



uAvionix FlightLine ASTERIX CAT021 Feed

Rev A

Aug 28th, 2023

© 2023 uAvionix Corporation. All rights reserved.

300 Pine Needle Lane

Bigfork, MT 59911

<http://www.uavionix.com>

support@uavionix.com

Except as expressly provided herein, no part of this guide may be reproduced, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express written permission of uAvionix. uAvionix grants permissions to download a single copy of this guide onto an electronic storage medium to be viewed for personal use, provided that the complete text of this copyright notice is retained. Unauthorized commercial distribution of this specification or any revision hereto is strictly prohibited.

uAvionix® is a registered trademark of uAvionix Corporation, and may not be used without express permission of uAvionix.

Contents

1	Revision History	4
2	Introduction	5
2.1	Format	5
2.2	Source Identifiers	5
2.3	Communication	5
3	Supported Data Items	5
4	Examples	6
4.1	Example 1	6
4.2	Example 2	8

1 Revision History

Revision	Date	Comments
A	8/28/2023	Initial Draft

2 Introduction

This document describes the uAvionix FlightLine ASTERIX Part 12 Category 21 Feed which delivers a real-time stream of decoded ADS-B messages from the FlightLine service.

2.1 Format

Messages are encoded using ASTERIX CAT021 Edition 2.6 which can be found at: <https://www.eurocontrol.int/publication/cat021-eurocontrol-specification-surveillance-data-exchange-asterix-part-12-category-21>

2.2 Source Identifiers

The Data Source Identifiers used by uAvionix are currently defined as:

Identifier	Value	Notes
System Area Code (SAC)	254 (0xFE)	Temporary Unassigned
System Identification Code	117 (0x75)	Temporary Unassigned

2.3 Communication

All messages are delivered to a customer's IP and Port over UDP. In order to secure that endpoint against unwanted messages, the customer will be provided with an official source IP address so that the endpoint can be firewalled to only allow the official source.

Each UDP message is one individual CAT021 track output in a 1:1 correlation, multiple CAT021 messages are not combined into a larger UDP message.

3 Supported Data Items

The following Data Items listed in the table below are supported. Many of these fields are optional and only included when the relevant data is available and valid or during specific target states.

FRN	Data Item	Description
1	I021/010	Data Source Identification
2	I021/040	Target Report Descriptor
6	I021/130	Position in WGS-84
7	I021/131	High-Resolution Position in WGS-84 Co-ordinates
9	I021/150	Calculated Air Speed
10	I021/151	True Air Speed
11	I021/080	Target Address
12	I021/073	Time of Message Reception of Position
14	I021/075	Time of Message Reception of Velocity
16	I021/140	Geometric Height
17	I021/090	Quality Indicators
18	I021/210	Mops Version
19	I021/070	Mode 3/A code
21	I021/145	Flight Level

22	I021/152	Magnetic Heading
23	I021/200	Target Status
24	I021/155	Barometric Vertical Rate
25	I021/157	Geometric Vertical Rate
26	I021/160	Airborne Ground Vector
28	I021/077	Time of Report Transmission
29	I021/170	Target Identification
30	I021/020	Emitter Category
36	I021/008	Aircraft Operational Status

4 Examples

The included examples are a WireShark export of a packet dissection of an individual UDP message.

4.1 Example 1

ASTERIX packet, Category 021

Category: 21

Length: 61

Asterix message, #01, length: 58

FSPEC

010, Data Source Identification

SAC, System Area Code: 0xfe (254)

SIC, System Identification Code: 0x75 (117)

040, Target Report Descriptor

000. = ATP, Address Type: 24-Bit ICAO address (0)

...0 0... = ARC, Altitude Reporting Capability: 25 ft (0)

.... .0.. = RC, Range Check: Default (0)

.... ..0. = RAB, Report Type: Report from target transponder (0)

.... ...1 = FX: Extension into next extent (1)

0... = DCR, Differential Correction: No differential correction (ADS-B) (0)

.0.. = GBS, Ground Bit Setting: Ground Bit not set (0)

..0. = SIM, Simulated Target: Actual target report (0)

...0 = TST, Test Target: Default (0)

.... 0... = SAA, Selected Altitude Available: Equipment capable to provide Selected Altitude

(0)

.... .00. = CL, Confidence Level: Report valid (0)

.... ...0 = FX: End of data item (0)

130, Position in WGS-84 Co-ordinates

LAT, Latitude, [°]: 37.0653176307678

LON, Longitude, [°]: -86.5382552146912

131, High-Resolution Position in WGS-84 Co-ordinates

LAT, Latitude, [°]: 37.0653176307678

LON, Longitude, [°]: -86.5382553823292

080, Target Address

Target Address: 0xa11b32 (10558258)

073, Time of Message Reception for Position

Time of Message Reception for Position, [s]: 128896.5625

075, Time of Message Reception for Velocity

Time of Message Reception for Velocity, [s]: 128896.5625

090, Quality Indicators

001. = NUCRNACV, Navigation Uncertainty Category for Velocity NUCr or the Navigation Accuracy Category for Velocity NACv: 1

...1 000. = NUCPNIC, Navigation Uncertainty Category for Position NUCp or Navigation Integrity Category NIC: 8

.... ...1 = FX: Extension into next extent (1)

0... = NICBARO, Navigation Integrity Category for Barometric Altitude: 0

.11. = SIL, Surveillance (version 1) or Source (version 2) Integrity Level: 3

...1 001. = NACP, Navigation Accuracy Category for Position: 9

.... ...1 = FX: Extension into next extent (1)

..0. = SILS, SIL-Supplement: Measured per flight-hour (0)

...1 0... = SDA, Horizontal Position System Design Assurance Level (as Defined in Version 2):

2

.... .10. = GVA, Geometric Altitude Accuracy: 2

.... ...0 = FX: End of data item (0)

210, MOPS Version

.0.. = VNS, Version Not Supported: The MOPS Version is supported by the GS (0)

..00 0... = VN, Version Number: ED102/D0-260 [Ref. 7] (0)

.... .001 = LTT, Link Technology Type: UAT (1)

145, Flight Level

Flight Level, [FL]: 66

200, Target Status

0... = ICF, Intent Change Flag (see Note): No intent change active (0)

.1.. = LNAV, LNAV Mode: LNAV Mode not engaged (1)

..0. = ME, Military Emergency: No military emergency (0)

...0 00.. = PS, Priority Status: No emergency / not reported (0)

.... ..00 = SS, Surveillance Status: No condition reported (0)

157, Geometric Vertical Rate

0... = RE, Range Exceeded Indicator: Value in defined range (0)

GVR, Geometric Vertical Rate, [ft/min]: 62.5

160, Airborne Ground Vector

0... = RE, Range Exceeded Indicator: Value in defined range (0)

GS, Ground Speed Referenced to WGS-84, [NM/s]: 0.0257568359375

TA, Track Angle Clockwise Reference to True North, [°]: 312.000732421875

077, Time of ASTERIX Report Transmission

Time of ASTERIX Report Transmission, [s]: 128896

170, Target Identification

Target Identification: 7244

020, Emitter Category

Emitter Category: Light aircraft <= 15500 lbs (1)

008, Aircraft Operational Status

0... = RA, TCAS Resolution Advisory Active: TCAS II or ACAS RA not active (0)

.00. = TC, Target Trajectory Change Report Capability: No capability for Trajectory Change Reports (0)

...0 = TS, Target State Report Capability: No capability to support Target State Reports (0)

.... 0... = ARV, Air-Referenced Velocity Report Capability: No capability to generate ARV-reports (0)

.... .0.. = CDTIA, Cockpit Display of Traffic Information Airborne: CDTI not operational (0)

.... ..0. = NOTTCAS, TCAS System Status: TCAS operational (0)

.... ...1 = SA, Single Antenna: Single Antenna only (1)

0000 02 00 00 00 45 00 00 59 88 b5 00 00 80 11 00 00E..Y.....

```

0010 7f 00 00 01 7f 00 00 01 f8 7d 22 b8 00 45 b5 2d .....}"..E.-
0020 15 00 3d c7 1b 33 5b c1 81 00 fe 75 01 00 1a 5b ..=.3[....u...[
0030 89 c2 76 31 0d 2d c4 80 e1 3b 18 7f a1 1b 32 fb ..v1.-...;....2.
0040 c0 48 fb c0 48 31 73 14 01 01 08 40 00 0a 01 a6 .H..H1s....@....
0050 dd de fb c0 00 df 2d 34 82 08 20 01 01 .....-4.. ..

```

4.2 Example 2

ASTERIX packet, Category 021

Category: 21

Length: 57

Asterix message, #01, length: 54

FSPEC

010, Data Source Identification

SAC, System Area Code: 0xfe (254)

SIC, System Identification Code: 0x75 (117)

040, Target Report Descriptor

000. = ATP, Address Type: 24-Bit ICAO address (0)

...0 0... = ARC, Altitude Reporting Capability: 25 ft (0)

.... .0.. = RC, Range Check: Default (0)

.... ..0. = RAB, Report Type: Report from target transponder (0)

.... ...1 = FX: Extension into next extent (1)

0... = DCR, Differential Correction: No differential correction (ADS-B) (0)

.0.. = GBS, Ground Bit Setting: Ground Bit not set (0)

..0. = SIM, Simulated Target: Actual target report (0)

...0 = TST, Test Target: Default (0)

.... 0... = SAA, Selected Altitude Available: Equipment capable to provide Selected Altitude

(0)

.... .00. = CL, Confidence Level: Report valid (0)

.... ...0 = FX: End of data item (0)

130, Position in WGS-84 Co-ordinates

LAT, Latitude, [°]: 28.2389831542969

LON, Longitude, [°]: -77.6239657402039

131, High-Resolution Position in WGS-84 Co-ordinates

LAT, Latitude, [°]: 28.2389824837446

LON, Longitude, [°]: -77.6239551790059

080, Target Address

Target Address: 0xaaed5a (11201882)

073, Time of Message Reception for Position

Time of Message Reception for Position, [s]: 128896.53125

075, Time of Message Reception for Velocity

Time of Message Reception for Velocity, [s]: 128896.53125

090, Quality Indicators

010. = NUCRNACV, Navigation Uncertainty Category for Velocity NUCr or the Navigation

Accuracy Category for Velocity NACv: 2

...1 000. = NUCPNIC, Navigation Uncertainty Category for Position NUCp or Navigation Integrity

Category NIC: 8

.... ...1 = FX: Extension into next extent (1)

1... = NICBARO, Navigation Integrity Category for Barometric Altitude: 1

.11. = SIL, Surveillance (version 1) or Source (version 2) Integrity Level: 3

...1 010. = NACP, Navigation Accuracy Category for Position: 10

.... ...1 = FX: Extension into next extent (1)

```

    ..0. .... = SILS, SIL-Supplement: Measured per flight-hour (0)
    ...1 0... = SDA, Horizontal Position System Design Assurance Level (as Defined in Version 2):

2
    .... .10. = GVA, Geometric Altitude Accuracy: 2
    .... ...0 = FX: End of data item (0)
210, MOPS Version
    .0.. .... = VNS, Version Not Supported: The MOPS Version is supported by the GS (0)
    ..01 0... = VN, Version Number: ED102A/DO-260B [Ref. 10] (2)
    .... .010 = LTT, Link Technology Type: 1090 ES (2)
070, Mode 3/A Code in Octal Representation
    .... 0011 0100 1001 = MODE3A, Mode-3/A Reply in Octal Representation: 01511
145, Flight Level
    Flight Level, [FL]: 320
200, Target Status
    0... .... = ICF, Intent Change Flag (see Note): No intent change active (0)
    .1.. .... = LNAV, LNAV Mode: LNAV Mode not engaged (1)
    ..0. .... = ME, Military Emergency: No military emergency (0)
    ...0 00.. = PS, Priority Status: No emergency / not reported (0)
    .... ..00 = SS, Surveillance Status: No condition reported (0)
155, Barometric Vertical Rate
    0... .... = RE, Range Exceeded Indicator: Value in defined range (0)
    BVR, Barometric Vertical Rate, [ft/min]: 0
160, Airborne Ground Vector
    0... .... = RE, Range Exceeded Indicator: Value in defined range (0)
    GS, Ground Speed Referenced to WGS-84, [NM/s]: 0.1221923828125
    TA, Track Angle Clockwise Reference to True North, [°]: 183.9990234375
077, Time of ASTERIX Report Transmission
    Time of ASTERIX Report Transmission, [s]: 128896
020, Emitter Category
    Emitter Category: No ADS-B Emitter Category Information (0)
008, Aircraft Operational Status
    0... .... = RA, TCAS Resolution Advisory Active: TCAS II or ACAS RA not active (0)
    .00. .... = TC, Target Trajectory Change Report Capability: No capability for Trajectory
Change Reports (0)
    ...0 .... = TS, Target State Report Capability: No capability to support Target State Reports
(0)
    .... 0... = ARV, Air-Referenced Velocity Report Capability: No capability to generate ARV-
reports (0)
    .... .0.. = CDTIA, Cockpit Display of Traffic Information Airborne: CDTI not operational (0)
    .... ..1. = NOTTCAS, TCAS System Status: TCAS not operational (1)
    .... ...1 = SA, Single Antenna: Single Antenna only (1)

0000 02 00 00 00 45 00 00 55 88 6f 00 00 80 11 00 00    ....E..U.O.....
0010 7f 00 00 01 7f 00 00 01 f8 7d 22 b8 00 41 41 69    .....}"..AAi
0020 15 00 39 c7 1b 3b 6b 41 81 00 fe 75 01 00 14 14    ..9..;kA...u....
0030 c0 c8 cc fd 0a 0a 5f fc e4 66 7e bf aa ed 5a fb    ....._..f~...Z.
0040 c0 44 fb c0 44 51 f5 14 12 03 49 05 00 40 00 00    .D..DQ....I..@..
0050 07 d2 82 d8 fb c0 00 00 03                          .....

```