ADS-B "Version Number" Subfield in Aircraft Operational Status Message

The ADS-B "Version Number" (VN) subfield is a 3-bit ("ME" bits 41 – 43, Message bits 73 – 75) field that **shall** be used to indicate the ADS-B Version Number of the formats and protocols in use on the aircraft installation. Encoding of the ADS-B Version Number subfield **shall** be as shown in Table 2-68. Airborne ADS-B systems conformant to the initial version of the 1090 MHz ADS-B MOPS (RTCA DO-260/EUROCAE ED-102) do not broadcast an explicit ADS-B Version Number. Therefore, ADS-B Receiving Subsystems conformant with this version of these MOPS (RTCA DO-260B/EUROCAE ED-102A) **shall** initially assume a ADS-B Version Number of ZERO (binary 000), until a received ADS-B Version Number data indicates otherwise.

Table 2-68: ADS-B Version Number Subfield Encoding

Coding		Meaning
(Binary)	(Decimal)	
000	0	Conformant to DO-260/ED-102 and DO-242
001	1	Conformant to DO-260A and DO-242A
010	2	Conformant to DO-260B/ED-102A and DO-242B
011 – 111	3 – 7	Reserved

"Navigation Accuracy Category for Position (NAC$_P$)" Subfield in Aircraft Operational Status Messages

The Navigation Accuracy Category for Position (NAC$_P$) is a 4-bit subfield of the ADS-B Aircraft Operational Status Message ("ME" bits 45 – 48, Message bits 77 – 80) that **shall** announce 95% accuracy limits for the horizontal position that is being currently broadcast in airborne position and surface position messages. Table 2-70 specifies the accuracy limits for each NAC$_P$ value. If an update has not been received from an on-board data source for NAC$_P$ within the past 2 seconds, then the NAC$_P$ subfield **shall** be encoded as a value of ZERO (0) indicating "Unknown Accuracy."

Note: *The Navigation Accuracy Category for Position (NAC$_P$) is reported so that surveillance applications may determine whether the reported geometric position has an acceptable level of accuracy for the intended use. See §2.1.2.13 of the ADS-B MASPS, RTCA DO-242A, for a fuller description of NAC$_P$.*

Table 2-70: Navigation Accuracy Category for Position (NAC$_P$) Encoding

Coding (Binary)	Coding (Decimal)	95% Horizontal Accuracy Bounds (EPU)	Comment	Notes
0000	0	EPU ≥ 18.52 km (≥10 NM)	Unknown accuracy	1
0001	1	EPU < 18.52 km (10 NM)	RNP-10 accuracy	1, 3
0010	2	EPU < 7.408 km (4 NM)	RNP-4 accuracy	1, 3
0011	3	EPU < 3.704 km (2 NM)	RNP-2 accuracy	1, 3
0100	4	EPU < 1852 m (1 NM)	RNP-1 accuracy	1, 3
0101	5	EPU < 926 m (0.5 NM)	RNP-0.5 accuracy	1, 3
0110	6	EPU < 555.6 m (0.3 NM)	RNP-0.3 accuracy	1, 3
0111	7	EPU < 185.2 m (0.1 NM)	RNP-0.1 accuracy	1, 3
1000	8	EPU < 92.6 m (0.05 NM)	e.g., GPS (with SA on)	1
1001	9	EPU < 30 m	e.g., GPS (SA off)	1, 2, 4
1010	10	EPU < 10 m	e.g., WAAS	1, 2, 4
1011	11	EPU < 3 m	e.g., LAAS	1, 2, 4
1100	12	Reserved		
1101	13	Reserved		
1110	14	Reserved		
1111	15	Reserved		

Notes for Table 2-70:

1. The Estimated Position Uncertainty (EPU) used in the table is a 95% accuracy bound on horizontal position. EPU is defined as the radius of a circle, centered on the reported position, such that the probability of the actual position lying outside the circle is 0.05. When reported by a GPS or GNSS system, EPU is commonly called HFOM (Horizontal Figure of Merit).

2. RNP accuracy includes error sources other than sensor error, whereas horizontal error for NAC_P only refers to horizontal position error uncertainty.

Table 2-14: "TYPE" Subfield Code Definitions (DF=17 or 18)

TYPE Code	Subtype Code	NIC Supplement A	NIC Supplement B	NIC Supplement C	Format (Message Type)	Horizontal Containment Radius Limit (R_c)	Navigation Integrity Category (NIC)	Altitude Type	Notes
0	Not Present	Not Applicable			No Position Information (Airborne or Surface Position Messages)	R_c unknown	NIC = 0	Baro Altitude or No Altitude Information	1, 2, 3
1	Not Present	Not Applicable			Aircraft Identification and Category Message (§2.2.3.2.5)	Not Applicable	Not Applicable	Not Applicable	Category Set D
2									Category Set C
3									Category Set B
4									Category Set A
5	Not Present	0	--	0	Surface Position Message (§2.2.3.2.4)	$R_c < 7.5$ m	NIC = 11	No Altitude Information	
6		0	--	0		$R_c < 25$ m	NIC = 10		
7		1	--	0		$R_c < 75$ m	NIC = 9		5
		0	--	0		$R_c < 0.1$ NM (185.2 m)	NIC = 8		
		1	--	1		$R_c < 0.2$ NM (370.4 m)	NIC = 7		
8		1	--	0		$R_c < 0.3$ NM (555.6 m)	NIC = 6		8
		0	--	1		$R_c < 0.6$ NM (1111.2 m)			
		0	--	0		$R_c \geq 0.6$ NM (1111.2 m) or unknown	NIC = 0		
9	Not Present	0	0	--	Airborne Position Message (§2.2.3.2.3)	$R_c < 7.5$ m	NIC = 11	Baro Altitude	
10		0	0	--		$R_c < 25$ m	NIC = 10		
11		1	1	--		$R_c < 75$ m	NIC = 9		5
		0	0	--		$R_c < 0.1$ NM (185.2 m)	NIC = 8		
12		0	0	--		$R_c < 0.2$ NM (370.4 m)	NIC = 7		
		0	1	--		$R_c < 0.3$ NM (555.6 m)	NIC = 6		
13		0	0	--		$R_c < 0.5$ NM (926 m)			7
		1	1	--		$R_c < 0.6$ NM (1111.2 m)			
14		0	0	--		$R_c < 1.0$ NM (1852 m)	NIC = 5		
15		0	0	--		$R_c < 2$ NM (3.704 km)	NIC = 4		
16		1	1	--		$R_c < 4$ NM (7.408 km)	NIC = 3		6
		0	0	--		$R_c < 8$ NM (14.816 km)	NIC = 2		
17		0	0	--		$R_c < 20$ NM (37.04 km)	NIC = 1		
18		0	0	--		$R_c \geq 20$ NM (37.04 km) or unknown	NIC = 0		
19	0	Not Applicable			Reserved	Not Applicable	Not Applicable	Difference between "Baro Altitude" and "GNSS Height (HAE)"	
	1 – 4				Airborne Velocity Message (§2.2.3.2.6)				
	5 – 7				Reserved				
20	Not Present	0	0	--	Airborne Position Message (§2.2.3.2.3)	$R_c < 7.5$ m	NIC = 11	GNSS Height (HAE)	2
21		0	0	--		$R_c < 25$ m	NIC = 10		
22		0	0	--		$R_c > 25$ m or unknown	NIC = 0		

Table 2-69: Navigation Integrity Category (NIC) Encoding.

NIC Value	Radius of Containment (R_c)	Airborne			Surface		
		Airborne Position TYPE Code	NIC Supplement Codes		Surface Position TYPE Code	NIC Supplement Codes	
			A	B		A	C
0	R_c unknown	0, 18 or 22	0	0	0, 8	0	0
1	R_c < 20 NM (37.04 km)	17	0	0	N/A	N/A	N/A
2	R_c < 8 NM (14.816 km)	16	0	0	N/A	N/A	N/A
3	R_c < 4 NM (7.408 km)	16	1	1	N/A	N/A	N/A
4	R_c < 2 NM (3.704 km)	15	0	0	N/A	N/A	N/A
5	R_c < 1 NM (1852 m)	14	0	0	N/A	N/A	N/A
6	R_c < 0.6 NM (1111.2 m)	13	1	1	8	0	1
	R_c < 0.5 NM (926 m)	13	0	0	N/A	N/A	N/A
	R_c < 0.3 NM (555.6 m)	13	0	1	8	1	0
7	R_c < 0.2 NM (370.4 m)	12	0	0	8	1	1
8	R_c < 0.1 NM (185.2 m)	11	0	0	7	0	0
9	R_c < 75m	11	1	1	7	1	0
10	R_c < 25m	10 or 21	0	0	6	0	0
11	R_c < 7.5m	9 or 20	0	0	5	0	0
12	Reserved						
13	Reserved						
14	Reserved						
15	Reserved						

Table 2-69 lists the possible NIC codes and the values of the TYPE Code subfield of the Airborne and Surface Position Messages, and of the NIC Supplement-A, NIC Supplement-B and NIC Supplement-C subfields that shall be used to encode those NIC codes in messages on the 1090 MHz ADS-B data link.

"Geometric Vertical Accuracy (GVA)" Subfield in Aircraft Operational Status Messages

The "Geometric Vertical Accuracy (GVA)" subfield of Subtype=0 Aircraft Operational Status Message is a 2-bit field ("ME" bits 49-50, Message bits 81-82) defined in Table 2-71. The GVA field **shall** be set by using the Vertical Figure of Merit (VFOM) (95%) from the GNSS position source used to report the geometric altitude.

Note: The geometric altitude may be reported directly in the altitude field in the Airborne Position Message or indirectly using the Difference From Barometric Altitude subfield (§2.2.3.2.6.1.15) in the Airborne Velocity Message (§2.2.3.2.6) when barometric altitude is reported in the altitude field in the Airborne Position Message (§2.2.3.2.3.4).

Table 2-71: Encoding of the Geometric Vertical Accuracy (GVA) Subfield in Aircraft Operational Status Messages

GVA Encoding (decimal)	Meaning (meters)
0	Unknown or > 150 meters
1	≤ 150 meters
2	< 45 meters
3	Reserved

Note: For the purposes of these MOPS (RTCA DO-260B/EUROCAE ED-102A) values for 0, 1 and 2 are encoded. It is expected that ADS-B transmitting subsystems with ADS-B Version Numbers greater than 2 will define the GVA encoding of "3" as a value less than 45 meters at some point in the future. Therefore, ADS-B Version 2 receiving subsystems should treat the GVA encoding of "3" as less than 45 meters for data received from ADS-B Version