AMC 20-12

AMC 20-12 Recognition of FAA Order 8400.12a for RNP-10 Operations

ED Decision 2006/012/R

1. PURPOSE

This AMC calls attention to the FAA Order 8400.12A "Required Navigation Performance 10 (RNP-10) Operational Approval", issued 9th February 1998. FAA Order 8400.12A addresses RNP-10 requirements, the operational approval process, application principles, continuing airworthiness and operational requirements. This AMC explains how the technical content and the operational principles of the Order may be applied as a means, but not the only means, to obtain EASA approval for RNP-10 operations.

2. REFERENCE DOCUMENTS

2.1 Related Requirements

CS/FAR 25.1301, 25.1307, 25.1309, 25.1316, 25.1321, 25.1322, 25.1329, 25.1431, 25.1335 25.1581.

CS/FAR 23.1301, 23.1309, 23.1311, 23.1321, 23.1322, 23.1329, 23.1335, 23.1431, 23.1581.

2.2 Related Guidance Material

2.2.1 ICAO

ICAO Doc 7030/4	Regional Supplementary Procedures
ICAO Doc 9613-AN/937	Manual on Required Navigational Performance

2.2.2 EASA/JAA

EASA AMC 25-11	Electronic Display Systems.
EASA AMC 20-5	Airworthiness Approval and Operational Criteria for the use of the Navstar Global Positioning System (GPS).
JAA Leaflet No 9	Recognition of EUROCAE Document ED-76 (RTCA DO-200A): Standards for Processing Aeronautical Data.

2.2.3 FAA

Order 8400.12A	Required Navigation Performance 10 (RNP-10) Operational Approval, issued February 1998.
Order 8110.60	GPS as Primary Means of Navigation for Oceanic/Remote Operations.
AC 25-4	Inertial Navigation Systems (INS).
AC 25-11	Electronic Display Systems.
AC 25-15	Approval of Flight Management Systems in Transport Category Airplanes.
AC 20-130A	Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors.

AC 20-138	Airworthiness Approval of NAVSTAR Global Positioning System (GPS) for use as a VFR and IFR Supplemental Navigation System.
14 CFR Part 121 Appendix G	Doppler Radar and Inertial Navigation System (INS): Request for Evaluation; Equipment and Equipment Installation; Training Program; Equipment Accuracy and Reliability; Evaluation Program.

2.2.4 Technical Standard Orders

ETSO-2C115() / TSO-C115()	Airborne Area Navigation Equipment Using Multi-sensor Inputs.
ETSO-C129a / TSO-C129()	Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)
ETSO-C145/ TSO-C145()	Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).
ETSO-C146/ TSO-C146()	Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).

2.2.5 EUROCAE / RTCA and ARINC

ED-75A / DO-236A	Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation.
ED-76 / DO-200A	Standards for Processing Aeronautical Data.
ED-77 / DO-201A	Standards for Aeronautical Information.
DO-229B	Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne equipment.
ARINC 424	Navigation System Data Base.

3. BACKGROUND

3.1 Airspace in various oceanic and remote regions of the world is being restructured progressively to provide capacity and operating benefits for the aircraft traffic. This restructuring involves reduced route spacing (e.g. 50NM in place of 100NM) that, in turn, demands improved aircraft navigational performance. Airspace for this purpose is designated as RNP-10 airspace.

3.2 The RNP-10 implementation is for the oceanic and remote phases of flight where ground based navigation aids do not exist except possibly at isolated locations. Hence aircraft navigation will need to be based on a long range navigation capability of acceptable performance using inertial navigation and/or global positioning systems.

3.3 Aircraft may qualify for RNP-10 airspace operational approval on the basis of compliance with an appropriate RNP build standard. The navigation performance of aircraft already in service also may qualify and this AMC provides a means of determining their eligibility.

3.4 It is not intended that RNP-10 operational approvals already granted by national authorities in compliance with FAA Order 8400.12A should be re-investigated.

4 CERTIFICATION CRITERIA

4.1 Airworthiness Approval

FAA Order 8400.12A discusses required system performance (paragraphs 10 and 15), certification actions (paragraph 16), continued airworthiness considerations (paragraph 14), and provides guidance (paragraph 12) for demonstrating eligibility for RNP-10 approval. Key aspects of the FAA Order are summarised in the following paragraphs of this AMC. These should be applied in conjunction with the technical content of the Order for the purposes of obtaining RNP-10 approval under EASA regulations.

4.2 Required Equipment and Performance

4.2.1 Aircraft operating in RNP-10 airspace shall have a 95% cross-track error of less than 10 NM. This includes positioning error, flight technical error (FTE), path definition error and display error. The aircraft shall have also a 95% along-track positioning error of less than 10 NM.

4.2.2 Loss of all long range navigation information should be Improbable (Remote), and displaying misleading navigational or positional information simultaneously on both pilot's displays should be Improbable (Remote). This requirement can be satisfied by the carriage of at least dual independent, long range navigation systems compliant with the criteria of this AMC and the FAA Order. See also EASA AMC 25-11.

4.3 Eligibility for RNP-10 Operations

In respect of system navigational performance, the Order defines three aircraft groups, which may be eligible for RNP-10 operations:

– Aircraft eligibility through RNP certification (Eligibility Group 1).

– Aircraft eligibility through prior navigation system certification (Eligibility Group 2).

– Aircraft eligibility through Data Collection (Eligibility Group 3).

In all cases, where navigation relies on inertial systems, a usage limit of 6.2 hours is set from the time the inertial system is placed into the navigation mode. The FAA Order explains, in paragraph 12d, the options available to extend the time limits for use of inertial systems.

RNP containment integrity/continuity, as defined in EUROCAE ED-75( ) (or RTCA DO-236( ) "MASPS for RNP Area Navigation"), are not required functions for RNP-10 operations.

4.3.1 Aircraft eligibility through RNP certification (Eligibility Group 1).

Group 1 aircraft are those that have obtained formal certification and approval of RNP capable systems integrated in the aircraft.

If RNP compliance is stated in the Aircraft Flight Manual (AFM), the operational approval of Group 1 aircraft will be based upon the performance defined in that statement.

Note: RNP value in AFM is typically not limited to RNP-10. The AFM will state RNP levels that have been demonstrated. An airworthiness approval specifically addressing only RNP-10 performance may be requested and granted.

4.3.2 Aircraft eligibility through prior navigation system certification (Eligibility Group 2).

Group 2 represents aircraft that can equate their level of performance, certified against earlier standards, to the RNP-10 criteria. Group 2 aircraft are sub-divided into three parts:

(a) Aircraft equipped with Inertial Systems

These aircraft are considered to meet all of the RNP-10 requirements for up to 6.2 hours of flight time if the inertial systems have been shown to meet the intent of CFR Part 121, Appendix G[1], or equivalent criteria. This time starts when the system is placed in the navigation mode and no en-route facility for radio updating is available. Operators may seek approval to extend this time limit by demonstrating inertial system accuracy, better than the assumed 2 NM per hour radial error, by means of an additional data collection.

If systems are updated en-route (radio navigation updating), the 6.2 hour limit can be extended taking account of the accuracy of the update. See paragraph 4.5 of this AMC.

(b) Aircraft where GPS provides the only means of long range navigation.

For aircraft in this group where GPS provides the only means of long range navigation (i.e. inertial systems are not carried) when out of range of conventional ground stations (VOR/DME), the aircraft flight manual should indicate that the GPS installation is approved as a primary means of navigation for oceanic and remote operations in accordance with FAA Notice 8110.60[2]. These aircraft are considered to meet the RNP-10 requirements without time limitations. At least dual GPS equipment, compliant with ETSO-C129a/TSO-C129(), are required, together with an approved availability prediction program for fault detection and exclusion (FDE) for use prior to dispatch. For RNP-10 operations, the maximum allowable period of time for which the FDE capability is predicted to be unavailable is 34 minutes.

(c) Multisensor Systems Integrating GPS with Inertial Data.

Multisensor systems integrating GPS with RAIM, FDE or an equivalent integrity method that are approved in accordance with FAA AC 20-130A are considered to meet RNP-10 requirements without time limitations. In this case, the inertial system will need to meet the intent of CFR Part 121, Appendix G, or equivalent criteria.

4.3.3 Aircraft eligibility through Data Collection (Eligibility Group 3).

Group 3 represents older out-of-production aircraft that contain widely varying navigation capability.

A data collection program, acceptable to the Agency, may be used by the applicant to demonstrate that the aircraft and navigation systems provide the flight crew with acceptable navigational situational awareness relative to the intended RNP-10 route. The Order describes the essential aspects of a data collection programme.

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1 See Annex 2

2 Notice 8110.60 is recognised by AMC 20-5. The material is now incorporated in AC 20-138A as Appendix 1

The Agency will accept as evidence, inertial system performance data obtained and analysed during previous programmes for RNP-10 approval including data that validates extended flight time.

4.4 Operational Approval and Procedures.

The operational principles given in the FAA Order may be used as the basis for RNP-10 operational approval. To obtain approval, the applicant should address at least the following:

4.4.1 Eligibility for RNP-10.

Evidence should be made available confirming that the aircraft has an approved RNP-10 navigation capability.

4.4.2 Aircraft Equipment and Minimum Equipment List.

The applicant should provide a configuration list of equipment to be used for RNP-10 operations. The MEL(MMEL) should be reviewed to ensure its compatibility with RNP-10 operations. Specific attention should be directed to the need for three inertial navigation units for dispatch if RNP-10 approval is based on a triple-mix solution.

4.4.3 Operational Procedures and Training.

4.4.3.1 Applicant should demonstrate to the responsible authority that the training items related to RNP-10 operations are incorporated into flight crew training. Training for other personnel should be included where appropriate (e.g., dispatchers and maintenance personnel).

4.4.3.2 Operating manuals and checklists should be revised to include information and guidance appropriate to RNP-10 operations. The manuals should include operating instructions for the navigation equipment, and RNP-10 operational procedures (see Appendix 4 of the Order).

4.4.3.3 Operating procedures will need to take account of the RNP-10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNP-10 airspace. Where an extension to the time limit is permitted, the flight crew will need to ensure en-route radio facilities are serviceable before departure, and to apply radio updates in accordance with any Flight Manual limits.

4.4.3.4 Manuals and checklists will need to be submitted to the responsible authority for review as part of the approval process.

4.5 Position Updating

Subject to approval, operators may extend their RNP-10 inertial navigation time by position updating as discussed in paragraph 12e and Appendix 7 of the Order. For position updating approval, aircraft operators will need to calculate, using statistically based typical winds for each planned route, points at which updates can be made, and the points at which further updates will not be possible.

4.5.1 Automatic radio position update.

Automatic radio position updating is acceptable for operations in RNP-10 airspace as discussed in paragraph 12f of the Order.

4.5.2 Manual radio position update.

Subject to an approved procedure, manual radio updating is permitted as discussed in the paragraph 12g and Appendix 7, of the Order.

4.6 Incident reporting.

Significant incidents associated with the operation of the aircraft that affect or could affect the safety of RNP-10 operations (i.e. navigation error) will need to be reported in accordance with applicable operational rules.

5. AVAILABILITY OF DOCUMENTS

JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on the JAA website and at www.avdataworks.com).

EUROCAE documents may be purchased from EUROCAE, 17 rue Hamelin, 75783 Paris Cedex 16, France, (Fax: 33 1 45 05 72 30). Web site: www.eurocae.org

FAA documents may be obtained from Department of Transportation, Subsequent Distribution Office SVC-121.23, Ardmore East Business Centre, 3341 Q 75th Avenue, Landover, MD 20785, USA. Web site www.faa.gov

RTCA documents may be obtained from RTCA Inc, 1828 L Street, NW., Suite 805, Washington, DC 20036, USA., (Tel: 1 202 833 9339; Fax 1 202 833 9434). Web site www.rtca.org

ICAO documents may be purchased from Document Sales Unit, International Civil Aviation Organisation, 999 University Street, Montreal, Quebec, Canada H3C 5H7, (Fax: 1 514 954 6769, e-mail: sales_unit@icao.org) or through national agencies.

ARINC documents may be purchased from ARINC Incorporated; Document Section, 2551 Riva Road, Annapolis, MD 21401-7465, USA, web site www.ARINC.com

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