



FIJI AERONAUTICAL INFORMATION CIRCULAR

Civil Aviation Authority of Fiji
Private Bag (NAP0354), Nadi Airport
Republic of Fiji
Tel: (679) 8923 155; Fax (679) 6721 500
Website: www.caaf.org.fj

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OPS/ATC

This AIC replaces AIC 02/20, which is hereby cancelled.

ADS-B SERVICE PERFORMANCE REQUIREMENTS FOR CATEGORY (TIER) 1, 2 and 3 FOR ATC SURVEILLANCE

1. Introduction

- 1.1 The purpose of this AIC is to advise ANSP of the key minimum quality performance requirements for an ADS-B system to enable the use for ADS-B Category (Tier) 1, 2 and 3 services.
- 1.2 In developing these minimum specifications reference was made to the ICAO Asia Pacific ADS-B Implementation & Operations Guidance Document and ICAO Circular 326 Appendix E2.

2. Definition:

NACp – Navigation Accuracy Category for Position, which specifies the accuracy of a reported aircraft's position;

NIC – Navigation Integrity Category, which specifies an integrity containment radius around an aircraft's reported position;

SIL – Source Integrity Level indicates the probability of the reported horizontal position exceeding the containment radius defined by the NIC;

NUCp – (Navigation Uncertainty Category) A numeric value that announces the integrity of the associated horizontal position data being broadcast.

3. Function of these quality figures

- 3.1 Accurate positional data is essential in Tier 1 for the ADS-B system to operate in a "radar like manner" and be the basis for the allocation of separation between aircraft.
- 3.2 However, ADS-B data transmitted from some avionics is not suitable for operational use and it is essential that data which does not meet the required quality standards be filtered so that misleading data is not transmitted and subsequently displayed to ATC or to pilots through cockpit displays.

3.3 These figures therefore can be said to be acting as quality thresholds levels for filters. Once data detected from an aircraft is found to be substandard, the controller is alerted and appropriate safety measures initiated.

3.4 The table below contains the position accuracy figures meeting equivalent Surveillance position accuracy:

| | Characteristic | CATEGORY 1 (TIER 1) 5NM Separation Capable Commensurate with Radars (Separation/Vectoring/High Performance with Reliability, Integrity & Latency) | CATEGORY 2 (TIER 2) Situational Awareness Similar to ADS-C (Safety-Net Alerts, SAR, Supports Procedural Separation Without Voice, Not 5nm Separation) | CATEGORY 3 (TIER 3) Position Reporting With Enhanced Flight Operation |
|----|--|---|--|---|
| 1. | Position: Accuracy | A 95-percentile accuracy of 0.5NM This can be represented by either: a) NACp \geq 5 or b) NUC \geq 4 | | |
| 2. | Position: Integrity | A containment radius of < 2 NM a) NUC \geq 4; or b) NIC \geq 4 and SIL \geq 2 | | |
| 3. | Aircraft Updates | 12 secs | 0.5 second < Interval < 20 seconds as Operationally required | 0.5 second < Interval < 60 seconds as Operationally required |
| 4. | Network Latency | 95% < 2 secs of receiver- station output | 95%:< 15 secs of receiver-station output | 95%: < 60 secs of receiver-station output |
| 5. | Reliability 1 | 2 autonomous receiver- stations including antenna, each providing data, no common point of failure | 1 unduplicated receiver-station including antenna | 1 unduplicated receiver-station including antenna |
| 6. | Reliability 2 – MTBF | Each receiver-station including antenna to have MTBF > 10,000hrs | Each receiver-station including antenna to have MTBF >10,000 hrs | Each receiver-station including antenna to have MTBF >10,000 hrs |
| 7. | Reliability – Communications Infrastructure | Completely duplicated, no common point of failure | Unduplicated, MTBF > 400 hrs | Unduplicated, MTBF > 200 hrs |
| 8. | Reliability – Total ADS-B Service | Total Service MTBF > 50,000 hrs | Total Service MTBF > 400hrs | Total Service MTBF > 200 hrs |
| 9. | Availability – Total ADS-B Service | Total Service Availability > 0.999 | Total Service Availability >.95 | Total Service Availability >.90 |
| 10 | Integrity – Ground Station | Site monitor System Monitoring | Site monitor System Monitoring | System Monitoring |
| 11 | Integrity – Data & Communications & Processing | All systems up to ATM systems, errors < 1 X 10E- 6 | All systems up to ATM system, errors < 1 x 10E-6 | All systems up to ATM system, errors < 1 x 10E-6 |

3.5 Aircraft fitted with legacy type transponders, compliant to DO260 standards emit a NUC value and not NAC, NIC and SIL as done by the upgraded DO260A and DO260B compliant transponders. ATS providers shall therefore ensure ATS systems are able to support DO260, DO260A and DO260B.

4. System Monitoring

4.1 System Monitoring is necessary in order to ensure that the system continues to meet or exceed its performance, safety and interoperability requirements, and that operational service delivery and procedures are working as intended.

4.2 Summarised statistical data should be produced periodically showing the performance of the system.

4.3 As problems or abnormalities arise, they should be identified, tracked, analysed and corrected and information disseminated as required, utilizing the ADS-B Problem Report.

4.4 The checklist of the parameters to be monitored include:

4.4.1 ADS-B Ground Station

| Site Monitoring | Remote Control & Monitoring (RCMS) | Logistic Support Monitoring |
|-----------------------------|---|---|
| 1. Receiver Sensitivity | 1. CPU Process Operation | 1. Record all failures, service outage and repair/return to service times |
| 2. Antenna Cable | 2. Temperature | |
| 3. GPS Health | 3. ASTERIX Output Load and Link Status | |
| 4. Coverage Check | 4. Time Synchronisation | |
| 5. Probability of Detection | 5. GPS Status | |
| 6. Station Service | 6. Power Status | |
| 7. Availability | 7. Site Monitor Status | |
| 8. Receiver Status | 8. Memory usage | |
| | 9. Software Version (Operating system and RCMS Application) | |

4.4.2 ADS-B Equipage Monitoring

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| 1. Update and maintain list of ADS-B equipped airframe details database |
| 2. Identify aircraft non-compliant to regional mandate. |

4.4.3 ADS-B Avionics Monitoring

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| 1. Track Consistency |
| 2. Valid Flight ID |
| 3. Presence of NACp/NIC/NUC/Values |
| 4. Presence of Geometric Altitude |
| 5. Correctness of ICAO Aircraft Address |
| 6. Avionics Configuration and Connections |
| 7. Update and maintain list of aircraft with faulty avionics |

4.4.4. ADS-B Performance Monitoring

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| 1. Percentage of aircraft with good integrity reports |
| 2. Accuracy of ADS-B Horizontal Position (Based on a reference sensor) |
| 3. Deviation between Geometric and Barometric height |
| 4. Monitor the number of position jumps |
| 5. message interval rate |

4.4.5 ADS-B Display on ATC Display

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| 1. Split Track – ADS-B reported position might be off |
| 2. Coupling Failure – wrong aircraft ID |
| 3. Duplicated ICAO Aircraft Address |
| 4. Display of data block. |

5.0 Management of Non-Compliant ADS-B Aircraft or Misleading Transmission

5.1 The transmission of a value of zero for the NUCp or the NIC or the NACp or the SIL by an aircraft indicates a navigational uncertainty related to the position of the aircraft or a navigation integrity issue that is too significant to be used by air traffic controllers.

5.2 The following procedure currently stipulated in the Regional Supplementary Procedures Doc 7030 shall be applicable in the Nadi or Fiji FIRs on commencement of ADS-B based surveillance services notified by AIP or NOTAM:

- a) If an aircraft operates within an FIR where ADS-B-based ATS surveillance service is provided, and
- b) carries 1090 extended squitter ADS-B transmitting equipment which does not comply with one of the following:
 - 1) EASA AMC 20-24; or
 - 2) the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia; or
 - 3) installation in accordance with the FAA AC No. 20-165 – Airworthiness Approval of ADS-B; or

- c) the aircraft ADS-B transmitting equipment becomes unserviceable resulting in the aircraft transmitting misleading information;

then:

- a) except when specifically authorized by the appropriate ATS authority, the aircraft shall not fly unless the equipment is:
 - 1) deactivated; or
 - 2) transmits only a value of zero for the NUCp or NIC or NACp or SIL

It is recommended to blacklist those non-compliant aircraft consistently transmitting misleading ADS-B information so as to refrain the aircraft from being displayed to ATC.

Note:

- 1. It is considered equivalent to deactivation if NUCp or NIC or NACp or SIL is set to continually transmit only a value of zero.
- 2. ATC systems should discard ADS-B data when NUC or NIC or NACp or SIL =0.