International Civil Aviation Organization
North American, Central American and Caribbean Office

INFORMATION PAPER

ADS-B/LEG — IP/02
09/11/18

Automatic Dependent Surveillance – Broadcast (ADS-B) Implementation and Regulation Meeting for the NAM/CAR/SAM Regions (ADS-B/LEG)

Mexico City, Mexico, 26 to 30 November 2018

Agenda Item 3: Overview of ADS-B Versions

Differences between DO-260 (Version 0), DO-260A (Version 1), and DO-260B (Version 2)

(Presented by United States)

EXECUTIVE SUMMARY	
This information paper outlines the major differences between the three versions of ADS-B. States should understand these differences when decoding and using ADS-B messages.	
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• ICAO Doc 9871, [E]TSO-C166b, FAA AC 20-165B, EASA CS-ACNS, EASA AMC 20-24

1. Introduction

1.1 During the Fourth meeting of the ANI/WG in Miami, United States, the Surveillance Task Force noted that there is a need for States in the region to better understand the technical differences between the various versions of ADS-B, as defined in DO-260/ED-102, DO-260A, and DO-260B/ED-102A.

1.2 This information paper outlines the technical differences between the various standards of Automatic Dependent Surveillance – Broadcast (ADS-B) Out. Primarily, it focuses on the changes in the quality parameters contained in the various Airborne and Surface ADS-B messages

2. Discussion

2.1 There are currently three versions of ADS-B requirements:

a. Version 0 = DO-260/ED-102
b. Version 1 = DO-260A
c. Version 2 = DO-260B/ED-102A

Note: These terms are used interchangeably in existing ICAO and industry requirements, policies, and guidance documents.

2.2 DO-260/ED-102 provided the initial standardization for the ADS-B messages transmitted by Mode-S Extended Squitter capable systems. In the initial standard, the Navigation Uncertainty Category for Position (NUCp) was the only means to indicate the accuracy or integrity of the horizontal position data being used by the ADS-B system.

2.3 The limitations imposed by using only NUCp were recognized, and in DO-260A the formats and protocols were revised to:

a. Allow the accuracy and integrity to be reported separately under the Navigation Accuracy Category for Position (NACp), Navigation Integrity Category (NIC), and Surveillance Integrity Level (SIL).

b. Addition of status parameters and ADS-B messages (e.g. Target State and Status) for Traffic Information Service – Broadcast (TIS-B) and Automatic Dependent Surveillance – Rebroadcast (ADS-R). Note that currently, the FAA is the only ANSP providing TIS-B and ADS-R services.

2.4 DO-260B/ED-102A was modified based on experience gained through the operational use of ADS-B data. Some of the important changes in DO-260B/ED-102A were:

a. Separation of position source and system integrity reporting.

b. Additional levels of NIC to better support airborne and surface applications.

c. Incorporation of the Broadcast of Mode A code into the emergency/priority message, increased transmission rates after a Mode A code change, and the broadcast of the Mode A code on the surface.

d. Including additional parameters in the Target State and Status Message.

e. Removed the ability to use the vertical component when calculating the NIC and NAC parameters.

f. Transition of specific Event-Driven Messages to Periodic Messages.
    a. Target State and Status
    b. Aircraft Operational Message
    c. Aircraft Status Message

g. ADS-R formats were modified to be compatible with the changes introduced in Version 2.

2.4.1 The formats for the delivery of critical data (e.g. Position, Velocity, etc.) between Versions 0, 1, and 2 are interoperable. Minor differences with non-critical data exist between Version 2 and previous Versions of ADS-B.

Note: Refer to Table 4-1 in ICAO Doc 9871 for a list of differences.

2.5 The United States and Europe have published a mandate requiring aircraft flying into specified airspace be equipped with ADS-B Version 2 avionics.

2.6 In addition, the US and EU regulations require that the aircraft transmit the following ADS-B parameters:

Parameters	U.S.	E.U.
Length and width of the aircraft	R	R
Latitude and longitude	R	R
Barometric pressure altitude	R	R
Velocity	R	R
TCAS II or ACAS is installed & operating in a mode that can generate resolution advisories	R	R
If a resolution advisory is in effect when an operable TCAS II or ACAS is installed	R	R
Mode 3/A transponder code	R	R
Aircraft Identification (the aircraft's call sign)	R	R
An emergency, radio, communication failure, or unlawful interference indication	R	R
''IDENT'' indication (SPI)	R	R
Assigned ICAO 24-bit address	R	R
Emitter category	R	R
ADS–B In capability	R	O
Geometric altitude	R	R
Navigation Accuracy Category for Position (NAC_P)	R (≥8)	R (≥7)
Navigation Accuracy Category for Velocity (NAC_V)	R (≥1)	R (≥1)
Navigation Integrity Category (NIC)	R (≥7)	R (≥6)
System Design Assurance (SDA)	R (≥2)	R (≥2)
Source Integrity Level (SIL)	R (=3)	R (=3)
Version number	R ($=2^4$)	R ($=2^5$)
Geometric Vertical Accuracy (GVA)	O	R
Vertical rate	O	R
GNSS antenna offset	O	R
Selected altitude	O	R
Barometric pressure setting	O	R

R = Required, O = Optional

2.7 The following section outlines the major differences between ADS-B Version 0, 1, and 2 transmitters.

2.7.1 ADS-B Messages

DO-260/ED-102: Introduced periodic and event-driven messages.

Transponder Register	Event-Driven Message	1090ES ADS-B Message
BDS 0,5	No	Airborne Position
BDS 0,6	No	Surface Position
BDS 0,8	No	Aircraft Identification and Category
BDS 0,9	No	Airborne Velocity
BDS 6,1	Yes	Aircraft Status
BDS 6,5	Yes	Aircraft Operational Status

DO-260A: Added Target State and Status to the list of event-driven messages. BDS 6,2 was modified to represent both Emergency/Priority Status and ACAS RA Broadcast.

Transponder Register	Event-Driven Message	1090ES ADS-B Message
BDS 0,5	No	Airborne Position
BDS 0,6	No	Surface Position
BDS 0,8	No	Aircraft Identification and Category
BDS 0,9	No	Airborne Velocity
BDS 6,1	Yes	Aircraft Status / ACAS RA
BDS 6,2	Yes	Target State and Status Information
BDS 6,5	Yes	Aircraft Operational Status

Note: The fields in the Aircraft Operational Status Message were completely re-defined.

DO-260B/ED-102A: Moved ADS-B messages from the event-driven protocol to periodic messages.

Transponder Register	Event-Driven Message Priority	1090ES ADS-B Message	Broadcast Rate		
			On-the-Ground, not moving	On-the-Ground and moving	Airborne
BDS 0,5	N/A	Airborne Position	N/A	N/A	2 / 1 second (0.4 – 0.6 sec)
BDS 0,6	N/A	Surface Position	LOW RATE 1 / 5 seconds (4.8 – 5.2 sec)	HIGH RATE 2 / 1 second (0.4 – 0.6 sec)	N/A
BDS 0,8	N/A	Aircraft Identification and Category	LOW RATE 1 / 10 seconds (9.8 – 10.2 sec)	HIGH RATE 1 / 5 seconds (4.8 – 5.2 sec)	HIGH RATE 1 / 5 seconds (4.8 – 5.2 sec)
BDS 0,9	N/A	Airborne Velocity	N/A	N/A	2 / 1 second (0.4 – 0.6 sec)
BDS 6,1	TCAS RA = 1 Emergency = 2	Aircraft Status (Emergency/Priority Status, Subtype=1) (TCAS RA Broadcast, Subtype=2)	TCAS RA or Mode A Code Change 0.7 – 0.9 seconds		
			No TCAS RA, No Mode A Change 4.8 – 5.2 seconds		
BDS 6,2	N/A	Target State and Status (TSS)	N/A	N/A	1.2 – 1.3 seconds
BDS 6,5	N/A	Aircraft Operational Status	4.8 – 5.2 seconds	No change NIC_{SUPP}/NAC/SIL 2.4 – 2.6 seconds	TSS being broadcast or not No change TCAS/NAC/SIL/NIC_{SUPP} 2.4 – 2.6 seconds
				Change in NIC_{SUPP}/NAC/SIL 0.7 – 0.9 seconds	TSS being broadcast Change in TCAS/NAC/SIL/NIC_{SUPP} 2.4 – 2.6 seconds
					TSS not broadcast [2] Change in TCAS/NAC/SIL/NIC_{SUPP} 0.7 – 0.9 seconds

Note: Mode A code information was added to the Aircraft Status Message.

2.7.2 Integrity

DO-260/ED-102: Navigation Uncertainty Category for Position (NUC_p)

This information was calculated by using the Horizontal Protection Limit (HPL) received by the aircraft's position source (e.g. Flight Management System, Inertial Reference System, Global Positioning System receiver). The value of NUCp determines the Type Code transmitted in the Airborne and Surface Position Message.

AIRBORNE POSITION MESSAGE "ME" FIELD								
MSG BIT #	33--37	38 ---------- 39	40	41 ------ 52	53	54	55 --------- 71	72 --------- 88
"ME" BIT #	1 --- 5	6 ---------- 7	8	9 ------- 20	21	22	23 --------- 39	40 --------- 56
FIELD NAME	TYPE [5]	SURVEILLANCE STATUS [2]	SINGLE ANTENNA [1]	ALTITUDE [12]	TIME (T) [1]	CPR FORMAT (F) [1]	ENCODED LATITUDE [17]	ENCODED LONGITUDE [17]
	MSB LSB	MSB LSB	MSB LSB	MSB LSB			MSB LSB	MSB LSB

DO-260A: Navigation Integrity Category (NIC)

The information is calculated by the Containment Radius (Rc), or in combination with Vertical Protection Limit (VPL) for the three highest values of NIC. The value of the NIC in combination with the NIC Supplement (transmitted in the Aircraft Operational Status Message) determines the Type Code transmitted in the Airborne and Surface Position Message.

Aircraft Operational Status ADS-B Message "ME" Field Format													
MSG BIT #	33 - 37	38 - 40	41 - 52	53 - 56	57 - 72	73 - 75	76	77 - 80	81 - 82	83 - 84	85	86	87 - 88
"ME" BIT #	1 - 5	6 - 8	9 - 20	21 - 24	25 - 40	41 - 43	44	45 - 48	49 - 50	51 - 52	53	54	55 – 56
FIELD NAME	**TYPE=31 [5]**	**Subtype=0 [3]** / **Subtype=1 [3]**	**Capability Class (CC) Codes [16]** / **CC Codes [12]**	**L/W Codes [4]**	**Operational Mode (OM) Codes [16]**	**MOPS Version Number [3]**	**NIC Supp. [1]**	**NAC_P [4]**	**BAQ = 0 [2]** / **Reserved [2]**	**SIL [2]**	**NIC_{BARO} [1]** / **TRK/HDG [1]**	**HRD [1]**	**Reserved [2]**
	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB		MSB LSB	MSB LSB	MSB LSB			MSB LSB

DO-260B/ED-102A: Navigation Integrity Category (NIC)

This information is calculated solely based on the Containment Radius (Rc). The value of the NIC in combination with NIC Supplement A & B determines the Type Code to be transmitted in the Airborne Position Message. The value of the NIC in combination with NIC Supplement A & C determines the Type Code transmitted in the Surface Position Message.

Note: US and EU ADS-B Installation Guidance for ADS-B Version 2 (the latest versions of FAA AC 20-165 and EASA CS-ACNS) require that the ADS-B Out system be directly connected to a GNSS receiver. Unlike prior installations, Version 2 ADS-B Out systems cannot use a Flight Management System or an Inertial Reference System as a position source (though certain GNSS/IRU integrated position sources are allowed).

Airborne Position Message "ME" Field								
Msg Bit #	33 -37	38 ---------- 39	40	41 ----- 52	53	54	55 ---- 71	72 ---- 88
"ME" Bit #	1 – 5	6 ---------- 7	8	9 ----- 20	21	22	23 --- 39	40 --- 56
Field Name	**TYPE Code [5]**	**Surveillance Status [2]**	**NIC Supplement-B [1]**	**Altitude [12]**	**Time (T) [1]**	**CPR Format (F) [1]**	**CPR Encoded Latitude [17]**	**CPR Encoded Longitude [17]**
	MSB LSB	MSB LSB		MSB LSB			MSB LSB	MSB LSB

Aircraft Operational Status ADS-B Message "ME" Field Format														
MSG BIT #	33 - 37	38 - 40	41 - 52	53 - 56	57 - 72	73 - 75	76	77 - 80	81 - 82	83 - 84	85	86	87	88
"ME" BIT #	1 - 5	6 - 8	9 - 20	21 - 24	25 - 40	41 - 43	44	45 - 48	49 - 50	51 - 52	53	54	55	56
FIELD NAME	**TYPE=31 [5]**	**Subtype=0 [3]**	**Airborne Capability Class (CC) Codes [16]**		**Airborne Operational Mode (OM) Codes [16]**	**MOPS Version Number [3]**	**NIC Supplement-A [1]**	**NAC_P [4]**	**GVA [2]**	**Source Integrity Level (SIL) [2]**	**NIC_{BARO} [1]**	**HRD [1]**	**SIL Supp [1]**	**Reserved [1]**
		Subtype=1 [3]	**Surface CC Codes [12]**	**L/W Codes [4]**	**Surface Operational Mode (OM) Codes [16]**				**Reserved [2]**		**TRK/HDG [1]**			
	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB		MSB LSB	MSB LSB	MSB LSB				

Msg Bit #	41	42	43	44	45	46	47	48	49 – 51	52
"ME" Bit #	9	10	11	12	13	14	15	16	17 – 19	20
Content	0,0		**Reserved = 0**	**1090ES IN**	**Reserved = 0,0**		**B2 Low**	**UAT IN**	**NAC_V [3]**	**NIC Supplement-C**
	0,1		Reserved							
	1,0		Reserved							
	1,1		Reserved							

The following figures show the breakdown of the integrity quality parameter contained in both the Airborne and Surface position messages.

Airborne Position

Horizontal Protection Limit (DO-260)	*Nuc_p (DO-260)*	*Type Code (DO-260)*	*Horizontal Containment Radius (Rc) (DO-260A)*	*NIC (DO-260A)*	*NIC Supplement (DO-260A)*	*Type Code (DO-260A)*	*Horizontal Containment Radius (Rc) (DO-260B)*	*NIC (DO-260B)*	*NIC Supplement A,B (DO-260B)*	*Type Code (DO-260B)*
HPL < 7.5 m	9	9	Rc < 7.5 m **and** VPL < 11 m	11	0	9	Rc < 7.5 m	11	0, 0	9
HPL < 25 m	8	10	Rc < 25 m **and** VPL < 37.5 m	10	0	10	Rc < 25 m	10	0, 0	10
HPL < 0.1 NM	7	11	Rc < 75 m **and** VPL < 112 m	9	1	11	Rc < 75 m	9	1,1	11
HPL < 0.2 NM	6	12	Rc < 0.1 NM	8	0		Rc < 0.1 NM	8	0,0	
HPL < 0.5 NM	5	13	Rc < 0.2 NM	7	0	12	Rc < 0.2 NM	7	0,0	12
HPL < 1.0 NM	4	14	Rc < 0.6 NM	6	1	13	Rc < 0.3 NM	6	0,1	13
HPL < 2.0 NM	3	15	Rc < 0.5 NM	6	0		Rc < 0.5 NM	6	0,0	
HPL < 10 NM	2	16	Rc < 1.0 NM	5	0	14	Rc < 0.6 NM	6	1,1	
HPL < 20 NM	1	17	Rc < 2 NM	4	0	15	Rc < 1.0 NM	5	0,0	14
HPL ≥ 20 NM	0	18	Rc < 4 NM	3	1	16	Rc < 2 NM	4	0,0	15
			Rc < 8 NM	2	0		Rc < 4 NM	3	1,1	16
			Rc < 20 NM	1	0	17	Rc < 8 NM	2	0,0	
			Rc ≥ 20 NM or unknown	0	0	18	RC < 20 NM	1	0,0	17
							Rc ≥ 20 NM or unknown	0	0,0	18

Surface Position

Horizontal Protection Limit (DO-260)	*Nuc_p (DO-260)*	*Type Code (DO-260)*	*Horizontal Containment Radius (DO-260A)*	*NIC (DO-260A)*	*NIC Supplement (DO-260A)*	*Type Code (DO-260A)*	*Horizontal Containment Radius (DO-260B)*	*NIC Supplement A,C (DO-260B)*	*NIC (DO-260B)*	*Type Code (DO-260B)*
HPL < 7.5 m	9	5	Rc < 7.5 m	11	0	5	Rc < 7.5 m	0,0	11	5
HPL < 25 m	8	6	Rc < 25 m	10	0	6	Rc < 25 m	0,0	10	6
HPL < 0.1 NM	7	7	Rc < 75 m	9	1	7	Rc < 75 m	1,0	9	7
HPL ≥ 0.1 NM	6	8	Rc < 0.1 NM	8	0	7	Rc < 0.1 NM	0,0	8	
			Rc ≥ 0.1 NM or unknown	0	0	8	Rc < 0.2 NM	1,1	7	8
							Rc < 0.3 NM	1,0	6	
							RC < 0.6 NM	0,1		
							Rc ≥ 0.6 NM or uknown	0,0	0	

2.7.3 Velocity

DO-260/ED-102: Navigation Uncertainty Category for Velocity (NUC_R)

This information is calculated using the Horizontal Figure of Merit (HFOM) and Vertical Figure of Merit (VFOM).

DO-260A: Navigation Accuracy Category for Velocity (NAC_v)

The parameter changed name to Navigation Accuracy Category for Velocity. The information continues to be calculated the same.

DO-260B/ED-102A: Navigation Accuracy Category for Velocity (NAC_v)

The information is calculated using only the Horizontal Figure of Merit, and is no longer allowed to use the Vertical component.

NUC_R or NACv	$HFOM_R$ and $VFOM_R$ for DO-260 and DO-260A	$HFOM_R$ for DO-260B
4	$HFOM_R < 0.3m/s$ and $VFOM_R < 0.46m/s$	$HFOM_R < 0.3m/s$
3	$HFOM_R < 1m/s$ and $VFOM_R < 1.5m/s$	$HFOM_R < 1m/s$
2	$HFOM_R < 3m/s$ and $VFOM_R < 4.6m/s$	$HFOM_R < 3m/s$
1	$HFOM_R < 10m/s$ and $VFOM_R < 15.2m/s$	$HFOM_R < 10m/s$
0	$HFOM_R \geq 10m/s$ or $VFOM_R \geq 15.2m/s$ or unknown	$HFOM_R \geq 10m/s$ or unknown

2.7.4 Surveillance Integrity Level / Source Integrity Level (SIL)

DO-260/ED-102: NOT AVAILABLE.

DO-260A: Introduced the Surveillance Integrity Level parameter to indicate the probability of the reported position exceeding the Integrity Containment Radius (Rc) reported as NIC without being detected.

SIL	Probability of exceeding the R_c
3	$\leq 1 \times 10^{-7}$ per flight hour or per sample
2	$\leq 1 \times 10^{-5}$ per flight hour or per sample
1	$\leq 1 \times 10^{-3}$ per flight hour or per sample
0	$>1 \times 10^{-3}$ per flight hour or per sample or unknown

DO-260B/ED-102A: The quality parameter was renamed from Surveillance Integrity Level to Source Integrity Level (SIL), to indicate that the reported integrity level is for the position source only. In addition, a SIL Supplement was also introduced to indicate whether the SIL value is calculated based on a per flight hour or per sample basis.

SIL supplement	Probability of exceeding the R_c
0	Based on per hour
1	Based on per sample

2.7.5 System Design Assurance (SDA)

DO-260/ED-102: NOT AVAILABLE

DO-260A: NOT AVAILABLE

DO-260B/ED-102A: Introduced to indicate the probability of undetected faults in the ADS-B system leading to the transmission of false or misleading information.

SDA Value	Probability of Undetected Fault causing transmission of False or Misleading Information
3	$\leq 1 \times 10^{-7}$ per flight hour
2	$\leq 1 \times 10^{-5}$ per flight hour
1	$\leq 1 \times 10^{-3}$ per flight hour
0	$>1 \times 10^{-5}$ per flight hour or unknown

2.7.6 Navigation Accuracy Category for Position (NAC_p)

DO-260/ED-102: NOT AVAILABLE

DO-260A: Introduced the parameter to portray the accuracy of the position. The parameter is derived from the 95% Horizontal and Vertical Accuracy Bounds (e.g. HFOM, VFOM).

DO-260B/ED-102A: Removed the ability to derive NAC_p by using the vertical component (i.e. VFOM) information. The parameter can only be calculated using the horizontal component.

<table>
<tr><th colspan="16">Aircraft Operational Status ADS-B Message "ME" Field Format</th></tr>
<tr><td>MSG BIT #</td><td>33 - 37</td><td>38 - 40</td><td>41 - 52</td><td>53 - 56</td><td>57 - 72</td><td>73 - 75</td><td>76</td><td>77 - 80</td><td>81 - 82</td><td>83 - 84</td><td>85</td><td>86</td><td>87</td><td>88</td></tr>
<tr><td>"ME" BIT #</td><td>1 - 5</td><td>6 - 8</td><td>9 - 20</td><td>21 - 24</td><td>25 - 40</td><td>41 - 43</td><td>44</td><td>45 - 48</td><td>49 - 50</td><td>51 - 52</td><td>53</td><td>54</td><td>55</td><td>56</td></tr>
<tr><td rowspan="2">FIELD NAME</td><td rowspan="2">TYPE=31 [5]</td><td>Subtype=0 [3]</td><td colspan="2">Airborne Capability Class (CC) Codes [16]</td><td>Airborne Operational Mode (OM) Codes [16]</td><td rowspan="2">MOPS Version Number [3]</td><td rowspan="2">NIC Supplement-A [1]</td><td rowspan="2">NAC_P [4]</td><td>GVA [2]</td><td rowspan="2">Source Integrity Level (SIL) [2]</td><td>NIC_{BARO} [1]</td><td rowspan="2">HRD [1]</td><td rowspan="2">SIL Supp [1]</td><td rowspan="2">Reserved [1]</td></tr>
<tr><td>Subtype=1 [3]</td><td>Surface CC Codes [12]</td><td>L/W Codes [4]</td><td>Surface Operational Mode (OM) Codes [16]</td><td>Reserved [2]</td><td>TRK/HDG [1]</td></tr>
<tr><td></td><td>MSB LSB</td><td>MSB LSB</td><td>MSB LSB</td><td>MSB LSB</td><td>MSB LSB</td><td>MSB LSB</td><td></td><td>MSB LSB</td><td>MSB LSB</td><td>MSB LSB</td><td></td><td></td><td></td><td></td></tr>
</table>

NAC_P	95% Horizontal and Vertical Accuracy Bounds (EPU and VEPU) for DO-260A	95% Horizontal Accuracy Bounds (EPU) for DO-260B	Comment
0	EPU ≥ 10NM	EPU ≥ 10NM	Unknown accuracy
1	EPU < 10NM	EPU < 10NM	RNP-10 accuracy
2	EPU < 4NM	EPU < 4NM	RNP-4 accuracy
3	EPU < 2NM	EPU < 2NM	RNP-2 accuracy
4	EPU < 1NM	EPU < 1NM	RNP-1 accuracy
5	EPU < 0.5NM	EPU < 0.5NM	RNP-0.5 accuracy
6	EPU < 0.3NM	EPU < 0.3NM	RNP-0.3 accuracy
7	EPU < 0.1NM	EPU < 0.1NM	RNP-0.1 accuracy
8	EPU < 0.05NM	EPU < 0.05NM	e.g. GPS (with SA on)
9	EPU < 30m and VEPU < 45m	EPU < 30m	e.g. GPS (SA off)
10	EPU < 10m and VEPU < 15m	EPU < 10m	e.g. WAAS
11	EPU < 3m and VEPU < 4m	EPU < 3m	e.g. LAAS
12-15	Reserved	Reserved	

Note: Estimated Position Uncertainty (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.

2.7.7 Barometric Altitude Integrity Code (NIC_{BARO})

DO-260/ED-102: NOT AVAILABLE

DO-260A: Introduced this parameter to indicate when the barometric pressure altitude has been cross-checked against a separate source of pressure altitude prior to being reported.

DO-260B/ED-102A: No change to this parameter from DO-260A.

Coding	Meaning
0	The barometric altitude that is being reported in the Airborne Position Message has not been cross-checked against another source of pressure altitude.
1	The barometric altitude that is being reported in the Airborne Position message has been cross-checked against another source of pressure altitude and verified as being consistent.

2.7.8 Aircraft Length/Width Code

DO-260/ED-102: NOT AVAILABLE

DO-260A: Introduced the encoding of the aircraft length and width code in the Aircraft Operational Status Message.

DO-260B/ED-102A: No change to the parameter from DO-260A.

L/W code	Length Category	Width Category
0	L<15m	W < 11.5m
1		W < 23m
2	L<25m	W < 28.5m
3		W < 34m
4	L<35m	W < 33m
5		W < 38m
6	L<45m	W < 39.5m
7		W <45m
8	L<55m	W < 45m
9		W < 52m
10	L<65m	W < 59.5m
11		W < 67m
12	L<75m	W < 72.5m
13		W < 80m
14	L<85m	W < 80m
15		W > 80m

2.7.9 Geometric Vertical Accuracy

DO-260/ED-102: NOT AVAILABLE

DO-260A: NOT AVAILABLE

DO-260B/ED-102A: Introduced in the Aircraft Operational Status message. Previously, the vertical component (i.e. VFOM) was used in calculating NAC_p (refer to Section 2.7.6). The VFOM used to encode the geometric altitude field in the Airborne Position Message is now used to calculate the Geometric Vertical Accuracy (GVA).

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

2.7.10 GNSS Antenna Offset

DO-260/ED-102: NOT AVAILABLE

DO-260A: NOT AVAILABLE

DO-260B/ED-102A: Introduced in the Aircraft Operational Status message OM field. This field identifies the position of the offset of the GPS antenna from the lateral and longitudinal axis of the aircraft.

Note: The latest versions of FAA AC 20-165() and EASA CS-ACNS contains guidance on how to properly encode this parameter.

2.7.11 Selected Altitude

DO-260/ED-102: NOT AVAILABLE

DO-260A: Introduced the Target State and Status message into the ADS-B message set. This message included information on the aircrafts Target Altitude. The information contained in this field was intended to represent the aircraft's next intended level-off altitude if in a climb or descent, or current altitude if the aircraft intends to remain at its current altitude.

DO-260B/ED-102A: Re-defined the Target State and Status message transmitted as Type Code 29 Subtype 1. The message includes two fields related to Selected Altitude:

a. Selected Altitude Type
b. MCP/FCU Selected Altitude or FMS Selected Altitude

2.7.12 Barometric Pressure Setting

DO-260/ED-102: NOT AVAILABLE

DO-260A: NOT AVAILABLE

DO-260B/ED-102A: Introduced in the newly defined Target State and Status message. This field provides the Barometric Pressure Setting of the aircraft after being adjusted by 800 millibars from the data received from the Barometric Pressure Setting Source (i.e. Barometric Press Setting – 800 millibars).

2.7.13 TCAS II or ACAS Operational

DO-260/ED-102: Created the baseline for the TCAS/ACAS operational status in the Aircraft Operational Status Message CC field. This field was encoded using four (2) bits.

CC 4 CODING		MEANING
Bit 9,10	Bit 11,12	
0 0	0 0	*TCAS Operational or unknown; CDTI not Operational or unknown*
	0 1	*TCAS Operational or unknown; CDTI Operational*
	1 0	*TCAS not Operational; CDTI not Operational or unknown*
	1 1	*TCAS not Operational; CDTI Operational*

DO-260A: Re-defined the number of bits needed to encode the Aircraft Operational Status Message CC field from two (2) to one (1) bits.

Msg Bit #	41	42	43	44	45	46	47	48	49	50	51 -- 56
"ME" Bit #	9	10	11	12	13	14	15	16	17	18	19 -- 24
Content	**Service Level** MSBs = 0 0		**Not-TCAS**	**CDTI**	**Service Level** LSBs = 0 0		**ARV**	**TS**	**TC**		**Reserved**

DO-260B/ED-102A: Re-named the field in the Airborne Operational Status Message CC field. Introduced a new field in the Target State and Status message. This field indicates whether the aircraft's TCAS system is operational. The information encoded in the Target State and Status message is equivalent to the information found in the Airborne Aircraft Operational Status Message CC field.

Msg Bit #	41	42	43	44	45	46	47	48	49	50	51	52	53 – 56
"ME" Bit #	9	10	11	12	13	14	15	16	17	18	19	20	21 -- 24
Content	0,0		**TCAS Operational**	**1090ES IN**	**Reserved** = 0,0		**ARV**	**TS**	**TC**		**UAT IN**	**Reserved for ADS-R**	**Reserved [4]**

Coding	**Meaning**
0	TCAS System is NOT Operational (Any time RI ≠ 3 or 4)
1	TCAS System is Operational (RI = 3 or 4)

2.7.14 TCAS II Resolution Advisory

DO-260/ED-102: NOT AVAILABLE

DO-260A: Introduced the TCAS/ACAS Resolution Advisory Active bit in the Aircraft Operational Status Message OM field. The bit identifies when a TCAS II system is in an active Resolution Advisory condition.

DO-260B/ED-102A: No change to the parameter from DO-260A.

2.7.15 Mode 3/A Transponder Code

DO-260/ED-102: NOT AVAILABLE

DO-260A: Introduced the ability to transmit the Aircraft Mode A code in a "TEST" message (Type Code 23, Subtype 7). This message is not known to have been used operationally.

MSG Bit #	33 ---------- 37	38 ---------- 40	41 ----- 53	54 ---------- 88
"ME" Bit #	1 ---------- 5	6 ---------- 8	9 ----- 21	22 ---------- 56
Field Name	**TYPE=23 [5]**	**SUBTYPE=7 [3]**	**Mode A Code [13]**	**Reserved [35]**
	MSB LSB	MSB LSB	MSB LSB	MSB LSB

Msg Bit #	33 37	38 40	41 43	44 88
"ME" Bit #	1 5	6 8	9 11	12 56
Field Name	TYPE=28 [5]	Subtype=1 [3]	Emergency/ Priority Status [3]	Reserved [45]
	MSB LSB	MSB LSB	MSB LSB	MSB LSB

DO-260B/ED-102A: Reformatted the Aircraft Status Message, Subtype 1, to include the Aircraft Mode A Code.

Msg Bit #	33 ----- 37	38 ------ 40	41 -------- 43	44 --------- 56	57 ---------- 88
"ME" Bit #	1 ------- 5	6 -------- 8	9 --------- 11	12 --------- 24	25 ---------- 56
Field Name	TYPE=28 [5]	Subtype=1 [3]	Emergency/ Priority Status [3]	Mode A Code [13]	Reserved [45]
	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB

2 Conclusion

2.1 States are invited to note the contents in the paper.

2.2 States should determine the appropriate version of ASTERIX CAT021 required to meet the desired needs:

a) v0.23 for DO-260/ED-102
b) v1.0 or later for DO-260/ED-102 & DO-260A
c) v2.1 or later for DO-260/ED-102, DO-260A & DO-260B/ED-102A

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