



# **EAC**

## **No. 91\_13**

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## Approval of Minimum Navigation Performance Specifications (MNPS)

### **EAC91-13.1 Purpose**

This Circular sets forth the requirements for obtaining approval to operate within a specific airspace designated as Minimum Navigation Performance Specifications MNPS airspace. The Required Navigation Performance (RNP) within that airspace is as defined in ICAO Document 9613-AN/937 Manual on Required Navigation Performance.

### **EAC91-13.3 Related ECAR sections**

- ECAR 91.703& 705, Appendix C.
- ECAR 121, Appendix G

### **EAC91-13.5 Related reading materials**

- (a) ICAO Doc. 7030/4 Regional Supplementary Procedures.
- (b) ICAO Doc.9613-AN/937 Manual on Required Navigation Performance(RNP)types.
- (c) ICAO Doc. NAT Doc. 001, T13.5 N, Consolidated Guidance Material North Atlantic Region.
- (d) ICAO Doc.4444-Rules of the Air and Air Traffic Services.
- (e) ICAO Annex 2.
- (f) North Atlantic (NAT) Minimum Navigation Performance Specifications airspace (MNPSA) Operations Manual- Seventh Edition, Dec.1997.
- (g) Aeronautical Information Publications( AIPS ) Published by States.
- (h) Notices To Airmen (NOTAMS).
- (i) U.S.FAA AC20-138 Airworthiness Approval of GPS Navigation Equipment for use as a VFR and IFR supplement navigation system.
- (j) U.S. FAA AC20-130 Airworthiness Approval of Multi-sensor Navigation systems.

### **EAC91-13.7 Background.**

The concept of the MNPS was proposed on a worldwide basis at the International Civil Aviation Organization (ICAO) 9th Air Navigation Conference. The objective of MNPS is to ensure safe separation of aircraft and enable operators to derive maximum economic benefit from the improvement in navigation performance demonstrated in recent years. The MNPS concept was scheduled to be implemented on a regional basis, taking into account particular regional operating conditions.

### **EAC91-13.9 North Atlantic Minimum Navigation Performance (NAT-MNPS) Airspace**

- (a) At the September 1976 Limited North Atlantic Regional Air Navigation Meeting, criteria for MNPS, and the introduction of these criteria within parts of the NAT Region, effective at 0001 GMT, December 29, 1977, were agreed upon. The area concerned is designated as the "NAT-MNPS" airspace.
- (b) NAT-MNPS airspace is defined by the volume of airspace from FL 285 to FL 420 extending between latitude 27 degrees north and the North Pole, bounded in the east by the eastern boundaries of control areas Santa Maria Oceanic, Shanwick Oceanic, and Reykjavik Oceanic and in the west by the western boundaries of control areas Reykjavik Oceanic, Gander Oceanic, and New York Oceanic, excluding the areas west of 60 degrees west and south of 38 degrees 30 minutes north.
- (c) Contingent upon supportive statistical data, the lateral separation of aircraft in the NAT-MNPS airspace has been reduced to 60 NM and the 1000 feet vertical separation retained. For users of the NAT Organized Track Structure (OTS), this provided additional tracks nearer the optimum track.
- (d) The NAT-MNPS represents navigational performance (necessary to reduce the risk of collision) on an internationally established level. The MNPS establishes the following four demanding criteria:
  - (1) The average lateral deviation (for any cause) cannot be greater than 6.3 NM from the exact centerline of the assigned route over any portion of the route.

- (2) Ninety-five percent of all of the lateral displacements (for any cause) from the exact centerline of the assigned route cannot be greater than 12.6 NM for all flights over any portion of that route.
- (3) Each operator cannot have more than 1 lateral deviation (for any cause) of 30 NM or more in 1,887 flights in the NAT-MNPS airspace. When errors of these magnitudes occur the aircraft has failed to navigate to the degree of accuracy required for the control of air traffic.
- (4) Each operator cannot have more than 1 lateral deviation (for any cause) which is within  $\pm 10$  NM of a multiple of the separation minimums applied in 7,693 flights in the NAT-MNPS airspace. NAT-MNPS airspace routes are separated by 60 NM. Multiples of 60 are 60, 120, 180, etc. Therefore,  $\pm 10$  NM of these multiples are 50 - 70 NM, 110 - 130 NM, 170 - 190 NM, etc. For example, if an error of 50 - 70 NM occurs, the aircraft has strayed into the airspace of an adjacent route. Errors of these magnitudes are extremely serious. The potential for a collision is high because the resulting flight path can overlap the flight path assigned to another aircraft (possibly coming from the opposite direction).

Note: Operational history in NAT-MNPS airspace clearly shows that most serious navigational errors are directly related to operator/pilot error. Equipment malfunction and equipment accuracy are usually not the primary cause for these errors. Most of these serious errors are caused by the crew navigating precisely to the wrong place while believing they know the actual position of the aircraft.

#### **EAC91-13.11 Approval process for NAT-MNPS**

- (a) Operators under (ECAR 91& 121) should submit an application to the FSSS in the form and manner prescribed by the ECAA. Each operator must submit his application at least 30 days before the date of intended operation along with the following:
  - (1) List of Aircraft Long Range Navigation Systems (LRNS) to be used for NAT-MNPS.
  - (2) Operational training programs and operating practices and procedures.
  - (3) Operating history that identifies relevant past problems and incidents, if any, related to Class II Navigation Errors for that operator and action taken to correct the situation.
  - (4) Minimum Equipment List (MEL) updates to reflect any new required dispatch conditions for NAT-MNPS Operations.
  - (5) Maintenance program updates .
  - (6) Procedures necessary for follow up action after navigation error reports, and the potential for removal of NAT-MNPS operating authority.
- (b) Each operator and each aircraft and navigation system combination must be approved before operating in NAT-MNPS airspace. To obtain NAT-MNPS approval, the operator must show compliance with the following conditions:
  - (1) Each aircraft is suitably equipped and capable of meeting the NAT-MNPS standards.
  - (2) Operating procedures are established which assure NAT-MNPS standards are met.
  - (3) The cockpit crews are capable of operating with sufficient precision to consistently meet NAT-MNPS requirements.
- (c) Each operator must demonstrate (validate) that it can meet NAT-MNPS standards before receiving approval. Sufficient accuracy data must be collected during this demonstration to show that navigation performance meets NAT-MNPS standards. Temporary approval for validation flights in revenue operation may be granted provided all other requirements are met including enough non revenue proving flights to validate equipment and cockpit crew operational and accuracy standards, and an navigation specialist is on board the validation flight(s). For ECAR 121 operators the NAT-MNPS approvals are granted by issuing paragraph B39 and by adding that area of enroute operation to paragraph B50 of the standard operations specifications. For ECAR 91 operators the NAT-MNPS approvals are granted by issuing a letter of authorization.

### **EAC91-13.13 Equipment requirements for operations within unrestricted NAT-MNPS airspace**

(a) Lateral navigation.

There are two navigational requirements for aircraft planning to operate in the MNPS. One refers to the navigation performance which should be achieved in terms of accuracy. The second refers to the need to carry stand-by equipment with comparable performance characteristics (ICAO Annex 6, Parts I and II, Chapter 7). Thus in order to justify consideration for State approval of unrestricted operation in the MNPS an aircraft must be equipped with the following:

(1) Two fully serviceable Long Range Navigation Systems LRNSs. A (LRNS) may be one of the following:

- (i) Inertial Navigation System (INS); complying with MNPS specifications.
- (ii) Global Navigation Satellite System (GNSS) ; or
- (iii) A navigation system using the inputs from one or more Inertial Reference System (IRSs) or any other sensor system complying with MNPS specifications.

Note 1: Only two GNSS currently exist, the Global Positioning System (GPS) and the Global Orbiting Navigation Satellite System (GLONASS).

Note 2 :A GPS installation must be approved as follows:

If the two required LRNSs are both GPS, they must be approved in accordance with U.S.FAA AC20-138, U.S.FAA AC20-130 or equivalent. If GPS serves as only one of the two required LRNSs, then it must be approved in accordance with U.S.FAA TSO-C129 as Class A1, A2, B1, B2, C1 or C2 or equivalent.

(b) Longitudinal navigation.

Longitudinal separations between subsequent aircraft following the same track (in-trail) and between aircraft on intersecting tracks in the NAT MNPS are assessed in terms of differences in ATAs/ETAs at common waypoints. The longitudinal separation minima currently used in the NAT MNPS are thus expressed in clock minutes. The maintenance of in-trail separation is aided by the application of the Mach Number Technique. However, aircraft clock errors resulting in waypoint ATA report errors can lead to an erosion of actual longitudinal separations between aircraft. It is thus vitally important that the time-keeping device intended to be used to indicate waypoint passing times is accurate, and is synchronized to an acceptable UTC time signal before commencing flight in MNPS. Thus the pre-flight procedures for any NAT MNPS operation must include a UTC time check and re synchronization of the aircraft master clock. A list of acceptable time sources for this purpose have been promulgated by NAT ATS provider States.

(c) Vertical navigation.

Operators that choose to operate between FL 330 and FL 370 inclusive, are required to be approved by for both MNPS and RVSM operation. Operators that choose to operate in MNPS airspace at FL 310 and below and /or FL 390 and above are required to be approved for MNPS operation only. For RVSM approval refer to EAC 91-9.

### **EAC91-13.15 Maintaining NAT-MNPS authorization.**

(a) In addition to initially meeting MNPS criteria, each operator must continuously maintain the required level of navigational performance. Each gross navigational error (errors greater than 25 NM) has a significant impact on flight safety in this airspace and must be fully investigated in a timely manner. The cause of each error must be identified and meaningful action must be taken to prevent reoccurrence of similar errors.

(b) When a particular operator (for any cause) experiences a gross navigation error rate higher than the internationally established error rate permitted in MNPS airspace, the ECAA must immediately notify the operator that timely action must be taken to improve navigation performance. After this notification, the ECAA must determine the effectiveness of the operator's actions as follows:

- (1) If it is determined that an operator's actions will prevent the occurrence of similar errors, the operator may be permitted to continue NAT-MNPS operations with close surveillance of the operator's navigational performance.

If similar errors occur (in subsequent operations) more frequently than permitted by the standard, stronger action must be taken.

- (2) If an operator fails to take action to improve navigation performance, action will be initiated to suspend NAT-MNPS authorization (operations specifications).
- (3) If it is determined that an operator's actions to improve navigational performance are inadequate or otherwise unsatisfactory, the operator will be notified that the corrective action is unacceptable. When an operator does not implement a satisfactory solution, the action must be initiated to suspend NAT-MNPS authorization.
- (4) The navigation specialists should participate in the investigation of gross navigation errors. These specialists must also participate in the evaluation of the actions proposed by the operator to preclude the occurrence of similar errors.

#### **EAC91-13.17 Crew knowledge**

- (a) Commercial Operators should ensure that crews have been trained to ensure that they are knowledgeable of the topics contained in this circular, limits of their NAT-MNPS navigation capabilities, effects of updating and NAT-MNPS contingency procedures.
- (b) ECAR 91 operators should show the pilots are knowledgeable on NAT-MNPS operations. The intent is for an applicant for NAT-MNPS authorization to show the crew members are knowledgeable on the material contained in this circular.

#### **EAC91-13.19 Canadian Minimum Navigation Performance Specifications Airspace**

Certain high altitude airspace in Northern Canada has been designated as Minimum Navigation Performance Specifications (MNPS) airspace (see Canadian AIP). The navigational performance criteria for operation in Canadian MNPS airspace is identical to the criteria for NAT-MNPS airspace.

- (a) General Criteria. In general, any aircraft/navigation system combination approved for unrestricted operation in NAT-MNPS airspace for a particular operator also meets Canadian MNPS criteria. A particular operator can (under most circumstances) be authorized to conduct Canadian MNPS operations with those aircraft and navigation system combinations authorized for that operator in NAT-MNPS airspace. However, due to the unique nature of operations in high latitudes and in areas of magnetic unreliability, approval for Canadian MNPS operation is not automatic. Each proposed operation must be evaluated on its own merits.
- (b) Special Factors. The following special factors must be considered and carefully evaluated before granting air navigation approvals for operation in Canadian MNPS airspace.
  - (1) For operators currently authorized to use an aircraft and an INS combination in NAT-MNPS airspace the following factors apply:
    - (i) INS systems meeting NAT-MNPS criteria automatically meet Canadian MNPS criteria.
    - (ii) Operations at high latitude airports (greater than 67° N/S) must not be authorized unless INS platform alignment has been successfully demonstrated or approved for those latitudes.
    - (iii) Training programs and crew procedures must provide techniques and methods for the following:
      - (A) Approaches and departures using appropriate heading references other than magnetic.
      - (B) Use of ground based NAVAIDs oriented to appropriate directional references other than magnetic.
  - (2) For operators who are not currently authorized to use an aircraft and a navigation system combination in NAT-MNPS airspace, but propose to operate in the Canadian MNPS airspace, the following direction applies:
    - (i) The operator must meet the criteria in this circular considering the conditions unique to Canadian MNPS airspace.
    - (ii) The operator must also meet the special factors specified in (b)(1).
    - (iii) All Canadian MNPS airspace approvals are granted by adding that area of enroute operations to paragraph B50 of the operations specifications.

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**EAC91-13.21 Expansion of MNPS to other oceanic airspace.**

In time, MNPS may be imposed on other oceanic airspace. The specifications imposed would be determined by the amount of air traffic anticipated, navigation aids available, etc. Specifications for other oceanic airspace may or may not be as demanding as those imposed over the North Atlantic. Approval to operate within the NAT-MNPS airspace does not constitute approval to operate within any other MNPS airspace that may be imposed in the future.