Civil Aviation Safety Authority
of Papua New Guinea

Advisory Circular

AC91-11

Aircraft ADS-B Equipment Standards

Issue 1

31 October 2022

GENERAL

Civil Aviation Safety Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

This Advisory Circular also includes Explanatory Material (EM) where it has been shown that further explanation is required. Explanatory Material must not be regarded as an acceptable means of compliance.

PURPOSE

This Advisory Circular provides a definition of the airborne components of the 1090 Megahertz Extended Squitter (ES) Automatic Dependent Surveillance Broadcast (ADS-) data link for use in PNG, and to provide information, guidance and advice for the airworthiness approval of aircraft equipment proposed to support that use.

RELATED CAR

This AC relates to CAR Part 91.547 and CAR Part 91 Appendix A-A.27.

CHANGE NOTICE

This AC replaces the Initial Issue dated 24 June 2015.

APPROVAL

This AC has been approved for publication by the Director of Civil Aviation

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1 ACRONYMS

Note: Please refer to this section if you are unsure of any acronyms used within this document as they may not be spelt out in the first instance in the body of the document.

AC	Advisory Circular
ADS-B	Automatic Dependent Surveillance – Broadcast
AEEC	Airlines Electronic Engineering Committee
AFM	Aircraft Flight Manual
ARINC	Aeronautical Radio Inc.
ATC	Air Traffic Control
ATSO	Australian Technical Standard Order
BARO	Barometric Sourced Data
CAO	Civil Aviation Order (Australian CASA)
CAR	Civil Aviation Rules (CASA PNG)
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation 1998 (Australian CASA)
EASA	European Aviation Safety Agency
ETSO	European Technical Standard Order
EUROCAE	European Organization for Civil Aviation Equipment
FAA	Federal Aviation Administration (USA)
FDE	Fault Detection and Exclusion
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HAE	Height Above Ellipsoid
HFOM	Horizontal Figure of Merit
HIL	Horizontal Integrity Limit
HPL	Horizontal Protection Limit
ICAO	International Civil Aviation Organization
JAA	Joint Aviation Authority of Europe
JTSO	JAA Technical Standard Order
MASPS	Minimum Aviation System Performance Standards
MEL	Minimum Equipment List

MMR	Multi Mode Receiver
MODE S (ES)	Mode Select (with Extended Squitter) – a transponder format to allow discreet interrogation and datalink capability/selective interrogation mode of SSR.
MOPS	Minimum Operational Performance Standards
MSL	Mean Sea Level
NAC	Navigation Accuracy Category
NACP	Navigation Accuracy Category for Position
NIC	Navigation Integrity Category
NUC	Navigation Uncertainty Category
POH	Pilot Operating Handbook
RTCA	RTCA Inc. (formerly Radio Technical Committee for Aeronautics)
SA	Selective Awareness
SIL	Surveillance Integrity Level
SPI	Special Position Identification
SSR	Secondary Surveillance Radar
TSOA	Technical Standard Order Authorization (FAA, USA)
TSO	Technical Standard Order (FAA, USA)

2 BACKGROUND

2.1 ADS-B is a surveillance application that periodically transmits aircraft parameters, such as identification, pressure altitude, position and position integrity, via a broadcast data link that is available to any receiver, either airborne or ground-based, within range of the transmitter.

2.2 ADS-B information is broadcast without any knowledge of which users may be receiving it and without the expectation of an acknowledgement or reply. As an automatic system, ADS-B requires no flight crew or controller action for the information to be transmitted. The surveillance-type information broadcast is dependent on the aircraft's navigation system and the broadcast capability of the source emitter.

2.3 An ADS-B "out" system consists of the following components:

(a) a transmitting subsystem that includes message generation and transmission functions at the source aircraft; and

(b) the data link broadcast medium.

2.4 The sources of the transmitted information, as well as the user applications, are not considered to be part of the ADS-B system, but their performance needs to be considered when defining overall ADS-B system performance.

3 APPLICABILITY

3.1 This AC is applicable to all Papua New Guinea registered aircraft operating in PNG ADS-B mandatory airspace designated as such under CAR Part 71 and foreign aircraft transmitting ADS-B information in Papua New Guinea in accordance with current rules.

4 FUNCTIONAL REQUIREMENT

4.1 ADS-B Avionics

4.1.1 For an aircraft to be ADS-B capable, it requires:

a. appropriate data sources, and

b. an ADS-B transmitter to broadcast the data in a predetermined standard format.

4.2 ADS-B Transmitter

4.2.1 The ADS-B transmitter needs to comply with the minimum performance standards detailed in RTCA Document DO-260A Para 2.2 latest revision.

4.2.2 For ADS-B data to be universally usable, it needs to be transmitted in the formats and characteristics defined in the following standards -

a) ICAO Annex 10, Volumes III and IV, Amendment 85;

b) RTCA/DO-260 change 2 (systems compliant with earlier versions may continue to use HFOM in abnormal situations described in paragraph 4.2.10; or

c) RTCA/DO-260A change 2; or

d) RTCA/DO-260B.

Note: Compliance with RTCA/DO-260B is preferred –noting that this is the requirement being implemented in the United States of America and Europe.

4.2.3 To be useable for ATC surveillance in a “radar like” manner, ADS-B transmitters must transmit the following minimum data set: -

a) **Position** (in extended squitter surface position message and in extended squitter airborne position message);

b) **Position Integrity Information** (e.g. NUC, NIC etc, value transmitted in the “TYPE” code in extended squitter surface position message and in extended squitter airborne position message);

c) **Pressure Altitude** (in extended squitter airborne position message, GNSS height may also be transmitted in this message when barometric altitude is not available);

d) **Identity** (in extended squitter identity and category message); and

e) **Version Number, SIL and NACP** in aircraft operational status message, if the avionics equipment is RTCA/DO-260A or RTCA/DO-260B compliant.

4.2.4 Additional ADS-B data, defined in ICAO Annex 10, Volumes III and Volume IV, Amendment 85 or RTCA/DO- 260 or RTCA/DO-260A, may also be transmitted.

4.2.5 Operators installing systems compliant with RTCA/DO-260B are urged to configure their systems to transmit all available parameters. Utilization of the failure annunciation output is recommended –refer RTCA/DO-260B paragraph 2.2.11.5.

4.2.6 Equipment marked as compliant with ATSO-C1004(a), ATSO-C1005(a), TSO-C166, TSO-C166a or TSO C166b, are considered capable of transmitting data described above in the correct formats. Later versions of these TSOs are acceptable.

4.2.7 Transponders marked as compliant with the following standards -

a) AEEC – ARINC 718A;

b) TSO C112;

c) EUROCAE ED-73B;

d) JTSO-2C112a; or

e) ETSO-2C112a

may be capable of transmitting this information in the correct formats. Functional testing of the installation would be required to confirm compliance.

4.2.8 ADS-B transmitters should also be compliant with the following -

1. For transmitters that also operate as ATC transponders:
   a) ATSO-C1004 (Type G1 only);
   b) ATSO-1C74c;
   c) TSO-C112 and compliant with RTCA/DO-181C; or
   d) EUROCAE ED73B or RTCA/DO-181C.
2. Non-transponder ADS-B transmitters:
   a) ATSO-C1005.

4.2.9 RTCA/DO-260 compliant ADS-B transmitters use the HPL/HIL data from the GNSS receiver as the highest priority data source for determination of NUC.

For RTCA/DO-260 compliant transmitters, ADS-B transmitters may use the Horizontal Figure of Merit (HFOM) data from the GNSS receiver during periods of HPL non- availability due to operational reasons (e.g. satellite geometry, etc).

For RTCA/DO-260A compliant transmitters, HPL is used for determination of Navigation Integrity Category (NIC) and HFOM is used for determination of Navigation Accuracy Category (NAC).

4.2.10 It is desirable that the flight crew are able to disable the ADS-B function on instruction from ATC without disabling the operation of the ATC transponder function. This will ensure that the ACAS/TCAS capability remains active.

4.2.11 It is desirable that the flight crew are able to initiate emergency messages and “IDENT” functions.

4.2.12 Transmitter antenna installation needs to comply with guidance for installation of ATC transponders to ensure satisfactory functioning. This is particularly, relevant to aircraft above 5700kg, or with a maximum cruising speed greater than 463 km/h (250knots).

4.3 ADS-B Data Source (Mandatory)

4.3.1 The following section describes the minimum data necessary for ADS-B transmitters to function in the ATC environment (for more detailed requirements including reference, see Appendix B of this AC). Each category is essential to ensure the message being transmitted has all the relevant data necessary to enable separation to be calculated. Failure to comply may render the prospective operator unable to obtain the benefits of ADS-B separation.

4.4 Positional Data

4.4.1 Accurate positional data is essential for the ADS-B system to operate in a “radar-like manner” and be the basis for the allocation of separation between aircraft. Valid GNSS data input provides an acceptable accuracy and integrity for separation purposes with the delivery of position information at a periodic interval of less than or equal to 1 second.

4.4.2 GNSS equipment compliant with TSO-C145a, TSO-C146a or another standard acceptable to the CASA are suitable for use with ADS-B.

4.4.3 Particular navigation packages that do not have an Australian Technical Standard Order (TSO), but can be demonstrated to achieve the accuracy and integrity values required, may be acceptable to CASA. In assessing the suitability of GNSS avionics that do not have a TSO-C145a/146a authorization, CASA may consider the system differences from the standards documented in RTCA/DO-229C (or later version), with particular regard to the following criteria:

a) The system’s capability of delivering position information with a periodic interval of at least one second; and
b) The system can continuously output the HPL value to the ADS-B transmitter or notify the pilot of an interruption due to availability issues (RAIM); and
c) If the system is intended primarily as a pilot navigation system with positional information being provided to the ADS-B system, it needs to meet the requirements of FAA AC 20-138A; and
d) The system takes advantage of GPS selective availability being set to zero.

4.5 Positional Integrity Data

4.5.1 HPL integrity data needs to be provided to the ADS-B transmitter from the GNSS receiver on the same interface as the positional data. This data is typically available as ARINC 429 label 130.

4.5.2 HFOM data shall be provided to the transponder on the same interface as the HPL data. HFOM typically uses ARINC 429 label 247.

An RTCA/DO-260A or RTCA/DO-260B compliant installation will use the HFOM value to calculate NAC.

In some cases, such as during rare periods of inadequate satellites, HPL may not be delivered to the interface. In this case, a RTCA/DO-260 compliant installation may use the HFOM value to generate NUC during the period of HPL non-availability, however, this is considered an abnormal situation.

4.5.3 In the case of RTCA/DO-260A or RTCA/DO-260B compliant installations, the SIL is intended to reflect the integrity of the navigation source of the position information broadcast. Where position integrity is based on HPL and the SIL cannot be unambiguously determined and set dynamically,

the value should be set to 2. During periods where HPL is not available, the NIC should be set to 0 (zero), and the NAC should reflect the accuracy of the broadcast position.

4.6 Pressure Altitude

4.6.1 Pressure altitude provided to transponders is to be in accordance with existing requirements for ATC transponders. It is preferable that 25 foot altitude encoding is used. This data is typically available on ARINC 429 label 203.

4.6.2 Suitable pressure altitude data source may be provided by:

a) A barometric encoder (FAA TSO-C88 or later version); or

b) A barometric altimeter (FAA TSO-C10 or later version); or

c) An air data computer (FAA TSO-C16 or later version); or

d) EASA equivalent versions of the above TSO standards.

4.7 Identity

4.7.1 Identity information, that is the aircraft flight identification (Flight ID) or aircraft registration mark, is to be provided to the transponder so that the information is identical to the filed flight plan. This information may be provided from: a flight management system; or a pilot control panel; or for aircraft which always operates with the same flight identity (e.g. using registration as a call-sign), it may be programmed into equipment at installation.

4.8 ADS-B Data Sources (Recommended Only)

4.8.1 GNSS altitude. GNSS altitude should be provided from an approved GNSS receiver to the ADS-B transmitter. Typically this data is available as GNSS Height (HAE) ARINC 429 label 370 or GNSS Alt (MSL) ARINC429 label 076.

4.8.2 Vertical rate (GNSS or Barometric). Vertical rate may be provided from either a GNSS receiver or from a pressure source:

a) GNSS vertical rate should be provided from an approved GNSS receiver, and is typically available as ARINC 429 label 165, or

b) Barometric vertical rate. Barometric (BARO) vertical rate is typically available as ARINC 429 label 212.

Note: The most accurate source should be used.

4.8.3 Velocity Information. Ground speed from an approved GNSS receiver in the form of East/West Velocity and North/South Velocity should be provided. This would be typically available as ARINC 429 label 174.

4.8.4 SPI Indication. For ATC transponders, the SPI capability is integrated into the transponder functionality and is controlled from the transponder control panel. For non-transponder implementations, a discrete input or a control panel may be provided to trigger the SPI indication.

4.8.5 Emergency indicator. For ATC transponders the emergency declaration capability is integrated into the transponder functionality and is controlled from the transponder control panel. For non-

transponder implementations a discrete input or a control panel may be provided to trigger the emergency and/or to indicate the type of emergency.

5 DESIGN, DEVELOPMENT AND APPROVAL OF AIRCRAFT MODIFICATIONS

5.1 Compliance

5.1.1 When utilizing this guidance material for the approval of an ADS-B installation, the following need to be considered:

a) The applicant will need to submit, to CASA, a compliance statement that shows how the criteria of this guidance material has been satisfied, together with evidence resulting from the activities described in this section.

b) Compliance with the airworthiness requirements for intended function and safety may be demonstrated by equipment qualification, safety analysis of the interface between the ADS-B equipment and data sources, equipment cooling verification and ground tests. To support the approval application, design data will need to be submitted showing that the requirements for ADS-B operation have been complied with.

5.1.2 The safety analysis of the interface between the ADS-B system and its data sources should show no unwanted interaction under normal or fault conditions. FAA AC 120-86 and AC 20-165 provides additional guidance by providing general information and acceptable methods of compliance for the certification, airworthiness, and operational approval of certain aircraft surveillance systems and selected associated aviation applications.

5.1.3 A Self-Evaluation checklist to assist in determining compliance is included Appendix A to this Advisory Circular.

5.2 Functional Testing

5.2.1 Testing of the installed system either on ground or in flight is intended to confirm:

a) System operation;
b) That the aircraft derived data in the transmitted messages, including integrity data, is correct; and
c) Correct functioning of installed system fault detectors.

5.2.2 Whilst some of the functionality for ADS-B OUT applications may be demonstrated by ground testing, thorough validation of the installed equipment combination may need a mix of ground and flight tests.

5.2.3 When a particular ADS-B equipment combination is being fitted to an aircraft the following issues need to be addressed:

a) If the equipment combination installation is in accordance with an existing proven design (ie. OEM fit, approved STC or PNG CAR Part 146 design organization engineering order) then the aircraft may only require transponder test set confirmation and the normal post maintenance check flight to confirm correct function of the installed equipment and overall aircraft operation. Coordination with local ATC may also be required.
b) If the proposed combination has not been implemented previously, but sufficient documentary evidence is submitted to prove compliance of the system integration with the performance

standards as detailed, then paragraph 5.2.1 of this AC would also apply.

5.1 Acceptance Configuration

5.3.1 Schedules 1 and 2 of Appendix B to this AC provides listings of the currently accepted equipment combinations. These combinations are not exhaustive and are historical record and not subject to further update.

5.4 Flight Manual

5.4.1 The AFM or the POH, whichever is applicable, should provide at least a statement that the transponder system(s) complies with the criteria of ICAO Annex 10 Volume III and IV, amendment 85 regarding extended squitter and any necessary procedures for expected operations. (e.g. The need to enter Flight ID) for use with ATC.

5.5 Minimum Equipment List

5.5.1 The MEL should clearly indicate that ADS-B OUT is mandatory for operations in ADS-B airspace unless specifically approved by CASA.

5.6 Maintenance

5.6.1 Maintenance tests should include a periodic verification check of aircraft ADS-B data including the ICAO 24 bit address (colloquially known as the 24-bit MODE S address) using suitable ramp test equipment. A check of the ICAO 24 bit aircraft address should be made in the event of a change of registration mark of the aircraft (this is especially necessary following a change in the State of registration) or whenever a transponder is replaced.

5.6.2 Where possible maintenance tests should check the correct functioning of system fault detectors (if any).

5.6.3 The maximum period between ADS-B maintenance tests of the ADS-B transmitter should be the same as for the ATC transponders and all transponders fitted to the aircraft should be checked.

5.7 Crew Operating Instructions

5.7.1 Crew Operating Instructions for the ADS-B system should emphasize the need to use the ICAO-defined format for entry of the aircraft identification or registration mark as applicable to the flight. The shortened format commonly used by Airlines (a format used by International Air Transport Association- IATA) is ***not*** compatible with the ground systems of the Air traffic services.

APPENDIX A – Self Evaluation Checklist

Aircraft Registration	
Aircraft Make/Model/Serial Number	
ADS-B Transmitter Manufacturer & Serial Number	
GNSS positional source Manufacturer & Model Number	
GNSS receiver TSO	**TSO C145a / TSO 146a / Other**
If not TSO C145a or TSO C146a compliant	• **Confirm supports Fault Detection Exclusion (FDE) - YES / NO** • **Confirm outputs HPL and HIL** • **Is BARO aiding provided to GNSS receiver?**
Transmitter Message formats compliant with – (Circle one)	• **ICAO Annex 10, Amendment 85; or** • **DO-260; or** • **DO-260A or TSO C166 or TSO C166a** • **DO-260B or TSO C166b**
Transmitter characteristics complaint with – (Circle one)	• **ATSO-C-1004b** • **ATSO-1C74c** • **TSO-C112d and compliant with RTCA/DO-181e or** • **ETSO-C112b or** • **ED73B or DO-181e** • **ATSO-C1005b**

HPL is provided to ADS-B transmitter on same interface as GNSS positional data and tested	**YES / NO**
Suitable barometric encoder(pressure altitude) data provided to transmitter and tested?	**YES / NO** **TSO-C10b or ETSO-C10b** **TSO-C106 or ETSO-C106** **TSO-C88b or ETSO-C88b**
Uses aircrafts own ATC transponder antenna?	**YES / NO**
If not using aircrafts own ATC antenna, has antenna been mounted in accordance with transponder mounting rules?	**YES / NO**
Flight ID source installed and tested? (Circle one)	**Programmed / pilot entry panel / Flight Management System interface**
Optional Data supported and tested (Circle those verified)	• **SPI indication** • **Emergency Flag** • **Ground track / Ground speed velocity vector** • **Emergency type indicator** • **GNSS height** • **GNSS vertical rate** • **BARO vertical rate**

APPENDIX B – Acceptable Equipment Combinations

Schedule 1 – ATC Transponder and MMR/GPS Receiver Combinations from multiple Manufacturers

Transponder Manufacturer and Model	Transponder Part Number	MMR/GPS Receiver Manufacturer and Model	MMR/GPS Receiver Part Number
ACSS XS-950 (with software mod A)	7517800-10005	Honeywell GR-550	HG2021GA03
			HG2021GC02
		Honeywell RMA-55B	066-50029-1161
		Rockwell Collins GLU-920	822-1152-001
			822-1152-002
			822-1152-121
			822-1152-130
			822-1152-131
			822-1152-220
		Rockwell Collins GLU-925	822-1821430
	7517800-10007	Rockwell Collins GLU-920	822-1152-001
			822-1152-002
			822-1152-121
			822-1152-130
			822—1152-220
		Rockwell Collins GLU-925	822-1821-001

ACSS XS-950 **(with software mod A)**	**751-7800-10009**	**Rockwell Collins GLU-920**	**822-1152-001**
			822-1152-002
			822-1152-121
			822-1152-130
			822-1152-220
	7517800-10100	**Rockwell Collins GLU-925**	**822-1821-430**
	7517800-11006	**Honeywell GR-550**	**HG2021GC02**
		Honeywell RMA-55B	**066-50029-1201**
		Rockwell Collins GLU-920	**822-1152-002**
		Rockwell Collins GLU-925	**822-1821-001**
	7517800-11009	**Honeywell GR-550**	**HG2021GC01**
		Honeywell RMA-55B	**HG2021GC02**
		Rockwell CollinsGLU-920	**822-11152-001**
			822-1152-002
		Rockwell Collins GLU-925	**822-1821-001**
Honeywell TRA-67A	**066-01127-1301**	**Honeywell GR-550**	**HG2021GP01**
		Rockwell Collins GLU-920	**822-1152-002**
		Honeywell RMA-55B	**066-50029-1161**

Honeywell TRA-67A	**066-01127-1402**	**Rockwell Collins GLU-920**	**822-1152-121**
			822-1152-130
			822-1152-131
		Thales TLS755	**TLS755-01-0101B**
			TLS755-01-0102A
	066-01127-1601	**Honeywell GR-550**	**HG2021GC01**
		Honeywell RMA-55B	**066-50029-1101**
		Rockwell Collins GLU-920	**822-1152-002**
	066-01127-1602	**Honeywell GR-550**	**HG2021GC01**
			HG2021GC02
			HG2021GP01
		Honeywell GR-551	**HG2021GP02**
	066-01127-1602	**Honeywell RMA-55B**	**066-50029-1101**
			066-50029-1201
		Litton LTN2001Mk2	**466200-0104**
		Rockwell Collins GLU-920	**822-1152-002**
			822-1152-003
		Rockwell Collins GLU-925	**822-1821-001**
			822-1821-003

		Thales TLS755	**TLS755-01-5101A**
Honeywell ISP-80A	**965-1694-001**	**Rockwell Collins GLU-925**	**822-1821-131**
			822-1821-430
Honeywell XS-858A	**7517401-960**	**CMC Electronics CMA-2024-1 (This is a modular unit normally located in a higher assembly)**	**245-604067-100**
Rockwell Collins TDR-94	**622-9352-108**	**Rockwell Collins GPS-4000S**	**822-2189-001**
	622-9352-409		**822-2189-002**
	622-9210-409		
Rockwell Collins TDR-94D	**622-9210-108**	**Rockwell Collins GPS-4000S**	**822-2189-001**
		Honeywell GR-550	**HG2021GD02**
Rockwell Collins TDR-94D	**622-9210-409**	**Freeflight Systems 1203**	**84327-01-0303**
			84327-02-100A
		Universal Electronics Systems UNS-1Lw	**3116-42-1116**
Rockwell Collins TPR-901	**822-1338-003**	**Freeflight systems**	**84327-50-200A**
		Freegflight systems	**84327-50-200B**
		Honeywell GR-500	**HG2021GC02**

	822-1338-003		**HG2021GP01**
		Honeywell RMA-55B	**066-50029-1101**
			066-50029-1201
		Rockwell Collins GLU-920	**822-1152-002**
			822-1152-005
		Rockwell Collins GLU-925	**822-1821-001**
			822-1821-330
Rockwell Collins TDR-901	**822-1338-020**	**Rockwell Collins GLU-920**	**822-1152-121**
	822-1338-021	**Rockwell Collins GLU-920**	**822-1152-121**
			822-1152-131
	822-1338-021	**Rockwell Collins GLU-925**	**822-1152-130**
			822-1821-430

Schedule 2 – ATC Transponder and GPS Receiver Manufactured by Garmin International

Table 1 – Transponders - Panel Mounted

Model	Part Number	Notes
GTX330	011-00455-60	(1) (2)
GTX330	011-00455-80	(1) (2)
GTX330D	011-00455-70	(1) (2)
GTX330D	011-00455-90	(1) (2)

Table 2 – Transponders –G1000 Avionics Suite

Model	Part Number	Notes
GTX33	011-00779-20	(1) (2)
GTX33	011-00779-30	(1) (2)
GTX33D	011-00779-21	(1) (2)

Table 3 – GPS Receivers – GPS / NAV /COMM 400W/500W Series Equipment

Model	Part Number	Notes
GNS530AW TAWS	011-01067-XX	(2) (3) (4)
GNS530AW	011-01066-XX	(2)(3)(4)
GNS530W TAWS	011-01065-XX	(2)(3)(4)
GNS530W	011-01064-XX	(2)(3)(4)
GNS500W TAWS	011-01063-XX	(2)(3)(4)
GPS500W	011-01062-XX	(2)(3)(4)

GNS430AW	**011-01061-XX**	**(2)(3)(4)**
GNS430W	**011-01060-XX**	**(2)(3)(4)**
GNC420AW	**011-01059-XX**	**(2)(3)(4)**
GNC420W	**011-01058-XX**	**(2)(3)(4)**
GPS400W	**011-01057-XX**	**(2)(3)(4)**

Table 4 – GPS Receivers –G1000 Avionics Suite

Model	Part Number	Notes
GIA 63W	**011-01105-00**	**(2)(5)(6)**
GIA 63W A2/B2	**011-01105-01**	**(2)(5)(6)**
GIA 63W	**011-01105-20**	**(2)(5)(6)**

Table 5 – GPS Receivers – GPS / NV/ COM 600/700 Series Equipment

Model	Part Number	Notes
GTN650	**011-02256-00**	

Notes Applicable to Schedule 2 Tables:

1. Software version 6.11 or later required (Garmin Service Bulletin 0935 refers)
2. Any transponder or GPS can be used in combination as they all support the Garmin RS-32 serial interface that allows GPS position and integrity information to be supplied to the transponder. Generally the G1000 transponders will be combined with the G1000 GPS unit, similarly, for the non G1000 transponders and GPS.
3. –XX denotes any numbered suffix. All part numbers in each model range are suitable for providing GPD data that can be used for ADS-B.
4. Software 3.20 or later required.
5. The unit part number shown in table 4 matches the part number printed on the nameplate or tag on the equipment itself.
6. Software version 5.80 or later required.