



Australian Government

Civil Aviation Safety Authority

Instrument number CASA 356/12

I, JOHN FRANCIS McCORMICK, Director of Aviation Safety, on behalf of CASA, make this instrument under regulations 174A and 179A of the *Civil Aviation Regulations 1988 (CAR 1988)*.

[Signed John F. McCormick]

John F. McCormick
Director of Aviation Safety

31 October 2012

Instructions — use of Global Navigation Satellite System (GNSS)

1 Duration

This instrument:

- (a) commences on 1 November 2012; and
- (b) stops having effect at the end of 31 October 2014.

2 Instructions

- (1) I issue the instructions in subsection (2) and Schedule 1.
- (2) To avoid doubt, for regulations 174A and 179A of CAR 1988, for the pilot in command of an aircraft to which Schedule 1 applies to use the Global Navigation Satellite System (GNSS), he or she is instructed to:
 - (a) carry the GNSS systems required for compliance with Schedule 1; and
 - (b) navigate, or positive position fix, the aircraft in accordance with each applicable requirement and condition set out in Schedule 1.

Schedule 1 Instructions

1 Definitions

- (1) In this Schedule:

approved database means a database:

 - (a) supplied by a person approved for paragraph 233 (1) (h) of CAR 1988; and
 - (b) on a medium approved by the manufacturer of the GNSS receiver as suitable for use with the receiver; and

- (c) incapable of modification by the operator or flight crew of an aircraft in which it is installed.

area navigation or RNAV means a method of navigation which permits an aircraft operation on any desired flight path within the coverage or the limits of capability of:

- (a) ground-based or space-based navigation aids (**NAVAIDS**); or
- (b) self-contained aids; or
- (c) a combination of the aids mentioned in paragraphs (a) and (b).

Note Area navigation includes performance-based navigation as well as other area navigation operations that do not meet the definition of **performance-based navigation**.

ATC means Air Traffic Control.

ATS means Air Traffic Service as defined in the Air Services Regulations.

CAR 1988 means the *Civil Aviation Regulations 1988*.

CASR 1998 means the *Civil Aviation Safety Regulations 1998*.

en route aircraft means an aircraft engaged in an oceanic, remote area or domestic en route phase of flight.

GNSS means Global Navigation Satellite System.

ground-based navigation aid means:

- (a) a non-directional beacon (**NDB**); or
- (b) a VHF omni-directional radio range (**VOR**); or
- (c) distance measuring equipment (**DME**).

GPS means the United States Department of Defence satellite navigation system known as the Global Positioning System.

NAT Doc 007 means the ICAO document titled *Guidance concerning Air Navigation in and above the North Atlantic MNPS Airspace*, Edition 2011, or later edition, published on behalf of the North Atlantic Systems Planning Group (NAT SPG) by the European and North Atlantic Office of ICAO.

RAIM means Receiver Autonomous Integrity Monitoring or another method of monitoring satellite signals approved by CASA under regulation 179A of CAR 1988.

RAIM loss means an indication that the RAIM system is unable to monitor compliance with the applicable horizontal integrity limit.

RAIM warning means an indication that the RAIM system has detected an anomalous condition causing position uncertainty to exceed the applicable horizontal integrity limit.

RNAV operations means aircraft operations using area navigation for the application of RNAV specifications. RNAV operations include the use of area navigation for operations which are not authorised under Civil Aviation Order (**CAO**) 20.91 or Part 91U of CASR 1998.

RNAV system means a navigation system which permits an aircraft operation on any desired flight path within the coverage of station-referenced NAVAIDs or

within the limits of the capability of self-contained aids, or a combination of these. An RNAV system may be included as part of a flight management system (FMS).

RNP operation means an aircraft operation using an RNP system for the application of an RNP specification.

RNP route means an air traffic system (ATS) route established for the use of an aircraft operating to a particular RNP specification.

RNP system means an area navigation system which supports on-board performance monitoring and alerting.

space-based navigation aid means a navigation system in which the user receives information from a satellite-based transmitter.

- (2) In this Schedule, the **applicable Horizontal Integrity Limit** is:
- (a) in an en route phase of flight — 2 nautical miles; or
 - (b) within 30 nautical miles of the departure or destination aerodrome (GNSS terminal mode) — 1 nautical mile; or
 - (c) during an approach — 0.3 nautical mile.

2 Application

- (1) These instructions are not applicable to operations conducted under CAO 20.91 or CASR Part 91U.
- (2) This Schedule applies to the following levels of GNSS equipment specification:
- (a) Technical Standard Order (**TSO**) C129/C129a;
 - (b) TSO C129/C129a Oceanic;
 - (c) TSO C145a/C146a or later version;
 - (d) TSO C196a or later;
 - (e) European Technical Standard Order (ETSO) C129a;
 - (f) ETSO C145/C145c or later version;
 - (g) ETSO C146/C146c or later version;
 - (h) ETSO C196a or later version;
 - (i) TSO C115 or ETSO C115 multi-sensor navigation systems where the primary input sensor is GNSS meeting any of the requirements of paragraphs (a) to (h).

Note Where the equivalent levels of RNP capability can be demonstrated, the same level of approval may be given by CASA.

3 Use of GNSS

- (1) The pilot in command may use GNSS in accordance with these instructions as a navigation system for:
- (a) an oceanic, remote continental area, or domestic en route, phase of flight; or
 - (b) operations in the North Atlantic Minimum Navigation Performance Specification (NAT MNPS) region in accordance with NAT Doc 007; or

- (c) V.F.R. operations.
- (2) For an operation mentioned in subclause 3 (1), the operator must ensure that the aircraft meets the equipment requirements set out in:
 - (a) 1 or more of the levels of GNSS equipment specification mentioned in subclause 2 (2); and
 - (b) Table 1 for the operation.

Note Table 1 contains mandatory requirements, as well as options and recommendations.

4 Procedures for using GNSS for oceanic, remote continental area, or domestic en route, phase of flight

- (1) The pilot in command may use GNSS as a navigation aid for descent below the relevant lowest safe altitude (*LSALT*) or minimum safe altitude (*MSA*) only in accordance with:
 - (a) CAO 20.91; or
 - (b) clause 7 or 8 of this Schedule.
- (2) The pilot in command may use a navigation database that is not current provided that:
 - (a) any data used for the navigation of the aircraft is verified as correct by checking it against other current aeronautical information, for example, maps and charts carried in the aircraft in accordance with paragraph 233 (1) (h) of CAR 1988; and
 - (b) if the navigation system affected by the out-of-date navigation data has a radio updating capability — the radio updating capability has been deselected.
- (3) The pilot in command may use GNSS with data that has been manually entered in a database only if the data entries:
 - (a) have been cross-checked for accuracy by at least 2 flight crew members; or
 - (b) for a single pilot operation — have been checked independently against other current aeronautical information, such as maps and charts carried in the aircraft in accordance with paragraph 233 (1) (h) of CAR 1988.
- (4) The pilot in command of an en route aircraft must ensure that GNSS-derived position and tracking information is checked:
 - (a) at, or before, each compulsory reporting point designated under regulation 158 of CAR 1988; and
 - (b) at, or before, each en route waypoint; and
 - (c) at hourly intervals during area navigation; and
 - (d) after the insertion of new data relating to the flight, such as a new flight plan or alteration of an existing flight plan.

- (5) The pilot in command may use GNSS as a navigation aid for an oceanic, or remote continental area, phase of flight if:
 - (a) the GNSS equipment has fault detection and exclusion (FDE) capability in accordance with:
 - (i) FAA Notice 8110.60; or
 - (ii) FAA Advisory Circular 20-138A, Appendix 1 or later version; or
 - (iii) TSO C145/TSO C146 or later version; or
 - (iv) ETSO C145/C146 or later version; or
 - (v) TSO C196 or later version; or
 - (vi) ETSO C196a or later version; and
 - (b) an appropriate en route prediction analysis conducted before the flight ensures that GNSS availability will provide a useable service.

5 Use of GNSS in V.F.R. operations

- (1) GNSS may be used under the V.F.R.:
 - (a) to supplement map reading and other visual navigation techniques; or
 - (b) for area navigation operations at night — for:
 - (i) position fixing and long-range navigation in accordance with the Aeronautical Information Publication (*AIP*) Part 2, En Route (ENR) 1.1, General Rules, section 19, Navigation requirements; or
 - (ii) operations on designated area navigation (RNAV or RNP) routes, including application of route designated LSALT; or
 - (iii) deriving distance information for en route navigation, traffic separation and ATC separation; or
 - (iv) meeting the night V.F.R. requirements for radio navigation systems mentioned in the AIP Part 1, General (GEN) 1.5, Aircraft Instruments, Equipment and Flight Documents, section 2, Radio Navigation Systems, and the alternate aerodrome requirements in accordance with AIP ENR 1.1, General Rules section 7.2.

Note ATC may apply area navigation-based separation standards to aircraft meeting the requirements for night V.F.R. RNAV.

- (2) If GNSS is used for night V.F.R. area navigation applications, the flight crew must be appropriately qualified.

6 Operating without RAIM on domestic en route phase of flight

- (1) If there is RAIM loss or loss of integrity on a domestic en route phase of a flight while using GNSS, the pilot in command must:
 - (a) monitor the aircraft's track by reference to other navigation aids with which the aircraft is equipped; or
 - (b) carry out procedures appropriate to the loss of navigation equipment.

- (2) If the pilot in command of an aircraft on a domestic en route phase of flight is using GNSS within a control area, he or she must advise ATS if:
 - (a) there is RAIM loss or loss of integrity for more than 5 minutes; or
 - (b) RAIM or data integrity is not available when ATS requests the provision of GNSS-derived information; or
 - (c) RAIM or data integrity is not available when ATS grants a clearance or imposes a requirement, based on GNSS-derived information; or
 - (d) the GNSS receiver is in dead reckoning mode, or experiences loss of its navigation function, for more than 1 minute; or
 - (e) the indicated displacement of the aircraft from the centreline of its track is found to exceed 2 miles (but not if the indicated displacement briefly exceeds 2 miles during waypoint transitions).
- (3) If valid position information is lost, with the GNSS receiver being placed in 2-dimensional or dead reckoning mode, or if there is RAIM loss for more than 5 minutes, the pilot in command must use another means of navigation until RAIM is restored and the aircraft is re-established on track.
- (4) If RAIM has been lost for more than 5 minutes, the pilot in command:
 - (a) must not use GNSS-derived information or supply it to ATS; and
 - (b) after RAIM is restored — must notify ATS before using or supplying information of that kind.
- (5) After RAIM or data integrity is restored, the pilot in command must notify ATS of the restoration before GNSS-derived information is used.
- (6) When advising ATS of the loss for more than 5 minutes of RAIM or of its subsequent restoration, the pilot in command must use the expression “RAIM failure” or “RAIM restored”.
- (7) If GNSS-derived information is supplied to ATS when RAIM has been unavailable for less than 5 minutes, the pilot in command must conclude the report with the expression “Negative RAIM”.

7 Use and supply of GNSS-derived distance information

- (1) This clause applies if the pilot in command is using GNSS.
- (2) If ATS asks for distance information without specifying the source of the information, the pilot in command may provide GNSS-derived distance information.
- (3) If ATS asks for a DME distance, the pilot in command may provide GNSS-derived distance information instead if a DME distance is not available.
- (4) When supplying GNSS-derived distance information to ATS, the pilot in command must include the source and the point of reference.

Examples “115 GPS ML VOR”, “80 GPS CTM NDB”, “267 GPS BEEZA”.

- (5) The pilot in command must only supply GNSS-derived distance information:
 - (a) by reference to waypoints and navigation aids shown in maps and charts carried in the aircraft in accordance with paragraph 233 (1) (h) of CAR 1988; and
 - (b) from a current approved database.

8 GNSS arrivals and DME arrivals

- (1) The pilot in command may use GNSS in a GNSS arrival, or a DME arrival only if:
 - (a) the coordinates of the destination VOR or NDB to which the procedure relates are obtained from a current approved database; and
 - (b) RAIM or data integrity is available at the time of descending below the applicable LSALT or MSA.
- (2) During a GNSS arrival, or DME arrival, the pilot in command must:
 - (a) use the destination VOR or NDB to provide the primary track guidance; and
 - (b) if there is a significant disparity between the track guidance provided by the destination VOR or NDB and the GNSS track indication — discontinue the arrival procedure.
- (3) If, at any time during the approach, there is doubt as to the validity of the GNSS information (e.g. RAIM warning) or if GNSS integrity is lost (e.g. RAIM not available), the pilot must conduct a missed approach.
- (4) For this clause, a significant disparity is:
 - (a) for an NDB — a divergence of more than 6.9°; and
 - (b) for a VOR — a divergence of more than 5.2°.

9 GNSS navigation equipment standards

- (1) A GNSS receiver must be installed in an Australian aircraft in accordance with:
 - (a) if fitted before 02 November 2005 — CAAP 35-1 or Advisory Circular (AC) 21-36; or
 - (b) if fitted on or after 02 November 2005 — AC 21-36; or
 - (c) for multi-sensor systems — Advisory Circular 21-37; or
 - (d) a design that provides an equivalent level of safety and that is:
 - (i) approved by CASA or an authorised person under Part 21 of CASR 1998; or
 - (ii) acceptable to CASA as conforming to the requirements for technical data under Part 21 of CASR 1998.
- (2) The automatic barometric aiding options as specified in TSO C129a, C145a, C146a or C196a or later versions, if provided in the GNSS unit, must be connected.

10 NAT MNPS operations

- (1) All operations in the North Atlantic Minimum Navigation Performance Specification (*NAT MNPS*) airspace must be approved by CASA for:
 - (a) MNPS operations; and
 - (b) RVSM operations.
- (2) For approval to operate in NAT MNPS airspace, an operator must demonstrate compliance with all relevant requirements in NAT Doc 007 and the ICAO Regional Supplementary Requirements Doc 7030, and demonstrate:
 - (a) that the aircraft is equipped with dual independent long-range navigation systems that comply with the requirements specified in NAT Doc 007, paragraphs 1.3.1 through to 1.3.4; and
 - (b) that the following have continuing airworthiness:
 - (i) navigation system performance monitoring;
 - (ii) navigation database validity monitoring and updating; and
 - (c) the adequacy of the following for flight operations:
 - (i) flight crew training for, and competency in conducting, NAT MNPS operations;
 - (ii) pre-departure procedures;
 - (iii) communications and position reporting requirements and procedures;
 - (iv) RAIM prediction requirements;
 - (v) en route navigation procedures;
 - (vi) post-flight procedures.

Note NAT Doc 007, Edition 2011 allows the use of SATCOM Voice for routine and non-routine communications. However, SATCOM Voice may not be used for ATS communications outside the NAT MNPS region. SATCOM Voice use in the NAT MNPS airspace must be in accordance with clause 11.

11 SATCOM Voice requirements for use in NAT MNPS airspace

- (1) CASA may approve an operator's application to use SATCOM Voice (*SCV*) instead of high frequency (*HF*) communication systems when operating an aircraft in NAT MNPS airspace, if the operator demonstrates to CASA's satisfaction that the operator meets the requirements of this clause.
- (2) The SCV system must:
 - (a) be an approved installation that:
 - (i) meets the requirements of Part 21 of CASR 1998 that apply for the installation and use of such a system; and
 - (ii) is capable of being operated in all phases of flight without take-off or landing limitations; and
 - (b) be:
 - (i) independent of the primary HF communications systems; and

- (ii) connected to an electrical power busbar that is unlikely to be shed in the event of an electrical power generation failure; and
 - (iii) such that there can be no common mode failures that result in the loss of the communications function; and
- (c) be:
- (i) fully integrated into the aircraft communications audio system; and
 - (ii) for pressurized aircraft — capable of being used by the flight crew when they are wearing a headset or an oxygen mask; and
- (d) have audible call annunciation with visual annunciators within the normal forward field of view of the flight crew; and
- (e) where applicable — be integrated with the Cockpit Voice Recorder and Flight Data Recorder systems; and
- (f) be a system that is demonstrably suitable for its intended purpose; and
- Note* For example, if there are no complicating factors, the SCV system may be considered suitable for its intended purpose if it has been tested and shown to meet the normal RTCA DO-160 environmental qualification requirements for avionics systems. Generally, new installations would not be considered suitable (and hence would not receive CASA approval under subclause 11 (1)) unless they used equipment that complies with TSO C159a.
- (g) have an Aircraft Flight Manual Supplement approved by CASA; and
- (h) store the calling numbers for the ATS units that must be contacted on the intended route; and
- Note* Free dialling to contact a relevant ATS unit is not permitted.
- (i) to ensure configuration control over the operator data stored in the system — be part of the operator’s active software configuration management system.
- (3) The operator must have written procedures and practical processes for the SCV system which provide the following:
- (a) airworthiness data to show that the system meets the relevant requirements under subclause (2);
 - (b) a Minimum Equipment List revision which:
 - (i) specifies that both the HF and SCV systems must be operating normally for dispatch; and
 - (ii) identifies the location of the SCV operating procedures whether in the operator’s Route Guide or elsewhere;
 - (c) Route Guide Procedures revision which:
 - (i) specifies the procedures to be used when the SCV system is being used as a back-up to the primary HF system; and
 - (ii) contains appropriate pre-departure procedures.
- (4) The operator’s flight operations group must have written procedures and practical processes for providing and updating the ATS unit calling numbers stored in the SCV. The procedures and practices must involve the operator’s

maintenance organisation, and be an integral part of the the software configuration management system.

- (5) Before the departure of an aircraft, the aircraft operator must:
- (a) identify all ATS units along the intended route (including alternates) that need to be contacted; and
 - (b) verify that the calling number of each ATS unit mentioned in paragraph (a) is appropriately stored in the SCV system; and
 - (c) verify that the phone number for the aircraft is included on the flight plan; and
 - (d) verify the SCV system operation.

Note Compliance with the pre-departure procedures is important to ensure that the SCV system provides a level of safety that is at least equivalent to the safety level of the HF communications system.

Table 1 Equipment requirements

(subclause 3 (2))

Phase of flight	Equipment requirement	Automatic barometric aiding	Manually entered data	RAIM prediction service	Loss RAIM	Alternate requirements
Visual navigation	Any GNSS receiver may be used	If GNSS receiver is installed, barometric aiding must be connected if the receiver has the capability	Permitted	Recommended	Not applicable	Not applicable
Night V.F.R. RNAV	Any of the following TSOed equipment: C129 C129a C145a C146a C196a Equivalent equipment may be approved	Must be connected if receiver has the capability	1 Cross checked by at least 2 crew members 2 In single pilot operations, cross checked against other aeronautical information such as current maps and charts carried in accordance with paragraph 233 (1) (h) of CAR 1988	Recommended	1 Monitor the aircraft's track by reference to other navigation aids with which the aircraft is equipped 2 Advise ATS and use an alternative means of navigation if there is RAIM loss or loss of integrity for more than 5 minutes 3 Use the phrases "RAIM failure" and "RAIM restored" as appropriate to advise ATS of RAIM status when required	Not applicable

Phase of flight	Equipment requirement	Automatic barometric aiding	Manually entered data	RAIM prediction service	Loss RAIM	Alternate requirements
					4 Advise ATS if RAIM is not available when ATS requests GNSS-derived information	
					5 Use the phrase “negative RAIM” to indicate that the position is based on non-RAIM information	
					6 Advise ATS if RAIM or data integrity is not available when ATS grants a clearance or gives instructions based on GNSS-derived information	
					7 Advise ATS if the GNSS receiver is in dead reckoning mode for more than 1 minute	
					8 Advise ATS if the indicated displacement of the aircraft from the centre line of its track is found to exceed 2 miles	

Phase of flight	Equipment requirement	Automatic barometric aiding	Manually entered data	RAIM prediction service	Loss RAIM	Alternate requirements
Oceanic RNAV	Any 2 of the following TSOed equipment with FDE and certified as compliant with FAA Notice 8110.60: C129 C129a C145a C146a C196a	Must be connected if receiver has the capability	RNAV 1 Cross checked by at least 2 crew members 2 In single pilot operations, cross checked against other aeronautical information such as current maps and charts carried in accordance with paragraph 233 (1) (h) of CAR 1988	Mandatory	RNAV	<ol style="list-style-type: none"> 1 Monitor the aircraft's track by reference to other navigation aids with which the aircraft is equipped 2 Advise ATS and use an alternative means of navigation if there is RAIM loss or loss of integrity for more than 5 minutes 3 Use the phrases "RAIM failure" and "RAIM restored" as appropriate to advise ATS of RAIM status when required 4 Advise ATS if RAIM is not available when ATS requests GNSS-derived information 5 Use the phrase "negative RAIM" to indicate that the position is based on

Phase of flight	Equipment requirement	Automatic barometric aiding	Manually entered data	RAIM prediction service	Loss RAIM	Alternate requirements
					non-RAIM information	
					6 Advise ATS if RAIM or data integrity is not available when ATS grants a clearance or gives instructions based on GNSS-derived information	
					7 Advise ATS if the GNSS receiver is in dead reckoning mode for more than 1 minute	
					8 Advise ATS if the indicated displacement of the aircraft from the centre line of its track is found to exceed 2 miles	
NAT MNPS	Dual Long Range Navigation Systems	Must be connected if receiver has the capability	RNAV 1 Cross checked by at least 2 crew members 2 In single pilot operations, cross checked against other aeronautical information such as	Mandatory	As required for navigation systems failure in NAT Doc 007	Not applicable

Phase of flight	Equipment requirement	Automatic barometric aiding	Manually entered data	RAIM prediction service	Loss RAIM	Alternate requirements
			current maps and charts carried in accordance with paragraph 233 (1) (h) of CAR 1988			