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**GACAR PART 91 – GENERAL OPERATING AND FLIGHT RULES**

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- (e) Be located on the instrument panel in a position acceptable to the President that will make it plainly visible to and usable by each pilot at his station,
- (f) Be appropriately lighted during all phases of operation, and
- (g) Give clear indication on the instrument panel that the attitude indicator(s) is (are) being operated by emergency power.

**APPENDIX C TO GACAR PART 91 – PERFORMANCE AND INSTALLATION STANDARDS FOR CERTAIN REQUIRED EQUIPMENT**

**VII. ADS–B Out.**

- (a) Definitions. For the purposes of this appendix:

**Table C–8.**

ADS–B Out	A function of an aircraft’s onboard avionics that periodically broadcasts the aircraft’s state vector (three-dimensional position and three-dimensional velocity) and other required information as described in this section.
Navigation Accuracy Category for Position (NAC <sub>P</sub> )	Specifies the accuracy of a reported aircraft’s position, as defined in FAA TSO–C166b and FAA TSO–C154c.
NAC for Velocity (NAC <sub>V</sub> )	Specifies the accuracy of a reported aircraft’s velocity, as defined in FAA TSO–C166b and FAA TSO–C154c.
Navigation Integrity Category (NIC)	Specifies an integrity containment radius around an aircraft’s reported position, as defined in FAA TSO–C166b and FAA TSO–C154c.
Position Source	Refers to the equipment installed on board an aircraft used to process and provide aircraft position (for example, latitude, longitude, and velocity) information.
Source Integrity Level (SIL)	Indicates the probability of the reported horizontal position exceeding the containment radius defined by the NIC on a per sample or per hour basis, as defined in FAA TSO–C166b and FAA TSO–C154c.
System Design Assurance (SDA)	Indicates the probability of an aircraft malfunction causing false or misleading information to be transmitted, as defined in FAA TSO–C166b and FAA TSO–C154c
Total latency	The total time between when the position is measured and when the position is transmitted by the aircraft.
Uncompensated latency	The time for which the aircraft does not compensate for latency.

- (b) All Extended Squitter (ES) ADS–B and Traffic Information Service–Broadcast (TIS–B) equipment

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operating on the radio frequency of 1090 MHz must meet the requirements in FAA TSO–C166b and the requirements in paragraphs (c) through (f) of this appendix. After 1 January 2020, the equipment must meet, in addition to paragraphs (c) through (f) of this appendix—

(1) FAA TSO–C166b or

(2) FAA TSO–C154c, Universal Access Transceiver (UAT) ADS–B Equipment Operating on the Frequency of 978 MHz.

**(c) 1 090 MHz ES and UAT broadcast links and power requirements:**

(1) Aircraft operating in Class A airspace must have equipment installed that meets the antenna and power output requirements of Class A1, A1S, A2, A3, B1S, or B1 equipment as defined in FAA TSO–C166b, ES ADS–B and TIS–B Equipment Operating on the Radio Frequency of 1 090 MHz.

(2) Aircraft operating in airspace designated for ADS–B Out, but outside of Class A airspace, must have equipment installed that meets the antenna and output power requirements of either—

(i) Class A1, A1S, A2, A3, B1S, or B1 as defined in FAA TSO–C166b or

(ii) Class A1H, A1S, A2, A3, B1S, or B1 equipment as defined in FAA TSO–C154c, UAT ADS–B Equipment Operating on the Frequency of 978 MHz.

**(d) ADS–B Out Performance Requirements for NACP, NACV, NIC, SDA, and SIL —**

(1) For aircraft broadcasting ADS–B Out as required under GACAR §§ 91.239(a) and (b)—

(i) The aircraft’s NACP must be less than 92.6 m (0.05 NM),

(ii) The aircraft’s NACV must be less than 10 m/s,

(iii) The aircraft’s NIC must be less than 370.4 m (0.2 NM),

(iv) The aircraft’s SDA must be 2, and

(v) The aircraft’s SIL must be 3.

(2) Changes in NACP, NACV, SDA, and SIL must be broadcast within 10 seconds.

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(3) Changes in NIC must be broadcast within 12 seconds.

(e) **Minimum broadcast message element set for ADS–B Out.** Each aircraft must broadcast the following information, as defined in FAA TSO–C166b or FAA TSO–C154c. The pilot must enter information for message elements listed in paragraphs (e)(7) through (10) of this section during the appropriate phase of flight.

(1) The length and width of the aircraft;

(2) An indication of the aircraft’s latitude and longitude;

(3) An indication of the aircraft’s barometric pressure altitude;

(4) An indication of the aircraft’s velocity;

(5) An indication of whether TCAS II or ACAS is installed and operating in a mode that can generate RA alerts;

(6) If an operable TCAS II or ACAS is installed, an indication of whether an RA is in effect;

(7) An indication of the Mode 3/A transponder code specified by ATC;

(8) An indication of the aircraft’s call sign submitted on the flight plan, or the aircraft’s registration number, except when the pilot has not filed a flight plan, has not requested ATC services, and is using an FAA TSO–C154c self assigned temporary 24 bit address;

(9) An indication of whether the flight crew has identified an emergency, radio communication failure, or unlawful interference;

(10) An indication of the aircraft’s “IDENT” to ATC;

(11) An indication of the aircraft assigned ICAO 24 bit address, except when the pilot has not filed a flight plan, has not requested ATC services, and is using an FAA TSO–C154c self assigned temporary 24 bit address;

(12) An indication of the aircraft’s emitter category;

(13) An indication of whether an ADS–B In capability is installed;

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(14) An indication of the aircraft's geometric altitude;

(15) An indication of the NACP;

(16) An indication of the NACV;

(17) An indication of the NIC;

(18) An indication of the SDA; and

(19) An indication of the SIL.

(f) ADS–B latency requirements.

(1) The aircraft must transmit its geometric position no later than 2.0 seconds from the time of measurement of the position to the time of transmission.

(2) Within the 2.0 second total latency allocation, a maximum of 0.6 seconds can be uncompensated latency. The aircraft must compensate for any latency above 0.6 seconds up to the maximum 2.0 seconds total by extrapolating the geometric position to the time of message transmission.

(3) The aircraft must transmit its position and velocity at least once per second while airborne or while moving on the aerodrome surface.

(4) The aircraft must transmit its position at least once every 5 seconds while stationary on the aerodrome surface.

(g) Equipment with an approved deviation. Operators with equipment installed with an approved deviation under GACAR § 21.293 also are in compliance with this section.

(h) Incorporation by reference. The standards required in this section are incorporated by reference with the approval of the President. All approved materials are available for inspection at the following address:

GACA Headquarters, Jeddah, Kingdom of Saudi Arabia. For more information on the availability of this material at the GACA, call +966 (02) 640 5000 or go to the GACA Web site .