**APPLICATION FOR REQUIRED NAVIGATION PERFORMANCE (RNP) 4**



**INSTRUCTIONS**

1. The operator will tick (√) the appropriate yes/no boxes and as applicable insert references from the AFM or Ops Manual with sample pages attached as appendix.

2. Operator must obtain and submit manufacturer’s written confirmation with regard to continuing maintenance.

3. Operating policy and procedures, training syllabus and lesson plan must be submitted for approval before commencement of flight crew / dispatcher training.

**PARTICULARS**

**Operator : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_AOC No:\_\_\_\_\_\_\_\_\_\_\_ Rep’s Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Position:\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| Aircraft manufacturer,  Type and series | | Serial number | Registration | No. of INS / IRS / IRU make and model | No. of GNSS make and model | | No. of FMS / FMGC make and model | CPDLC / ADS-C  Make and model | |
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| **AC98-2-5** | **Title of Paragraph** | | | | | **Applicant’s Compliance Reference** | | | **CAAS Use** |
| □yes □no  □yes □no  □yes □no | **AIRWORTHINESS REQUIREMENTS**  **AIRCRAFT ELIGIBILITY**  **Aircraft with formal approval of RNP integration accounting for oceanic and remote area operations such as AFM, STC or manufacturer’s documentation, service attesting to RNP 4 airworthiness compliance are acceptable by the Authority.**  **Aircraft using only GNSS with predeparture fault detection and exclusion (FDE) availability prediction program. (Twenty-five minutes is the maximum allowable time for which FDE capability is projected to be unavailable on any one event)**  **1. Aircraft with Technical Standard Order (TSO)-C129( ) equipment must also document the equipment is approved for oceanic operations according to AC 20-138( ), Appendix 1.**  **2. TSO-C115b (or later revision) is acceptable for multisensor systems incorporating GNSS sensors.**  **Note: AFM documentation of compliance to FAA AC 90-105A Appendix F is one of the means to demonstrate RNP 4 capability.** | | | | |  | | |  |
| **2**  **2.1** □yes □no  2.2 □yes □no | **COMMUNICATION, SURVEILLANCE AND SEPARATION REQUIREMENT**  Subject to Regional Supplementary Procedures (Doc 7030) and State AIP, RNP 4 separation requirement may scale down to 30/30 (lateral/longitudinal) provided CPDLC and ADS-C with the appropriate update rate in the complete CNS solution.  This AC addresses only the navigation requirements associated with RNP 4. For information on separation minima including communication and surveillance requirements, refer to ICAO Annex 11 Chapter 3 and ICAO PANS-ATM Doc 4444 Chapter 5.4. | | | | |  | | |  |
| **4**  4.1 □yes □no  4.1 □yes □no  4.2 □yes □no | **GNSS**  GNSS is fundamental to the RNP 4 navigation specification, and its carriage precludes any need for operating time limitation. The loss of GNSS navigation though remote, needs to be considered and here are a number of requirements in the navigation specification to address this situation:  a) Because of remote probability that a fault may be detected en-route, a fault detection and exclusion (FDE) function needs be installed. As this function is not standard on TSO C129a receivers, for oceanic operations a modification is required.  b) With FDE fitted, integrity monitoring is available provided there are sufficient satellites of a suitable configuration in view. Some reduction in availability of positioning service with integrity may result from requirement for additional satellites. As the alerting requirements for RNP 4 are large, it is highly improbable that this service will not be available.  RNP 4 operation supported by a multi-sensor system does not require dispatch prediction of the availability of integrity monitoring (with FDE). The multi-sensor system integrates GNSS and IRS signals and will revert to IRS in the remote possibility that GNSS is unavailable.  Other methods of integrity monitoring include proprietary hybrid GNSS/IRS monitoring systems which provide high level of navigation with integrity need no GNSS availability prediction. | | | | |  | | |  |
| **5**  5.1 □yes □no  5.2 □yes □no  5.3 □yes □no | **FUNCTIONALITY**  FMS equipped transport aircraft normally comply with required functionalities for RNP 4 operations except for provision of a non-numeric lateral deviation display system. For this category deviation is not normally displayed on a CDI or HSI but is commonly available on a map display, usually with numeric indication of cross-track error in 1/10th nm and in some cases not the display is not within the FOV e.g. CDU.  Aircraft equipped with stand-alone GNSS navigation systems should provide track guidance via a CDI or HSI. The CDI/HSI must be coupled to the RNAV route providing a direct indication of lateral position reference to the flight planned track. This type of unit in en-route mode (normal outside 30NM from departure and destination airports) defaults to a CDI/HSI full-scale display of 5 nm, which is adequate for RNP 4. A lateral deviation display is often incorporated in the unit, and may be suitable if of sufficient size and position to allow either pilot to manoeuvre and monitor cross-track deviation.  Other functionalities required for RNP 4:  a) Display of nav-data  b) Track to fix (TF) path terminator  c) Direct to track (DF)d) Direct to function  e) Course to fix (CF)  f) Parallel offset  g) Fly-by transition criteria  h) User interface displays  i) Flight planning path selection  j) Flight planning fix sequencing  k) User course to fix  l) Path steering  m) Alerting requirement  n) Nav-database access  o) WGS 84 geodetic reference system  p) Automatic radio position update | | | | |  | | |  |
| □yes □no | **CONTINUING AIRWORTHINESS**  Maintenance programme reference | | | | |  | | |  |
| **3**  3.1 □yes □no  3.2 □yes □no | **OPERATIONAL REQUIREMENTS**  To meet RNP 4 requirements, the aircraft must maintain track-keeping accuracy of ±4 nm for 95% of flight time and for RNP specification, the functionality must include monitoring and alerting system.  .A summary of RNP 4 requirements is as follows:  a) Two LRNS (long range navigation systems)  b) At least one GNSS receiver  c) Navigation database  d) Navigation displays in the pilot’s FOV must be sufficient to permit track following and manoeuvring  e) Maximum permitted cross-track error/deviation is 2 nm. | | | | |  | | |  |
| **7**  7.1 □yes □no  7.2 □yes □no    7.3 □yes □no | **OPERATION PROCEDURES**  For RNP 4 operations the standard operating procedures adopted by the operator for oceanic and remote routes shall include Authority requirements as well as approval guidance documents in paragraph 9 above.  The essential elements to be incorporated in the operator’s procedures are:  a) The aircraft is serviceable for RNP 4 operations  b) The RNP 4 capability is indicated on the flight plan  c) En-route loss of capability is identified and reported  d) Procedures for alternative navigation are described  GNSS based operations require the prediction of FDE availability. GNSS service prediction programs are generally based on prediction at a destination and not over a route or a large area. In view that the probability of the constellation unable to support FDE for RNP 4 operations is remote, the operator may satisfy this requirement by either a general route analysis or a dispatch prediction of satellite availability. | | | | |  | | |  |
| **Doc 9613**  □yes □no | **OPERATIONS MANUAL**  **Flight Planning**   * Verify RNAV 5 Operational Approval. * Confirm adequacy of normal and contingency procedures.   **Pre-flight procedures**   * Verify flight plan entry. * Verify navdata for validity and currency * Verify Navaid infrastructure and if GNSS fault detection (5minutes).l   **En-route ABAS**  Check RAIM.  **General operating procedures**  **Contingency procedures.** | | | | |  | | |  |
| **8**  □yes □no | **PILOT KNOWLEDGE AND TRAINING**  Operators holding RNAV operational approval will need to familiarise with the monitoring and alerting functionality of RNP operations and to ensure that flight crew are familiar with the principles and operations of GNSS. | | | | |  | | |  |
| □yes □no | **MEL** Minimum equipment list showing LRNS provisions | | | | |  | | |  |
| □yes □no | **HMI** Human / Machine Interface review. | | | | |  | | |  |
| □yes □no | **QSRA** Qualitative Safety Risk Assessment | | | | |  | | |  |

**“Warning:   Notice is given that the operator shall accept full responsibility for all information given in this application form. Any attempt to provide false information will result in rejection of the application and, if already granted, the withdrawal of the Operational Approval. In addition, the operator may render himself liable to prosecution under section 29C(1)(b) of the Air Navigation Act.**

    “I declare to the best of my knowledge and belief that the statements made and the information supplied in this form are complete and correct.  I understand that any false representations made by me for the purpose of procuring the Singapore aviation safety instrument is an offence under section 29C(1)(b) of the Air Navigation Act and I may be subject to the penalties stipulated thereunder and any Singapore aviation safety instrument granted pursuant to the application will be revoked.”

**Signature / Name of person representing the operator:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Signature / Name of FS Officer accepting this form :\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| Revision History | | | |
| Version | Date | Paragraph(s) | Details |
| 1.0 | 01 October 2015 | Various | Minor editorial |
| 2.0 | 31 July 2019 | Various | Change in References |

**REFERENCES**

Regulatory: (1) ANR-98

Compliance: (1) CAAS AC 98-2-5 (2) ICAO Doc 9613 (3) FAA Order 8400.33