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## **Performance-based Navigation in Australian airspace**

### **General guidance on the GNSS mandate, decommissioning of navigation aids, and implementation of RNP 1 and RNP 2**

- 1) Implementation of Performance-based Navigation (PBN)<sup>1</sup> is a State responsibility under ICAO Annex 11, paragraph 2.7. Australia has developed the framework to implement PBN through a range of regulatory measures which, when combined, provide for the necessary aircraft equipment, operational and airworthiness requirements to meet applicable ICAO PBN navigation specifications. Details on Australia's transition to a PBN environment are contained in AIC H10/16<sup>2</sup>.
- 2) Key to the overall implementation of PBN is the application of high performance navigation capabilities that ensure highly accurate track keeping in all dimensions. This will be facilitated in Australian airspace by way of the carriage and use of suitable GNSS equipment in all IFR aircraft as required by the GNSS mandate.
- 3) Under Civil Aviation Order (CAO) 20.18<sup>3</sup> from 4 February 2016 all Australian registered aircraft operating under the IFR must be equipped with an (E)TSO C129, C145, C146 or C196a GNSS<sup>4</sup> system. Amongst other things, because the RNP 1 and RNP 2 navigation specifications have been developed on the basis of these (E)TSOs, this "GNSS mandate" has the effect that all Australian registered IFR aircraft will be RNP 1 and RNP 2 capable.
- 4) CAO 20.91<sup>5</sup> clause 8.1 requires Australian aircraft to operate in accordance with the particular ICAO PBN navigation specification in any airspace for which that PBN specification is required – this obliges Australian aircraft to comply with ICAO PBN requirements in foreign States.
- 5) CAO 20.91 includes all of the navigation specifications for RNAV 5, RNAV 1 & 2, RNP 1, RNP 2, RNP APCH, RNP AR etc. Oceanic RNP 4 and RNP (RNAV) 10 navigation specifications are contained in CASR Subpart 91.U<sup>6</sup>. Further information on PBN navigation authorisations is contained in AC 91.U-01<sup>7</sup> and airworthiness requirements in AC 91.U-04<sup>8</sup>

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1. See ICAO Performance-based Navigation (PBN) Manual (Doc 9613)

2. AIC H10/16 Australia's Transition to a Performance Based Navigation Environment

3. Civil Aviation Order 20.18 (Aircraft equipment — basic operational requirements) Instrument 2014

4. Advisory Circular AC 21-36 Global Navigation Satellite Systems (GNSS) Equipment Airworthiness Guidelines

5. Civil Aviation Order 20.91 (Instructions and directions for performance-based navigation) Instrument 2014

6. Civil Aviation Safety Regulation Subpart 91.U – Navigation Authorisations

7. Advisory Circular AC 91.U-01 - Navigation authorisations

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6) CAO 20.18 and CAO 20.91 also contain requirements for aircraft equipment, pilot qualifications and training, and continuing airworthiness.

## **PROGRESSIVE IMPLEMENTATION of RNP 1 and RNP 2**

7) Australia is actively transitioning to RNP 1 exclusive terminal operations (SIDS & STARS) and RNP 2 exclusive continental enroute operations. RNP 2 routes and RNP 1 SIDS and STARS will be progressively implemented commencing 26 May, 2016.

### **Australian registered aircraft**

8) The ICAO RNP 1 and RNP 2 navigation specifications have been developed on the basis of the FAA and European TSOs for GNSS systems. Hence, aircraft fitted with CAO 20.18 GNSS equipment (“boxes”) have the RNP 1 and RNP 2 capability already contained “in the box”. Therefore, Australian registered aircraft and Australian qualified pilots are automatically RNP 1 and RNP 2 compliant. Accordingly:

- a) Australian pilots are automatically eligible to specify RNP 2 or RNP 1 on an IFR flight plan notification if:
- the aircraft meets the requirements of CAO 20.18, and
  - the pilot is authorised to conduct a flight under the IFR using GNSS and competent in the use of the radio navigation aids according to CASR Part 61 requirements.

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- b) For Australian pilots, the RNP 1 and/or RNP 2 route specifications are met if:
- the aircraft is fitted with radio navigation aids that meet the requirements of CAO 20.18 and these navigation aids are used, and
  - the pilot is authorised to conduct a flight under the IFR using GNSS and competent in the use of the radio navigation aids according to CASR Part 61 requirements; and
  - the pilot maintains the aircraft within as close as practicable to the route centreline and certainly within a Flight Technical Error (FTE) below half the RNP value in order to meet a Total System Error (TSE) of:
    - (i) 2NM of the centreline for RNP 2 operations and
    - (ii) 1NM of the centreline for RNP 1 operations.
- c) Route lowest safe altitudes (LSALT) depicted on ERC and TAC charts are only valid for RNP 2 operations. For other than RNP 2 operations, use a pilot calculated route LSALT or default to grid LSALT - see Australian AIC H13/16<sup>9</sup>

### Foreign registered aircraft and international operators

9) CASA, Airservices Australia and the Royal Australian Air Force will facilitate the continued operation of International Operators that are unable to comply with RNP 1 and RNP 2 Navigational Specifications (Nav Spec) into Australian terminal and continental enroute airspace on RNP 1 procedures and RNP 2 routes. This may require special CASA assistance to both the International operator, and the applicable NAA, such that the NAA can issue a “No technical objection” for RNP operations, for that particular operator, in Australian continental and terminal airspace.

10) Australia expects that foreign operators will obtain RNP 1 and RNP 2 authorisations from State of Registry or State of Operator for flights in Australian terminal (SIDS and STARS) and continental enroute airspace on and after 26 May 2016. However, Australia recognises that RNP 2 in particular is a relatively new navigation specification and consequently many States have not yet established processes for including RNP 2 authorisation on their Operations Specifications (Ops Spec). Additionally, aircraft manufacturers may not have provided their customers with AFM, AFM Supplement or OEM service letters specifying the available PBN capability per airframe.

11) For these reasons Australia has instigated transition arrangements applicable to foreign registered aircraft and International operators for a two-year period. In order to facilitate RNP 1 and RNP 2 operations within Australian continental enroute and terminal airspace (SIDS and STARS) an Acceptable Means of Compliance (AMC) has been provided. The AMC requirements are reflected in regulatory instrument CASA EX06/16.<sup>10</sup>

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9. AIC H13/16 – RNP 2 and Route Lowest Safe Altitudes (LSALT)

10. General Exemption CASA EX06/16 - RNP 1 and RNP 2 Acceptable means of Compliance using GNSS based RNAV 1 and RNAV 2

12) The AMC will allow RNAV 1 and RNAV 2 authorisations issued by the State of Registry or State of Operator, together with GNSS equipment complying with ICAO Doc 9613 (ICAO PBN Manual) and Ops Spec authorisations for RNAV 1 and RNAV 2 based on GNSS, to be accepted as equivalent to RNP 1 and RNP 2 authorisations for the purposes of operations within Australian continental enroute and terminal airspace (SIDS & STARS) for the duration of the transition arrangements. The AMC will take effect for flights on or after 26 May 2016. All flights operating in accordance with the AMC will be required to enter **RMK/CASA RNP AMC** in item 18 of the flight plan.

13) Operators intending to take advantage of CASA EX06/16 should register their intent with CASA International Operations by completing the template form at: <https://www.casa.gov.au/files/form667pdf> prior to the first operation on or after 26 May 2016, providing all details called for by CASA EX06/16. Fleet operators are encouraged to identify all aircraft types expected to be operated in Australia under the AMC first submission.

14) In Australia, Airservices Australia and the Royal Australian Air Force (Australia's ANSPs) are responsible for the provision of air traffic services in accordance with ICAO Annex 11. Reliance is placed on accurate notification of navigation capabilities in the flight plan. ATC automated systems in Australia have the capability to highlight to controllers the navigation performance of each aircraft based on the flight plan notification; appropriate ATC separation standards and procedures are then applied.

15) Operations under other PBN navigation specifications (i.e. RNP (RNAV) 10, RNAV 5, RNAV 4, RNP APCH and RNP AR) will be permitted in accordance with the flight plan but are subject to the Ops Spec requirements defined for those PBN Nav Specs. Such flights will not receive the benefits of an RNP 2 air traffic service but instead will receive a service commensurate with the navigation capability notified in the flight plan.

## **DECOMMISSIONING OF NAVIGATION AIDS**

16) The GNSS mandate of 4 February 2016 will enable Airservices Australia to implement the Navigation Rationalisation Project (NRP) which will see the reduction in ground-based navigation capability by approximately 50% with the decommissioning of about 190 ground based aids – see AIC H11/16<sup>11</sup>. The remaining network of navigation aids will form the Backup Navigation Network (BNN).

17) The BNN will serve as a contingency network in the case of GNSS failure to enable aircraft to make a safe landing at an airport. However, because of the limited number and wide geographical spacing of remaining navaids, the BNN may not be capable of sustaining navigation services to flight planned destination. Those ground-based navigation aids identified for decommissioning will be removed from service on 26 May 2016 AIRAC.

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11. AIC H11/16 – Airservices Navigation Aid Rationalization Project (NRP)

18) The nav aids decommissioned under the NRP will be replaced, where necessary, by area navigation waypoints. The route amendments substituting waypoints for nav aids will take effect from 26 May 2016, the first AIRAC chart publication date after the February GNSS mandate. Beyond the substitution of waypoints for nav aids, no other significant route amendments will take place at this time.

## SUMMARY

1. The RNP 1 and RNP 2 ICAO PBN Nav Specs will be the standard navigation specifications from 26 May, 2016 for terminal area (SID & STARS) and continental enroute operations, respectively, in Australia. Australia will progressively implement RNP 2 exclusive routes and RNP 1 exclusive SIDS & STARS commencing 26 May, 2016. Notification of changes will be made via the AIS system in the normal way.
2. From 4 February 2016, all aircraft operating under the IFR must be equipped with GNSS systems meeting (E)TSO C129, C145, C146 or C196a specifications which enables compliance with RNP 1 terminal area and RNP 2 enroute operations.
3. Foreign operators intending to enter Australian continental enroute and terminal airspace on and after 26 May 2016 should obtain authorisations for RNP 1 and RNP 2 from State of Registry or State of Operator to assist the full implementation of RNP 1 and RNP 2 and enable operators to accrue benefits.
4. As soon as an authorisation for RNP 1 and/or RNP 2 has been issued by State of Registry or State of Operator, this should be notified in the flight plan immediately – no need to wait until May 2016. RNP 2 is indicated in the flight plan by **GRZ** in field 10a and **NAV/RNP2** in field 18.
5. In cases where foreign operators are administratively unable to obtain RNP 1 and/or RNP 2 authorisations from State of Registry or State of Operator because such States have not yet established processes for these authorisations, for a transition period of 2 years Australia will apply Acceptable Means of Compliance (AMC) arrangements as reflected in regulatory instrument CASA EX06/16.
6. On and after 26 May 2016 all flights operating in accordance with the AMC will be required to enter **RMK/CASA RNP AMC** in item 18 of the flight plan for each flight. The Flight Plan entries should be used as soon as available.
7. Operations under other PBN Nav Specs will be permitted in accordance with the Nav Specs on the flight plan but are subject to the Operating Specifications requirements defined for those PBN Navigation Specifications.
8. Where necessary, ICAO 5 character waypoints will replace approximately 190 ground based navigation aids from 26 May 2016 when the navigation aids are decommissioned.
9. AIP, charts and the Designated Airspace Handbook (DAH) are being updated with effect from 26 May 2016 to reflect route amendments substituting waypoints for

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navigation aids, RNP 2 for continental enroute and RNP 1 for terminal operations (SIDS & STARS).

10. From 26 May 2016, route LSALT published in DAH and on Charts are only valid for RNP 2 operations. For other than RNP 2 operations use a pilot calculated route LSALT or default to grid LSALT.

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