EUROCONTROL Specification for Surveillance Data Exchange

ASTERIX Part 26

Category 239

FOD Detection Alert Reports

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Abstract

This document specifies the contents of ASTERIX Category 239 messages used for the transmission of FOD Detection Alert reports.

Keywords

Data Exchange	Reports	SAC	SIC
Data Category	Data Field	FOD	Data Item
ASTERIX	UAP		

Contact Person(s)	Tel	Unit
Alexander Engel	+32-2-729 3355	DPS/STAN

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DOCUMENT APPROVAL

This document has been approved by the ASTERIX Maintenance Group AMG.

For management approval of the complete set of ASTERIX documentation please refer to Part 1.

DOCUMENT CHANGE RECORD

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

EDITION NUMBER	EDITION DATE	REASON FOR CHANGE	PAGES AFFECTED
0.1	December 2013	First draft of a proposed new category 239	ALL
0.2	June 2014	Data Item I239/000 “Message Type” added Data Item I239/200 “Time of Event Termination” added	5.2.1 5.2.11
1.0	October 2015	Approved Version	All

Publications
EUROCONTROL Headquarters
96 Rue de la Fusée
B-1130 BRUSSELS

Tel: +32 (0)2 729 4715
Fax: +32 (0)2 729 5149
E-mail: publications@eurocontrol.int

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1. INTRODUCTION

1.1 Scope

This document describes the report structure for the transmission of alert reports from a system for the automatic detection of Foreign Object Debris (FOD).

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2. REFERENCES

2.1 General

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

At the time of publication of this EUROCONTROL Standard Document, the editions indicated for the referenced documents and standards were valid.

Any revision of the referenced ICAO Documents shall be immediately taken into account to revise this EUROCONTROL Standard Document.

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

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

2.2 Reference Documents

1. EUROCONTROL Specification SPEC-0149, edition 2.2, 17 October 2014 “EUROCONTROL Specification for Surveillance Data Exchange – Part 1 All Purpose Structured EUROCONTROL Surveillance Information Exchange – ASTERIX”.

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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 Category: Classification of the data in order to permit inter alia an easy identification.

3.1.3 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.

3.1.4 Data Item: The smallest unit of information in each Data Category.

3.1.5 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.

3.1.6 User Application Profile: The mechanism for assigning Data Items to Data Fields, and containing all necessary information which needs to be standardised for the successful encoding and decoding of the reports.

3.2 Acronyms and Abbreviations

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

ASTERIX	All purpose STructured EUROCONTROL suRveillance Information eXchange
AMG	ASTERIX Maintenance Group
CAT	Data Category
FOD	Foreign Object Debris
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
ICAO	International Civil Aviation Organization
LEN	Length Indicator
LSB	Least Significant Bit
NM	Nautical Mile, unit of distance (1852 metres)
REP	Field Repetition Indicator
s	second, unit of time
SAC	System Area Code
SIC	System Identification Code
SP	Special Purpose Indicator
UAP	User Application Profile (see Definitions)
UTC	Co-ordinated Universal Time

4. GENERAL PRINCIPLES

4.1 Time Management

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

4.2 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.

4.3 Addressing Concepts

4.3.1 Addressing Concepts: Assigning SAC/SIC Codes

By convention a dedicated and unambiguous SAC/SIC code shall be assigned to every FOD Detection System.

The SAC is assigned to a specific area by EUROCONTROL and can be retrieved from the ASTERIX website at www.eurocontrol.int/asterix . Please note that a specific SAC (SAC=0) has been reserved for local airport applications.

The SIC is assigned to a specific system by the national authority responsible for the surveillance infrastructure.

4.4 User Application Profile and Report Structure

A single UAP has been standardised and shall be used to transmit alert reports from a FOD Detection System to user systems.

The structure of reports of Category 239 follows the principle according to Part 1 of ASTERIX edition 2.2 or later. Each report is composed according to the following principle:

CAT = 239	LEN	FSPEC	DATA ITEM	DATA ITEM	DATA ITEM	…

Where:

- CAT = 239 is a one-octet field indicating reports from an automatic FOD Detection System;
- LEN is a two-octet field indicating the total length in octets of the Category 239 report, including the CAT and LEN fields;
- FSPEC is the Field Specification

4.5 Composition of Reports

4.5.1 Sequence of Data Items

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

4.5.2 Presence of Data Items

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

5. LAYOUT OF FOD DETECTION ALERT REPORTS

5.1 Standard Data Items

The standardised Data Items which shall be used for the transmission of ground station service reports are defined in Table 1 and described in the following pages.

Table 1 - Standard Data Items of Category 239

Data Item Ref. No.	Description	System Resolution
I239/000	Message Type	N.A.
I239/010	Data Source Identifier	N.A.
I239/030	Alert Identifier	N.A.
I239/070	Time of Day	1/128 s
I239/130	Position of FOD in WGS-84 Coordinates	$180/2^{23}$ °
I239/140	Size of FOD	1 cm
I239/150	Time of First Detection of FOD	1/128 s
I239/160	FOD Characterisation	N.A.
I239/170	Identity of Potential Source of FOD	N.A.
I239/200	Time of event termination	1/128 s

5.2 Description of Standard Data Items

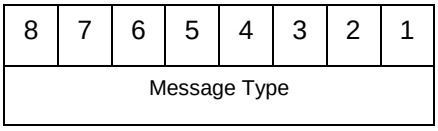
5.2.1 Data Item I239/000, Message Type

Definition : This Data Item allows for a more convenient handling of the messages at the receiver side by further defining the type of information..

Format : One-octet fixed length Data Item.

Structure:

Octet no. 1



bits-8/1 Message Type

NOTES

1. In applications where data of various types is 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 239 records:

- 001 FOD Alert Message
- 002 FOD Alert Termination Message

The list of items present for the two message types is defined in the following table. M stands for mandatory, O for optional X for never present.

Table 2 – Items per Message Types

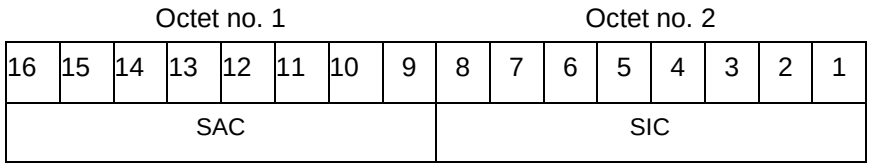
Item	Type	001 FOD Alert Message	002 FOD Alert Termination Message
I239/000	Message Type	M	M
I239/010	Data Source Identifier	M	M
I239/020	ASTERIX Record length	M	M
I239/030	Alert Identifier	M	M
I239/070	Time of Day	M	M
I239/130	Position of FOD in WGS-84 Coordinates	M	X
I239/140	Size of FOD	O	X
I239/150	Time of First Detection of FOD	O	X
I239/160	FOD Characterisation	O	X
I239/170	Identity of Potential Source of FOD	O	X
I239/200	Time of event termination	X	M

5.2.2 Data Item I239/010, Data Source Identifier

Definition : Identification of the FOD Detection System from which the report is received.

Format : Two-octet fixed length Data Item.

Structure:



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). Please note that a specific SAC (SAC=0) has been reserved for local airport applications.

NOTE - The SICs are allocated by the national authority responsible for the surveillance infrastructure.

Encoding Rule: See Table 2

5.2.3 Data Item I239/030, Alert Identification

Definition : Unique Identification of the Alert.
Format : One-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
AID															

bits-16/1 (AID) Alert Identification

Note: The alert identification is allocated by the system.

Encoding Rule: See Table 2

5.2.4 Data Item I239/070, Time of Day

Definition : Absolute time stamping expressed as UTC time.
Format : Three-octet fixed length Data Item.
Structure:

Octet no. 1

24	23	22	21	20	19	18	17
TIME							

Octet no. 2 Octet no. 3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
OF DAY															LSB

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

Encoding Rule:

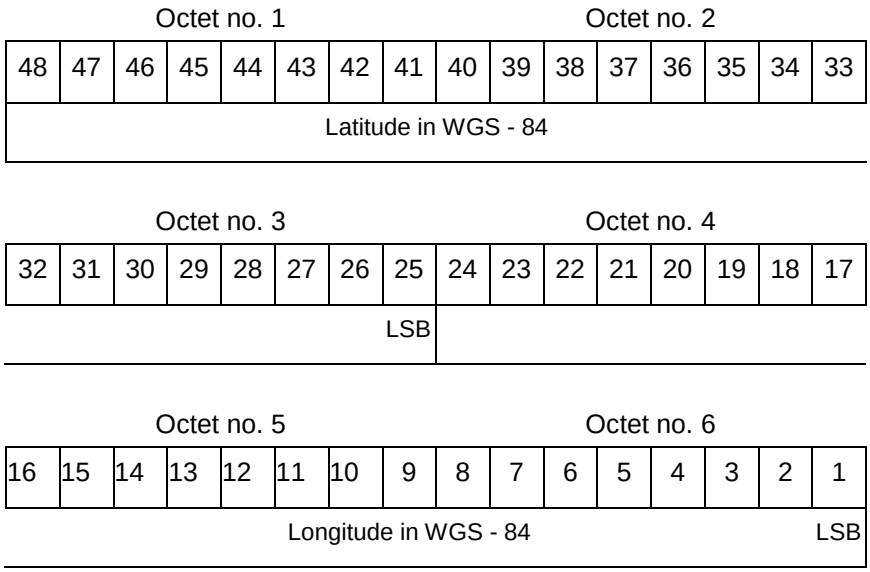
This data item shall be present in every ASTERIX record, except in case of failure of all sources of time-stamping.

NOTES

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

5.2.5 Data Item I239/130, Position in WGS-84 Co-ordinates

Definition : Position of the FOD in WGS-84 Co-ordinates.
Format : Six-octet fixed length Data Item.
Structure:



bits-48/25	(Latitude)	In WGS.84 in two's complement. Range -90 <= latitude <= 90 deg. LSB = $180/2^{23}$ degrees. = $2.145767 * 10^{-05}$ degrees. This corresponds to a resolution of at least 2.4 meters
bits-24/1	(Longitude)	In WGS.84 in two's complement. Range -180 <= longitude < 180 deg. LSB = $180/2^{23}$ degrees. = $2.145767 * 10^{-05}$ degrees. This corresponds to a resolution of at least 2.4 meters.

Encoding Rule: See Table 2

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

5.2.6 Data Item I239/140, Size of FOD

Definition : Surface of the FOD element as determined by the FOD Detection System.

Format : Two-octet fixed length Data Item.

Structure:

Octet no. 1

16	15	14	13	12	11	10	9
LENGTH							LSB

Octet no. 2

8	7	6	5	4	3	2	1
WIDTH							LSB

bits-16/9	(LENGTH)	Length of the Object LSB = 1cm
bits-8/1	(WIDTH)	Width of the Object LSB = 1cm

Encoding Rule: See Table 2

5.2.7 Data Item I239/150, Time of First Detection of FOD

Definition : Time at which the FOD was first detected expressed as UTC.
Format : Three-octet fixed length Data Item.
Structure:

Octet no. 1

24	23	22	21	20	19	18	17
FIRST TIME							

Octet no. 2 Octet no. 3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
OF DETECTION															LSB

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

Encoding Rule: See Table 2

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

5.2.8 Data Item I239/160, FOD Characterisation

Definition : Description of Characteristics of the FOD.

Format : Repetitive Data Item, starting with a one-octet Field Repetition Indicator (REP) followed by at least one error code of 1 octet.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
REP							

bits-8/1 (REP) Number of error codes to be transmitted

Octet no. 1

8	7	6	5	4	3	2	1
Code							

bits-8/1 (Code)

Encoding Rule: See Table 2. This item shall only be sent when the value of "Code" is different from "0"

Note: The content of this data item is implementation specific and shall be defined in an Interface Control Document (ICD).

5.2.9 Data Item I239/170, Identity of Potential Source of FOD

Definition : Information on the aircraft/vehicle which has been identified as potential source of the FOD.

Format : One octet extensible data field.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
CHAR1							FX

bits-8/2	(CHAR1)	First character of the identity as an ASCII value
bit-1	(FX)	Field Extension = 0 End of data item = 1 Extension into next extension

Note: This data item contains information determined by the FOD Detection System as to the potential source of the FOD. This can be a call sign, a registration marking, a vehicle number or something similar.

5.2.10 Data Item I239/200, Time of Event Termination

Definition : Time at which the FOD alert has been closed expressed as UTC.

Format : Three-octet fixed length Data Item.

Structure:

Octet no. 1

24	23	22	21	20	19	18	17
TIME							

Octet no. 2 Octet no. 3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
OF EVENT TERMINATION															LSB

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

Encoding Rule: See Table 2

5.3 Standard User Application Profile

The following standard UAP shown in Table 3 shall be used for the transmission of FOD Detection Alert reports:

Table 3 - Standard UAP for FOD Detection Alert Reports

FRN	Data Item	Data Item Description	Length
1	**I239/010**	Data Source Identifier	2
2	**I239/000**	Message Type	1
3	**I239/030**	Alert Identifier	2
4	**I239/070**	Time of Day	3
5	**I239/130**	Position of FOD in WGS-84 Coordinates	6
6	**I239/140**	Size of FOD	2
7	**I239/150**	Time of First Detection of FOD	1+
FX	**N/A.**	Field Extension Indicator	N/A.
8	**I239/160**	FOD Characterisation	3
9	**I239/170**	Identity of Potential Source of FOD	1+
10	**I239/200**	Time of Event Termination	3
11	**SP-Data Item**	Special Purpose Field	1+1 +
12	-	spare	-
13	-	spare	-
14	-	spare	-
FX	**N/A.**	Field Extension Indicator	N/A.

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 one-octet followed by n-octets extent as necessary.