RTCA Special Committee 186, Working Group 3

ADS-B 1090 MOPS, Revision A

Meeting #13

Proposed New Appendix N, detailing the Proposed DO-260A Provisions for Backward Compatibility with DO-260 Message Formats

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Summary

DO-260A will include a number of changes to the Extended Squitter ADS-B Message formats. 1090 MHz Extended Squitter receivers built and certified against DO-260A will need to interoperate with ADS-B Transmitting Subsystems that are broadcasting ADS-B Messages in the ADS-B Version 0 format defined by DO-260. Since DO-260A will replace DO-260, the definition of the ADS-B Version 0 messages will need to be retained within DO-260A.

References:

1. DO-260, MOPS for 1090 MHz ADS-B, Sept. 2000

2. DO-260A, working draft, August 2002

1. Introduction

DO-260A will include a number of changes to the extended squitter ADS-B message formats. 1090 MHz extended squitter receivers built and certified against DO-260A will need to interoperate with ADS-B systems that are broadcasting ADS-B messages in the ADS-B Version 0 format defined by DO-260. Since DO-260A will replace DO-260, the definition of the ADS-B Version 0 messages that must be decoded and used by the report assembly function of a Version 1 receiving system will need to be retained within DO-260A, at least at a minimal level.

2. Proposal

Attachment 1 to this working paper proposes a number of changes within section 2.2 of the MOPS to require backward compatibility with ADS-B Version 0 messages. Attachment 2 to this working paper proposes a new Appendix N that would define the format of the ADS-B Version 0 messages that must be supported by a Version 1 1090 MHz ADS-B receiver. Note that TCP and operational coordination messages, as defined by DO-260, are not required to be used by Version 1 receivers as they are not used for report generation as per draft DO-260A and DO-242A.

ATTACHMENT 1

Proposed DO-260A Changes to require interoperability with Version 0 messages

Para. 2.2.3.2.7.3.5 (Version Number subfield in Aircraft Operational Status Message) – Modify as shown below (original draft text from WP12-13)

The "Version Number" subfield is a 3-bit ("ME" bits 41 through 43, Message bits 73 through 75) field used to indicate the Version Number of the formats and protocols in use on the aircraft installation. Encoding of the Version Number subfield shall be as shown in Table 2.2.3.2.7.3.5 (and in Table A-21 in Appendix A). Upon receipt of an Aircraft Operational Status Message (i.e., with a message type code of 31), ADS-B Receiving Subsystems conformant with this version of the 1090 MHz MOPS shall decode 'ME' bits 41 through 43 in order to determine the ADS-B Version to be used for the decoding of the remainder of the message. An ADS-B Version One (1) receiving system shall, as a default, ~~will~~ initially assume a Version Number of Zero (binary 000), until received Version Number data indicates otherwise. However, in the case of an ADS-B Version One (1) receiving system's reception of an Aircraft Operational Status message, the receiving system shall decode ME bits 41-43 (i.e., the Version Number subfield) to determine ADS-B Version Number in order to correctly decode the remainder of that message (i.e., applying the message format applicable to that version number).

The version determined from the decoding of the Version Number subfield of the Aircraft Operational Status message shall be retained and associated with the specific target. This version number shall then be used for determining the applicable message formats to be applied for the decoding of all subsequent 1090 MHz ADS messages received from that target.

Notes: 1. A summary of the DO-260 compliant, ADS-B Version Zero (0), message formats that must be accommodated by Version One (1) 1090 MHz ADS-B receiving systems is provided in Appendix N.

2. The Version One (1) Aircraft Operational Status message format includes an explicit Version Number subfield ("ME" bits 41-43). For an ADS-B Version Zero (0) Aircraft Operational Status message these same bits are unassigned and are required to be set to a value of Zero (binary 000). Thus in this latter case a 1090 MHz ADS-B receiving system will decode "ME" bits 41-43 to indicate a version number of Zero (0).

Table 2.2.3.2.7.3.5: Version Number Encoding in Aircraft Operational Status Message.

Value	MOPS Version	MASPS Version
0	DO-260	DO-242
1	DO-260A	DO-242A
2-7	Reserved for future growth	Reserved for future grown

Para. 2.2.9.1 (ADS-B Receiver Reporting Requirements for Class A Equipage) – Add a new second paragraph:

> The report assembly function shall maintain backward compatibility with prior versions of the relevant 1090 MHz ADS-B messages (i.e., Airborne Position, Surface Position, Airborne Velocity, Aircraft Status, and Aircraft Operational Status, Identification and Category) that are used to as the basis to generate State Vector, Air Referenced Velocity and Mode Status Reports. The message formats used for Version Zero (0) messages, conformant to DO-260, are defined in Appendix N.

Para. 2.2.9.1.3 (ADS-B Target State Reports for Class A Equipage) – Add new third paragraph and a note:

> c. Target State Reports for newly acquired target aircraft shall not be provided until or unless an Aircraft Operational Status Message (Para. 2.2.3.2.7.3) has been received from the target aircraft indicating an ADS-B Version Number of other than Zero (0).
>
> *Note: Version Zero (0) messages that convey trajectory intent information using message type code 29 (see Appendix N) are not used by 1090 MHz ADS-B receiving systems conformant to this MOPS for the purpose of report generation. Therefore a positive determination that the applicable Version Number is other than Zero (0) for a received message with a type code of 29 is necessary in order to avoid errors in the reporting of the target aircraft trajectory intent.*

Appendix N

Version 0 (DO-260) Extended Squitter Formats And Coding Definitions

<<<<<Editors Notes: Will need to check cross references to Appendix A and to the new material on Version 0 mapping to NIC/NAC/SIL after those changes are agreed. Also we may be able to replace some of the proposed following appendix N text with a reference to Appendix A if the new Appendix A contains identical material.>>>>>

N.1 Introduction

Notes:

1. This appendix defines the formats and coding for extended squitter ADS-B messages that are broadcast by ADS-B Version Zero (0), DO-260 conformant 1090MHz ADS-B systems. 1090 MHz ADS-B receivers are required to be backward compatible with the ADS-B Version Zero (0) messages as defined in this appendix.

2. When extended squitter capability is incorporated into a Mode S transponder, the registers used to contain the extended squitter messages are part of the transponder's Ground-Initiated Comm-B service. This service consists of defined data available on board the aircraft being put into one of the 255 registers (each with a length of 56 bits) in the Mode S transponder by a serving process, e.g. ADS-B, at specified intervals. The Mode S ground interrogator can extract the information from any of these registers at any time and pass it to the ground-based application. In the case of extended squitter, the information in the registers defined for ADS-B are spontaneously broadcast as specified in RTCA/DO-181B.

3 If the extended squitter capability is implemented as a non-transponder function, the convention for register numbering does not apply. However, the data content conveyed in the ADS-B message is the same as specified for the transponder case.

N.2 1090 MHz ADS-B Message Types

Table N-1 provides the those ADS-B Version Zero (0) (i.e., originating from a DO-260 conformant 1090 MHz ADS-B system) 1090 MHz ADS-B messages that shall be received and processed by a Version One (1) conformant receiving system. Table N-1 also defines the associated Mode S transponder register allocation.

Note: Table N-1 lists only those Version Zero (0) 1090 MHz message types that are required to be received by a Version One (1) 1090 MHz ADS-B receiving system. The other Version Zero (0) messages types defined by DO-260, including messages types 29 and 30, are not used by Version One (1) receiving systems for the purpose of ADS-B report generation.

Table N-1 ADS-B Version 0 Register Allocation/Message Types

Transponder Register number	Extended Squitter Message Type Code(s)	Assignment	Nominal Broadcast Rate
05_{16}	9 through 18 and 20 through 22	Extended squitter Airborne Position	0.5 s
06_{16}	5 through 8	Extended squitter Surface Position	0.5 s in motion/5.0 s stationary
08_{16}	1 through 4	Extended squitter Identification and Type	5.0 s airborne/10.0 s surface
09_{16}	19	Extended squitter Airborne Velocity	0.5 s
61_{16}	28	Extended squitter Aircraft Status (e.g., emergency/priority)	1.0 s
65_{16}	31	Aircraft Operational Status	1.7 s

Notes: The register number is equivalent to the BDS B-Definition Subfield (BDS) value 2.2.14.4.14.b of DO-181B.

N.3 General Conventions On Data Formats

N.3.1 Validity of Data

The data value is expected to be valid at the time of broadcast. This is indicated by a data field status (i.e., validity) bit (if provided). When this status bit is set to "ONE," the associated data field(s) are valid. When this status bit is set to "ZERO," the associated data field(s) are invalid.

N.3.2 Representation of Numerical Data

Numerical data shall be represented as follows:

1. Numerical data are represented as binary numerals. When the value is signed, 2's complement representation is used, and the bit following the status bit is the sign bit.

2. Whenever applicable, the resolution has been either tailored to the corresponding ARINC 429 label or aligned with ICAO documents.

3. Unless otherwise specified, whenever more bits of resolution are available from the data source than in the data field into which that data is to be loaded, the data shall be rounded to the nearest value that can be encoded in that data field.

4. Where ARINC 429 data are used, the ARINC 429 status bits 30 and 31 are replaced with a single status bit, for which the value is VALID or INVALID as follows:

   a) If bits 30 and 31 represent "Failure Warning, No Computed Data" then the status bit shall be set to "INVALID."

   b) If bits 30 and 31 represent "Normal Operation," "plus sign," or "minus sign," or "Functional Test" then the status bit shall be set to "VALID" provided that the data are being updated at the required rate.

c) If the data are not being updated at the required rate, then the status bit shall be set to "INVALID."

For interface formats other than ARINC 429, a similar approach is used.

5. In all cases where a status bit is used, it must be set to "ONE" to indicate VALID and to "ZERO" to indicate INVALID.

6. Where the sign bit (ARINC 429 bit 29) is not required for a parameter, it has been actively excluded.

7. Bits are numbered in the Message, Comm-B Field in order of their transmission, beginning with bit 1. If numerical values are encoded by groups of bits (fields), then the first bit transmitted is the most significant bit (MSB) unless otherwise stated.

Note: BDS A, B is equivalent to register number AB_{16}.

N.4 Extended Squitter Formats for ADS-B Version Zero (0) Systems

N.4.1 Format Type Codes

The first 5-bit field in every Mode S extended squitter message shall contain the format type. The format type shall differentiate the messages into several classes: airborne position, airborne velocity, surface position, identification, aircraft state, etc. In addition, the format type shall encode the measurement precision category into classes based on the Horizontal Protection Limit (HPL) or horizontal position error of the source used for the position report. The format type shall also differentiate the airborne messages as to the type of their altitude measurements: barometric pressure altitude or GNSS height (HAE). The 5-bit encoding for format type shall conform to the definition contained in Table N-2. The horizontal containment radius and vertical position error information that is conveyed in the ADS-B Version Zero (0) 1090 format type shall be mapped into a Navigation Integrity Category (NIC) as defined for Version One (1) messages for the purpose of ADS-B report generation. The required mapping is provided in Table 2.2.3.2.3.1.

Table N-2 Format Type Codes

"TYPE" Subfield Code Definitions (DF = 17 or 18)					
Type Code	**Format**	**Horizontal Protection Limit, HPL**	**95% Containment Radius, m and n, On Horizontal and Vertical Position Error**	**Altitude Type**	**NUC_P**
0	No Position Information			Baro Altitude or No Altitude Information	0
1	Identification (Category Set D)			*Not Applicable*	
2	Identification (Category Set C)			*Not Applicable*	
3	Identification (Category Set B)			*Not Applicable*	
4	Identification (Category Set A)			*Not Applicable*	
5	Surface Position	HPL < 7.5 m	μ< 3 m	No Altitude Information	9
6	Surface Position	HPL < 25 m	3 m $\leq \mu$ < 10 m	No Altitude Information	8
7	Surface Position	HPL < 185.2 m (0.1 NM)	10 m $\leq \mu$ < 92.6 m (0.05 NM)	No Altitude Information	7
8	Surface Position	HPL $\geq$ 185.2 m (0.1 NM)	(0.05 NM) 92.6 m $\leq \mu$	No Altitude Information	6
9	Airborne Position	HPL < 7.5 m	μ < 3 m	Baro Altitude	9
10	Airborne Position	7.5 m $\leq$ HPL < 25 m	3 m $\leq \mu$ < 10 m	Baro Altitude	8
11	Airborne Position	25 m $\leq$ HPL < 185.2 m (0.1 NM)	10 m $\leq \mu$ < 92.6 m (0.05 NM)	Baro Altitude	7
12	Airborne Position	185.2 m (0.1 NM) $\leq$ HPL < 370.4 m (0.2 NM)	92.6 m (0.05 NM) $\leq \mu$ < 185.2 m (0.1 NM)	Baro Altitude	6
13	Airborne Position	380.4 m (0.2 NM) $\leq$ HPL < 926 m (0.5 NM)	185.2 m (0.1 NM) $\leq \mu$ < 463 m (0.25 NM)	Baro Altitude	5
14	Airborne Position	26 m (0.5 NM) $\leq$ HPL < 1852 m (1.0 NM)	463 m (0.25 NM) $\leq \mu$ < 926 m (0.5 NM)	Baro Altitude	4
15	Airborne Position	1852 m (1.0 NM) $\leq$ HPL < 3704 m (2.0 NM)	926 m (0.5 NM) $\leq \mu$ < 1.852 km (1.0 NM)	Baro Altitude	3
16	Airborne Position	7.704 km (2.0 NM) $\leq$ HPL < 18.52 km (10 NM)	1.852 km (1.0 NM) $\leq \mu$ < 9.26 km (5.0 NM)	Baro Altitude	2
17	Airborne Position	18.52 km (10 NM) $\leq$ HPL < 37.04 km (20 NM)	9.26 km (5.0 NM) $\leq \mu$ < 18.52 km (10.0 NM)	Baro Altitude	1
18	Airborne Position	HPL $\geq$ 37.04 km (20 NM)	8.52 km (10.0 NM) $\leq \mu$	Baro Altitude	0
19	Airborne Velocity	*Not Applicable*	*Not Applicable*	*Difference between "Baro Altitude" and "GNSS Height (HAE) or GNSS Alr (MSL)"(N.4.5.6)*	*N/A*
20	Airborne Position	HPL < 7.5 m	μ < 3 m and ν < 4 m	GNSS Height (HAE)	9
21	Airborne Position	HPL < 25 m	μ < 10 m and ν < 15 m	GNSS Height (HAE)	8
22	Airborne Position	HPL $\geq$ 25 m	$\mu \geq$ 10 m or $\nu \geq$ 15 m	GNSS Height (HAE)	**TBD**
23	Reserved for Test Purposes				
24	Reserved for Surface System Status				
25 - 27	Reserved				
28	Extended Squitter Aircraft Status				
29	Reserved (for ADS-B Version 0 systems) for Trajectory Intent and System Satus				
30	Reserved				
31	Aircraft Operational Status				

Notes:

1. *"Baro-Altitude" refers to barometric pressure altitude, relative to a standard pressure of 1013.25 millibars (29.92 in Hg). It does not refer to baro corrected altitude.*

2. *The GNSS height (HAE) defined in Type Codes 20 to 22 is used when baro altitude is not available.*

3. *The term "broadcast" as used in this appendix refers to a spontaneous transmission by the transponder. This is distinct from the Comm-B broadcast protocol.*

4. *ADS-B Version Zero (0) message formats define the 95% containment limit, m, on horizontal position error is derived from ARINC 429 label 247, HFOM (Horizontal Figure of Merit). Likewise, the 95% containment limit, n, on vertical position error is derived from ARINC 429 label 136, VFOM (Vertical Figure of Merit). The horizontal protection level, HPL, is derived from ARINC 429 label 130, which is variously called HIL (Horizontal Integrity Limit) or HPL (Horizontal Protection Level).*

N.4.2 Airborne Position Message Format

The ADS-B Version Zero (0) airborne position message is formatted as specified in Figure N-1, for message type codes 9 through 18 and 20 through 22.

Note: Additional details are specified in the following paragraphs. The coding of longitude, latitude, altitude and time synchronization are the same as used for Version One (1) conformant 1090 MHz ADS-B messages as specified in Appendix A, paragraph A.4.2

N.4.2.1 Compact Position Reporting (CPR) Format (F)

In order to achieve coding that is unambiguous world wide, CPR (see paragraph A.7) shall use two format types, known as "**even**" and "**odd**." This one-bit field (bit 22) shall be used to define the CPR format type. A CPR Format equal to ZERO (0) shall denote an "**even**" format coding, while a CPR Format equal to ONE (1) shall denote an "**odd**" format coding.

N.4.2.2 Time Synchronization (T)

This one-bit field (bit 21) shall indicate whether or not the time of applicability of the message is synchronized with UTC time. T equal to zero shall denote that the time is not synchronized to UTC. T equal to one shall denote that time of applicability is synchronized to UTC time. Synchronization shall only be used for airborne position messages having the top two horizontal position precision categories (Type Codes 9, 10, 20 and 21).

When T=1, the time of validity in the airborne message format shall be encoded in the 1-bit F field which (in addition to CPR format type) shall indicate the 0.2 second time tick for UTC time of position validity. The F bit shall alternate between 0 and 1 for successive 0.2 second time ticks, beginning with F=0 when the time of applicability shall be an exact even-numbered UTC second.

N.4.2.3 Latitude/Longitude

Latitude and Longitude shall be coded using Compact Position Report (CPR) as defined in Appendix A, paragraph A.7. The latitude/longitude field in the airborne position message shall be a 34-bit field containing the latitude and longitude of the aircraft airborne position. The latitude and longitude shall each occupy 17 bits. The airborne latitude and longitude encoding shall contain airborne CPR-encoded values in accordance with A.7. The unambiguous range for the local decoding of airborne messages shall be 666 km (360 NM). The positional accuracy maintained by the airborne CPR encoding shall be approximately 5.1 meters.

Note: The latitude/longitude encoding is also a function of the CPR format value (the "F" bit) described above.

N.4.2.3.1 Extrapolating Position (When T=1)

This extrapolation shall conform to paragraph A.4.2.3.1.

N.4.2.3.2 Extrapolating Position (When T=0)

This extrapolation shall conform to paragraph A.4.2.3.2.

N.4.2.3.3 Time-Out When New Position Data is Unavailable

This time-out shall conform to paragraph A.4.2.3.3.

N.4.2.4 Altitude

Encoding of altitude information shall conform to paragraph A.4.2.4

N.4.2.5 Single Antenna Flag (SAF)

This one-bit field shall indicate the type of antenna system that is being used to transmit extended squitters. SAF equal to ONE shall signify a single transmit antenna. SAF equal to ZERO shall signify a dual transmit antenna system. At any time that the diversity configuration cannot guarantee that both antenna channels are functional, then the SAF Subfield shall be set to ONE.

N.4.3 Surface Position Message Format

The surface position squitter shall be formatted as specified in Figure N-2, for message type codes 5 though 8.

Note: Additional details are specified in below. The coding of longitude, latitude, aircraft/vehicle movement and time synchronization are the same as used for Version 1 conformant 1090 MHz ADS-B messages as specified in Appendix A, paragraph A.4.3

N.4.3.1 Movement

This 7-bit field shall provide information on the ground speed of the aircraft. A non-linear scale shall be used as defined in the Table N-3, where speeds are given in km/h (kt).

Table N-3 Coding of the Movement Field

Encoding	*Meaning*	*Quantization*
0	no information available	
1	aircraft stopped (ground speed < 0.2315 km/h (0.125 kt))	
2-8	0.2315 km/h (0.125 kt) ≤ ground speed < 1.852 km/h (1 kt)	(in 0.2315 km/h (0.125 kt) steps)
9-12	1.852 km/h (1 kt) ≤ ground speed < 3.704 km/h (2 kt)	(in 0.463 km/h (0.25 kt) steps)
13-38	3.704 km/h (2 kt) ≤ ground speed < 27.78 km/h (15 kt)	(in 0.926 km/h (0.5 kt) steps)
39-93	27.78 km/h (15 kt) ≤ ground speed < 129.64 km/h (70 kt)	(in 1.852 km/h (1.0 kt) steps)
94-108	129.64 km/h (70 kt) ≤ ground speed < 185.2 km/h (100 kt)	(in 3.704 km/h (2.0 kt) steps)
109-123	185.2 km/h (100 kt) ≤ ground speed < 324.1 km/h (175 kt)	(in 9.26 km/h (5.0 kt) steps)
124	ground speed ≤ 324.1 km/h (175 kt)	
125	Reserved	
126	Reserved	
127	Reserved	

N.4.3.2 Ground Track (true)

N.4.3.2.1 Ground Track Status

This one bit field shall define the validity of the ground track value. Coding for this field shall be as follows: 0=not valid and 1= valid.

N.4.3.2.2 Ground Track Value

This 7-bit (14-20) field shall define the direction (in degrees clockwise from true north) of aircraft motion on the surface. The ground track shall be encoded as an unsigned angular weighted binary numeral, with an MSB of 180 degrees and an LSB of 360/128 degrees, with ZERO (0) indicating true north. The data in the field shall be rounded to the nearest multiple of 360/128 degrees.

N.4.3.3 Compact Position Reporting (CPR) Format (F)

The one-bit (22) CPR format field for the surface position message shall be encoded as specified for the airborne message. That is, F = 0 shall denote an "**even**" format coding, while F = 1 shall denote an "**odd**" format coding (N.7.7).

N.4.3.4 Time Synchronization (T)

This one-bit field (21) shall indicate whether or not the time of applicability of the message is synchronized with UTC time. T equal to ZERO (0) shall denote that the time is not synchronized to UTC. T equal to ONE (1) shall denote that time of applicability is synchronized to UTC time. Synchronization shall only be used for surface position messages having the top two horizontal position precision categories (Type Codes 5 and 6).

When T=1, the time of validity in the airborne message format shall be encoded in the 1-bit F field which (in addition to CPR format type) shall indicate the 0.2 second time tick for UTC time of position validity. The F bit shall alternate between 0 and 1 for successive 0.2 second time ticks, beginning with F=0 when the time of applicability is an exact even-numbered UTC second.

N.4.3.5 Latitude/longitude

Latitude and Longitude shall be coded using Compact Position Report (CPR) as defined in Appendix A, paragraph A.7. The latitude/longitude field in the surface message shall be a 34-bit field containing the latitude and longitude coding of the aircraft's surface position. The latitude (*Y*) and longitude (*X*) shall each occupy 17 bits. The surface latitude and longitude encoding shall contain surface CPR-encoded values in accordance with A.7. The unambiguous range for local decoding of surface messages shall be 166.5 km (90 NM). The positional accuracy maintained by the surface CPR encoding shall be approximately 1.25 meters.

Note: The latitude/longitude encoding is also a function of the CPR format value (the "F" bit) described above.

N.4.3.5.1 Extrapolating Position (When T=1)

This extrapolation shall conform to paragraph A.4.2.3.1 (Substitute "surface" for "airborne" where appropriate).

N.4.3.5.2 Extrapolating Position (When T=0)

This extrapolation shall conform to paragraph A.4.2.3.2 (Substitute "surface" for "airborne" where appropriate).

N.4.3.5.3 Time-Out When New Position Data is Unavailable

This time-out shall conform to paragraph A.4.2.3.3 (Substitute "surface" for "airborne" where appropriate).

N.4.4 Identification and Category Message Format

The identification and category squitter shall be formatted as specified in the definition of register 0,8, Figure N-3, for message type codes 1 through 4.

Note: Additional details are specified in the following paragraphs.

N.4.4.1 Aircraft Identification Coding

Note: The coding of aircraft identification is defined in section 2.2.17.1.13 of RTCA/DO-181B. It is reproduced here for convenience.

Each character shall be coded as a six-bit subset of the ICAO 7-unit coded character set (ICAO Annex 10, Vol. IV, Section 3.1.2.10, Table 3-6) as specified in the Table N-4. The character set shall be transmitted with the most significant bit (MSB) first. The reported aircraft code shall begin with character 1. Characters shall be coded consecutively without an intervening SPACE code. Any unused character spaces at the end of the subfield shall contain a SPACE character code.

Table N-4 Aircraft Identification Character Coding

				b_6	0	0	1	1
				b_5	0	1	0	1
b_4	b_3	b_2	b_1					
0	0	0	0			P	SP[1]	0
0	0	0	1		A	Q		1
0	0	1	0		B	R		2
0	0	1	1		C	S		3
0	1	0	0		D	T		4
0	1	0	1		E	U		5
0	1	1	0		F	V		6
0	1	1	1		G	W		7
1	0	0	0		H	X		8
1	0	0	1		I	Y		9
1	0	1	0		J	Z		
1	0	1	1		K			
1	1	0	0		L			
1	1	0	1		M			
1	1	1	0		N			
1	1	1	1		O			

[1]SP = SPACE code

N.4.5 Airborne Velocity Message Format

The airborne velocity squitter shall be formatted as specified in Figures N-4, N-5, and N-6, for message type code 19.

Notes:

1. Additional details are specified in the following paragraphs.

2. Transmission of this format type will be discontinued by the transponder if register 0,9 is not updated for 60 seconds (N.5.3).

N.4.5.1 Subtypes 1 and 2

Subtypes 1 and 2 of the airborne velocity format shall be used when the transmitting aircraft's velocity over ground is known. Subtype 1 shall be used for velocities under 1000 knots and subtype 2 shall be used for aircraft capable of supersonic flight when the velocity might exceed 1022 knots.

This message shall not be broadcast if the only valid data is the Intent Change and the IFR Capability flags (N.4.5.3, N.4.5.4). After initialization, broadcast shall be suppressed by loading register 0,9 with all zeros and then discontinuing updating the register until data input is available again.

The supersonic version of the velocity coding shall be used if either the east-west OR north-south velocities exceed 1022 kt. A switch to the normal velocity coding shall be made if both the east-west AND north-south velocities drop below 1000 kt.

N.4.5.2 Subtypes 3 and 4

Subtypes 3 and 4 of the airborne velocity format shall be used when the transmitting aircraft's velocity over ground is not known. These subtypes shall substitute airspeed and heading for the velocity over ground. Subtype 3 shall be used at subsonic velocities, while subtype 4 shall be reserved for airspeeds in excess of 1000 knots.

This message shall not be broadcast if the only valid data is the Intent Change and the IFR Capability flags (N.4.5.3, N.4.5.4). After initialization, broadcast shall be suppressed by loading register 0,9 with all zeros and then discontinuing updating the register until data input is available again.

The supersonic version of the velocity coding shall be used if the airspeed exceeds 1022 kt. A switch to the normal velocity coding shall be made if the airspeed drops below 1000 kt.

N.4.5.3 Intent change Flag in Airborne Velocity messages

An intent change event shall be triggered 4 seconds after the detection of new information being inserted in registers 4,0 to 4,2. The code shall remain set for 18 ± 1 seconds following an intent change.

Intent Change Flag coding:

0 = no change in intent
1 = intent change

Notes:

1. Register 4,3 is not included since it contains dynamic data which will be continuously changing.

2. A four-second delay is required to provide for settling time for intent data derived from manually set devices.

N.4.5.4 IFR Capability Flag (IFR) in Airborne Velocity messages

The IFR Capability Flag shall be a one-bit (bit 10) subfield in the subtype 1, 2, 3 and 4 airborne velocity messages. IFR = 1 shall signify that the transmitting aircraft has a capability for applications requiring ADS-B equipage class A1 or above. Otherwise, IFR shall be set to 0.

N.4.5.5 Magnetic Heading in Airborne Velocity messages

N.4.5.5.1 Magnetic Heading Status

This one bit field shall define the availability of the magnetic heading value. Coding for this field shall be: 0 = not available and 1 = available.

N.4.5.5.2 Magnetic Heading Value

This 10-bit field shall give the aircraft magnetic heading (in degrees clockwise from magnetic north) when velocity over ground is not available. The magnetic heading shall be encoded as an unsigned angular weighted binary numeral with an MSB of 180 degrees and an LSB of 360/1024 degrees, with ZERO (0) indicating magnetic north. The data in the field shall be rounded to the nearest multiple of 360/1024 degrees.

N.4.5.6 Difference from Baro Altitude in Airborne Velocity messages

This 8-bit field shall give the signed difference between barometric and GNSS altitude. (Coding for this field shall be as indicated in Fig N.8-6 and N.8-7).

Note: The difference between baro altitude and GNSS height above ellipsoid (HAE) is preferred. However, GNSS altitude (MSL) may be used when airborne position is being reported using Format Type Codes 11 through 18.

If airborne position is being reported using Format Type Codes 9 or 10, only GNSS HAE shall be used. For Format Type Codes 9 or 10, if GNSS HAE is not available, the field shall be coded with all zeros. The basis for the baro altitude difference (either GNSS HAE or altitude MSL) shall be used consistently for the reported difference.

N.4.6 Event Driven Messages

Notes: 1. Event driven messages are used to broadcast information at rates and for time durations appropriate to the specific event type.

2 Additional details on the use of Event Driven messages are specified in the following sub-paragraphs.

N.4.6.1 Purpose

Note: The event driven messages intended as a flexible means to support the broadcast of information beyond those defined for position, velocity, and

identification. These typically will be messages that are broadcast regularly for a period of time based on the occurrence of an event. An example is the broadcast of emergency/priority status every second during a declared aircraft emergency. A second example is the periodic broadcast of intent information for the duration of the operational condition.

N.4.6.2 Format Type Structure

Note: For Version Zero (0) 1090 MHz ADS-B systems, four Format Type Codes are assigned for messages that are delivered using the event driven protocol. These are defined for aircraft status, trajectory intent, aircraft operational coordination and operational status. Additional reserved Format Type Codes in the range of 24-27 can be assigned for event driven protocol messages if growth capability becomes necessary.

N.4.6.3 Aircraft Status (Emergency/Priority Status) Message

The emergency/priority status squitter shall be formatted as specified in the Figure N-7, for message type code 28.

N.4.6.4 Trajectory Intent Message

DO-260 defined a message format using message type code 29 to convey aircraft trajectory intent information in the form of a Trajectory Change Point (TCP) information. A 1090 MHz ADS-B receiver conforming to this MOPS (i.e., DO-242A) shall not use any message with a type code of 29 that is received from an ADS-B Version Zero (0) aircraft for the purpose of report generation.

Note: Prior to report generation, the 1090 MHz ADS-B must positively confirm that any received message with a type code of 29 has originated from a target aircraft with an ADS-B Version Number other than Zero (0). The ADS-B Version can be determined from the contents of the Version Number subfield of the Operational Status message (see N.4.6.6.3).

N.4.6.5 Operational Coordination Message

DO-260 defined a Version Zero (0) message format using message type code 30 to convey operational coordination information. A 1090 MHz ADS-B receiver conforming to this MOPS (i.e., DO-242A) shall not use any message with a type code of 30 for the purpose of report generation.

N.4.6.6 Aircraft Operational Status Message

The aircraft operational status message squitter shall be formatted as specified in Figure N-8 for message type code 31.

Note: Additional details are specified in the following paragraphs.

N.4.6.6.1 Operational Capabilities Coding

The ADS-B Version Zero (0), DO-260 conformant, format for Aircraft Operational Status messages defines coding only for the case of CC-4 (En Route Operational Capabilities). Therefore the CC-1, CC-2 and CC-3 subfields, as defined in Table N-8, are to be considered reserved and not used for ADS-B Version Zero (0) messages.

For the case of CC-4, this 4-bit (9-12) subfield shall be used to indicate en route operational capabilities of the ADS-B transmitting system to other aircraft as specified by the following encoding shown in Table N-5.

Table N-5 En Route Operational Capabilities Encoding

CC-4 ENCODING: EN ROUTE OPERATIONAL CAPABILITIES		
CC-4 CODING		
Bit 9,10	Bit 11,12	MEANING
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*
0 1	**0 0**	*TBD*
	0 1	*TBD*
	1 0	*TBD*
	1 1	*TBD*
1 0	**0 0**	*TBD*
	0 1	*TBD*
	1 0	*TBD*
	1 1	*TBD*
1 1	**0 0**	*TBD*
	0 1	*TBD*
	1 0	*TBD*
	1 1	*TBD*

Note: In Table N-13 "TCAS Operational" is meant to represent TCAS II (ACAS) operating in TA/RA mode.

N.4.6.6.2 Operational Capability Status

ADS-B Version Zero (0), DO-260 conformant, message formats do not define coding for the operational capability status subfields of the operational status message. Therefore the OM-1, OM-2, OM-3 and OM-4 subfields, as defined in Figure N-8, are to be considered reserved and not used for ADS-B Version Zero (0) messages.

N.4.6.6.3 ADS-B Version Number

The format of the Operational Status message substantially differs between the ADS-B Version Zero (0) format shown in Figure N-8 and the ADS-B Version One (1) format defined by paragraph 2.2.3.2.7.3 of these MOPS (i.e., DO-260A).

The Version One (1) Operational Status message format includes an explicit Version Number subfield (ME bits 41-43). For an ADS-B Version Zero (0) Operational Status message these same bits are unassigned and are expected to be set to a value of zero. An ADS-B Version One (1) receiving system shall, as a default, assume the received messages are using ADS-B Version Zero (0) format unless or until the version number is confirmed to be other than Zero. However, in the case of an ADS-B Version One (1) system's reception of an Operational Status message, the receiving system must decode "ME" bits 41-43 and determine if the target aircraft is broadcasting messages that are ADS-B Version Zero (0) or a version other than Zero and then decode the remainder of the message in accordance with the message format applicable to that version number.

Notes:. The version number determined from the decoding of the Version Number subfield of the Operational Status message must be retained and associated with the specific target since it is used in determining the applicable formats to be used for the decoding the other message types.

N.5 Formats for 1090 MHz ADS-B Messages

1090MHz ADS-B receivers conformant to this MOPS (DO-260A) shall receive and decode all Version One (1) compliant messages plus, for backward compatibility, certain messages types conforming to the previous DO-260, ADS-B Version Zero (0), formats. The following figures define the format of those ADS-B Version Zero (0) extended squitter messages that shall be received and decoded and from which ADS-B reports shall be generated.

Notes:

1. *In some cases, ARINC 429 labels are referenced for specific message fields. These references are only intended to clarify the field content, and are not intended as a requirement to use these ARINC 429 labels as the source for the message field.*

2. *The formats of the Version Zero (0) messages that are not required to be received and used for report generation by a Version One (1) 1090 MHz ADS-B receiving system are not shown in the following figures.*

Figure N-1 Extended Squitter Airborne Position Message

Transponder Register BDS 0,5

1	
2	
3	FORMAT TYPE CODE
4	(See N.4.1 and Note)
5	
6	SURVEILLANCE STATUS
7	
8	SINGLE ANTENNA FLAG (SAF) (See N.4.2.5)
9	
10	
11	ALTITUDE
12	Specified by the Format Type Code
13	
14	(1) the altitude code (AC) as specified
15	in section 2.2.13.1.2 of DO-181B but
16	with the M-bit removed
17	(Ref ARINC 429 Label 203), or
18	
19	(2) GNSS height (HAE)
20	(Ref. ARINC 429 Label 370)
21	TIME (T) (See N.4.2.2)
22	CPR FORMAT (F) (See N.4.2.1)
23	MSB
24	
25	
26	
27	
28	
29	
30	ENCODED LATITUDE
31	
32	(CPR Airborne Format
33	See N.7.1 to N.7.5)
34	
35	
36	
37	
38	
39	LSB
40	MSB
41	
42	
43	
44	
45	
46	
47	ENCODED LONGITUDE
48	
49	(CPR Airborne Format
50	See N.7.1 to N.7.4)
51	
52	
53	
54	
55	
56	LSB

Purpose: To provide accurate airborne position information

Surveillance Status coding
0 = no condition information
1 = permanent alert (emergency condition)
2 = temporary alert (change in Mode A identity code other than emergency condition)
3 = SPI condition

Codes 1 and 2 take precedence over code 3.

Note: When horizontal position information is unavailable, but altitude information is available, the airborne position message is transmitted with a Format Type Code of ZERO in bits 1-5 and the barometric pressure altitude in bits 9 to 20. If neither horizontal position nor barometric altitude information is available, then all 56 bits of register 0,5 shall be ZEROed. The ZERO Format Type Code field indicates that latitude and longitude information is unavailable, while the ZERO altitude field indicates that altitude information is unavailable.

Figure N-2 Extended Squitter Surface Position Message

Transponder Register BDS 0,6

1	
2	
3	FORMAT TYPE CODE
4	(See N.4.1)
5	
6	
7	
8	
9	MOVEMENT
10	(See N.4.3.1)
11	
12	
13	STATUS for Gnd Tk (1 =valid, 0 = not valid)
14	MSB
15	
16	GROUND TRACK (7 bits)
17	(See N.4.3.2)
18	
19	**Resolution = 360/128 deg**
20	LSB
21	TIME (T) (See N.4.2.2)
22	CPR FORMAT (F) (See N.4.2.1)
23	MSB
24	
25	
26	
27	
28	
29	
30	ENCODED LATITUDE
31	
32	(CPR Surface Format
33	See N.7.1 to N.7.4 and 7.6)
34	
35	
36	
37	
38	
39	LSB
40	MSB
41	
42	
43	
44	
45	
46	
47	ENCODED LONGITUDE
48	
49	(CPR Surface Format
50	See N.7.1 to N.7.4)
51	
52	
53	
54	
55	
56	LSB

Purpose: To provide accurate surface position information.

Figure N-3 Extended Squitter Identification and Category Message

Transponder Register BDS 0,8

1	
2	
3	FORMAT TYPE CODE
4	(See N.4.1)
5	
6	
7	AIRCRAFT CATEGORY
8	
9	MSB
10	
11	CHARACTER 1
12	
13	
14	LSB
15	MSB
16	
17	CHARACTER 2
18	
19	
20	LSB
21	MSB
22	
23	CHARACTER 3
24	
25	
26	LSB
27	MSB
28	
29	CHARACTER 4
30	
31	
32	LSB
33	MSB
34	
35	CHARACTER 5
36	
37	
38	LSB
39	MSB
40	
41	CHARACTER 6
42	
43	
44	LSB
45	MSB
46	
47	CHARACTER 7
48	
49	
50	LSB
51	MSB
52	
53	CHARACTER 8
54	
55	
56	LSB

Purpose: To provide aircraft identification and category.

Type coding:

1 = Aircraft identification, category set D
2 = Aircraft identification, category set C
3 = Aircraft identification, category set B
4 = Aircraft identification, category set A

ADS-B Emitter Category coding:

Set A
0 = No ADS-B Emitter Category Information
1 = Light (< *15 500* lbs.)
2 = Small (*15 500* to 75 000 lbs.)
3 = Large (75 000 to 300 000 lbs.)
4 = High Vortex Large(aircraft such as B-757)
5 = Heavy (> 300 000 lbs.)
6 = High Performance (> 5 g acceleration and > 400kts)
7 = Rotorcraft

Set B
0 = No ADS-B Emitter Category Information
1 = Glider/sailplane
2 = Lighter-than-Air
3 = Parachutist/Skydiver
4 = Ultralight/hang-glider/paraglider
5 = Reserved
6 = Unmanned Aerial Vehicle
7 = Space/Trans-atmospheric vehicle

Set C
0 = No ADS-B Emitter Category Information
1 = Surface Vehicle – Emergency Vehicle
2 = Surface Vehicle – Service Vehicle
3 = Fixed Ground or Tethered Obstruction
4-7 = Reserved

Set D : Reserved

Aircraft identification coding:

Coding as specified for N.4.4

Figure N-4 Extended Squitter Airborne Velocity Message (Subtype 0: Initial Coding)

Transponder Register BDS 0,9

1	MSB		**1**
2			**0**
3	FORMAT TYPE CODE = 19		**0**
4			**1**
5	LSB		**1**
6	SUBTYPE CODE	0	
7		0	
8		**0**	
9	**RESERVED**		
10	DIRECTION BIT for E-W velocity (0=East, 1=West)		
11			
12	EAST-WEST VELOCITY (1 knot resolution)		
13			
14	0 = no information	**Ref . ARINC 429 Labels:**	
15	1 = 0 kt	**GPS: 174**	
16	2 = 1 kt	**INS: 367**	
17	3 = 2 kt		
18	-		
19	2046 = 2045 kt		
20	All ones = greater than 2045.5 kt		
21			
22	DIRECTION BIT for N-S velocity **(0=North, 1=South)**		
23			
24	NORTH-SOUTH VELOCITY (1 knot resolution)		
25			
26	0 = no information	**Ref . ARINC 429 Labels:**	
27	1 = 0 kt	**GPS: 166**	
28	2 = 1 kt	**INS: 366**	
29	3 = 2 kt		
30	-		
31	2046 = 2045 kt		
32	All ones = greater than 2045.5 kt		
33			
34	SIGN BIT FOR TURN RATE **(0=Right, 1= Left)**		
35			
36	TURN RATE		
37	All zeros = no information		
38	All ones = greater than 15 degrees/s		
39			
40	Resolution 15/62 deg/sec		
41	SIGN BIT FOR VERTICAL RATE **(0=up, 1=down)**		
42	VERTICAL RATE (Resolution 32 ft/min)		
43			
44	0 = no information		
45	1 = 0 ft/min		
46	2 = 32 ft/min	**Ref. ARINC 429 Labels:**	
47	-	**GPS: 165**	
48	510 = 16288 ft/min	**INS: 365**	
49	All ones = greater than 16228 ft/min		
50			
51			
52	RESERVED		
53			
54			
55			
56			

Purpose: To provide additional state information on airborne aircraft**.**

Subtype Coding

Code	Velocity	Type
0	As in first edition of Doc 968	
1	Ground speed	normal
2		supersonic
3	Airspeed, heading	normal
4		supersonic
5	Not assigned	
6	Not assigned	
7	Not assigned	

Figure N-5 Extended Squitter Airborne Velocity Message (Subtypes 1 and 2: Velocity Over Ground)

Transponder Register BDS 0,9

1	MSB		**1**	
2			**0**	
3	FORMAT TYPE CODE = 19		**0**	
4			**1**	
5	LSB		**1**	
6	SUBTYPE 1	0	SUBTYPE 2	0
7		0		1
8		1		0
9	**INTENT CHANGE FLAG (N.4.5.3)**			
10	IFR CAPABILITY FLAG			
11	NAVIGATION UNCERTAINTY			
12	CATEGORY – VELOCITY			
13	(NUC_R)			
14	DIRECTION BIT for E-W velocity **(0=East, 1=West)**			
15	EAST-WEST VELOCITY (10 bits)			
16	NORMAL : LSB = 1 knot		SUPERSONIC : LSB =4 knots	
17	All zeros = no velocity info		All zeros = no velocity info	
18	Value	Velocity	Value	Velocity
19	1	0 kts	1	0 kt
20	2	1 kt	2	4 kt
21	3	2 kt	3	8 kt
22	-	-	-	-
23	1022	1021 kt	1022	4084 kt
24	1023	>1021.5 kt	1023	> 4086kt
25	DIRECTION BIT for N-S velocity **(0=North, 1=South)**			
26	NORTH-SOUTH VELOCITY (10 bits)			
27	NORMAL : LSB = 1 knot		SUPERSONIC : LSB =4 knots	
28	All zeros = no velocity info		All zeros = no velocity info	
29	Value	Velocity	Value	Velocity
30	1	0 kts	1	0 kt
31	2	1 kt	2	4 kt
32	3	2 kt	3	8 kt
33	-	-	-	-
34	1022	1021 kt	1022	4084 kt
35	1023	>1021.5 kt	1023	> 4086kt
36	SOURCE BIT FOR VERTICAL RATE: 0 = Geometric, 1 = baro (1 bit)			
37	SIGN BIT FOR VERTICAL RATE: 0 = up, 1 = down			
38	VERTICAL RATE (9 bits)			
39	All zeros – no vertical rate information, LSB = 64 ft/min			
40	Value	Vertical rate	Ref. ARINC 429 labels	
41	1	0 ft/min	GPS: 165	
42	2	64 ft/min	INS: 365	
43	-	-		
44	510	32576 ft/min		
45	511	> 32608 ft/min		
46				
47	TURN INDICATOR (2 bits)			
48	TBD			
49	DIFFERENCE SIGN BIT (0 = above baro, 1 = below baro alt))			
50	GEOMETRIC HEIGHT DIFFERENCE FROM BARO. ALT. (7 bits) (N.4.5.6)			
51	All zeros = no info; LSB = 25 ft			
52	Value	Difference		
53	1	0 ft		
54	2	25 ft		
55	-	-		
56	126	3125 ft		
	127	> 3137.5 ft		

Purpose: To provide additional state information for both normal and supersonic flight.

Subtype Coding

Code	Velocity	Type
	As in first edition of the ICAO Manual on Mode S Specific Services	
1	Ground speed	normal
2		supersonic
3	Airspeed, heading	normal
4		supersonic
5	Not assigned	
6	Not assigned	
7	Not assigned	

IFR Capability Flag coding:

0 = Transmitting aircraft has no capability for applications requiring ADS-B equipage class A1 or above

1 = Transmitting aircraft has capability for applications requiring ADS-B equipage class A1 or above.

Ref. ARINC Labels for Velocity:

East-West	North-South
GPS: 174	GPS: 166
INS: 367	INS: 366

Ref. ARINC Labels
GNSS Height (HAE): GPS: 370
GNSS Altitude (MSL): GPS: 076

Navigation Uncertainty Category:
See the definition of NUC_R in subparagraph 2.2.3.2.6.1.5.

Figure N-6 Extended Squitter Airborne Velocity Message (Subtypes 3 and 4: Airspeed and Heading)

Transponder Register BDS 0,9

1	MSB			**1**	
2				**0**	
3	FORMAT TYPE CODE = 19			**0**	
4				**1**	
5	LSB			**1**	
6	SUBTYPE 3	0	SUBTYPE 4	1	
7		1		0	
8		1		0	
9	**INTENT CHANGE FLAG (A,4.5.3)**				
10	IFR CAPABILITY FLAG				
11	NAVIGATION UNCERTAINTY				
12	CATEGORY – VELOCITY				
13	(NUC_R)				
14	STATUS BIT – 1 = Magnetic heading available, 0 = not available				
15	MSB				
16					
17					
18	MAGNETIC HEADING (10 bits)				
19	(N.4.5.5)				
20					
21				Ref. ARINC 429 Label:	
22				INS: 320	
23	Resolution = 360/1024 deg				
24	LSB				
25	AIRSPEED TYPE: 0 = IAS, 1 = TAS				
26	AIRSPEED (10 bits)				
27	NORMAL : LSB = 1 knot		SUPERSONIC : LSB =4 knots		
28	All zeros = no velocity info		All zeros = no velocity info		
29	Value	Velocity	Value	Velocity	
30	1	0 kts	1	0 kt	
31	2	1 kt	2	4 kt	
32	3	2 kt	3	8 kt	
33	-	-	-	-	
34	1022	1021 kt	1022	4084 kt	
35	1023	>1021.5 kt	1023	> 4086 kt	
36	SOURCE BIT FOR VERTICAL RATE: 0 = Geometric, 1 = baro (1 bit)				
37	SIGN BIT FOR VERTICAL RATE: 0 = up, 1 = down				
38	VERTICAL RATE (9 bits)				
39	All zeros – no vertical rate information				
40	LSB = 64 ft/min				
41	Value	Vertical rate		Ref. ARINC labels	
42	1	0 ft/min		GPS: 165	
43	2	64 ft/min		INS: 365	
44	-	-			
45	510	32576 ft/min			
46	511	> 32608 ft/min			
47	TURN INDICATOR (2 bits)				
48	TBD				
49	DIFFERENCE SIGN BIT (0 = above baro, 1 = below baro alt))				
50	GEOMETRIC HEIGHT DIFFERENCE FROM BARO. ALT. (7 bits) (N.4.5.6)				
51	All zeros = no info; LSB = 25 ft				
52	Value	Vertical rate		Ref. ARINC 429 labels	
53	1	0 ft			
54	2	25 ft			
55	-	-			
56	126	3125 ft			
	127	> 3137.5 ft			

Purpose: To provide additional state information for both normal and supersonic flight based on airspeed and heading.

Note: *This format is only used if velocity over ground is not available*

See the definition of NUC_R in section 2.2.3.2.6.1.5.

Subtype Coding

Code	Velocity	Type
0	As in first edition of the ICAO Manual on Mode S Specific Services	
1	Ground speed	normal
2		supersonic
3	Airspeed, heading	normal
4		supersonic
5	Not assigned	
6	Not assigned	
7	Not assigned	

IFR Capability Flag coding:

0 = Transmitting aircraft has no capability for applications requiring ADS-B equipage class A1 or above

1 = Transmitting aircraft has capability for applications requiring ADS-B equipage class A1 or above.

Ref. ARINC 429 Labels for Air Data Source:
IAS: 206
TAS: 210

Figure N-7 Extended Squitter Aircraft Status Message
(Subtype 1: Emergency/Priority Status)

Transponder Register BDS 6,1

1–5	FORMAT TYPE CODE = 28
6–8	Subtype Code = 1
9–16	EMERGENCY/PRIORITY STATUS (3 bits)
17–32	RESERVED
33–56	RESERVED

Purpose. To provide additional information on aircraft status.

Subtype Coding:

0 = No Information
1 = Emergency/Priority Status
2-7 = Reserved

Emergency/Priority Status Coding

Value	*Meaning*
0	No emergency
1	General emergency
2	Lifeguard/medical
3	Minimum fuel
4	No communications
5	Unlawful interference
6	Reserved
7	Reserved

Notes:

1. *Message delivery is accomplished once per second using the event driven protocol.*

2. *Termination of emergency state is detected by coding in the surveillance status field of the airborne position message.*

Figure N-8 Aircraft Operational Status Message

Transponder Register BDS 6,5

1	MSB
2	
3	FORMAT TYPE CODE = 31
4	
5	LSB
6	MSB
7	Subtype Code=0
8	LSB
9	MSB
10	Enroute Operational Capabilities (CC-4)
11	(See N.4.8.3)
12	LSB
13	MSB
14	Terminal Area Operational Capabilities(CC-3)
15	(See N.4.8.4)
16	LSB
17	MSB
18	Approach/ Landing Operational Capabilities (CC-2)
19	(See N.4.8.5)
20	LSB
21	MSB
22	Surface Operational Capabilities (CC-1)
23	(See N.4.8.6)
24	LSB
25	MSB
26	Enroute Operational Capability Status (OM –4)
27	(See N.4.8.7)
28	LSB
29	MSB
30	Terminal Area Operational Capability Status (OM-3)
31	(See N.4.8.8)
32	LSB
33	MSB
34	Approach/ Landing Operational Capability Status (OM-2)
35	(See N.4.8.9)
36	LSB
37	MSB
38	Surface Operational Capability Status (OM-1)
39	(See N.4.8.10)
40	LSB
41	
42	
43	
44	
45	
46	
47	Not Assigned
48	
49	
50	
51	
52	
53	
54	
55	
56	

Purpose. To provide the capability class and current operational mode of ATC related applications on board the aircraft.