

Annex F

Details of ICAO Standards Incorporated by Reference

Extracted from Annex 10, Aeronautical Telecommunications,
Volume IV, Surveillance Radar and Collision Avoidance Systems,
Chapter 3 (4th Edition, July 2007) of the Chicago Convention

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The following SARPs are incorporated in the Civil Aviation Order 20.18 Amendment Instrument, subparagraph 9C.8.

3.1.2.10.5.2.3 Data formats for standard length transactions and required downlink aircraft parameters (DAPs)

3.1.2.10.5.2.3.1 All level 2 and above transponders shall support the following registers:

- the capability reports (3.1.2.6.10.2);
- the aircraft identification protocol register 20 {HEX} (3.1.2.9); and
- for ACAS-equipped aircraft, the active resolution advisory register 30 {HEX} (4.3.8.4.2.2).

3.1.2.10.5.2.3.2 Where required, DAPs shall be supported by the registers listed in Table 3-10. The formats and minimum update rates of transponder registers shall be implemented consistently to ensure interoperability.

3.1.2.10.5.2.3.3 The downlink standard length transaction interface shall deliver downlink aircraft parameters (DAPs) to the transponder which makes them available to the ground. Each DAP shall be packed into the Comm-B format ('MB' field) and can be extracted using either the ground-initiated Comm-B (GICB) protocol, or using MSP downlink channel 3 via the dataflash application.

Note.— The formats and update rates of each register and the dataflash application are specified in the Technical Provisions for Mode S Services and Extended Squitter (Doc 9871).

Table 3-10. DAPs registers

<i>Register</i>	<i>Name</i>	<i>Data content</i>	<i>Bits</i>
40{HEX}	Selected vertical intention	MCP/FCU selected altitude	1-13
		FMS selected altitude	14-26
		Barometric pressure setting minus 800 mb	27-39
		MCP/FCU mode bits	48-51
		Target altitude source bits	54-56
50{HEX}	Track and turn report	Roll angle	1-11
		True track angle	12-23
		Ground speed	24-34
		Track angle rate	35-45
		True airspeed	46-56
60{HEX}	Heading and speed report	Magnetic heading	1-12
		Indicated airspeed	13-23
		Mach	24-34
		Barometric altitude rate	35-45
		Inertial vertical velocity	46-56

The following standards and recommended practices (SARPs) are incorporated in the Civil Aviation Order 20.18 Amendment Instrument, subparagraph 9C.9 (d).

3.1.2.10.4 *Transponder antenna system and diversity operation.* Mode S transponders equipped for diversity operation shall have two RF ports for operation with two antennas, one antenna on the top and the other on the bottom of the aircraft's fuselage. The received signal from one of the antennas shall be selected for acceptance and the reply shall be transmitted from the selected antenna only.

3.1.2.10.4.1 *Radiation pattern.* The radiation pattern of Mode S antennas when installed on an aircraft shall be nominally equivalent to that of a quarter-wave monopole on a ground plane.

Note.— Transponder antennas designed to increase gain at the expense of vertical beamwidth are undesirable because of their poor performance during turns.

3.1.2.10.4.2 *Antenna location.* The top and bottom antennas shall be mounted as near as possible to the centre line of the fuselage. Antennas shall be located so as to minimize obstruction to their fields in the horizontal plane.

3.1.2.10.4.2.1 Recommendation.— *The horizontal distance between the top and bottom antennas should not be greater than 7.6 m (25 ft).*

Note.— *This recommendation is intended to support the operation of any diversity transponder (including cables) with any diversity antenna installation and still satisfy the requirement of 3.1.2.10.4.5.*

3.1.2.10.4.3 Antenna selection. Mode S transponders equipped for diversity operation shall have the capability to evaluate a pulse sequence simultaneously received on both antenna channels to determine individually for each channel if the *P1* pulse and the *P2* pulse of a Mode S interrogation preamble meet the requirements for a Mode S interrogation as defined in 3.1.2.1 and if the *P1* pulse and the *P3* pulse of a Mode A, Mode C or intermode interrogation meet the requirements for Mode A and Mode C interrogations as defined in 3.1.1.

Note.— *Transponders equipped for diversity operation may optionally have the capability to evaluate additional characteristics of the received pulses of the interrogations in making a diversity channel selection. The transponder may as an option evaluate a complete Mode S interrogation simultaneously received on both channels to determine individually for each channel if the interrogation meets the requirements for Mode S interrogation acceptance as defined in 3.1.2.4.1.2.3.*

3.1.2.10.4.3.1 If the two channels simultaneously receive at least a *P1* – *P2* pulse pair that meets the requirements for a Mode S interrogation, or a *P1* – *P3* pulse pair that meets the requirements for a Mode A or Mode C interrogation, or if the two channels simultaneously accept a complete interrogation, the antenna at which the signal strength is greater shall be selected for the reception of the remainder (if any) of the interrogation and for the transmission of the reply.

3.1.2.10.4.3.2 If only one channel receives a pulse pair that meets the requirements for an interrogation, or if only one channel accepts an interrogation, the antenna associated with that channel shall be selected regardless of received signal strength.

3.1.2.10.4.3.3 Selection threshold. If antenna selection is based on signal level, it shall be carried out at all signal levels between MTL and –21 dBm.

Note.— *Either antenna may be selected if the difference in signal level is less than 3 dB.*

3.1.2.10.4.3.4 Received signal delay tolerance. If an interrogation is received at one antenna 0.125 microsecond or less in advance of reception at the other antenna, the interrogations shall be considered to be simultaneous interrogations, and the above antenna selection criteria applied. If an accepted interrogation is received at either antenna 0.375 microsecond or more in advance of reception at the other antenna, the antenna selected for the reply shall be that which received the earlier interrogation. If the relative time of receipt is between 0.125 and 0.375 microsecond, the transponder shall select the antenna for reply either on the basis of the simultaneous interrogation criteria or on the basis of the earlier time of arrival.

3.1.2.10.4.4 Diversity transmission channel isolation. The peak RF power transmitted from the selected antenna shall exceed the power transmitted from the non-selected antenna by at least 20 dB.

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