

ARINC 424 NDB

**Draft 4 of Supplement 23
Proposal**

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INCLUDE VAL AND LAL VALUES TO GBAS PATH POINT (PQ) RECORDS

V.1

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SUMMARY

1.0 INTRODUCTION/ BACK GROUND

Based on the input from Lufthansa Aviation Training, Sam asked me to write a proposal to include the requested data attributes HAL and VAL to the GBAS Path Point Records.

As a short introduction, the SBAS Path Point (PP) record include the Horizontal Alert Limit and the Vertical Alert Limit (HAL/VAL) values in position 110 thru 115. The GBAS Path Point (PQ) record do not include these fields, they are defined as blank.

4.1.28.1 Airport SBAS Path Point Primary Records

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
94 thru 98	Course Width at Threshold (5)	5.228
99 thru 102	*Length Offset (4)	5.259
103 thru 108	*Path Point TCH (6)	5.265
109	*TCH Units Indicator (1)	5.266
110 thru 112	*HAL (3)	5.263
113 thru 115	*VAL (3)	5.264
116 thru 123	SBAS FAS Data CRC Remainder (8)	5.229
124 thru 128	File Record Number (5)	5.31
129 thru 132	Cycle Date (4)	5.32

Note 1: In the Path Point Record description, the field prefixed with * in the Field Name are those columns that have been determined as required for the data wrap for CRC calculations

4.1.35.1 GBAS Path Point Primary Records

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
99 thru 102	*Length Offset (4)	5.259
103 thru 108	*Path Point TCH (6)	5.265
109	*TCH Units Indicator (1)	5.266
110 thru 115	Blank (Spacing) (6)	
116 thru 123	GBAS FAS Data CRC Remainder (8)	5.229
124 thru 128	File Record Number (5)	5.31
129 thru 132	Cycle Date (4)	5.32

Note 1: In the GBAS Path Point Record description, the fields prefixed with * in the Field Name are those columns that have been determined as required for the data wrap for CRC calculations.

However, this is not an error in the ARINC 424 implementation, it is based on the RTCA definition of the SBAS and the GBAS Final Approach Data Block (FAS DB), RTCA DO-229 and DO-246.

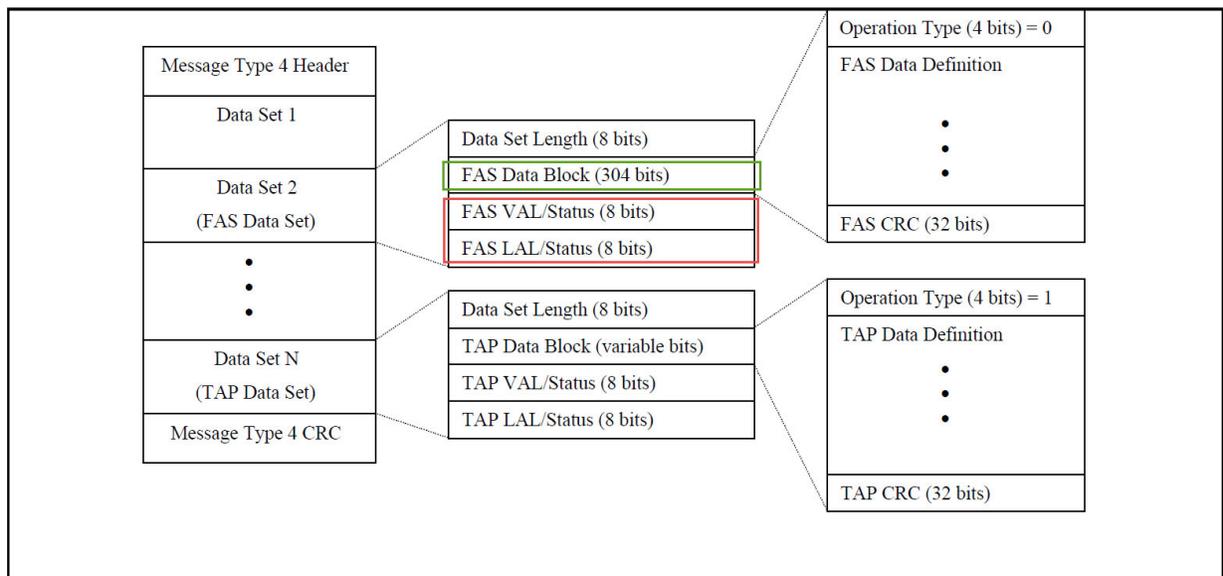


Figure 2-11 Message Type 4 Structure Extended to Accommodate Terminal Area Path (TAP) Data Sets

According to one GLS expert, the default values for GLS CAT 1 approaches would be 10m and 40m. For CAT 2, since there are no default values established, one would need to revert to the CAT 3, which would be 10m/10m.

At this time, there are no published GLS approaches having CAT 2 minima to my knowledge. In Germany, the DFS is planning to publish a GLS CAT 2 in the near future, but it will initially be a separate approach, not combined with the existing CAT 1 approach. Eventually, it will become a GLS approach having both CAT 1 and CAT 2 minima.

Then, I did try to find the best way to include the information in state publications. Unfortunately, there is almost zero support in ICAO. Many countries believe it is a safety risk if the details of GBAS FAS DBs, VAL and LAL are to be published.

2.0 DISCUSSION and or ACTION

Based on the information I could obtain so far, I would propose to add the fields Lateral Alert Limit (LAL) and Vertical Alert Limit (VAL) to the GBAS Path Point continuation record.

In order to achieve this without duplicating a lot of text, I would combine the LAL into the HAL field and add text to say that for GBAS, the value might be derived.

At the same time, the title of 5.263 could be extended to include the full text Horizontal Alert Limit (HAL).

5.263 [Horizontal Alert Limit \(HAL\)/Lateral Alert Limit \(LAL\)](#)

Definition/Description: The Horizontal Alert Limit (HAL) [for SBAS Path Points or Lateral Alert Limit \(LAL\) for GBAS Path Points](#) is the radius of a circle in the horizontal plane (the local plane tangent to the WGS-84 ellipsoid), with its center being at the true position, which describes the

decimal point suppressed, derived from official government sources.
[For GBAS Path Points, the value may be a derived value based on lines of minima or other information. The source will be indicated in 5.xxx](#)

Used On: Airport and Helicopter Operations SBAS Path Point Records, [GBAS Path Point Continuation Records](#)

Then, the same text should be included in the VAL field (5.264)

5.264 [Vertical Alert limit \(VAL\)](#)

Definition/Description: The Vertical Alert Limit (VAL) is half the length of a segment on the

decimal point suppressed, derived from official government sources.
[For GBAS Path Points, the value may be a derived value based on lines of minima or other information. The source will be indicated in 5.xxx](#)

Used On: Airport and Helicopter Operations SBAS Path Point Records, [GBAS Path Point Continuation Records](#)

The mentioned source field needs to be defined

5.xxx [Source of LAL/VAL](#)

Definition/Description: The Source of LAL/VAL flag defines if the LAL and VAL values have been coded based on official source, or have been derived from other information.

Source/Content: A value of Y means that the LAL and VAL values are included in official source. A value of M means that the LAL and VAL values are derived defaults based on the available lines of minima for the GLS approach. A value of N means no indication is given and a default value is used. In case the LAL and VAL values are blank, this field is left blank as well.

Source of LAL/VAL	Approach Minima	LAL value (5.263)	VAL value (5.264)
Y		According Source	According Source
M	CAT 1	400	100
M	CAT 2	100	100
M	CAT 3	100	100
N		400	100

Used On: [Airport and Helicopter Operations SBAS Path Point Records, GBAS Path Point Continuation Records](#)

Length: [1 Character](#)

Character Type: [Alpha](#)

3.0 Changes as depicted (Track Changes is Helpful)

4.1.35.2 GBAS Path Point Continuation Records

Column	Field Name (Length)	Reference
1 thru 26	Fields as on Primary Record Type	
27	Continuation Record Number (1)	5.16
28	Application Type (1)	5.91
29 thru 34	(FPAP) Ellipsoid Height (6)	5.225
35 thru 40	(FPAP) Orthometric Height (6)	5.227
41 thru 46	(LTP) Orthometric Height (6)	5.227
47 thru 56	Approach Type Identifier (10)	5.262
57 thru 61	GBAS/SBAS Channel Number (5)	5.244
62 thru 64	Lateral Alert Limit (3)	5.263
65 thru 67	Vertical Alert Limit (3)	5.264
68	Source of LAL/VAL (1)	5.xxx
62-69 thru 123	Blank (Spacing) (65 55)	
124 thru 128	File Record Number (5)	5.31
129 thru 132	Cycle Date (4)	5.32

5.263 Horizontal Alert Limit (HAL)/Lateral Alert Limit (LAL)

Definition/Description: The Horizontal Alert Limit (HAL) **for SBAS Path Points or Lateral Alert Limit (LAL) for GBAS Path Points** is the radius of a circle in the horizontal plane (the local plane tangent to the WGS-84 ellipsoid), with its center being at the true position, which describes the region which is required to contain the indicated horizontal position with the required probability for a particular navigation mode assuming the probability of a GPS satellite integrity failure being included in the position solution is less than or equal to 10^{-4} per hour.

Source/Content: A value, expressed in meters to a resolution of tenths of meters with the decimal point suppressed, derived from official government sources.

For GBAS Path Points, the value may be a derived value based on lines of minima or other information. The source will be indicated in 5.xxx

Used On: Airport and Helicopter Operations SBAS Path Point Records, **GBAS Path Point Continuation Records**

Length: 3 Characters

Character Type: Numeric

Examples: 400, 200, **100**

5.264 Vertical Alert limit (VAL)

Definition/Description: The Vertical Alert Limit (VAL) is half the length of a segment on the vertical axis (perpendicular to the horizontal plane of WGS-84 ellipsoid), with its center being at the true position, which describes the region which is required to contain the indicated vertical position with a probability of $1-10^{-7}$ per approach, assuming the probability of a GPS satellite integrity failure being included in the position solution is less than or equal to 10^{-4} per hour. For approaches with lateral only guidance, the VAL will equal 0. This indicates the vertical deviations cannot be used.

Source/Content: A value, expressed in meters to a resolution of tenths of meters with the decimal point suppressed, derived from official government sources.

For GBAS Path Points, the value may be a derived value based on lines of minima or other information. The source will be indicated in 5.xxx

Used On: Airport and Helicopter Operations SBAS Path Point Records, **GBAS Path Point Continuation Records**
Length: 3 Characters
Character Type: Numeric
Examples: 120, 500. **350, 100**

5.xxx Source of LAL/VAL

Definition/Description: The Source of LAL/VAL flag defines if the LAL and VAL values have been coded based on official source, or have been derived from other information.

Source/Content: A value of Y means that the LAL and VAL values are included in official source. A value of M means that the LAL and VAL values are derived defaults based on the available lines of minima for the GLS approach. A value of N means no indication is given and a default value is used. In case the LAL and VAL values are blank, this field is left blank as well.

Source of LAL/VAL	Approach Minima	LAL value (5.263)	VAL value (5.264)
Y		According Source	According Source
M	CAT 1	400	100
M	CAT 2	100	100
M	CAT 3	100	100
N		400	100

Used On: Airport and Helicopter Operations SBAS Path Point Records, GBAS Path Point Continuation Records
Length: 1 Character
Character Type: Alpha