



# Advisory Circular

**Subject: Terminal and En Route Area Navigation Operations (RNAV 1 and 2)**

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## 1.0 INTRODUCTION

This Advisory Circular (AC) is provided for information and guidance purposes. It may describe an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards. This AC on its own does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards.

### 1.1 Purpose

The purpose of this AC is to inform Canadian air operators that they may now obtain an authorization to operate in accordance with the navigation performance requirements of Area Navigation (RNAV), RNAV 1 and 2 via an amendment to their air operator certificate with operations specification 612.

### 1.2 Applicability

- (1) This AC applies to Canadian air operators holding an air operator certificate issued under Part VII of the Canadian Aviation Regulations (CARs) who wish to operate in en route or terminal airspace requiring RNAV 1 and 2 navigation performance.
- (2) RNAV 1 and 2 criteria apply to operations on some RNAV routes, Departure Procedures (Obstacle Departure Procedures and Standard Instrument Departures) and Standard Terminal Arrivals (STARS).
- (3) This document is also applicable to all Transport Canada Civil Aviation (TCCA) employees, to individuals and organizations when they are exercising privileges granted to them under an External Ministerial Delegation of Authority. This information is also available to the aviation industry at large for information purposes.

### 1.3 Description of Changes

Not applicable.

## 2.0 REFERENCES AND REQUIREMENTS

### 2.1 Reference Documents

It is intended that the following reference materials be used in conjunction with this document:

- (a) *Aeronautics Act*;
- (b) Part V of the Canadian Aviation Regulations (CARs)—*Airworthiness*;
- (c) Subpart 702 of the CARs— *Aerial Work*;
- (d) Subpart 704 of the CARs—*Commuter Operations*;
- (e) Subpart 705 of the CARs—*Airline Operations*;
- (f) Subpart 722 of the Commercial Air Services Standards (CASS)—*Aerial Work*;
- (g) Subpart 724 of the CASS—*Commuter Operations*;
- (h) Subpart 725 of the CASS— *Airline Operations*;
- (i) Federal Aviation Administration Advisory Circular (FAA-AC) 90-96A, *Approval of U.S. Operators and Aircraft to operate under instrument flight rules in European Airspace designated for Basic Area Navigation (B-RNAV) and Precision Area Navigation (P-RNAV)*, dated 1/13/05;
- (j) FAA AC 90-100A, U.S. *Terminal and En Route Area Navigation (RNAV) Operations*, dated 03/01/07;

- (k) International Civil Aviation Organisation (ICAO) Document 9613, *Performance Based Navigation Manual*, Third Edition, 2008;
- (l) Joint Aviation Authorities (JAA ) GAI-20 ACJ 20X4, *JAA Guidance Material on the Airworthiness and Operational Criteria for the use of navigation systems in European Airspace Designated for Basic RNAV Operations*;
- (m) JAA TGL No. 10 Rev 1: *Airworthiness and Operational Approval for Precision RNAV Operations in Designated European Airspace*; and
- (n) *EuroControl P-RNAV Enhanced Navigation Approval, Guidance Information Brochure*, Edition 3 – June 2007.

## 2.2 Cancelled Documents

Not applicable.

## 2.3 Definitions and Abbreviations

The following definitions and abbreviations are used in this document:

- (a) **NAA** means National Aviation Authority.
- (b) **RNAV**: A method of navigation which permits aircraft operations 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.

**Note:** *Area navigation includes performance-based navigation as well other operations that do not meet the definition of performance based navigation.*

- (c) **Navigation specification**: A set of aircraft and flight crew requirements needed to support performance based navigation operations within a defined airspace. There are two kinds of navigation specification:
  - (i) **Required Navigation Performance (RNP) specification**: A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.
  - (ii) **RNAV specification**: A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.

**Note:** *The ICAO Performance Based Navigation Manual (Doc 9613) contains detailed guidance on navigation specifications.*

- (d) **Performance Based Navigation (PBN)**: Area navigation based on performance requirements for aircraft operating along an Air Traffic Services (ATS) route, on an instrument approach procedure or in a designated airspace.

**Note:** *Performance requirements are expressed in navigation specification (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept.*

### 3.0 BACKGROUND

- (1) This RNAV 1 and 2 navigation specification is based on ICAO harmonization efforts and encompasses elements of Joint Aviation Authorities/European Aviation Safety Agency (JAA/EASA) P-RNAV, FAA P-RNAV and FAA RNAV 1 and 2. Operations specification 612 utilizes criteria from the ICAO PBN Manual. This operations specification will also form the basis upon which a foreign National Aviation Authority (NAA) may authorize a Canadian air operator to operate in RNAV 1 and 2 airspace within their jurisdiction.
- (2) With the publication of the ICAO PBN Manual, the existing P-RNAV guidance (FAA and JAA/EASA) and FAA RNAV 1 and 2 guidance has been harmonized under ICAO navigation specification RNAV 1 and RNAV 2. The ICAO PBN Manual, Volume II, Part B, Chapter 3, defines RNAV 1 and 2 requirements and the differences between ICAO RNAV 1 and 2, P-RNAV (JAA TGL No. 10 Rev 1 and FAA AC 90-96A) and FAA RNAV 1 and 2 (FAA AC 90-100A). Operations specification 612 provides air operators with the ability to acquire operational approval for RNAV 1 and 2 globally by allowing credit for FAA and JAA/EASA compliance with the technical requirements of P-RNAV and/or the technical requirements of FAA RNAV 1 and 2, while also showing compliance with the additional functional requirements found in the ICAO PBN Manual Vol II, Part B, Chapter 3, Tables II-B-3-1 and II-B-3-2 (reproduced below).

**Table II-B-3-1. Additional requirements for obtaining an RNAV 1 and RNAV 2 approval from a TGL-10 approval**

<b>Operator has TGL-10</b>	<b>Operator needs to confirm these performance capabilities for ICAO RNAV 1 and RNAV 2</b>	<b>Note</b>
If approval includes use of DME/VOR (DME/VOR may be used as the only positioning input where this is explicitly allowed)	RNAV 1 does not accommodate any routes based on DME/VOR RNAV	RNAV system performance must be based on GNSS, DME/DME, or DME/DME/IRU. However, DME/VOR input does not have to be inhibited or deselected
If approval includes use of DME/DME	No action required if RNAV system performance meets specific navigation service criteria in this Chapter 3, 3.3.3.2.2 (DME/DME RNAV only) or 3.3.3.2.3 (DME/DME/IRU RNAV)	Operator can ask manufacturer or check FAA website for list of compliant systems
RNAV SID specific requirement with DME/DME aircraft	RNAV guidance available no later than 500 ft above field elevation (AFE) on AC 90-100 Type B procedure	Operator should add these operational procedures
If approval includes use of GNSS	No action required	

**Table II-B-3-2. Additional requirements for obtaining RNAV 1 and RNAV 2 approval from an AC 90-100 approval**

Operator has AC 90-100	Needs to confirm these performance capabilities to ICAO RNAV 1/RNAV 2	Note
If approval is based on GNSS(TSO-C129)	GPS pseudo-range step detector and GPS health word checking is required in accordance with TSO C129a/ETSO C129a	The operator should check if pseudo-range step detector and health word checking is supported by the installed GPS receiver or check if GPS receiver is approved in accordance with TSO C129a/ETSO C129a
No navigation database updating process required under AC 90-100	Data suppliers and avionics data suppliers must have Letter of Acceptance (LOA) in accordance with 3.3.3.3 m) (database integrity, RTCA DO-200A/EUROCAE document ED76, Standards for Processing Aeronautical Data)	The operator should ask the data supplier for the status of the RNAV equipment

- (3) The aircraft requirements for RNAV 1 or RNAV 2 are identical. System positional accuracy (1 nm versus 2 nm) can be influenced by the proximity, quantity and geometry of navigation aid infrastructure (DME's for example). RNAV 1 and 2 system accuracy requirements are as follows:
- (a) RNAV 1, requires a total system error of not more than  $\pm 1$  nm for 95% of the total flight time.
  - (b) RNAV 2, requires a total system error of not more than  $\pm 2$  nm for 95% of the total flight time.
- (4) JAA TGL No. 10, Rev 1, Jun 05, Airworthiness and Operational Approval for Precision RNAV Operations in Designated European Airspace defines the following level of system accuracy:
- (a) During operations on routes or in areas notified exclusively for P-RNAV aircraft, the lateral track keeping accuracy of the on-board P-RNAV system shall be equal to or better than  $\pm 1$  NM for 95% of the flight time.

#### 4.0 ACTION

- (1) Canadian air operators may obtain RNAV 1 and 2 approval through their Principal Operations Inspector (POI). The air operator should submit to Transport Canada information which confirms that each of the air operator's RNAV systems and installation comply with the operational and functional performance criteria of:
- (a) FAA AC 90-100A U.S. *Terminal and En Route Area Navigation (RNAV) Operations*; and/or
  - (b) FAA AC 90-96A, *Approval of U.S. Operators and Aircraft to operate under instrument flight rules in European Airspace designated for Basic Area Navigation (B-RNAV) and Precision Area Navigation (P-RNAV) (Note: P-RNAV portion only)*; and/or

- (c) JAA TGL No. 10 Rev 1: *Airworthiness And Operational Approval For Precision RNAV Operations In Designated European Airspace*; and
  - (d) The additional requirements noted in the ICAO PBN Manual for RNAV 1 and 2 (see section 3.0 (2) of this AC) are met.
- (2) The air operator must submit to Transport Canada an amendment to their Company Operations Manual (COM) for approval, which provides details on operating procedures within RNAV 1 and 2 airspace, including:
- (a) Procedures to be followed in the event of a loss of RNAV capability while in RNAV 1 and 2 airspace or prior to entering that airspace;
  - (b) Minimum equipment necessary to meet RNAV 1 and 2 requirements;
  - (c) Any restrictions or limitations imposed on the RNAV equipment being used; and
  - (d) Any other information relevant to the company's operations in RNAV 1 and 2 airspace.
- (3) The air operator must submit to Transport Canada an amendment to their training program that addresses operations that meet RNAV 1 and 2 requirements for approval.
- (a) The air operator must provide training to operational control personnel, maintenance personnel when applicable and to each flight crew member involved with RNAV 1 and 2 operations that addresses at least the following:
    - (i) The operation of the area navigation systems in accordance with the training requirements set out in the subsection of the Commercial Air Services Standards (CASS) referred to in section 5 of its operations specification; and
    - (ii) For a flight crew member or operational control personnel to qualify for operations on RNAV 1 and 2 routes, an air operator must have initial and recurrent approved training programs that ensure that each individual is proficient in the following areas:
      - (A) flight planning;
      - (B) navigation performance requirements;
      - (C) en route procedures; and
      - (D) contingency procedures.
- (4) Transport Canada approval of the above amendments to the air operators Company Operations Manual and Training Program with respect to RNAV 1 and 2 operations is required prior to the air operator being issued operations specification 612 for RNAV 1 and 2.

## 5.0 CONCLUSION

- (1) The POI, with the assistance of the Principal Maintenance Inspector (PMI) or Regional Airworthiness office, should be satisfied that each of the air operators RNAV systems and installations comply with the above references as appropriate for RNAV 1 and 2 operations. Aircraft flight manuals may contain a note indicating that the navigation equipment meets RNAV 1 and 2 and/or P-RNAV and /or RNP standards. Aircraft manufactured in 1997 or before likely will not meet these standards.
- (2) Updates to the air operator company operations manual and training program should be done in accordance with the requirements of Sections 704.115, 704.121, 705.124 and 705.135 of the CARs, as applicable.

## 6.0 CONTACT OFFICE

For more information, please contact the:  
Commercial and Business Aviation (AARTF)

Phone: 613-993-6975  
Fax: 613-954-1602  
E-mail: [CAIRS\\_NCR@tc.gc.ca](mailto:CAIRS_NCR@tc.gc.ca)

Suggestions for amendment to this document are invited, and should be submitted via the Transport Canada Civil Aviation Issues Reporting System (CAIRS) at the following Internet address:

<http://www.tc.gc.ca/eng/civilaviation/secretariat-cairs-menu.htm>

or by e-mail at: [CAIRS\\_NCR@tc.gc.ca](mailto:CAIRS_NCR@tc.gc.ca)

*Original signed by Susan Greene for*

D.B. Sherritt  
Director, Standards  
Civil Aviation