

CIVIL AVIATION AUTHORITY, BANGLADESH  
AIR NAVIGATION ORDERS  
(Flight Operations Requirements)

**PART A – Flight Crew Licencing, Training and Authorization**

**ANO (OPS) A-9 – REQUIREMENTS OF TRAINING OF FLIGHT CREW FOR  
AREA NAVIGATION / REQUIRED NAVIGATION PERFORMANCE.**

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## 1. INTRODUCTION

- 1.1 Rules 143 (2) (b) of CAR'84 stipulate that every airplane shall be fitted with instrument and equipment, including radio apparatus and special equipment, as may be specified according to the use and circumstances under which the flight is to be conducted. This CAR lays down the requirements for obtaining airworthiness and operational approvals for the use of navigation system in the airspace designated for RNAV operations. It establishes an acceptable means, but not the only means that can be used in the approval process to conduct flight in airspace or on routes where RNAV operation is applicable. The operator is also required to meet the RNAV airspace requirements of the State on which aircraft is flying.

## 2. DEFINITIONS

**Area Navigation (RNAV)**- A method of navigation which permits aircraft operation on any desired flight path within the coverage of station-referenced ground or space based navigation aids or within the limits of the capability of self-contained navigation aids, or a combination of these. This removes the restriction imposed on conventional routes and procedures where the aircraft must overfly the referenced navigation aids, thereby permitting operational flexibility, navigational accuracy and efficiency. The specified RNAV accuracy must be met 95% of the total sector flight time.

- RNAV 1 requires a total system error of not more than 1 NM for 95% of the total sector flight time.
- RNAV 2 requires a total system error of not more than 2 NM for 95% of the total sector flight time

**Area Navigation Route** - An ATS route established for the use of aircraft capable of employing area navigation.

**Aircraft-Based Augmentation System (ABAS)** - An augmentation system that augments and/or integrates the information obtained from the other GNSS elements with information available on board the aircraft.

**Note** - The most common form of ABAS is receiver autonomous integrity monitoring (RAIM).

**ATS Surveillance Service** - Term used to indicate a service provided directly by means of an ATS surveillance system.

**ATS Surveillance System** - A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground based system that enables the identification of aircraft.

**Flight Management System (FMS)** - An integrated system, consisting of airborne sensor, receiver and computer with both navigation and aircraft performance data bases, which provides performance and RNAV guidance to a display and automatic flight control system.

**Mixed Navigation Environment** - An environment where different navigation specifications may be applied within the same airspace (e.g. RNP 10 routes, RNP 4 routes etc in the same airspace) or where operations using conventional navigation are allowed together with RNAV or RNP applications.

**Navigation Aid (Navaid) Infrastructure** -Navaid Infrastructure refers to space-based and or ground-based navigation aids available to meet the requirements in the navigation specification.

**Navigation Function** - The detailed capability of the navigation system (such as the execution of leg transitions, parallel offset capabilities, holding patterns, navigation data bases) required to meet the Airspace Concept.

**Note**- Navigational functional requirements are one of the drivers for selection of a particular Navigation Specification.

**Navigation Specification** - A set of aircraft and air crew requirements needed to support Performance Based Navigation operations within a defined airspace. There are two kinds of navigation specification: RNAV and RNP.

A RNAV specification does not include requirements for on-board performance monitoring and alerting. But a RNP specification includes requirements for onboard performance monitoring and alerting.

**Navigation Application** - The application of a navigation specification and the supporting Navaid infrastructure, to routes, procedures, and/or defined airspace volume, in accordance with the intended Airspace Concept.

*Note* - The navigation application is one element, along with, communication, surveillance and ATM procedures that meets the strategic objectives in a defined Airspace Concept.

**Parallel Offset Path** - A desired track parallel to and left or right of the "parent" track specified in nautical miles of offset distance.

**Performance Based Navigation** - Performance Based Navigation specifies system performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

**Procedural Control** - Air traffic control service provided by using information derived from sources other than an ATS surveillance system

**Receiver Autonomous Integrity Monitoring (RAIM)** - A form of ABAS whereby a GNSS receiver processor determines the integrity of the GNSS navigation signals using only GPS signals or GPS signals augmented with altitude (baro aiding). This determination is achieved by a consistency check among redundant pseudo-range measurements. At least one additional satellite needs to be available with the correct geometry over and above that needed for the position estimation for the receiver to perform the RAIM function.

**RNAV Equipment** -A combination of navigation equipment used to provide RNAV guidance.

**RNAV Operations** - Aircraft operations using area navigation for RNAV applications. RNAV operations include the use of area navigation for operations which are not developed in accordance with the PBN Manual.

**RNAV System** -A navigation system which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these. A RNAV system may be included as part of a Flight Management System (FMS).

**RNP and RNAV Specifications** - For oceanic, remote, en route and terminal operations, a RNP specification is designated as RNP X e.g. RNP 4. RNAV specification is designated as RNAV X, e.g. RNAV 1. If two navigation specifications share the same value for X, they may be distinguished by use of a prefix e.g. Advanced-RNP 1 and Basic- RNP 1.

For both RNP and RNAV designations the expression 'X' (where stated) refers to the lateral navigation accuracy in nautical miles that is expected to be achieved at least 95

percent of the total sector flight time by the population of aircraft operating within the airspace, route or procedure.

**RNP (Required Navigation Performance)** - A statement of the navigation performance accuracy necessary for operation within a defined airspace.

**RNP Route** -An ATS Route established for the use of aircraft adhering to a prescribed RNP Specification

**RNP System** -An area navigation system which supports on-board performance monitoring and alerting.

**RNP Operations** -Aircraft operations using a RNP System for RNP applications.

**Satellite Based Augmentation System (SBAS)** -A wide coverage augmentation system in which the user receives augmentation from a satellite based transmitter.

**Standard Instrument Arrival (STAR)** -A designated instrument flight rule (IFR) arrival route linking a significant point, normally on an ATS route, with a point from which a published instrument approach procedure can be commenced.

**Standard Instrument Departure (SID)** - A designated instrument flight rule (IFR) departure route linking the aerodrome or a specified runway of the aerodrome with a specified significant point, normally on a designated ATS route, at which the en-route phase of a flight commences.

### 3. BASIC REQUIREMENTS

No person shall operate Bangladesh registered aircraft in airspace designated for RNAV operations unless:

- (i) Aircraft is equipped with a RNAV system as mentioned in the ANO (AW) E.12;
- (ii) RNAV system and aircraft operations are compliant with the requirements contained in this ANO (OPS) A-9 for the particular navigation application and authorized by Chairman, CAAB for the operation; and
- (iii) The Operations Specifications contained in the Operating Permit of an operator are endorsed by Chairman, CAAB to conduct RNAV operations.

*Note: The navigation specification details the flight crew and aircraft requirements needed to support the navigation application. This specification includes the level of navigation performance, functional capabilities, and operational considerations required for the RNAV system.*

### 4. OPERATIONAL APPROVAL

#### 4.1 General

The pre-requisite for the operational approval process for an operator is to ensure that the corresponding installation/airworthiness approval be obtained. To this end reference may be made to section-8 of ANO (AW) E-12. During operation, the crew should respect AFM and AFM supplements limitations. Normal procedures are provided in the navigation specification and detailed necessary crew action is to be conducted during pre-flight planning, prior to commencing the procedure and during the procedure. Similar to Normal Procedures, Abnormal Procedures are also provided in the navigation specification. These procedures should detail crew action in case of on-board RNAV system failure and in case of system inability to maintain the prescribed performance of the on board monitoring and alerting function. The Operator should have in place a system for investigation events affecting the safety of operations to determine its origin (coded procedure, accuracy problem, etc). Minimum equipment list (MEL) should identify the minimum equipment necessary to satisfy the navigation application.

4.2 The assessment of a particular operator shall be made by Chairman, CAAB for granting operational approval of RNAV taking into account:

- a) Evidence of aircraft eligibility (whether Airworthiness Approval has been granted?)
- b) Assessment of the operating procedures for the navigation systems to be used.
- c) Control of those procedures through acceptable entries in the Operations Manual.
- d) Identification of flight crew training requirements.
- e) Where required, control of navigation database process.

4.3 The operational approval should be documented in the Air Operators Certificate (AOC) and appended in the Operations Manual.

4.4 The following minimum requirements shall be considered while approving the specific RNAV approval for each operator:

- a) Approval is required to be obtained by each individual operator, as well as for each individual aircraft type group/equipment (manufacturer/ model) utilized by an operator;
- b) Each aircraft type/ group utilized by an operator shall be shown to be capable of maintaining navigation performance accuracy relevant to the level of RNAV approval being sought;

- c) Each aircraft carrying RNAV/ flight management systems shall receive airworthiness approval prior to being reviewed for operational approval.

CAAB shall evaluate the airworthiness documents for each aircraft type/group equipment (manufacturer/ model). If in-service experience shows that the navigation performance of a particular aircraft type utilized by an operator does not meet the requirements, the operator shall take steps to improve navigation performance to the required level. If performance is not improved, operational approval for the aircraft type may be withdrawn. In case where navigation performance is observed to be grossly in error, approval shall be withdrawn instantaneously.

## 5. TRAINING REQUIREMENTS

- 5.1 AOC holders should have a training program addressing the operational practices, procedures and training items related to applicable RNAV operations (e.g. initial, upgrade or recurrent training for flight crew, dispatchers and maintenance personnel).

*Note: It is not required to establish a separate training program if RNAV training is already an integrated element of a training program. However, adequacy of training with respect to RNAV must be in place within the training program of the operator to authenticate system efficiency.*

- 5.2 The pilot training programme shall be approved by Chairman, CAAB.

- 5.3 The Training Programme shall consist of:

### 5.3.1 For RNAV 5

The following items should be addressed in the pilot training program (for example, flight simulation training device, or aircraft) for the aircraft's RNAV system:

- a) Flight Crew knowledge on the capabilities and limitations of the RNAV system installed.
- b) The operations and airspace for which the RNAV system is approved to operate.
- c) The Nav-aid limitations in respect of the operation of the RNAV system to be used for the RNAV 5 operation.
- d) Contingency procedures for RNAV failures.

- e) The Radio/Telephony Phraseology for the airspace in accordance to Doc 4444 and Doc 7030 as appropriate.
- f) The flight planning requirements for the RNAV operation.
- g) RNAV requirements as determined from chart depiction and textual description.
- h) RNAV system-specific information, including:
  - i) Levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation.
  - ii) Functional integration with other aircraft systems.
  - iii) Monitoring procedures for each phase of flight. (for example, monitor PROG or LEGS page).
  - iv) Types of navigation sensors (for example, DME, IRU, GNSS) utilized by the RNAV system and associated system prioritization/ weighting/logic.
  - v) Turn anticipation with consideration to speed and altitude effects.
  - vi) Interpretation of electronic displays and symbols.
- i) RNAV equipment operating procedures, as applicable, including how to perform the following actions:
  - i) Verify currency of aircraft navigation data.
  - ii) Verify successful completion of RNAV system self-tests.
  - iii) Initialize RNAV system position.
  - iv) Fly direct to a waypoint.
  - v) Intercept a course/track.
  - vi) Be vectored off and rejoin a procedure.
  - vii) Determine cross-track error/deviation.
  - viii) Remove and reselect navigation sensor input.
  - ix) When required, confirm exclusion of a specific navigation aid or navigation aid type.
  - x) Perform gross navigation error check using conventional navigation aids.

### 5.3.2 For RNAV 1 and 2 OR Basic RNP 1

The training program should provide sufficient training (for example, flight simulation training device, or aircraft) on the aircraft's RNAV system to the extent that the pilots are familiar with the following:

- a) The information given in Volume II Part B Chapter 3 (RNAV 1 and 2)/ Part C Chapter 3 (Basic RNP 1) of ICAO Doc 9613
- b) The meaning and proper use of Aircraft Equipment/Navigation Suffixes.
- c) Procedure characteristics as determined from chart depiction and textual description.
- d) Depiction of waypoint types (fly-over and fly-by) and path terminators (provided in section 3.4.3.4 AIRINC 424 path terminators) and any other types used by the operator, as well as associated aircraft flight paths.
- e) Required navigation equipment for operation on Basic-RNP 1 SIDs, and STARs and RNAV routes/SIDs/STARs e.g. DME/DME, DME/DME/IRU, and GNSS.
- f) RNP/RNAV system-specific information:
  - i) Levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation.
  - ii) Functional integration with other aircraft systems.
  - iii) The meaning and appropriateness of route discontinuities as well as related flight crew procedures.
  - iv) Pilot procedures consistent with the operation.
  - v) Types of navigation sensors utilized by the RNP system and RNAV system (e.g. DME, IRU, GNSS) associated system prioritization/ weighting/logic.
  - vi) Turn anticipation with consideration to speed and altitude effects.
  - vii) Interpretation of electronic displays and symbols.
  - viii) Understanding of the aircraft configuration and operational conditions required to support Basic-RNP 1/RNAV operations, i.e., appropriate selection of CDI scaling (lateral deviation display scaling).



- g) RNP/RNAV system operating procedures, as applicable, including how to perform the following actions:
- i) Verify currency and integrity of aircraft navigation data.
  - ii) Verify successful completion of RNP/RNAV system self-tests.
  - iii) Initialize navigation system position.
  - iv) Retrieve and fly a SID or STAR with appropriate transition.
  - v) Adhere to speed and/or altitude constraints associated with a SID or STAR.
  - vi) Select the appropriate SID or STAR for the active runway in use and be familiar with procedures to deal with a runway change.
  - vii) Perform a manual or automatic update (with takeoff point shift, if applicable)
  - viii) Verify waypoints and flight plan programming.
  - ix) Fly direct to a waypoint.
  - x) Fly a course/track to a waypoint.
  - xi) Intercept a course/track.
  - xii) Flying radar vectors and rejoining a Basic-RNP 1/RNAV route from 'heading' mode.
  - xiii) Determine cross-track error/deviation. More specifically, the maximum deviations allowed to support Basic-RNP 1/RNAV must be understood and respected.
  - xiv) Resolve route discontinuities.
  - xv) Remove and reselect navigation sensor input.
  - xvi) When required, confirm exclusion of a specific navigation aid or navigation aid type.
  - xvii) Change arrival airport and alternate airport.
  - xviii) Perform parallel offset function if capability exists. Pilots should know how offsets are applied, the functionality of their particular RNP/RNAV system and the need to advise ATC if this functionality is not available.
  - xix) Perform RNAV holding function.

- h) Operator-recommended levels of automation for phase of flight and workload, including methods to minimize cross-track error to maintain route centre line.
- i) R/T phraseology for RNAV/RNP applications
- j) Contingency procedures for RNAV/RNP failures.

Chairman, Civil Aviation Authority, Bangladesh is pleased to issue this order in pursuance of rule 4, 143 (2) (b) of the Civil Aviation Rules 1984 and the ANO will come into immediate effect.



Chairman  
Civil Aviation Authority, Bangladesh