Time to Closest Approach** Remaining time until the targets in a conflict will have reached the point of their closest proximity.

3.2 Acronyms and Abbreviations

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

AFDA	Approach Funnel Deviation Alert
ALM	Arrival / Landing Monitor
ASTERIX	All Purpose STructured Eurocontrol suRveillance Information Exchange
AM	Alive Message
APW	Area Proximity Warning
CAT	Data Category
CLAM	Clearance Level Adherence Monitor
EATM	European Air Traffic Control Management
EOC	End of Conflict
FIS-B	Flight Information Service - Broadcast
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
ICAO	International Civil Aviation Organisation
LEN	Length Indicator
LSB	Least Significant Bit
MLT	Multilateration
MSAW	Minimum Safe Altitude Warning
MSSR	Monopulse Secondary Surveillance Radar
MTD	Moving Target Detection
NM	Nautical Mile, unit of distance (1852 metres)
OTA	Opposite Traffic Alert
PSR	Primary Surveillance Radar
RAMHD	Route Adherence Monitor Heading Deviation
RAML D	Route Adherence Monitor Longitudinal Deviation
RCM	Runway / Taxiway Crossing Monitor
RDEFG	Radar Data Exchange Focus Group
RDM	RIMCAS Departure Monitor
RDP	Radar Data Processing (System)
RDPC	Radar Data Processing Chain
REP	Field Repetition Indicator
RIMCA	Runway Incursion Monitor and Conflict Alert
s	second, unit of time
SAC	System Area Code
SBOA	Stop-Bar Overrun Alert
SDP	Surveillance Data Processing (system)
SIC	System Identification Code
SP	Special Purpose Indicator

SSR	Secondary Surveillance Radar
STCA	Short Term Conflict Alert
SURT	Surveillance Team (EATM)
TSM	Taxiway Separation Monitor
UAP	User Application Profile (see Definitions)
UTC	Coordinated Universal Time
UTMM	Unauthorised Taxiway Movement Monitor
WRA	Wrong Runway Alert

4. GENERAL PRINCIPLES

4.1 General

4.2 Time Management

The time stamping shall comply with the Coordinated Universal Time (UTC) as specified in ICAO Annex 5.

4.3 Unused Bits in Data Items.

Decoders of ASTERIX data **shall never assume and rely on** specific settings of spare or unused bits. However in order to improve the readability of binary dumps of ASTERIX records, it is recommended to set all spare bits to zero.

4.4 Definitions and Addressing Concepts

4.4.1 Addressing Concepts: Assigning SAC/SIC Codes

By convention a dedicated and unambiguous SAC/SIC code shall be assigned to every Safety Net Server.

4.5 Safety Net Messages

4.5.1 Types of Safety Net Messages

17 types of safety net messages have been identified:

- Alive Message
- Route Adherence Monitor Longitudinal Deviation (RAMLD)
- Route Adherence Monitor Heading Deviation (RAMHD)
- Minimum Safe Altitude Warning (MSAW)
- Area Proximity Warning (APW)
- Clearance Level Adherence Monitor (CLAM)
- Short Term Conflict Alert (STCA)
- Approach Funnel Deviation Alert (AFDA)
- RIMCAS – Arrival / Landing Monitor (ALM)
- RIMCAS – Arrival / Departure Wrong Runway Alert (WRA)
- RIMCAS – Arrival / Departure Opposite Traffic Alert (OTA)
- RIMCAS – Departure Monitor (RDM)
- RIMCAS – Runway / Taxiway Crossing Monitor (RCM)
- RIMCAS – Taxiway Separation Monitor (TSM)
- RIMCAS – Unauthorized Taxiway Movement Monitor (UTMM)
- RIMCAS – Stop Bar Overrun Alert (SBOA)
- End of Conflict (EOC)

Note: RIMCAS denotes a Runway Incursion Monitoring and Conflict Alert System installed at airports.

4.5.1.1 Alive Message

This message type is sent periodically by the Safety Net Server. It will report the status of the Safety Net server and its functions.

4.5.1.2 Route Adherence Monitor Longitudinal Deviation

The Route Adherence Monitor Longitudinal Deviation is the Safety Net function responsible to alert in situations when an aircraft is ahead or behind its planned position. This RAMLD is performed by calculating the longitudinal distance the flight has from its planned position at the present time. When the longitudinal distance is greater than a threshold, an alert is generated.

4.5.1.3 Route Adherence Monitor Heading Deviation

The Route Adherence Monitor Heading Deviation is the Safety Net function responsible to alert in situations when an aircraft is deviating from its planned heading. This RAMHD is performed by calculating the transversal distance the flight has from its planned position at the present time. When the lateral deviation distance is greater than a threshold, an alert is generated.

4.5.1.4 Minimum Safe Altitude Warning

The Minimum Safe Altitude Warning (MSAW) is the Safety Net function responsible to alert in situations when an aircraft is, or is predicted to be, flying at an altitude below a defined threshold, and consequently there is the possibility of collision with an obstacle (Terrain, Building, etc...).

A specific case of MSAW is the infringement of the Minimum Radar Vectoring Altitude (MRVA). This will be signaled by setting bit 6 in the first extension of the first subfield of item 1004/120.

4.5.1.5 Area Proximity Warning

The Area proximity Warning is the Safety Net function responsible to alert in situations when an aircraft is, or is predicted to be, crossing the border of a reserved area.

4.5.1.6 Clearance Level Adherence Monitor

The Clearance Level Adherence Monitor is the Safety Net function responsible to alert in situations when an aircraft is deviating from its Cleared Flight level by a value greater than a threshold.

4.5.1.7 Short Term Conflict Alert

The Short Term Conflict Alert is the Safety Net function responsible to detect, predict and report cases of conflicts (separation violations) for one or more pair of tracks. A conflict is a violation of the prescribed separation minima, both vertically and horizontally.

4.5.1.8 Approach Funnel Deviation Alert

The Approach Funnel Deviation Alert (sometimes also known as Approach Monitoring Aid) is the Safety Net function responsible to alert in situations when an aircraft deviates from the approach funnel, either laterally or vertically.

4.5.1.9 RIMCAS Arrival / Landing Monitor (ALM)

The Arrival / Landing monitor is designed to raise an alarm if during arrival or after landing of an aircraft a potential conflict with another target is detected.

4.5.1.10 RIMCAS Arrival / Departure Wrong Runway Alert (WRA)

This function raises an alert if it is detected that an aircraft that is in the approach phase or is accelerating for departure moves in a direction other than for the runway it has been cleared for.

4.5.1.11 RIMCAS Arrival / Departure Opposite Traffic Alert (OTA)

This alert is generated when it has been detected that during approach two aircraft are approaching the same runway from opposite directions. In case of departures this alert is raised if it is detected that two departures use the same runway in opposite directions.

4.5.1.12 RIMCAS Departure Monitor (RDM)

This function supervises the departure area and raises an alarm if another target is detected inside this area.

4.5.1.13 RIMCAS Runway / Taxiway Crossing Monitor (RCM)

This function monitors the crossing between two runways or between a runway and a taxiway. If the system detects two targets approach the respective crossing area with a potential collision between the two targets, an alert is generated.

4.5.1.14 RIMCAS Taxiway Separation Monitor (TSM)

The controllers are alerted by this function if the prescribed separation minima between two targets on a taxiway are endangered.

4.5.1.15 RIMCAS Unauthorized Taxiway Movement Monitor (UTMM)

The taxiways are monitored for aircraft heading towards each other on the same taxiway, for targets entering the taxiway against the prescribed direction and for targets violating the prescribed speed-limit on the taxiway.

4.5.1.16 RIMCAS Stop-Bar Overrun Alert (SBOA)

A stop-bar is a point on the airport surface where targets are required to stop. An alert is raised if it is detected that a target is passing an active stop-bar.

4.5.1.17 End Of Conflict (EOC)

This message is transmitted if the conflicting situation no longer exists

4.5.2 User Application Profile and Data Block

A single UAP has been standardised and shall be used to transmit messages from a Safety Net to user systems.

Data Blocks containing Safety Net messages shall have the following layout:

CAT = 004	LEN	FSPEC	Items of the first record	FSPEC	Items of the last record
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Where:

- CAT = 004 is a one-octet field indicating that the Data Block contains safety net messages;
- 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.

4.6 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.
- 4.9.2** When sent, items shall always be transmitted in a Record with the corresponding FSPEC bits set to one.

5. HIGH LEVEL CONCEPTS OF THE STCA SAFETY NET

5.1 Introduction

In this section, we present some concepts of the STCA safety net which were already partly introduced in the EUROCONTROL reference document no 3. Note that, in the following, words in capital letters will denote parameters of STCA.

5.2 Conflict Nature

The nature of a conflict is represented by a set of properties of the conflict. The latter include:

- Different types of separation infringements, expressing the severity of the loss of separation;
- Properties of the geometrical situation of the conflict, such as the crossing and divergence properties of a pair of aircraft.

Note that the nature of a conflict may be generalized by the introduction of additional properties of the conflict.

5.2.1 Major and Minor Separation Infringements

Two types of separation infringements for a pair of aircraft are defined, depending on the severity of the loss of separation.

A *major* separation infringement occurs when

(lateral separation < DL_MAJOR) **and** (vertical separation < DV_MIN).

A *minor* separation infringement occurs when

(DL_MAJOR ≤ lateral separation < DL_MINOR)

and (vertical separation < DV_MIN).

Note that the prediction of a separation infringement might also take into account the uncertainty of trajectory prediction.

The separation thresholds depend on the type of airspace region concerned. Typical values are:

- DL_MAJOR = 3 NM;
- DL_MINOR = 5 NM;
- DV_MIN = 800 feet.

5.2.2 Crossing and Divergence

The crossing and divergence tests are applied to the current or predicted track positions and speed vectors and are based on the assumption that the speed vectors remain constant. Intuitively speaking, the crossing and divergence properties represent some safety conditions about the local geometry of a conflict situation. The divergence property represents the evolution of the lateral and vertical separations of the aircraft in the near future. The crossing property describes the geometry of both linearly extrapolated lateral trajectories, and allows to distinguish between nearly parallel, converging or diverging trajectories¹.

Crossing

The *cross-over point* is the point in the horizontal plane that both aircraft will pass through (usually at different times), assuming their track headings are continued. The cross-over point will already have been passed for aircraft on diverging trajectories and does not exist for aircraft on parallel trajectories.

The *cross-over time* is the time at which the *first* aircraft in the pair is predicted to reach the cross-over point.

The pair is considered as crossed if any of the following conditions are satisfied:

- The cross-over time has already passed;
- The aircraft trajectories are nearly parallel with the smaller angle between them being less than ZERO_CROSS_ANGLE;
- The cross-over time is more than MIN_CROSS_TIME ahead;
- The difference in times for the two aircraft to reach the cross-over point is more than MIN_DIFF_CROSS_TIME.

Divergence

Basically, a pair of aircraft is diverging if its separation is increasing with time (i.e. negative closing speed) and is not too small. However, under some constraints, the pair can still be considered as diverging in the following two boundary cases:

- When the lateral closing speed is nearly zero;
- When the pair is in the vicinity of the time of minimum lateral distance and the lateral closing speed is rapidly changing.

The pair of aircraft is said to be:

- Fast diverging laterally if the lateral closing speed is less than – MIN_LAT_VCLOS;

¹ Note that a diverging pair is not the same as a diverging trajectory !

- Slow converging/diverging laterally if the absolute value of the lateral closing speed is less than MIN_LAT_VCLOS;
- Fast converging laterally if the lateral closing speed is more than MIN_LAT_VCLOS;
- Fast diverging vertically if the vertical closing speed is less than – MIN_VERT_VCLOS.

The pair of aircraft is said to be *diverging* if any of the following conditions are satisfied:

- The pair is fast diverging, laterally or vertically, and the predicted lateral distance is more than MIN_LAT_DIST_DIV;
- The pair is slow converging/diverging laterally and the predicted lateral distance is more than MIN_LAT_DIST_SLOW;
- The pair is fast converging laterally and the predicted minimum lateral distance assuming constant lateral speed vectors is more than MIN_LAT_DIST_FAST.

Note that the parameters MIN_LAT_DIST_SLOW and MIN_LAT_DIST_FAST may depend on the prediction time. This is to account for position prediction errors that grow linearly with the prediction time due to heading or ground speed fluctuations.

Note also that the parameters involved in the latter definitions depend on the type of airspace region concerned.

5.3 Conflict Severity

This chapter describes a high level example for a possible implementation of the concept of conflict severity. The actual classification and especially the thresholds to be applied are dependent and configurable for each application.

In order to express the severity of a conflict, six distinct conflict classes are defined by combining the two types of separation infringements with the crossing and divergence properties. The conflict classes are defined in Table 1. In this classification, the maximum class leading to a conflict declaration can be configured. Please note that classes 5 and 6 are added for completeness only. They do not reflect a conflict situation.

Class	Condition
1	major separation infringement and not (crossed and diverging)
2	minor separation infringement and not (crossed and diverging)
3	major separation infringement and (crossed and diverging)
4	minor separation infringement and (crossed and diverging)
5	no separation infringement and not (crossed and diverging)
6	no separation infringement and (crossed and diverging)

Table 1 : Conflict Classes

6. LAYOUT OF SAFETY NET MESSAGES

6.1 Standard Data Items

The standardised Data Items, which shall be used for the transmission of safety net messages, are defined in Table 2 and described in the following pages.

Table 2 : Standard Data Items of Category 004

Data Item Ref. No.	Description	System Units
I004/000	Message Type	N.A.
I004/010	Data Source Identifier	N.A.
I004/015	SDPS Identifier	N.A.
I004/020	Time of Message	1/128 sec
I004/030	Track Number 1	N.A.
I004/035	Track Number 2	N.A.
I004/040	Alert Identifier	N.A.
I004/045	Alert Status	N.A.
I004/060	Safety Net Functions Status	N.A.
I004/070	Conflict Timing and Separation	N.A.
I004/074	Longitudinal Deviation	32m
I004/075	Transversal Distance Deviation	0.5m
I004/076	Vertical Deviation	25 ft
I004/100	Area Definitions	N.A.
I004/110	FDPS Sector Control Positions	N.A.
I004/120	Conflict Characteristics	N.A.
I004/170	Aircraft Identification & Characteristics 1	N.A.
I004/171	Aircraft Identification & Characteristics 2	N.A.

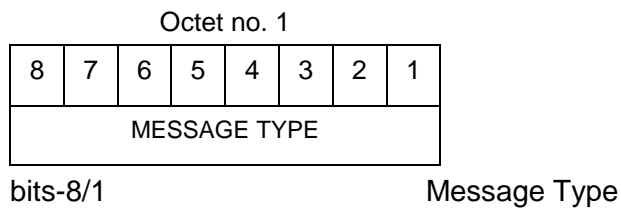
6.2 Description of Standard Data Items

6.2.1 Data Item I004/000, 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:



Encoding Rule:

This data item shall be present in every ASTERIX record.

NOTES

1. In applications 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 004 records:
 - 001 Alive Message
 - 002 Route Adherence Monitor Longitudinal Deviation
 - 003 Route Adherence Monitor Heading Deviation
 - 004 Minimum Safe Altitude Warning
 - 005 Area Proximity Warning
 - 006 Clearance Level Adherence Monitor
 - 007 Short Term Conflict Alert
 - 008 Approach Funnel Deviation Alert
 - 009 RIMCAS Arrival / Landing Monitor (ALM)
 - 010 RIMCAS Arrival / Departure Wrong Runway Alert (WRA)
 - 011 RIMCAS Arrival / Departure Opposite Traffic Alert (OTA)
 - 012 RIMCAS Departure Monitor (RDM)
 - 013 RIMCAS Runway / Taxiway Crossing Monitor (RCM)
 - 014 RIMCAS Taxiway Separation Monitor (TSM)
 - 015 RIMCAS Unauthorized Taxiway Movement Monitor(UTMM)
 - 016 RIMCAS Stop Bar Overrun Alert (SBOA)
 - 017 End Of Conflict (EOC)

4. The list of items present for the 16 types of messages is defined in the following 2 tables.

M stands for mandatory, O for optional, X for never present.

Type Item	001 Alive Message	002 RAMLD	003 RAMHD	004 MSAW	005 APW	006 CLAM	007 STCA	008 AFDA
I004/000	M	M	M	M	M	M	M	M
I004/010	M	M	M	M	M	M	M	M
I004/015	O	O	O	O	O	O	O	O
I004/020	M	M	M	M	M	M	M	M
I004/030	X	M	M	M	M	M	M	M
I004/035	X	X	X	X	X	X	M	X
I004/040	X	M	M	M	M	M	M	M
I004/045	X	O	O	O	O	O	O	O
I004/060	M	X	X	X	X	X	X	X
I004/070	X	X	X	O	O	X	O	X
I004/074	X	M	X	X	X	X	X	X
I004/075	X	X	M	X	X	X	X	M
I004/076	X	X	X	X	X	O	X	O
I004/100	X	X	X	X	M	X	X	O
I004/110	X	O	O	O	O	O	O	O
I004/120	X	X	X	M	M	X	M	X
I004/170	X	O	O	O	O	O	O	O
I004/171	X	X	X	X	X	X	O	X

Table 3 : Message Types 001 - 008

Table 4 shows the RIMCAS-related message types separately:

Type	009	010	011	012	013	014	015	016	017
Item	ALM	WRA	OTA	RDM	RCM	TSM	UTMM	SBOA	EOC
I004/000	M	M	M	M	M	M	M	M	M
I004/010	M	M	M	M	M	M	M	M	M
I004/015	O	O	O	O	O	O	O	O	X
I004/020	M	M	M	M	M	M	M	M	M
I004/030	M	M	M	M	M	M	M	M	O
I004/035	M	X	M	M	M	M	O	X	O
I004/040	M	M	M	M	M	M	M	M	M
I004/045	O	O	O	O	O	O	O	O	O
I004/060	X	X	X	X	X	X	X	X	X
I004/070	O	X	O	O	O	O	O	X	X
I004/074	X	X	X	X	X	X	X	X	X
I004/075	X	X	X	X	X	X	X	X	X
I004/076	X	X	X	X	X	X	X	X	X
I004/100	M	M	M	M	M	M	M	M	X
I004/110	O	O	O	O	O	O	O	O	X
I004/120	M	M	M	M	M	O	O	O	X
I004/170	O	O	O	O	O	O	O	O	X
I004/171	O	X	O	O	O	O	O	X	X

Table 4 : Message Types 009 - 017

6.2.2 Data Item I004/010 Data Source Identifier

Definition : Identification of the Safety Nets server sending the message.

Format : Two-octet fixed length Data Item.

Structure:

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

bits-16/9 (SAC) System Area Code
 bits-8/1 (SIC) System Identification Code

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

6.2.3 Data Item I004/015 SDPS Identifier

Definition : Identification of the SDPS providing data to the safety nets server.

Format : Repetitive Data Item starting with one-octet Field Repetition Indicator (REP) followed by at least one SDPS Identifier.

Structure:

Octet no. 1							Octet no. 2								Octet no. 3								
24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
REP							SAC								SIC								

bits-24/17 (REP) Repetition Factor
 bits-16/9 (SAC) System Area Code
 bits-8/1 (SIC) System Identification Code

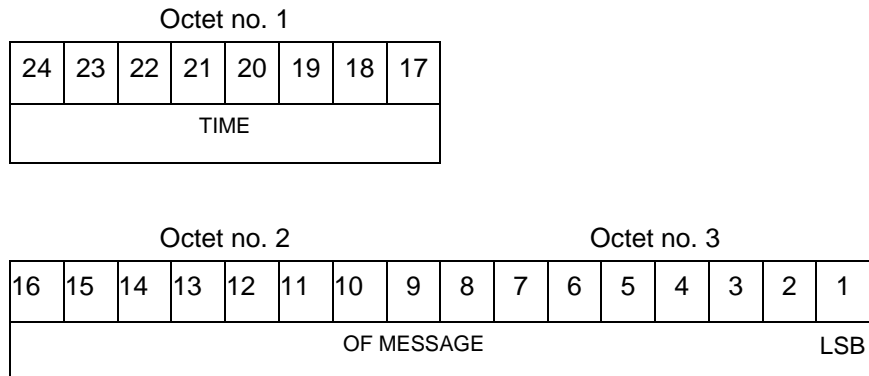
NOTE - The up-to-date list of SACs is published on the Eurocontrol Web Site (<http://www.eurocontrol.int/asterix>).

6.2.4 Data Item I004/020, Time of Message

Definition : Absolute time stamping of the message in the form of elapsed time since last midnight

Format : Three-octet fixed length Data Item.

Structure:



$$\text{bit-1 (LSB)} = (2^{-7}) \text{ sec} = 1/128 \text{ sec}$$

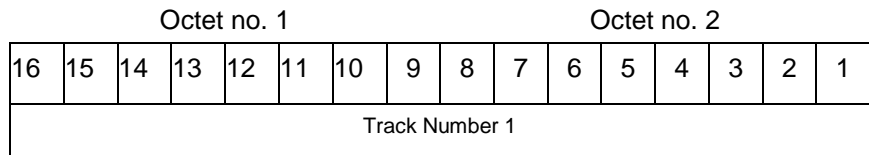
This time is given at an application level (e.g. time at which a message is filled), and not at the communication level (i.e. not the time at which the data-block containing the message is sent).

6.2.5 Data Item I004/030, Track Number 1

Definition : Identification of a track number related to conflict

Format : Two-octet fixed length Data Item.

Structure:



bits 16/1 (TRACK NUMBER) : 0 to 65535

NOTES

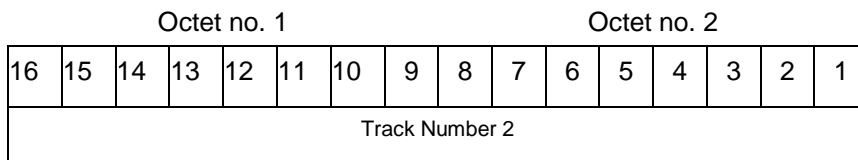
1. This is the track number of the first track involved in the conflict in case of an STCA or a RIMCA or the track involved in case of one of the other Safety Net functions.
2. This track number is distributed in this field exactly as it was received from the Radar Processor Unit (identified by I004/015) and its range is depending on the range used by that unit

6.2.6 Data Item I004/035, Track Number 2

Definition : Together with I004/030, this item defines the track pair in conflict.

Format : Two-octet fixed length Data Item.

Structure:



bits 16/1 (TRACK NUMBER) : 0 to 65535

NOTES

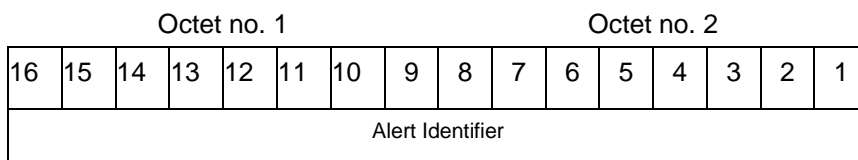
1. This is the track number of the second track involved in the conflict in case of an STCA or a RIMCA.
2. For the other Safety Net functions, this item is not used.
3. This track number is distributed in this field exactly as it was received from the Radar Processor Unit and its range is depending on the range used by that unit

6.2.7 Data Item I004/040, Alert Identifier

Definition : Identification of an alert (Alert number)

Format : Two-octet fixed length Data Item.

Structure:



bits 16/1 (Alert Identifier) : 0 to 65535

NOTES

1. This item is the Alert Identification of the conflict in the system
2. This number shall be assigned, by the Safety Net Server, incrementally to every new alert and restart on zero after reaching the maximum value (65535)

6.2.8 Data Item I004/045, Alert Status**Definition :** Information concerning status of the alert**Format :** One-octet fixed length Data Item.**Structure:**

Octet no. 1

8	7	6	5	4	3	2	1
0	0	0	0	Alert status		0	

bits-8/5 Spare bits set to 0

bits-4/2 (STAT) Status of the alert

bit-1 Spare bit set to 0

The content of this item is implementation dependent.

6.2.9 Data Item I004/060, Safety Net Function Status**Definition :** Status of the Safety Nets functions handled by the system**Format :** Variable length Data Item comprising a first part of one octet, followed by one-octet extents as necessary.**Structure:**

Octet no. 1

8	7	6	5	4	3	2	1
MRVA	RAMLD	RAMHD	MSAW	APW	CLAM	STCA	FX

bit-8	(MRVA)	= 0	Default
		= 1	MRVA function
bit-7	(RAMLD)	= 0	Default
		= 1	RAMLD function
bit-6	(RAMHD)	= 0	Default
		= 1	RAMHD function
bit-5	(MSAW)	= 0	Default
		= 1	MSAW function
bit-4	(APW)	= 0	Default
		= 1	APW function
bit-3	(CLAM)	= 0	Default
		= 1	CLAM function
bit-2	(STCA)	= 0	Default
		= 1	STCA function
bit-1	(FX)	= 0	No extension
		= 1	Extension

Structure of First Extent:

Octet no. 2

8	7	6	5	4	3	2	1
AFDA	RIMCA	0	0	0	0	0	FX

bit-8	(AFDA)	= 0	Default
		= 1	AFDA function
bit-7	(RIMCA)	= 0	Default
		= 1	RIMCA function

NOTES

1. This item only sent in “alive messages” to describe the status of the Safety Net functions, handled by the system
2. Value 0 means either that the function is not managed by the system or has failed.
3. Value 1 means that the function is managed by the system and is running well

6.2.10 Data Item I004/070, Conflict Timing and Separation**Definition :** Information on Timing and Aircraft Separation**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
TC	TCA	CHS	MHS	CVS	MVS	0	FX

bit-8	(TC)	Subfield #1: Time to Conflict = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-7	(TCA)	Subfield #2: Time to Closest Approach = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-6	(CHS)	Subfield #3: Current Horizontal Separation = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-5	(MHS)	Subfield #4: Estimated Minimum Horizontal Separation = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-4	(CVS)	Subfield #5: Current Vertical Separation = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-3	(MVS)	Subfield #6: Estimated Minimum Vertical Separation = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-2		Spare Bit, Set to 0
bit-1	(FX)	Extension Indicator = 0 no extension = 1 extension

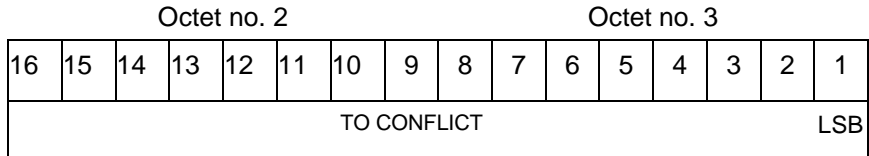
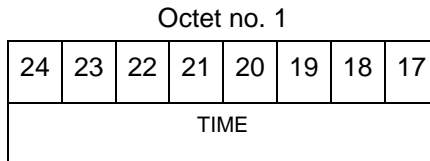
Structure of Subfield #1:

Time to Conflict:

Definition : Time remaining to actual conflict situation

Format : Three-octet fixed length Data Item.

Structure:



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

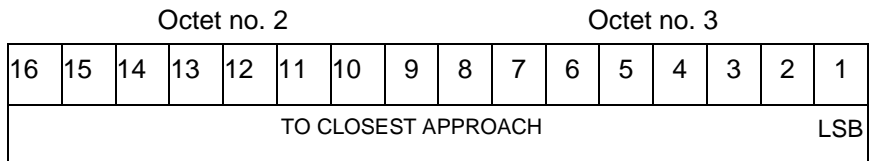
Structure of Subfield #2:

Time to Closest Approach

Definition : Time to closest proximity between entities in conflict

Format : Three-octet fixed length Data Item.

Structure:



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

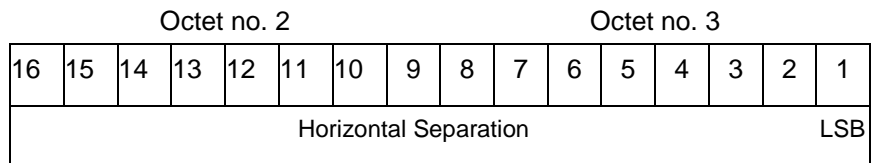
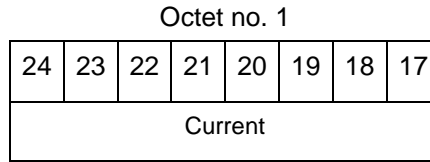
Structure of Subfield #3:

Current Horizontal Separation

Definition : Current horizontal separation

Format : Three-octet fixed length Data Item.

Structure:



bits 24/1 (Current horizontal separation)
 LSB = 0.5m

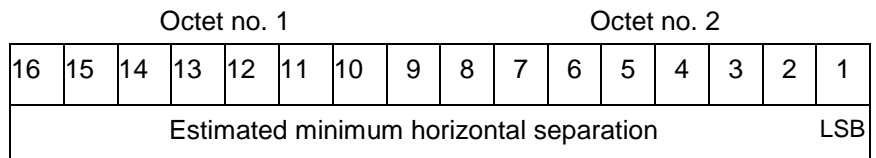
Structure of Subfield #4:

Estimated Minimum Horizontal Separation

Definition : Estimated minimum horizontal separation.

Format : Two-octet fixed length Data Item.

Structure:



bits 16/1 (Estimated minimum horizontal separation)
 LSB = 0.5m

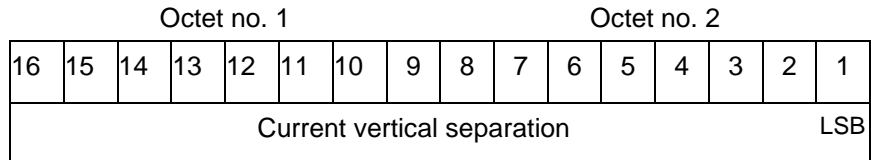
Structure of Subfield #5:

Current Vertical Separation

Definition : Current vertical separation

Format : Two-octet fixed length Data Item.

Structure:



bits 16/1 (Current vertical separation)
 LSB = 25 ft

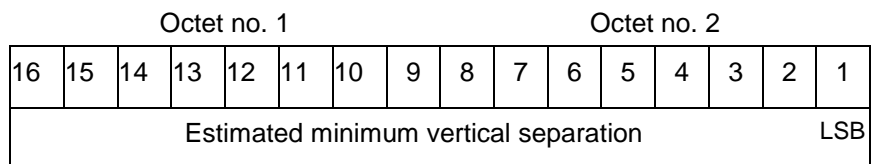
Structure of Subfield #6:

Estimated Minimum Vertical Separation

Definition : Estimated minimum vertical separation.

Format : Two-octet fixed length Data Item.

Structure:



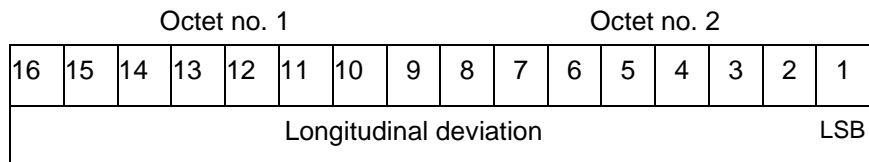
bits 16/1 (Estimated minimum vertical separation)
 LSB = 25 ft

6.2.11 Data Item I004/074, Longitudinal Deviation

Definition : Longitudinal deviation for Route Adherence Monitoring, in two's complement form.

Format : Two-octet fixed length Data Item.

Structure:



bits 16/1 (Longitudinal deviation)
LSB = 32m

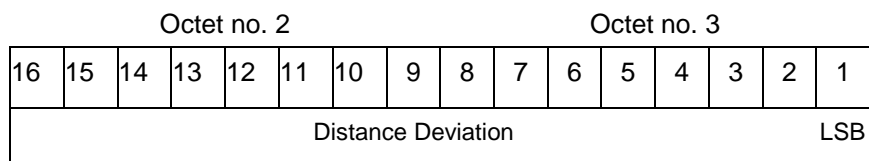
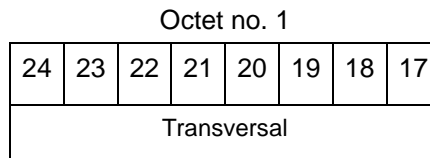
NOTE - Longitudinal deviation will be positive if the aircraft is ahead of its planned position.
Longitudinal deviation will be negative if the aircraft is behind its planned position.

6.2.12 Data Item I004/075, Transversal Distance Deviation

Definition : Transversal distance deviation for Route Adherence Monitoring, in two's complement form.

Format : Three-octet fixed length Data Item.

Structure:



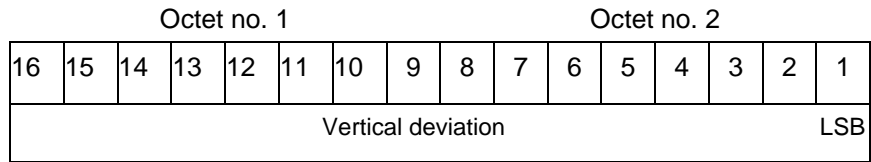
bits 24/1 (Current horizontal separation)
LSB = 0.5m

NOTE - Clockwise deviation will be coded as a positive value.
Anticlockwise deviation will be coded as a negative value

6.2.13 Data Item I004/076, Vertical Deviation

Definition : Vertical Deviation from planned altitude, in two's complement form.

Format : Two-octet fixed length Data Item.



bits 16/1 (Vertical deviation)
 LSB = 25 ft

NOTE - Positive value if aircraft is above planned altitude
 Negative value if aircraft is below planned altitude

6.2.14 Data Item I004/100, Area Definition

Definition : Definition of Areas involved in a Safety Net Alert
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
AN	CAN	RT1	RT2	SB	G	0	FX

- bit-8 (AN) Subfield #1: Area Name
 = 0 Absence of Subfield #1
 = 1 Presence of Subfield #1
- bit-7 (CAN) Subfield #2: Crossing Area Name
 = 0 Absence of Subfield #2
 = 1 Presence of Subfield #2
- bit-6 (RT1) Subfield #3: Runway/Taxiway Designator 1
 = 0 Absence of Subfield #3
 = 1 Presence of Subfield #3
- bit-5 (RT2) Subfield #4: Runway/Taxiway Designator 2
 = 0 Absence of Subfield #4
 = 1 Presence of Subfield #4
- bit-4 (SB) Subfield #5: Stop Bar Designator
 = 0 Absence of Subfield #5
 = 1 Presence of Subfield #5
- bit-3 (G) Subfield #6: Gate Designator
 = 0 Absence of Subfield #6
 = 1 Presence of Subfield #6
- bit-2 Spare Bit, Set to 0
- bit-1 (FX) Extension Indicator
 = 0 no extension
 = 1 extension

Structure of Subfield #1:

Area Name:

Definition: Name of the area involved in an APW alarm

Format: Six-octet fixed length Data Item.

Structure:

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

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

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

bits-48/1 Characters 1-8 (coded on 6 Bits each) defining the name of the area. Coding rules are provided in [4] Section 3.1.2.9

NOTE - The area name is always left adjusted. If needed, the remaining characters are filled with space character.

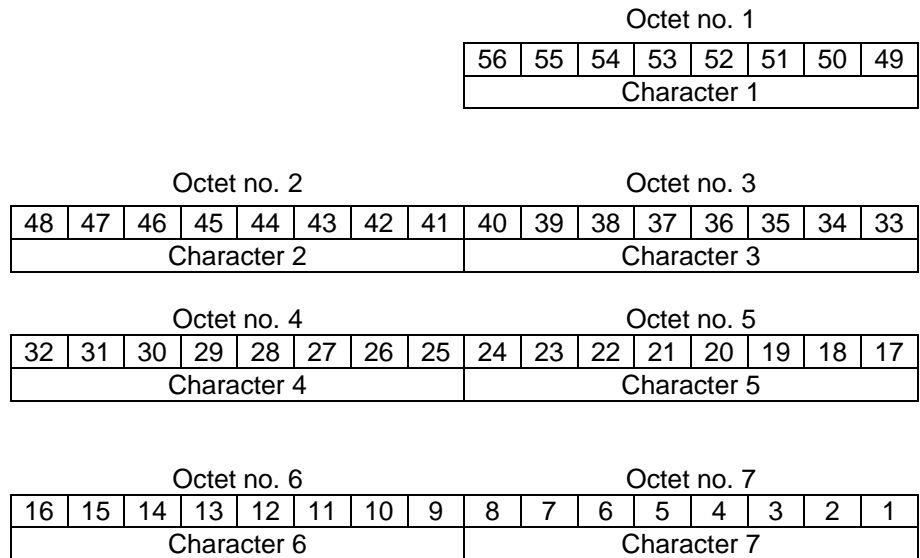
Structure of Subfield #2:

Crossing Area Name

Definition: Name of Crossing Area Involved in a RIMCA

Format: Seven-octet fixed length Data Item.

Structure:



bits-56/1

Each octet is an ASCII character defining the name of the crossing area involved in a runway/taxiway crossing alert (message type 013)

NOTE - The name of the crossing area is always left adjusted. If needed, the remaining characters are filled with space characters.

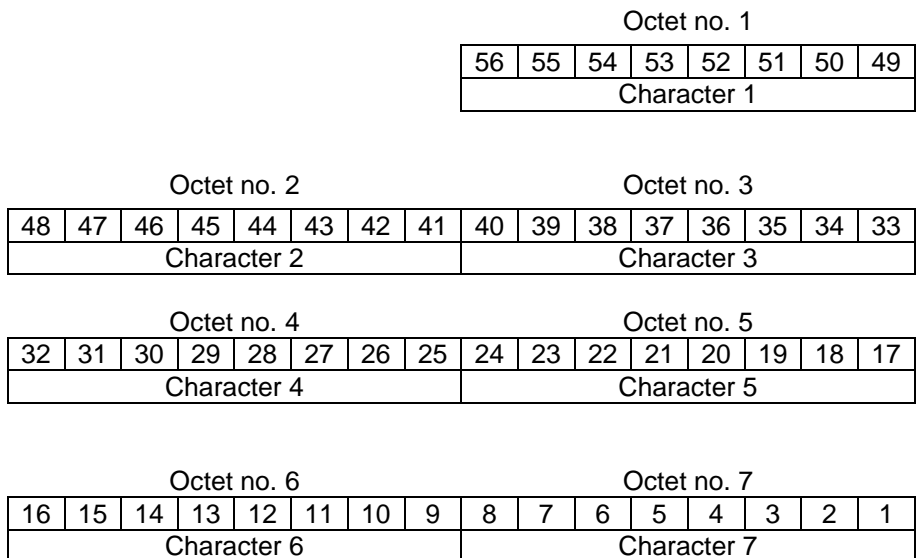
Structure of Subfield #3:

Runway/Taxiway Designator 1

Definition: Designator of Runway/Taxiway 1 Involved in a RIMCA

Format: Seven-octet fixed length Data Item.

Structure:



bits-56/1 Each octet is an ASCII character defining the runway designator

NOTE - The runway designator is always left adjusted. If needed, the remaining characters are filled with space characters. The runway is encoded as follows: Location indicator, runway direction, left or right.
 Example: EGLL09L means London Heathrow (EGLL), Runway 09 (direction 090 degrees) left runway

**Structure of Subfield #4:
Runway/Taxiway Designator 2**

Definition: Designator of Runway/Taxiway 2 Involved in a RIMCA

Format: Seven-octet fixed length Data Item.

Structure:

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						

bits-56/1

Each octet is an ASCII character defining the runway designator

NOTE - The runway designator is always left adjusted. If needed, the remaining characters are filled with space characters.
The runway is encoded as follows: Location indicator, runway direction, left or right.
Example: EGLL09L means London Heathrow (EGLL), Runway 09 (direction 090 degrees) left runway

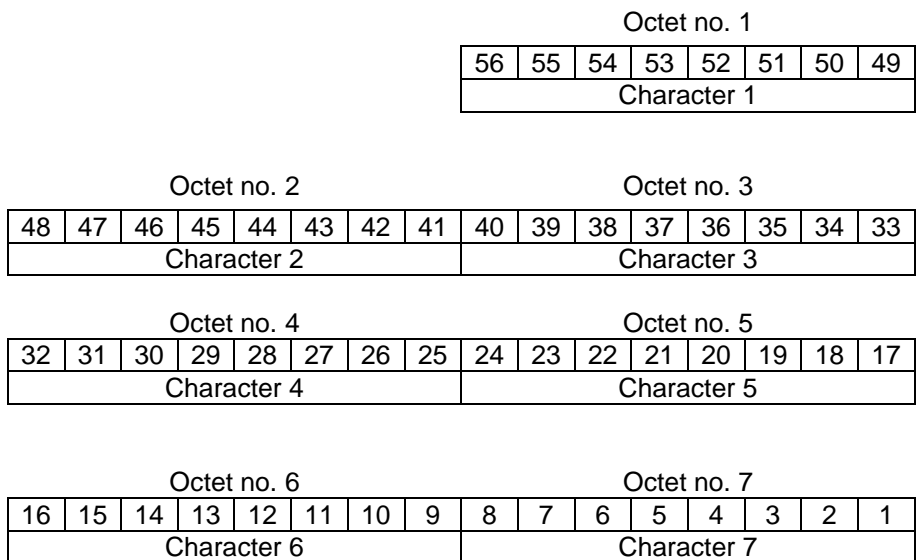
Structure of Subfield #5:

Stop Bar Designator

Definition: Designator of Stop-Bar Involved in a RIMCA

Format: Seven-octet fixed length Data Item.

Structure:



bits-56/1

Each octet is an ASCII character defining the stop-bar involved in a stop-bar crossed alert (message type 016)

NOTE - The stop-bar designator is always left adjusted. If needed, the remaining characters are filled with space characters.

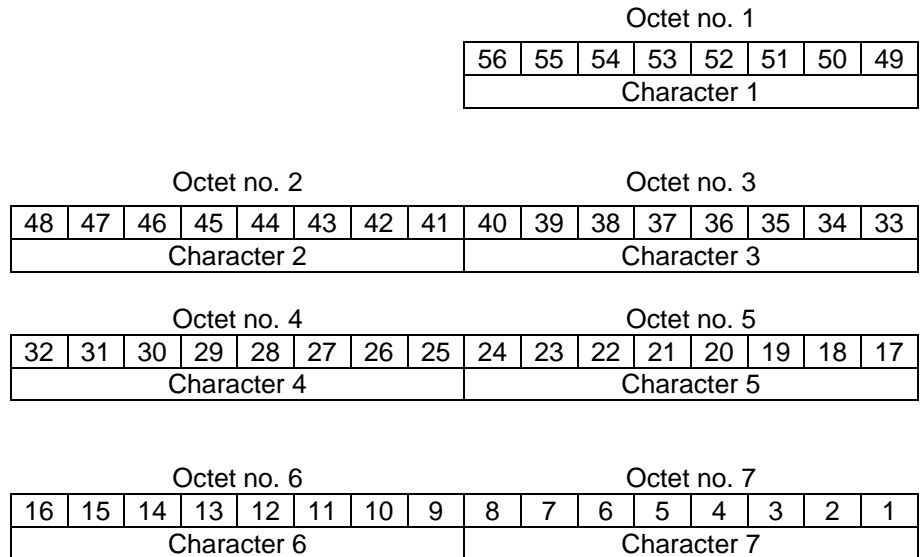
Structure of Subfield #6:

Gate Designator

Definition: Gate Designator (in 7 characters) of the approaching aircraft in a RIMCA

Format: Seven-octet fixed length Data Item.

Structure:



bits-56/1 Each octet is an ASCII character defining the gate for the approaching aircraft

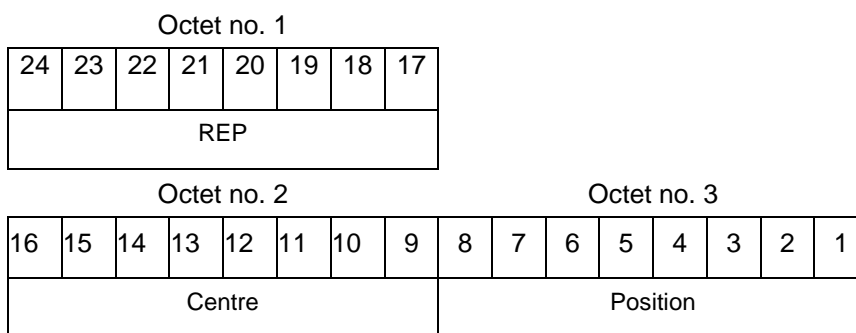
NOTE - The gate designator is always left adjusted. If needed, the remaining characters are filled with space character.

6.2.15 Data Item I004/110, FDPS Sector Control Identification

Definition : Identification of a list of FDPS Sector Control Positions in charge of the involved targets, as provided by the FDPS

Format : Repetitive Data Item starting with one-octet Field Repetition Indicator (REP) followed by at least one FDPS Sector Control Position

Structure:



bits 24/17 (REP) Repetition Factor

bits 16/9 (Centre) Centre identification code

bits 8/1 (Position) Control position identification code

NOTE - The Centre identification code and the Control position identification code must be defined between the communication partners.

6.2.16 Data Item I004/120, Conflict Characteristics**Definition :** Description of the Conflict Properties**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
CN	CC	CP	CD	0	0	0	FX

- bit-8 (CN) Subfield #1: Conflict Nature
 = 0 Absence of Subfield #1
 = 1 Presence of Subfield #1
- bit-7 (CC) Subfield #2: Conflict Classification
 = 0 Absence of Subfield #2
 = 1 Presence of Subfield #2
- bit-6 (CP) Subfield #3: Conflict Probability
 = 0 Absence of Subfield #3
 = 1 Presence of Subfield #3
- bit-5 (CD) Subfield #4: Conflict Duration
 = 0 Absence of Subfield #4
 = 1 Presence of Subfield #4
- bit-4/2 Spare Bits, Set to 0
- bit-1 (FX) Extension Indicator
 = 0 no extension
 = 1 extension

Structure of Subfield #1:**Conflict Nature:****Definition :** Nature of the conflict expressed by a set of properties**Format :** Variable length Data Item comprising a first part of one octet, followed by one-octet extents as necessary.**Structure:** The structure of this Data Item is defined as follows:

Octet no. 1							
8	7	6	5	4	3	2	1
MAS	CAS	FLD	FVD	Type	Cross	Div	FX

- bit-8 (MAS) Conflict location in military airspace
 = 0 conflict not predicted to occur in military airspace
 = 1 conflict predicted to occur in military airspace
- bit-7 (CAS) Conflict location in civil airspace
 = 0 conflict not predicted to occur in civil airspace
 = 1 conflict predicted to occur in civil airspace
- bit-6 (FLD) Fast lateral divergence
 = 0 Aircraft are not fast diverging laterally at current time
 = 1 Aircraft are fast diverging laterally at current time
- bit-5 (FVD) Fast vertical divergence
 = 0 Aircraft are not fast diverging vertically at current time
 = 1 Aircraft are fast diverging vertically at current time
- bit-4 (Type) Type of separation infringement
 0 = Minor separation infringement
 1 = Major separation infringement
- bit-3 (Cross) Crossing test
 0 = Aircraft have not crossed at starting time of conflict
 1 = Aircraft have crossed at starting time of conflict
- bit-2 (Div) Divergence test
 0 = Aircraft are not diverging at starting time of conflict
 1 = Aircraft are diverging at starting time of conflict
- bit-1 (FX) Field extension indicator
 0 = No extension
 1 = Extension

Structure of First Extent:

Octet no. 2

8	7	6	5	4	3	2	1
RRC	RTC	MRVA	0	0	0	0	FX

bit-8	(RRC)	Runway/Runway crossing in RIMCAS = 0 Default = 1 Runway/Runway Crossing
bit-7	(RTC)	Runway/Taxiway Crossing in RIMCAS = 0 Default = 1 Runway/Taxiway Crossing
bit-6	(MRVA)	= 0 Default = 1 Msg Type 4 (MSAW) indicates MRVA
bits-6/2		Spare bits set to 0
bit-1	(FX)	= 0 No extension = 1 Extension

NOTE - The spare bits and extended octets may be used to define additional properties of a conflict.

Structure of Subfield #2:

Conflict Classification

Definition : Severity classification of the conflict

Format : One-octet fixed length Data Item

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
Table Id				Severity Class			CS

- bits-8/5 (Table Id) Identification of conflict categories definition table
- bits-4/2 (Severity Class) Conflict Severity Class
- bit-1 (CS) Conflict Severity
 = 0 LOW
 = 1 HIGH

For STCA, Table Id = 0000 defines the following conflict classes:

Class	Condition
001	major separation infringement and not (crossed and diverging)
010	minor separation infringement and not (crossed and diverging)
011	major separation infringement and (crossed and diverging)
100	minor separation infringement and (crossed and diverging)

For STCA, Table Id = 0001 defines the following filter settings:

- bits-4 (LPF) Linear Prediction Filter
 = 0 Filter not set
 = 1 Filter set
- bits-3 (CPF) Current Proximity Filter
 = 0 Filter not set
 = 1 Filter set
- bits-2 (MHF) Manoeuvre Hazard Filter
 = 0 Filter not set
 = 1 Filter set

For RIMCAS, Table Id = 0010 defines the following alert stages:

- bits-4 (RAS) RIMCAS Alert Stage
 = 0 Stage One Alert
 = 1 Stage Two Alert

NOTE - Additional conflict classes may be defined by introducing additional properties of a conflict.

Structure of Subfield #3:

Conflict Probability

Definition : Probability of the conflict

Format : One-octet fixed length Data Item

Structure:

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

bits-8/1 (Probability) Conflict probability
 LSB = 0.5%

Structure of Subfield #4:

Conflict Duration

Definition : The duration of the conflict is the elapsed time since the declaration of the conflict.

Format : Three-octet fixed length Data Item

Structure:

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

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

bit-24/1 (Duration) Conflict duration
 LSB = 1/128 sec

6.2.17 Data Item I004/170, Aircraft Identification & Characteristics 1

Definition : Identification & Characteristics of Aircraft 1 Involved in the Conflict.

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
AI1	M31	CPW	CPC	TT1	DT1	AC1	FX

Octet no. 2							
8	7	6	5	4	3	2	1
MS1	FP1	CF1	0	0	0	0	FX

bit-16	(AI1)	Subfield #1: Aircraft Identifier 1 = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-15	(M31)	Subfield #2: Mode 3/A Code Aircraft 1 = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-14	(CPW)	Subfield #3: Predicted Conflict Position 1 (WGS84) = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-13	(CPC)	Subfield #4: Predicted Conflict Position 1 (Cartesian Coordinates) = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-12	(TT1)	Subfield #5: Time to Threshold Aircraft 1 = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-11	(DT1)	Subfield #6: Distance to Threshold Aircraft 1 = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-10	(AC1)	Subfield #7: Aircraft Characteristics Aircraft 1 = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-9	FX	Extension indicator = 0 no extension = 1 extension
bit-8	(MS1)	Subfield #8: Mode S Identifier Aircraft 1 = 0 Absence of Subfield #8 = 1 Presence of Subfield #8

bit-7	(FP1)	Subfield #9: Flight Plan Number Aircraft 1 = 0 Absence of Subfield #9 = 1 Presence of Subfield #9
bit-6	(CF1)	Subfield #10: Cleared Flight Level Aircraft 1 = 0 Absence of Subfield #10 = 1 Presence of Subfield #10
bits-5/2		Spare Bits, set to 0
bit-1	FX	Extension indicator = 0 no extension = 1 extension

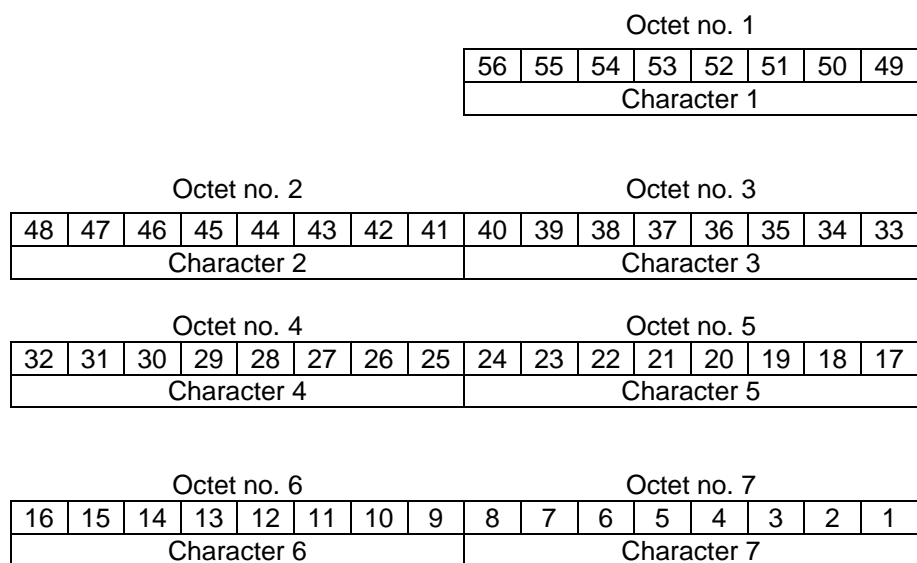
Structure of Subfield # 1:

Aircraft Identifier 1

Definition: Aircraft Identifier (in 7 characters) of Aircraft 1 Involved in the Conflict

Format: Seven-octet fixed length Data Item.

Structure:



bits-56/1 Each octet is an ASCII character defining the first aircraft

NOTE - The aircraft identifier is always left adjusted. If needed, the remaining characters are filled with space character.

Structure of Subfield # 2:**Mode 3/A Code Aircraft 1**

Definition : Mode-3/A code (converted into octal representation) of Aircraft 1 Involved in the Conflict

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

bits-12/1

Spare bits set to 0

Mode-3/A reply in octal representation

Structure of Subfield # 3:**Predicted Conflict Position Aircraft 1 (WGS-84)****Definition :** Predicted conflict position target 1 in WGS-84 Coordinates.**Format :** Ten-octet fixed length Data Item**Structure:**

Octet no. 1										Octet no. 2					
80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65
Conflict Latitude in WGS - 84															
Octet no. 3								Octet no. 4							
64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
LSB															
Octet no. 5								Octet no. 6							
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Conflict Longitude in WGS - 84															
Octet no. 7								Octet no. 8							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
LSB															
Octet no. 9								Octet no. 10							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Conflict Altitude															
LSB															

bits-80/49	(Latitude)	In WGS-84 in two's complement. Range $-90 \leq \text{latitude} \leq 90$ deg.
	(LSB)	$= 180/2^{25}$ degrees
bits-48/17	(Longitude)	In WGS-84 in two's complement. Range $-180 \leq \text{longitude} < 180$ deg.
	(LSB)	$= 180/2^{25}$ degrees

The LSB provides a resolution better than 0.6m.

bits-16/1	(Altitude)	Altitude of predicted conflict
	(LSB)	$= 25\text{ft}$
	Hmin	$= -15\text{FL}$
	Hmax	$= 1500\text{FL}$

NOTE - Altitude expressed in two's complement form

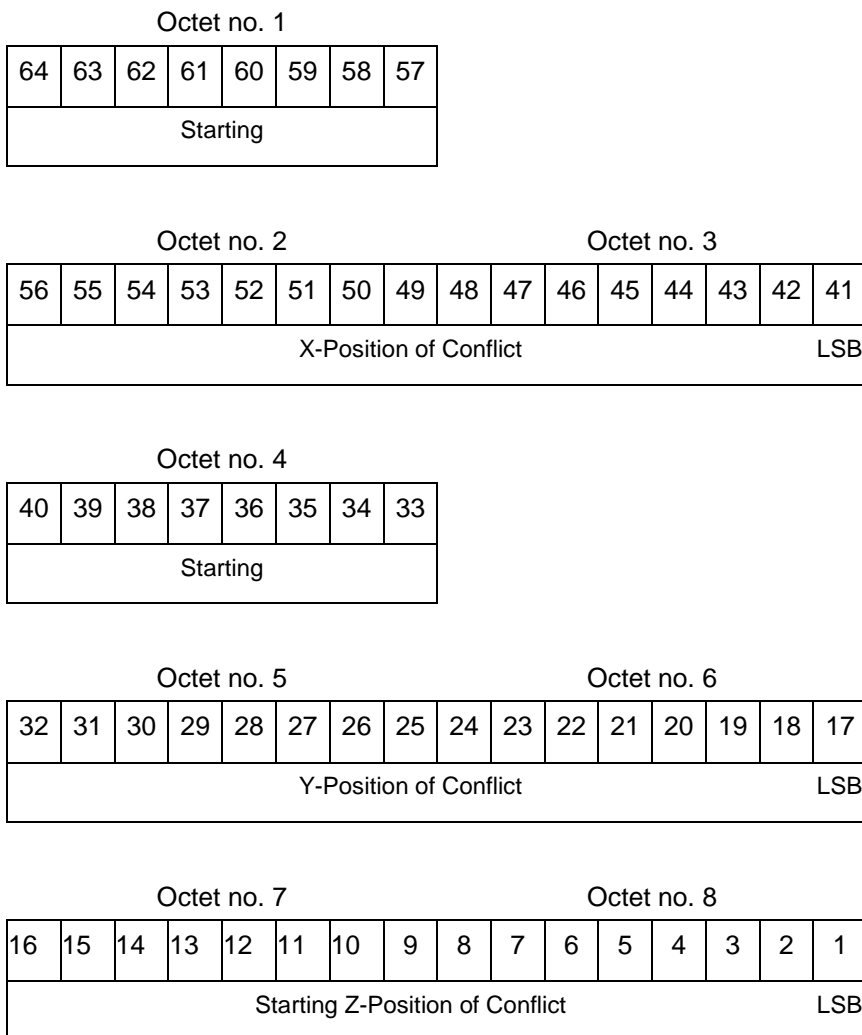
Structure of Subfield # 4:

Predicted Conflict Position Aircraft 1 in Cartesian Coordinates

Definition : Predicted conflict position for the aircraft 1 involved in the conflict

Format : Eight-octet fixed length Data Item

Structure:



- bit-48/33 (X-position) Starting X-position of the conflict
LSB = 0.5m
- bit-32/17 (Y-position) Starting Y-position of the conflict
LSB = 0.5m
- bit-16/1 (Z-position) Starting Z-position of the conflict
LSB = 25 ft

NOTE - Two's complement fixed-point format.

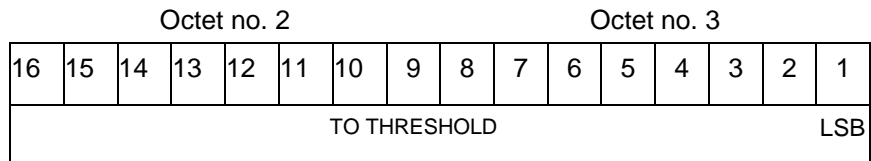
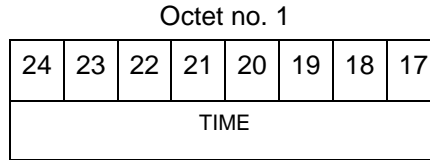
Structure of Subfield # 5:

Time to Threshold Aircraft 1

Definition : Time to runway threshold for first approaching aircraft in a RIMCA

Format : Three-octet fixed length Data Item.

Structure:



$$\text{bit-1 (LSB)} = (2^{-7}) \text{ sec} = 1/128 \text{ sec}$$

NOTE - Time to Threshold expressed in Two's Complement

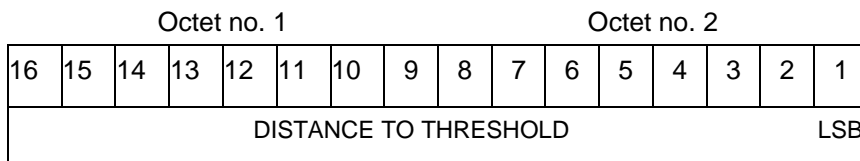
Structure of Subfield # 6:

Distance to Threshold Aircraft 1

Definition : Distance from threshold for Aircraft 1 involved in a RIMCA.

Format : Two-octet fixed length Data Item.

Structure:



$$\text{bits 16/1 (Distance to Threshold)} \\ \text{LSB} = 0.5\text{m}$$

Structure of Subfield #7 :

Aircraft Characteristics Aircraft 1

Definition : Characteristics of Aircraft 1 involved in the Conflict

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
GAT/OAT		FR1/FR2		RVSM		HPR	FX

- 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 (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
CDM		PRI	GV	0	0	0	FX

- bit-8/7 (CDM) Climbing/Descending mode
 = 00 Maintaining
 = 01 Climbing
 = 10 Descending
 = 11 Invalid
- bit 6 (PRI) = 0 Non primary target
 = 1 Primary target
- bit 5 (GV) = 0 Default
 = 1 Ground Vehicle
- bits-4/2 spare bits set to zero
- bit-1 (FX) = 0 End of Data Item
 = 1 Extension into second extent

Structure of Subfield # 8:

Mode-S Identifier Aircraft 1

Definition: Aircraft Identification downloaded from Aircraft 1 involved in the Conflict if equipped with a Mode-S transponder.

Format: Six-octet fixed length Data Item.

Structure:

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

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 aircraft identification when a flight plan is available or the registration marking when no flight plan is available. Coding rules are provided in [4] Section 3.1.2.9

Structure of Subfield # 9:

Flight Plan Number Aircraft 1

Definition: Number of the Flight Plan Correlated to Aircraft 1 Involved in the Conflict

Format: Four-octet fixed length Data Item.

Structure:

Octet no. 1										Octet no. 2					
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
0	0	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-32/28 spare bits set to zero
 bits-27/1 (NBR) Number from 0 to 99 999 999

Structure of Subfield # 10:

Cleared Flight Level Aircraft 1

Definition : Cleared Flight Level for Aircraft 1 Involved in the Conflict

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
CFL														LSB	

bits 16/1 (CFL) Cleared Flight Level
 LSB = ¼ FL

6.2.18 Data Item I004/171, Aircraft Identification & Characteristics 2

Definition : Identification & Characteristics of Aircraft 2 Involved in the Conflict.

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
AI2	M32	CPW	CPC	TT2	DT2	AC2	FX

Octet no. 2							
8	7	6	5	4	3	2	1
MS2	FP2	CF2	0	0	0	0	FX

bit-16	(AI2)	Subfield #1: Aircraft Identifier 2 = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-15	(M32)	Subfield #2: Mode 3/A Code Aircraft 2 = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-14	(CPW)	Subfield #3: Predicted Conflict Position 2 (WGS84) = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-13	(CPL)	Subfield #4: Predicted Conflict Position 2 (Cartesian Coordinates) = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-12	(TT2)	Subfield #5: Time to Threshold Aircraft 2 = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-11	(DT2)	Subfield #6: Distance to Threshold Aircraft 2 = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-10	(AC2)	Subfield #7: Aircraft Characteristics Aircraft 2 = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-9	FX	Extension indicator = 0 no extension = 1 extension

bit-8	(MS2)	Subfield #8: Mode S Identifier Aircraft 2 = 0 Absence of Subfield #8 = 1 Presence of Subfield #8
bit-7	(FP2)	Subfield #9: Flight Plan Number Aircraft 2 = 0 Absence of Subfield #9 = 1 Presence of Subfield #9
bit-6	(CF2)	Subfield #10: Cleared Flight Level Aircraft 2 = 0 Absence of Subfield #10 = 1 Presence of Subfield #10
bits-5/2		Spare Bits, set to 0
bit-1	FX	Extension indicator = 0 no extension = 1 extension

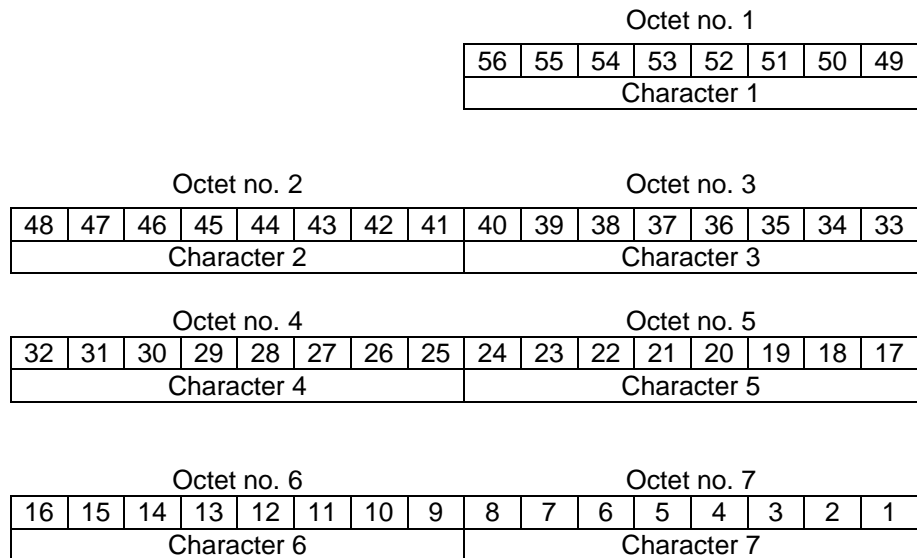
Structure of Subfield # 1:

Aircraft Identifier 2

Definition: Aircraft Identifier (in 7 characters) of Aircraft 2 Involved in the Conflict

Format: Seven-octet fixed length Data Item.

Structure:



bits-56/1 Each octet is an ASCII character defining the first aircraft

NOTE - The aircraft identifier is always left adjusted. If needed, the remaining characters are filled with space character.

Structure of Subfield # 2:**Mode 3/A Code Aircraft 2**

Definition : Mode-3/A code (converted into octal representation) of Aircraft 2 Involved in the Conflict

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

bits-12/1

Spare bits set to 0

Mode-3/A reply in octal representation

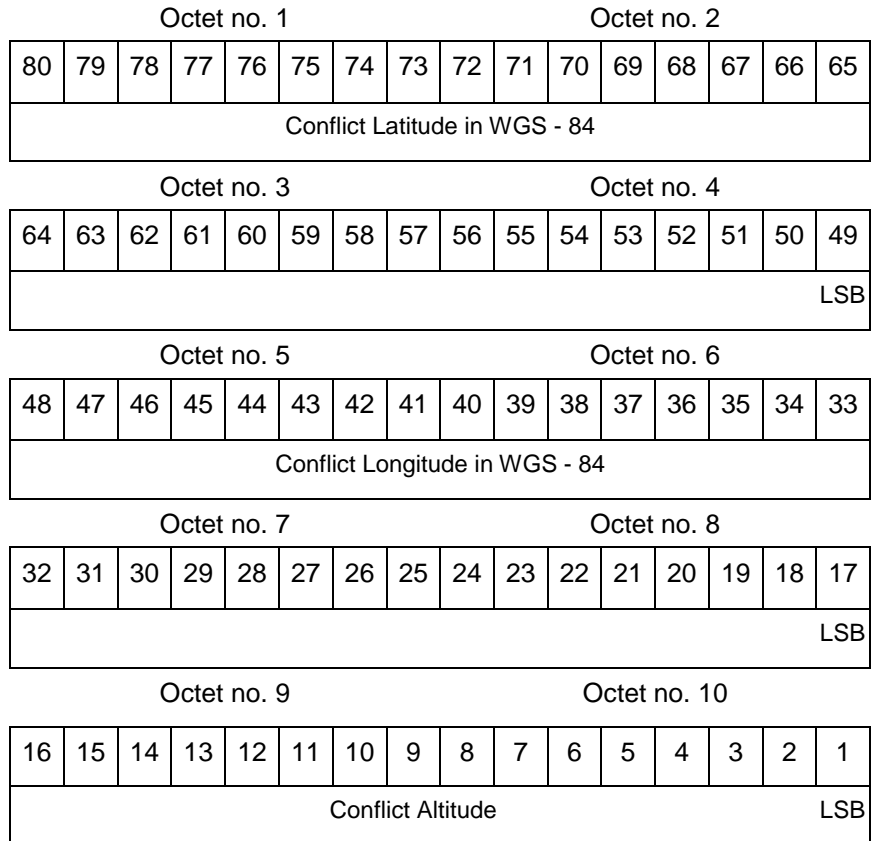
Structure of Subfield # 3:

Predicted Conflict Position Aircraft 2 (WGS-84)

Definition : Predicted conflict position target 2 in WGS-84 Coordinates.

Format : Ten-octet fixed length Data Item

Structure:



bits-80/49	(Latitude)	In WGS-84 in two's complement. Range -90 <= latitude <= 90 deg.
	(LSB)	= 180/2 ²⁵ degrees
bits-48/17	(Longitude)	In WGS-84 in two's complement. Range -180 <= longitude < 180 deg.
	(LSB)	= 180/2 ²⁵ degrees

The LSB provides a resolution better than 0.6m.

bits-16/1	(Altitude)	Altitude of predicted conflict
	(LSB)	= 25ft
	Hmin	= -15FL
	Hmax	= 1500FL

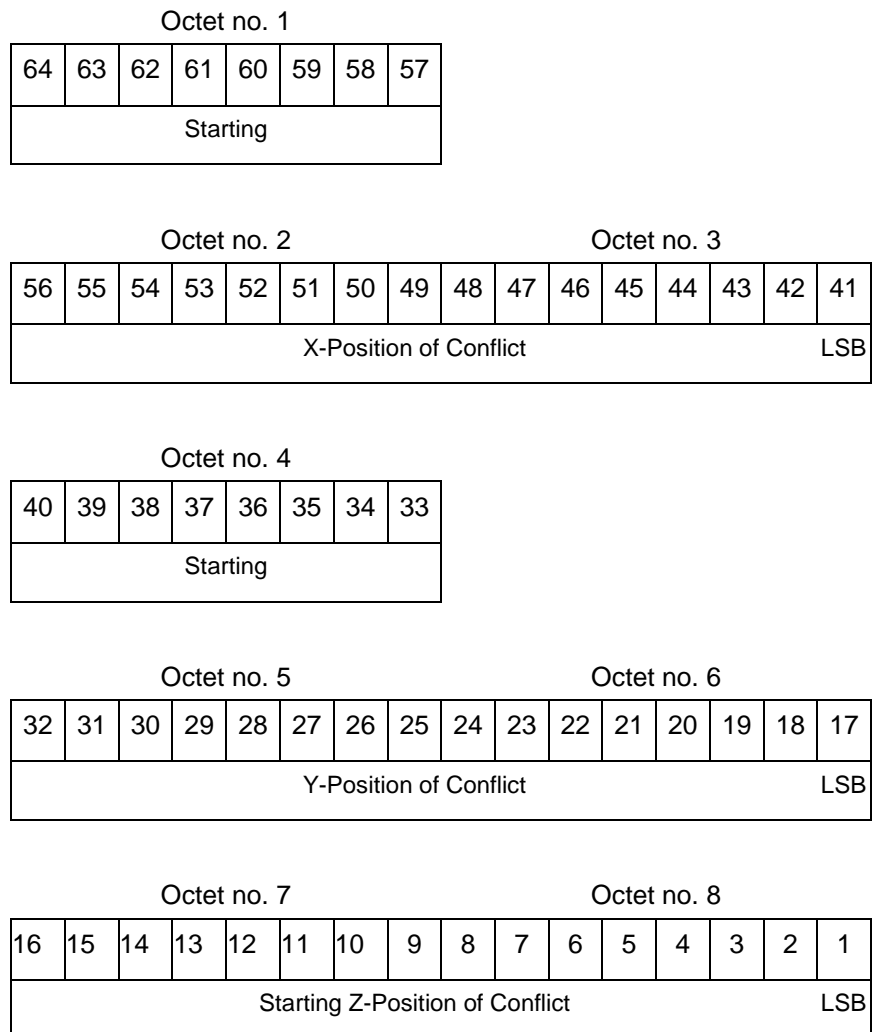
NOTE - Altitude expressed in two's complement form

Structure of Subfield # 4:**Predicted Conflict Position Aircraft 2 in Cartesian Coordinates**

Definition : Predicted conflict position for the aircraft 2 involved in the conflict

Format : Eight-octet fixed length Data Item

Structure:



bit-48/33 (X-position) Starting X-position of the conflict
LSB = 0.5m

bit-32/17 (Y-position) Starting Y-position of the conflict
LSB = 0.5m

bit-16/1 (Z-position) Starting Z-position of the conflict
LSB = 25 ft

NOTE - Two's complement fixed-point format.

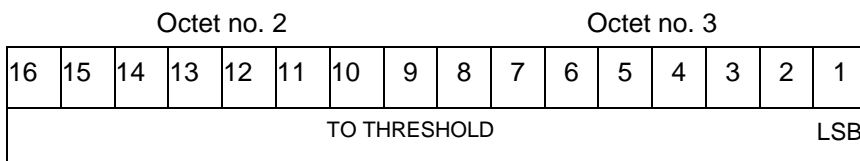
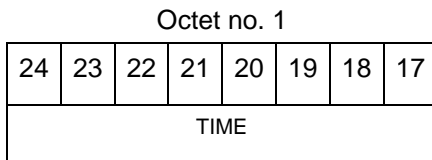
Structure of Subfield # 5:

Time to Threshold Aircraft 2

Definition : Time to runway threshold for first approaching aircraft in a RIMCA

Format : Three-octet fixed length Data Item.

Structure:



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

NOTE - Time to Threshold expressed in Two's Complement

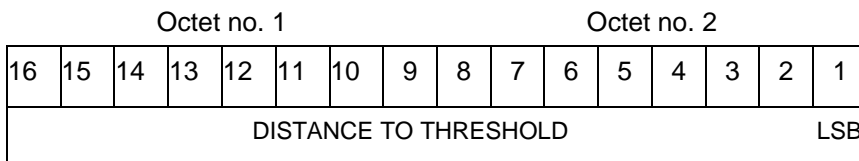
Structure of Subfield # 6:

Distance to Threshold Aircraft 2

Definition : Distance from threshold for Aircraft 2 involved in a RIMCA.

Format : Two-octet fixed length Data Item.

Structure:



bits 16/1 (Distance to Threshold)
LSB = 0.5m

Structure of Subfield #7 :

Aircraft Characteristics Aircraft 2

Definition : Characteristics of Aircraft 2 involved in the Conflict

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
GAT/OAT		FR1/FR2		RVSM		HPR	FX

- 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 (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
CDM		PRI	GV	0	0	0	FX

- bit-8/7 (CDM) Climbing/Descending mode
 = 00 Maintaining
 = 01 Climbing
 = 10 Descending
 = 11 Invalid
- bit 6 (PRI) = 0 Non primary target
 = 1 Primary target
- bit 5 (GV) = 0 Default
 = 1 Ground Vehicle
- bits-4/2 spare bits set to zero
- bit-1 (FX) = 0 End of Data Item
 = 1 Extension into second extent

Structure of Subfield # 8:**Mode-S Identifier Aircraft 2**

Definition: Aircraft Identification downloaded from Aircraft 2 involved in the Conflict if equipped with a Mode-S transponder.

Format: Six-octet fixed length Data Item.

Structure:

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

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 aircraft identification when a flight plan is available or the registration marking when no flight plan is available. Coding rules are provided in [4] Section 3.1.2.9

Structure of Subfield # 9:

Flight Plan Number Aircraft 2

Definition: Number of the Flight Plan Correlated to Aircraft 2 Involved in the Conflict

Format: Four-octet fixed length Data Item.

Structure:

Octet no. 1										Octet no. 2					
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
0	0	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-32/28 spare bits set to zero
 bits-27/1 (NBR) Number from 0 to 99 999 999

Structure of Subfield # 10:

Cleared Flight Level Aircraft 2

Definition : Cleared Flight Level for Aircraft 2 Involved in the Conflict

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
CFL															
LSB															

bits 16/1 (CFL) Cleared Flight Level
 LSB = ¼ FL

6.3 User Application Profile for Category 004

The following User Application Profile shall be used for the transmission of Safety Nets messages.

FRN	Data Item	Information	Length
1	I004/010	Data Source Identifier	2
2	I004/000	Message Type	1
3	I004/015	SDPS Identifier	1+
4	I004/020	Time Of Message	3
5	I004/040	Alert Identifier	2
6	I004/045	Alert Status	1
7	I004/060	Safety Net Functions Status	1+
FX	-	Field Extension Indicator	-
8	I004/030	Track Number 1	2
9	I004/170	Aircraft Identification & Characteristics 1	1+
10	I004/120	Conflict Characteristics	1+
11	I004/070	Conflict Timing and Separation	1+
12	I004/076	Vertical Deviation	2
13	I004/074	Longitudinal Deviation	2
14	I004/075	Transversal Distance Deviation	3
FX	-	Field Extension Indicator	-
15	I004/100	Area Definitions	1+
16	I004/035	Track Number 2	2
17	I004/171	Aircraft Identification & Characteristics 2	1+
18	I004/110	FDPS Sector Control Identifier	1+
19	-	Spare	-
20	RE	Reserved Expansion Field	1+
21	SP	Reserved For Special Purpose Field	1+
FX	-	Field Extension Indicator	-

Table 5 : Safety Net Messages UAP

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.