Trinidad and Tobago
Civil Aviation Authority

TTCAA Advisory Circular

Subject: APPROVAL OF TRINIDAD AND TOBAGO OPERATORS AND AIRCRAFT TO OPERATE UNDER INSTRUMENT FLIGHT RULES (IFR) IN EUROPEAN AIRSPACE DESIGNATED FOR BASIC AREA NAVIGATION (B-RNAV) AND PRECISION AREA NAVIGATION (P-RNAV)

TTCAA Advisory Circular TAC- 033

Date: 05/04/12

PURPOSE

1. (1) The purpose of this TTCAA Advisory Circular (TAC) is to provide operational approval and airworthiness guidance material regarding Area Navigation (RNAV) requirements for operators of Trinidad and Tobago registered civil aircraft, operating in a Basic Area Navigation (B-RNAV) or Precision Area Navigation (P-RNAV) environment in European RNAV airspace.

(2) This TAC is is based on the United States of America's FAA Advisory Circular AC 90-96A. Numbering and structuring of the Appendices have been kept intact for ease of cross reference. It is issued for guidance purposes and to outline a method of compliance with European requirements. In lieu of following this method without deviation, operators may elect to follow an alternative method, provided the alternative method is also found to be acceptable for B-RNAV and/or P-RNAV, by the Trinidad and Tobago Civil Aviation Authority (TTCAA). Since the P- RNAV airworthiness and operational requirements are more stringent than those for B-RNAV, compliance with P-RNAV criteria includes operational approval for both P-RNAV and B-RNAV.

(3) The guidance material is applicable to B-RNAV and P-RNAV operations in European airspace where appropriate. For the purposes of this TAC, B-RNAV procedures apply to en route and certain terminal operations. P-RNAV procedures are expected to apply to operations including departures, arrivals, and approaches up to the point of the final approach fix (FAF). For the immediate future, expect holding patterns to be flown with conventional procedures. For P-RNAV operations in terminal airspace, obstacle clearance protection, up to the FAF, will assume that aircraft comply with the P-RNAV accuracy requirements.

(4) European Regional Supplementary procedures for B-RNAV and P-RNAV are contained in International Civil Aviation Organization (ICAO) Doc 7030-4, Rules of the Air, Air Traffic Services and Search and Rescue. The implementation date for P-RNAV will be announced in publications such as Notices to Airmen (NOTAM) and Aeronautical Information Publications (AIP). ICAO Doc 7030 also requires the State of Aircraft Registry or State of the Operator to verify conformance of the Air Operators Navigation System to B-RNAV and provide approval necessary for aircraft in a B-RNAV environment or to P-RNAV for aircraft in a P-RNAV environment.

RELATED TTCAR REFERENCES

2. TTCAR No.2:143, TTCAR No.2:IS143, TTCAR No.7:13, No. 7:25

DEFINITIONS

3. For the purpose of B-RNAV and P-RNAV operations in European airspace, the following definitions are provided:

(a) **Area Navigation (RNAV).** A method of navigation that 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. For the purpose of this AC, RNAV equipment is considered to be equipment that operates by automatically determining aircraft position from one or a combination of the following sensors with the means to establish and follow a desired path:

(i) VOR/DME;

(ii) DME/DME;

(iii) INS or IRS;

(iv) LORAN C; and

(v) GNSS or GPS.

***Note**: Sensor application is subject to the limitations contained in the relevant Appendix for B-RNAV/P-RNAV.*

(b) **Basic Area Navigation (B-RNAV).** B-RNAV is defined as RNAV that meets a track keeping accuracy equal to or better than +/-5 NM for 95 percent of the flight time. This value includes signal source error, airborne receiver error, display system error, and flight technical error. This navigation performance assumes the necessary coverage provided by satellite or ground-based navigation aids is available for the intended operation.

(c) **Precision Area Navigation (P-RNAV).** P-RNAV is defined as RNAV that meets a track keeping accuracy equal to or better than +/- 1 NM for 95 percent of the flight time. This value includes signal source error, airborne receiver error, display system error, and flight technical error. This navigation performance assumes the necessary coverage provided by satellite or ground-based navigation aids is available for the intended operation.

(d) **Global Positioning System (GPS).** The U.S. Global Navigation Satellite System (GNSS) core satellite constellation that provides space-based positioning, velocity, and time. GPS is composed of space, control, and user elements. The space element nominally is composed of at least 24 satellites in 6 orbital planes. The control element consists of five monitor stations, three ground antennas and a master control station. The user element consists of antennas and receiver processors that provide positioning, velocity, and precise timing to the user.

(e) **Receiver Autonomous Integrity Monitoring (RAIM).** A technique used within a GPS receiver/processor to monitor GPS signal performance. This integrity determination is achieved by a consistency check among redundant measurements.

RELATED READING MATERIALS

4. ***Note****: All references to the editions are current as of the publication date of this AC.*

(a) FAA AC 20-121, Airworthiness Approval of Airborne Loran-C Navigation Systems for use in the U.S. National Airspace System (NAS) and Alaska.

(b) FAA AC 20-130, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors.

(c) FAA AC 20-138A, Airworthiness Approval of Global Navigation Satellite System (GNSS) Equipment.

(d) FAA AC 25-4, Inertial Navigation Systems (INS).

(e) FAA AC 25-15, Approval of Flight Management Systems in Transport Category Airplanes.

(f) FAA AC 90-45A, Approval of Area Navigation Systems for Use in the U.S. National Airspace System.

(g) FAA AC 90-94, Guidelines for Using Global Positioning System Equipment for IFR En Route and Terminal Operations and for Nonprecision Instrument Approaches in the U.S. National Airspace System.

(h) JAA AMJ 20X2 - Guidance Material on Airworthiness Approval and Operational Criteria for the use of Navigation Systems in European Airspace Designated for Basic RNAV Operations (formerly known as JAA TGL 2).

(i) JAA ACJ20X5 - Guidance Material on Airworthiness Approval and Operational Criteria for the use of the Navstar Global Positioning System (GPS) (formerly known as JAA TGL 3).

(j) JAA TGL-10, Airworthiness and Operational Approval for Precision RNAV Operations in Designated European Airspace and the corresponding JAA TGL-10 Frequently Asked Questions (FAQ) Document.

(k) RTCA/DO-200A, Standards for Processing Aeronautical Data.

(l) RTCA/DO-201A, Standards for Aeronautical Information.

(m) RTCA/DO-208, Minimum Operational Performance Standards for Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS).

(n) RTCA/DO-229C, Minimum Operational Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment.

(o) RTCA/DO-236A, Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation.

(p) RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification.

(q) TSO-C115, any version , Airborne Area Navigation Equipment Using Multi-sensor Inputs.

(r) TSO-C129/C129A, Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS).

(s) TSO-C145A, Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).

(t) TSO-C146A, Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).

BACKGROUND

5. Since January 1998, Europe has mandated a Basic RNAV (B-RNAV) capability for operations in European en route airspace. JAA AMJ 20X2 is the European source document for obtaining B-RNAV approval.

(a) In 2001, Europe concluded that B-RNAV did not meet the needs for terminal area operations/procedures. In 2003, Europe announced the intent to implement P-RNAV in high-density terminal airspace by November 2004; and, in the remaining terminal maneuvering areas by April, 2005.

(b) The TTCAA identifies eligible navigation system types and the criteria to determine acceptable means of compliance for Trinidad and Tobago operators for JAA AMJ 20X2 (B-RNAV) and/or JAA TGL 10 (P-RNAV) approval(s).

(c) A vertical navigation (VNAV) capability is not mandated.

APPROVAL PROCESS—INCLUDING FUNCTIONAL AND PERFORMANCE REQUIREMENTS

6. Operators should address the guidance contained in the attachments as follows: Appendix 1 is for B-RNAV; Appendix 2 is for P-RNAV. Each Appendix contains a continuance of this TAC. Specifically, RNAV system equipage, eligibility and usage limitations; the general operating procedures, the pilot knowledge items, the flight plan procedures, and policies or procedures related to B-RNAV and/or P-RNAV operations. The Appendices also discuss the documents and the processes to be used for approval of operators and RNAV systems. P-RNAV approval encompasses the requirements for B-RNAV operations. Authorization for P-RNAV may be used as the basis for B-RNAV and as a basis for operating in European B-RNAV airspace. Appendix 3 provides the suffixes to be filed in ICAO flight plans for operations within European B-RNAV and/or P-RNAV airspace/procedures.

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Director General of Civil Aviation

APPENDIX 1 BASIC AREA NAVIGATION (B-RNAV)

1. OPERATOR/RNAV SYSTEM APPROVAL FOR B-RNAV IN DESIGNATED B-RNAV AIRSPACE

a. Aircraft Equipage. An aircraft may be considered eligible for Basic Area Navigation (B-RNAV) approval if it is equipped with one or more aircraft navigation systems approved and installed in accordance with the guidance contained in this document. The minimum level of availability and integrity required for B-RNAV systems for use in designated airspace can be met by a single installed system comprising of one or more sensors, an Area Navigation (RNAV) computer, a control display unit, and a navigation display(s) (e.g., heading situation indicator (HIS), or course deviation indicator (CDI)), provided the system is monitored by the flightcrew and in the event of a system failure, the aircraft retains the capability to navigate relative to ground based navigation aids (e.g., very high frequency omnidirectional range (VOR), distance measuring equipment (DME), Tactical Air Navigational Aid (TACAN), nondirectional beacon (NDB), etc). Aircraft not suitably equipped will not be permitted to operate in the designated B-RNAV airspace.

b. Eligibility Based on the Aircraft Flight Manual (AFM) (Supplement) or Pilot Operating Handbook (POH).

(1) Aircraft B-RNAV System Eligibility. The aircraft should be considered eligible for B-RNAV operations, if the AFM or POH shows the appropriate instrument flight rules (IFR) navigation system installation has received airworthiness approval in accordance with this advisory circular (TAC) or with one of the following Federal Aviation Administration (FAA) ACs: AC 90-45A, AC 20-121A, AC 20-130, AC 20-138, or AC 25-15). The guidance for airworthiness approval contained in these ACs provide aircraft navigation performance that is equivalent to at least the criteria for B-RNAV (accuracy and functional requirements as defined in Appendix 1, paragraph 1e). See Appendix 1, paragraph 1d for limitations on design and use of RNAV systems in B-RNAV airspace. Once equipment eligibility is established, operator approval should proceed in accordance with Appendix 1, paragraph 1b(2) or (3), as appropriate.

(2) General Aviation Aircraft/Operator Approval. General Aviation operators should review their AFM or POH to ensure aircraft system eligibility as detailed in Appendix 1, paragraph 1b(1). Once aircraft system eligibility has been established, the operator should take steps to ensure B-RNAV operations are conducted in accordance with the guidance contained in Appendix 1, paragraph 1d, 2, 3, and 4, as well as any other established operational or airspace requirements. Operators must ensure the required functions of Appendix 1 are met. Once these actions are completed, the operator may begin to conduct B-RNAV operations. A letter of authorization (LOA) is not required when eligibility is based on the AFM or POH. See Appendix 1, paragraph 1c, for actions to take if the operator is unable to determine from the AFM or POH whether the aircraft system has been approved and installed in accordance with an appropriate standard.

(3) Air Operator Approval. TTCAR No. 2 and No. 3 operators should present the following documentation to the TTCAA: sections of the AFM that document airworthiness approval as detailed in Appendix 1, paragraph 1b(1) and training and operations manuals that reflect the operating policies of Appendix 1, paragraph 1d, 2, 3, 4 as well as any other operational or airspace requirements established by European authorities. Operators must ensure the required functions of Appendix 1 are met. Once the operator has addressed the guidance in

these paragraphs to the satisfaction of the TTCAA, Operations Specifications will be issued to reflect B-RNAV approval. See Appendix 1, paragraph 1c for guidance on actions to take if the operator is unable to determine from the AFM whether the aircraft RNAV system has been approved in accordance with an appropriate FAA AC.

c. Eligibility Not Based on the AFM (Supplement) or POH.

(1) The operator makes a request for assessment of RNAV equipment for B-RNAV eligibility to the TTCAA. The operator should provide the following:

- RNAV system make, model and part number
- Evidence of meeting +/- 5 NM (95 percent) accuracy. (This can be determined through the evaluation of system design. Evidence of meeting the requirements of another AC can be used for this purpose)
- Proof that the system meets the required functions for B-RNAV operations (see Appendix 1, paragraph 1e)
- Crew operating procedures, bulletins
- Any other pertinent information

(2) If the TTCAA is unable to determine equipment eligibility, the request and supporting data will be forwarded through the appropriate State of Design to seek advice on the suitability of the proposed equipment for B-RNAV operations.

(3) For General Aviation operations, after the TTCAA determines the aircraft equipment is eligible for B-RNAV operations the TTCAA will issue a letter of finding, documenting that finding to the operator.

(4) For air operators, the TTCAA will verify aircraft RNAV system eligibility, including the required functions in Appendix 1, paragraph 1e, and determine that the operator's training and operations manuals reflect the operating policies of Appendix 1, paragraphs 1d, 2, 3, and 4. Once these steps are completed, operations specifications (OpSpecs) for air operators are issued by the TTCAA for B-RNAV approval.

d. Limitations on the Design and/or Use of Navigation Systems. Although the following navigation systems have RNAV capability, these system limitations are required for their use when conducting operations in designated B-RNAV airspace.

(1) Inertial Navigation Systems (INS). Those INS system installations meeting B-RNAV required performance and functions contained in this Appendix that do not have automatic radio navigation updating of INS position, are limited to a maximum 2 hours of operation in designated B-RNAV airspace from the time the system is placed in the navigation mode (Navigation (NAV) SELECT). The TTCAA will consider extending the 2-hour time limit for specific INS installations (e.g., triple-mix inertial systems) where performance data justifies extending the limit. The TTCAA will coordinate this effort with the JAA. Submit requests for time extensions with supporting rationale and data to the State of Design and copy the TTCAA who will coordinate the evaluation of such requests.

NOTE: Certain inertial systems perform automatic radio navigation aid updates when the pilot manually selects ground-based navigation aids. Such systems are not limited to the 2-hour time limit discussed in Appendix 1, paragraph 1d(1) when the operator has established procedures for pilots to follow.

(2) Loran-C. Use of Loran-C, in compliance with FAA AC 20-121A, is considered an acceptable means to comply with B-RNAV in those areas and on routes with acceptable Loran-C coverage. Loran-C users must refer to the AFM or POH to determine if operational use of the Loran system is limited to a specified Loran-C Operational Area.

(3) Global Navigation Satellite System (GNSS).

(a) Global positioning system (GPS) or wide area augmentation system (WAAS) design. Use of Technical Standard Order (TSO)-C145a or TSO-C146a WAAS equipment installed in accordance with FAA AC 20-138A, is considered an acceptable means to comply with B-RNAV requirements. TSO-C129, any version, GPS equipment installed in accordance with FAA AC 20-138 shall provide pseudo range step detection and health word checking functions in accordance with TSO-C129A, paragraphs (a)(5)(vii)6 and a(6). Compliance with these requirements can be established by one of the following:

1. A statement in the AFM or POH indicating the GPS equipment meets the criteria for Primary Means of Navigation in Oceanic and Remote Airspace, or

2. A placard on the GPS receiver certifying it meets TSO-C129A, TSO-C145A, TSO-C146A, or

3. A State of Design letter of design approval for the applicable equipment. Operators should contact the avionics manufacturer to determine if the equipment complies with these requirements and ask if a letter of design approval is available. Manufacturers may obtain a letter by submitting appropriate documentation to their Aircraft Certification Office (ACO). Operators should keep this letter with the AFM or POH as evidence of B-RNAV aircraft system eligibility. Any limitations included in the letter of design approval should be reflected in a letter of finding to operators, (see Appendix 1, paragraph 1c(2) or in OpSpecs for air operators), or

4. For operations within European B-RNAV airspace, GPS equipment approved in accordance with TSO-C129, but not satisfying the step detection and health word checking requirements, may still obtain a letter of design approval for B-RNAV. In this case, B-RNAV operations are limited to flights where receiver autonomous integrity monitoring (RAIM) outages do not exceed 5 minutes for the intended flight (route and time). With this restriction, TSO-C129 equipment is equivalent to equipment that provides step detection and health word checking. The maximum RAIM outage shall not be extended beyond 5-minute limit for TSO-C129 equipment.

(b) Flight planning restrictions for GPS or WAAS. During pre-flight planning, if there are no GPS satellites scheduled to be out-of-service (or no more than one satellite is scheduled to be out of service for WAAS equipment or installations of GPS equipment that incorporate baro-aiding), then the aircraft can depart without further action. However, if any GPS satellites are scheduled to be out-of-service (or more than one satellite is scheduled to be out-of-service for WAAS equipment or installations of GPS equipment that incorporate baro-aiding), then the availability of GPS integrity RAIM shall be confirmed for the intended flight (route and time). This should be obtained from a prediction program within the unit installed in the aircraft, a prediction program run outside the aircraft (such a program should use the same algorithms as those in the aircraft equipment); or, from an alternative method considered acceptable to the Administrator. This prediction is required for any route, route segment or airport procedure (departure, arrival or approach) based upon the use of GPS or WAAS equipment. Where a GPS Integrity Monitoring RAIM Prediction Program is used as a means of compliance, the program should meet the following criteria:

1. The program should provide prediction of availability of the integrity monitoring RAIM function of the equipment, suitable for conducting B-RNAV operations in designated airspace.

2. The prediction program software should be developed in accordance with at least RTCA DO 178B/EUROCAE 12B, level D guidelines.

3. The program should use either a RAIM algorithm identical to that used in the airborne equipment, or an algorithm based on assumptions for RAIM prediction that provide a more conservative result.

4. The program should calculate RAIM availability based on a satellite mask angle of not less than five degrees, except where use of a lower mask angle has been demonstrated and deemed to be acceptable to the Administrator.

5. The program should have the capability to exclude GPS satellites that are out-of-service for the intended flight.

6. The program should allow the user to select the intended route of flight and declared alternate airports, and the time and duration of the intended flight.

7. In the event of a predicted continuous loss of RAIM of more than 5 minutes for any part of the intended flight, the flight should be delayed, canceled, or re routed on a track where RAIM requirements can be met.

NOTE: Submit alternate methods of meeting RAIM requirements, e.g., Aircraft Autonomous Integrity Monitoring (AAIM), to the TTCAA for approval.

(c) Loss of RAIM en route. In the event of loss of the RAIM detection function or loss of integrity, the GPS or WAAS equipment may continue to be used for navigation as long as the flightcrew determines that the system is continuing to provide an acceptable level of IFR navigation performance by cross-checking other on-board navigation system(s). Otherwise, the flightcrew should notify air traffic control (ATC) and revert to an alternative means of navigation (e.g., VOR, DME, or NDB).

(d) Actions when failure detected. In the event of a detected failure (including detected satellite failure impacting the performance of GPS-based RNAV systems) the flightcrew should notify ATC and revert to an alternative means of navigation.

(e) Availability of VOR, DME, TACAN, or ADF. VOR, DME, TACAN or ADF capability shall be installed and operative consistent with the applicable operating rules (TTCAA No. 2 and No. 3) and available along the intended route-of-flight to ensure availability of a suitable alternative means of navigation in the event of GPS/RNAV system failure.

NOTE: Only those TACANs that meet the performance requirements of Annex 10, Vol 1, Radio Navigation Aids, and are identified in the applicable AIP may be used.

e. Required Functions. The following system functions are the minimum required to conduct B-RNAV operations:

(1) Continuous display of the aircraft's position relative to the desired track to be displayed to the pilot flying on a navigation display situated in the pilot's primary field of view;

NOTE: In addition, where the aircraft type certificate requires more than one pilot, information depicting aircraft position shall be displayed in the non-flying pilot's primary field of view.

(2) Display of distance and bearing to the active (To) waypoint;

(3) Display of ground speed or time to the active (To) waypoint;

(4) The ability to store a minimum of four waypoints; and

(5) Appropriate failure indication of the aircraft systems, including failure of the navigation sensors.

2. B-RNAV OPERATING PROCEDURES (GENERAL). For B-RNAV operations, the flightcrew should be familiar with normal operating and contingency procedures detailed in subparagraphs a and b.

a. Normal Operating Procedures. The procedures for the use of navigational equipment on B-RNAV routes should include the following:

(1) When a navigation database is installed, the database should be checked to ensure that it is current before the flight.

(2) Other NAVAIDs (e.g., VOR, DME, and ADF) should be selected to allow immediate crosschecking or reversion in the event of loss of RNAV capability.

b. Contingency Procedures. The flightcrew should be familiar with the following general provision: pilots should notify ATC of conditions (e.g., equipment failures and weather conditions) that may affect the ability of the aircraft to maintain position within the designated B-RNAV airspace. In this case, flightcrews should state their intentions, coordinate a plan of action, and obtain a revised ATC clearance. If unable to obtain an ATC clearance prior to deviating from the B-RNAV airspace, the flightcrew should follow established contingency procedures and obtain an ATC clearance as soon as possible.

3. PILOT KNOWLEDGE REQUIREMENTS. Pilots should be knowledgeable in the following areas:

a. RNP-5 as it relates to B-RNAV requirements in B-RNAV airspace;

b. Airspace where B-RNAV is required;

c. Changes to charting and documents to reflect B-RNAV;

d. Navigation equipment required to be operational for flight in designated B-RNAV airspace, and the limitations associated with the RNAV equipment;

e. Flight planning requirements;

f. Contingency procedures (e.g., for equipment failure);

g. En route, terminal, and approach procedures applicable to B-RNAV; and

h. The pilot information in this TAC.

4. FLIGHT PLANS. Trinidad and Tobago-registered aircraft filing flight plans into B-RNAV designated airspace are expected to meet the B-RNAV airspace requirements. Operators should indicate approval for B-RNAV operations by annotating block 10 (Equipment) of the ICAO flight plan as defined within ICAO Doc 7030 for these operations. If there are any other flight plan annotations required by individual States, operators should make appropriate annotations.

APPENDIX 2 PRECISION AREA NAVIGATION (P-RNAV)

1. OPERATOR/RNAV SYSTEM APPROVAL FOR P-RNAV IN DESIGNATED P-RNAV AIRSPACE.

NOTE: EUROCONTROL has published approval guidance information. These materials can be retrieved from http://www.ecacnav.com/p-rnav.

a. Assumptions. This guidance material is based on the assumptions contained in Joint Aviation Authorities (JAA) temporary guidance leaflet (TGL) 10 for P-RNAV operations in the European region. The following is a subset of the assumptions contained in JAA TGL-10 for P-RNAV operations in the European region. (Refer to JAA TGL-10 for the complete set.)

(1) All terminal P-RNAV procedures:

(a) Take account of the lack of a mandate for vertical navigation by ensuring that traditional means of vertical navigation can continue to be used.

(b) Support integrity checking performed by the flightcrew, by including on the charts fix data (e.g., range and bearing to navigational aids) from selected waypoints.

(c) Take account of the functional and performance capabilities of RNAV systems and their safety levels as detailed in JAA TGL-10.

(2) P-RNAV procedures are based upon World Geodetic System (WGS) 84 coordinates.

(3) The design of a P-RNAV procedure and the supporting navigation infrastructure have been assessed and validated. This includes flight checking where appropriate.

(4) If a choice of navigation infrastructure is provided, e.g., DME/DME, VOR/DME or GNSS, the obstacle clearance assessment has been based upon the infrastructure providing the poorest precision.

(5) If any critical navigation aids exist, they are identified in the Aeronautical Information Publication (AIP) and on the relevant charts.

(6) Navigation aids that must be excluded from the operation of a specific procedure are identified in the AIP and on the relevant charts.

(7) Temperature compensation is not addressed as a special P-RNAV consideration.

(8) A requirement for the carriage of dual P-RNAV systems is identified in the AIP for specific terminal P-RNAV procedures, e.g., procedures below the applicable minimum safe altitude/minimum obstacle clearance altitude, or where radar performance is inadequate.

(9) Where radar is used for contingency procedures, radar performance has been shown to be adequate and the requirement for a radar service is identified.

(10) Exclude navigation aids that are not compliant with ICAO Annex 10, e.g., TACANs.

b. Aircraft Equipage. An aircraft may be considered eligible for P-RNAV approval when equipped with one or more aircraft systems approved and installed in accordance with the guidance contained in this document. The minimum level of availability and integrity required for P-RNAV systems for use in designated airspace can be met by a single installed system comprised of one or more sensors, an RNAV computer, a control display unit, and a navigation display(s) (e.g., heading situation indicator (HSI), or course deviation indicator (CDI)), provided the system is monitored by the flightcrew and in the event of a system failure, the aircraft retains the capability to navigate relative to ground based navigation aids. Aircraft not suitably equipped for P-RNAV operations will not be permitted to operate in the designated P-RNAV airspace or on P-RNAV procedures.

c. Eligibility Based on the Aircraft Flight Manual (AFM) (Supplement) or Pilot Operating Handbook (POH).

(1) Aircraft P-RNAV System Eligibility. Consider the aircraft eligible for P-RNAV operations, if the AFM or POH shows the appropriate instrument flight rules (IFR) navigation system installation has received airworthiness approval in accordance with this TAC or has a statement of compliance to the performance and functional requirements of JAA TGL-10.

(2) General Aviation Aircraft/Operator Approval. General aviation operators present the following documentation to the TTCAA: sections of the AFM or POH as appropriate to establish P-RNAV system eligibility; and, evidence of meeting the requirements contained in Appendix 2, sections 3, 4 and 5. The TTCAA issues LOA or similar operational approval documentation authorizing P-RNAV operations to the General aviation operator. Appendix 2, paragraph 1d provides guidance for operators not able to determine from the AFM or POH that the aircraft system has been approved and installed in accordance with an appropriate TTCAA AC.

(3) Air Operator Approval. TTCAR No. 2 and No. 3 operators should present the following documentation to the TTCAA: sections of the AFM or POH that establish P-RNAV eligibility. Once the operator has satisfied the requirements described in Appendix 2, sections 3, 4, and 5; the TTCAA: issues OpSpecs to reflect Basic Area Navigation (B-RNAV) and P-RNAV approval; and, approves changes to the minimum equipment list (MEL) to account for B-RNAV and P-RNAV operations. Appendix 2, paragraph 1d provides guidance if the operator is unable to determine from the AFM or POH whether the aircraft system is approved in accordance with an appropriate standard.

d. Eligibility Not Based on the AFM (Supplement) or POH.

(1) The operator should submit either a statement of compliance from the Original Equipment Manufacturer (OEM) or his own statement of compliance to the TTCAA. The operator should develop this statement with supporting documentation, e.g., Boeing Commercial Aviation Services Service Letter: 717-SL-02-101, 737-SL02-020, 747-SL-02-016, 757-SL-02-020, 767-SL-02-013, 777-SL-02-005, MD10-SL-02-101, MD11-SL-

02-101, MD80-SL-02-101, MD90-SL-02-101, ATA: 0200-00 dated June 4, 2003. If the TTCAA is unable to make a determination of system eligibility, the operator will be advised to obtain the relevant documentation from the manufacturer.

(a) Existing installations (ACO). The applicant will need to submit a compliance statement showing how the criteria listed in paragraph 2 have been satisfied for existing installations. Compliance may be established by inspection of the installed system to confirm the availability of required features and functionality. The performance and integrity criteria of JAA TGL 10 section 6 may be confirmed by reference to statements in the AFM, POH or to other applicable approvals and supporting certification data. In the absence of such evidence, supplementary analyses and/or tests may be required. JAA TGL 10, paragraph 9.3 addresses AFM/POH changes that might be necessary.

(b) New installations or systems that are being modified (ACO). The applicant will submit a compliance statement showing how the criteria listed in paragraph 2 have been satisfied. The statement will be based on a plan that identifies the certification data to be submitted and includes, as appropriate, a system description together with evidence resulting from the following activities:

1. Demonstrate compliance with the airworthiness requirements for the intended function and safety by equipment qualification, system safety analysis, confirmation of appropriate software design assurance level, performance analyses, and a combination of ground and flight tests. To support the approval application, submit design data showing the objectives and criteria of JAA TGL 10, sections 6 and 7 have been satisfied.

2. Evaluate use of the RNAV systems and the manner of presentation of lateral and vertical guidance information on the flight deck to show the risk of flightcrew error has been minimized. In particular, during the transition to the final approach, the display of instrument landing system (ILS) information simultaneously with RNAV information to the flight crewmember will need careful consideration.

> **NOTE: In particular, the evaluation should consider presentation to the pilot during transition from RNAV to final approach guidance, e.g., ILS. This evaluation is not meant to imply a requirement for simultaneous RNAV and ILS information.**

3. Evaluate equipment failure scenarios involving conventional navigation sensors and the RNAV system(s) to demonstrate adequate alternative means of navigation are available following failure of the RNAV system, and reversion to other navigation sources, e.g., VOR#2 on HSI#1, do not lead to misleading or unsafe display configurations. The evaluation must also consider the probability of failures within the switching arrangements.

4. Evaluate the coupling arrangements for the aircraft system to flight director/automatic pilot to show clear, unambiguous indications of the operating modes, including annunciation of system failures modes and impacts on these modes of operation.

5. Demonstrate compliance with Appendix 2, section 2, the execution of all leg types (in particular when intercepting a CF leg) possible without the need for manual intervention. Specifically, there should not be a need to disengage the selected navigation mode and manually make course selection. This does not preclude means for manual intervention when needed.

(2) General Aviation Aircraft/Operator Approval. General aviation operators present the documentation received from the ACO to the TTCAA and evidence of meeting the requirements contained in Appendix 2, sections 3, 4 and 5. The TTCAA issues LOA or similar operational approval documentation authorizing P-RNAV operations to general aviation operators.

(3) Air Operator Aircraft/ Operator Approval. TTCAR No.2 and TTCAR No.3 operators should present the documentation from the ACO to the TTCAA and evidence of meeting the requirements described in Appendix 2, sections 3, 4, and 5. The TTCAA issues OpSpecs to reflect B-RNAV and P-RNAV approval; and, if applicable, changes to the MEL to account for B-RNAV and P-RNAV operations.

2. REQUIREMENTS.

a. Performance. P-RNAV operations are based upon the use of RNAV equipment that automatically determines aircraft position in the horizontal plane using inputs from the following types of positioning sensor (no specific priority):

> **NOTE: Operators should consider currency and/or accuracy of their magnetic variation tables. Errors introduced from outdated values may impact certain RNAV procedures. Further guidance on magnetic variation may be found in RTCA DO-236A/EUROCAE ED-75A, paragraph 3.2.5.2.**

(1) Distance Measuring Equipment giving measurements from two or more distance measuring equipment (DME) ground stations (DME/DME);

(2) Very high frequency (VHF) omni-directional radio (VOR) range with a co-located DME (VOR/DME) where it is identified as meeting the requirements of the procedure; and

(3) GNSS.

(a) The use of GPS or WAAS equipment to perform P-RNAV operations is limited to equipment approved under TTCAA TSO-C145A and TSO-C146A, and TSO-C129A. TSO-C129A equipment classes A1, B1, C1, B3 and C3 meet P-RNAV performance requirements.

(b) For TSO-C129 equipment, GPS equipment approved in accordance with TSO-C129 and satisfying the step-detection and health word checking contained in TSO-C129A meet P-RNAV performance requirements.

(4) Inertial Navigation System (INS) or Inertial Reference System (IRS), with automatic updating from suitable radio based navigation equipment.

NOTE: Loran-C is not an acceptable navigation sensor for terminal airspace operations.

NOTE: TACAN beacons may be included in the onboard navigation database and used to supplement DME, provided they meet ICAO Annex 10 Standards and are listed in the AIP.

(5) Use of Inertial Data. In the event of unavailability or loss of radio sensor derived automatic position updating, it is permissible to use, for a short period of time, data from an inertial system as the only means of positioning. For such operations, in the absence of a position integrity indication, the applicant must establish how long the aircraft can maintain the required accuracy using only inertial data. Consider both takeoff and terminal area operations when addressing the contingency procedures. Base the limits on an acceptable drift rate model agreed to by the TTCAA.

b. Functional.

NOTE: This section only covers the required functionality of JAA TGL-10. JAA TGL 10 also includes recommended functions, contained in section 7.2, table 2.

Item Functional Description

1. Display elements, e.g., CDI, (E)HSI, each with a lateral deviation display, to/from flag, and failure indicator, for use as primary flight instruments for navigation of the aircraft, for maneuver anticipation, and for failure/status/integrity indication, visible to the pilot and located in the primary field of view when looking forward along the flight path. The course selector of the deviation display shall be automatically slaved to the RNAV computed path. The deviation display shall have a full-scale deflection suitable for the phase of flight and based on the required track keeping accuracy. Scaling may be set automatically by default logic or to a value obtained from a navigation database. The full-scale deflection value must be known or made available for display to the flightcrew. For P-RNAV operations, a value of ±1 NM is acceptable. An acceptable alternative for P-RNAV is a navigation map display, readily visible to the flightcrew, with appropriate map scales and giving equivalent functionality to the lateral deviation display, except that scaling may be set manually by the pilot.

2. Capability to continuously display to the pilot flying, on the primary flight instruments for navigation of the aircraft, the RNAV computed desired path (DTK) and aircraft position relative to the path.

3. Where the minimum flightcrew is two pilots, means for the pilot not flying to verify the desired path and the aircraft position relative to the path.

4. A navigation database, containing current navigation data officially promulgated for civil aviation, which can be updated in accordance with the Aeronautical Information Regulation and Control (AIRAC) cycle and from which terminal airspace procedures can be retrieved and loaded into the RNAV system. The resolution to which the data is stored must be sufficient to achieve the required track keeping accuracy. The database must be protected against flightcrew modification of the stored data.

NOTE: When a procedure is loaded from the database, the aircraft system is required to fly it as published. This does not preclude the flightcrew from having the means to modify a procedure or route already loaded into the aircraft system as permitted by Appendix 2, paragraph 3 (Operating Procedures) or JAA TGL 10, section 10. However, the procedure stored in the database must not be modified and must remain intact within the database for future use and reference.

5. Means to display the validity period of the navigation database to the flightcrew.

6. Means to retrieve and display data stored in the navigation database relating to individual waypoints and navigation aids, to enable the flightcrew to verify the procedure to be flown.

7. Capacity to load the whole terminal procedure(s) to be flown from database into the RNAV system.

8. Display of the active navigation sensor type, either in the pilot's primary field of view, or on a readily accessible page on a multi-function control display unit (MCDU) together with a means of determining navigation system performance.

9. Display of the identification of the active (To) waypoint, either in the pilot's primary field of view, or on a readily accessible page on an MCDU, readily visible to the flightcrew.

10. Display of distance and bearing to the active (To) waypoint in the pilot's primary field of view. Where impracticable, the data may be displayed on a readily accessible page on an MCDU, readily visible to the flightcrew.

11. Display of ground speed or time to the active (To) waypoint, either in the pilot's primary field of view, or on a readily accessible page on a MCDU, readily visible to the flightcrew.

12. Where the MCDU is to be used to support the accuracy checks of Appendix 2, paragraph 3 (Operating Procedures), or JAA TGL-10, section 10, display of lateral deviation with a resolution of 0.1 NM.

13. When used for RNAV position updates, automatic tuning of VOR and DME navigation aids and the capability to inhibit individual navigation aids from the automatic selection process.

NOTE: Further guidance may be found in ED-75A/DO-236A, section 3.7.3.1.

14. Capability for the P-RNAV system to perform automatic selection (or de-selection) of navigation sources, a reasonableness check, an integrity check, and a manual override or deselect.

NOTE: Further guidance may be found in ED-75A/DO-236A, section 3.7.3.1.

15. Capability for the “Direct to” function.

16. Capability for automatic leg sequencing with display of sequencing to the flightcrew.

17. Capability to execute database procedures including fly-over and fly-by turns.

18. Capability to execute leg transitions and maintain tracks consistent with the following Aeronautical Radio, Inc. (ARINC) 424 path terminators, or their equivalent:

Initial Fix (IF)
Track between Two Fixes (TF)
Course to a Fix (CF)
Course from a Fix to an Altitude (FA)
Direct to a Fix (DF)

NOTE: Path terminators are defined in ARINC Specification 424, and their application is described in more detail in documents EUROCAE ED-75A/RTCA DO-236A, ED-77/DO-201A, and EUROCONTROL document NAV.ET1.ST10.

19. Indication of the RNAV system failure, including the associated sensors, in the pilot’s primary field of view.

20. For multi-sensor systems, automatic reversion to an alternate RNAV sensor if the primary RNAV sensor fails.

NOTE: This does not preclude means for manual navigation source selection.

21. Alternative means of displaying navigation information, sufficient to perform the checking procedures of Appendix 2, paragraph 3 (Operating Procedures) or JAA TGL 10, section 10 (Operational Criteria).

3. P-RNAV OPERATING PROCEDURES (GENERAL). In addition to B-RNAV operating procedures, in Appendix 1, paragraph 2, flightcrews should be familiar with the P-RNAV normal operating and contingency procedures.

a. Normal.

(1) Pre-flight Planning.

(a) During the pre-flight planning phase, the availability of the navigation infrastructure, required for the intended operation, including any non-RNAV contingencies, shall be confirmed for the period of intended operation. Confirm availability of the onboard navigation equipment necessary for the route to be flown. The onboard navigation database must be appropriate for the region of intended operation and must include the navigation aids, waypoints, and coded terminal airspace procedures for the departure, arrival and alternate airfields.

NOTE: If during the flight the AIRAC cycle changes, operators should establish procedures to ensure the accuracy of navigation data, including suitability of navigation facilities used to define the route of flight, and approach. Traditionally, this has been accomplished by verifying electronic data against paper products. An acceptable means is to compare aeronautical charts (new and old) to verify navigation fixes prior to dispatch. If an amended chart is published for the procedure, the data within the database shall not be used to conduct the operation.

(b) Where the responsible airspace authority has specified in the AIP that dual P-RNAV systems are required for a specific terminal P-RNAV procedure, confirm the availability of dual P-RNAV systems. This typically will apply where procedures are effective below the applicable minimum safe altitude/minimum obstacle clearance altitude or where radar coverage is inadequate for the purposes of supporting P-RNAV. This will also take into account the particular hazards of a terminal area and the feasibility of contingency procedures following loss of P-RNAV capability.

(c) If a stand-alone GPS is to be used for P-RNAV, confirm the availability of receiver autonomous integrity monitoring (RAIM) with the latest information from the U.S. Coast Guard giving details of satellite non-availability (see http://www.navcen.uscg.gov). The U.S. Notices to Airmen (NOTAM) Office also provides satellite non-availability data. See Appendix 1, paragraph 1d(3)(b) for guidance materials on RAIM prediction.

NOTE: RAIM prediction may be a function of the equipment when satellite non-availability data can be entered. In the absence of such a function, an airspace service provider may offer an approved RAIM availability service to users. The use of the EUROCONTROL AUGUR tool may be used to satisfy this requirement (see http://www.augur.ecacnav.com).

(2) Departure.

(a) At system initialization, the flightcrew must confirm the navigation database is current and verify the aircraft's present position is entered correctly. The flightcrew shall check the active flight plan by comparing the charts, Standard Instrument Departure (SID) or other applicable documents, with the map display (if applicable) and the MCDU. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. If required by a procedure, a check will need to be made to confirm that updating will use a specific navigation aid(s), or to confirm exclusion of a specific navigation aid. A procedure shall not be used if doubt exists as to the validity of the procedure in the navigation database.

NOTE: As a minimum, the departure checks could be a simple inspection of a suitable map display that achieves the objectives of this paragraph.

(b) The creation of new waypoints by manual entry into the aircraft system is not permitted and invalidates any affected P-RNAV procedure, e.g., manual entry or modification by the flightcrew of the loaded procedure, using temporary waypoints or fixes not provided in the database, is not permitted. Route modifications in the terminal area may take the form of radar headings or 'direct to' clearances and the flightcrew must be capable of reacting in a timely fashion. This may include the insertion of waypoints into the flight plan loaded from the database.

(c) Prior to commencing take off, the flightcrew must verify the aircraft's RNAV system is available and operating correctly and, where applicable, the correct airport and runway data is loaded.

(d) The flightcrew must ensure initialization on the runway either by means of a manual runway threshold or intersection update, as applicable, unless automatic updating of the actual departure point is provided. This is to preclude any inappropriate or inadvertent position shift after take-off. Where GNSS is used, the signal must be acquired before the take-off roll commences and GNSS position may be used in place of the runway update.

(e) During the procedure and where feasible, flight progress should be monitored for navigational reasonableness, by crosschecks with conventional navigation aids using the primary flight displays and the MCDU. Where applicable and when used, the flightcrew procedures shall include flightcrew monitoring to verify automatic updating of the inertial systems and the ability to ensure the time period without updating does not exceed the permitted limit.

(f) Where the initialization described in subparagraph (d) is not achieved, the departure should be flown by conventional navigation means. A transition to the P-RNAV structure should be made at a point where the aircraft's RNAV system has had sufficient time to provide a position update.

NOTE: If a procedure is designed to be started conventionally, then the latest point of transition to the P-RNAV structure will be marked on the charts. If a pilot elects to start a P-RNAV procedure using conventional methods, there will not be any indication on the charts of the transition point to the P -RNAV structure.

(3) Arrival.

(a) Prior to the arrival phase, the flightcrew should verify that the correct terminal procedure has been loaded, and check the active flight plan by comparing the charts with the map display (if applicable) and the MCDU. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. If required by a procedure, a check will need to be made to confirm that updating will exclude a particular navigation aid. A procedure shall not be used if doubt exists as to the validity of the procedure in the navigation database.

NOTE: As a minimum, the arrival checks could be a simple inspection of a suitable map display that achieves the objectives of this paragraph.

(b) Manual entry creation of new waypoints into the aircraft's system invalidates the P-RNAV procedure and is not permitted.

(c) The flightcrew must make the necessary preparation to revert to a conventional arrival procedure where required as a contingency.

(d) During the procedure and where feasible, the flightcrew should monitor flight progress for navigational reasonableness by crosschecks with conventional navigation aids using the primary displays in conjunction with the MCDU. In particular, the flightcrew shall display and check the reference VOR/DME used for the construction of a VOR/DME RNAV procedure. A navigation reasonableness check is required during the descent phase before reaching the initial approach fix (IAF) for RNAV systems without GNSS updating. For GNSS based systems, absence of an integrity alarm is considered sufficient. If the check fails or a GNSS integrity alarm is received, a conventional procedure must be flown.

NOTE: For example, display bearing/range to a VOR/DME from the RNAV system and compare the result with the radio magnetic indicator (RMI) read-out (selected to same VOR/DME) where feasible.

NOTE: In some systems the accuracy may be derived from the navigation mode or accuracy mode.

NOTE: Where the MCDU shows only integers and is unable to display errors with sufficient resolution for P-RNAV accuracy checks, an alternative means of checking will need to be followed.

(e) Route modifications in the terminal area may take the form of radar headings or "direct to" clearances and the flightcrew must be capable of reacting in a timely fashion. This may include the insertion of tactical waypoints loaded from the database. Manual entry or modification by the flightcrew of the loaded procedure, using temporary waypoints or fixes not provided in the database, is not permitted.

(f) All published altitude and speed constraints must be observed even though a particular method is not mandated.

b. Contingency Procedures.

(1) The operator will need to develop contingency procedures to address cautions and warnings for the following conditions:

(a) Failure of the RNAV system components including, those affecting flight technical error (e.g., failures of the flight director or automatic pilot);

(b) Multiple system failures; and

(c) Failure of the navigation sensors.

NOTE: The loss of RAIM for GNSS-based system constitutes the loss of P-RNAV capability.

(d) Coasting on inertial sensors beyond a specified time limit.

(2) The flightcrew must notify ATC of any loss of the P-RNAV capability, together with the proposed course of action.

(3) The flightcrew should continue with the P-RNAV procedure in accordance with the published lost communication procedure in the event of communications failure.

(4) The flightcrew should navigate using an alternative means of navigation which may include the use of an inertial system in the event of loss of P-RNAV capability. The alternative doesn't need to be RNAV.

c. Incident Reporting. Report significant incidents associated with the operation of the aircraft which affect or could affect the safety of P-RNAV operations, in accordance with JAR-OPS 1.420. Specific examples may include:

(1) Aircraft system malfunctions during P-RNAV operations which lead to:

(a) Navigation errors (e.g., map shifts) not associated with transitions from an inertial navigation mode to radio navigation mode;

(b) Significant navigation errors attributed to incorrect data or a navigation database coding error;

(c) Unexpected deviations in lateral or vertical flight path not caused by pilot input;

(d) Significant misleading information without a failure warning; and

(e) Total loss or multiple navigation equipment failure.

(2) Problems with ground navigational facilities leading to significant navigation errors not associated with transitions from an inertial navigation mode to radio navigation mode.

d. Database Integrity.

(1) The navigation database updating process shall comply with EUROCAE ED-76/RTCA DO-200A, or equivalent approved procedures. The navigation database should be obtained from an approved supplier complying with EUROCAE/RTCA document ED-76/DO-200A, Standards for Processing Aeronautical Data. Until such approved suppliers become available, prior to the effective date of the navigation database, as a minimum, the operator must implement navigation database integrity checks using appropriate software tools or approved manual procedures to verify data relating to waypoints below the applicable minimum obstacle clearance altitude. Such checks are in addition to any previously performed by the Aeronautical Information Services (AIS), unapproved navigation database suppliers, or navigation equipment manufacturers. The integrity checks need to identify any discrepancies between the navigation database and the published charts/procedures. Integrity checks may be performed by an approved third party. Discrepancies that invalidate a procedure must be reported to the navigation database supplier and affected procedures must be prohibited by an operator's notice to its flightcrew. Aircraft operators should consider the need to continue their own database checks even for products obtained from approved suppliers.

NOTE: See JAR-OPS 1.035.

(2) Quality Systems. To aid database integrity checking, a suitable tool having the following functionality may be used. A database integrity check tool is a software tool which enables an aircraft operator to conduct independent checks on specific data areas in a navigation database to ensure integrity is maintained. These checks can be delegated to a service organization. The software tool does not have to be qualified in accordance with EUROCAE ED-12B/RTCA DO-178B. The tool should include the following functionality:

- Allow a user to specify the data areas to be checked and the critical data items to be monitored
- Detect any changes in monitored data items
- Generate reports listing all identified changes
- Provide a full data history to support configuration control
- Maintain non-editable log-files of all online actions
- Provide analyses of database quality and changes in quality levels by tracking of rates of discovered errors
- Provide a flexible data input interface to enable database integrity checks for a variety of database providers

4. PILOT KNOWLEDGE REQUIREMENTS. In addition to the requirements specified in Appendix 1, paragraph 3, pilots should be knowledgeable in the following areas:

a. RNP-1 definition as it relates to P-RNAV requirements in P-RNAV airspace;

b. Airspace where P-RNAV is required;

c. Changes to charting and documents to reflect P-RNAV;

d. Required navigation equipment for flight in designated P-RNAV airspace, and limitations associated with the RNAV equipment;

e. Flight planning requirements;

f. Contingency procedures (e.g., for equipment failure);

g. En route, terminal, and approach procedures applicable to RNAV;

h. The information in this AC;

i. Theory of RNAV, including the differences between B-RNAV and P-RNAV; and

j. Limitations of RNAV.

(1) Charting, database and avionics issues including:

(a) Waypoint naming concepts;

(b) RNAV Path terminator concepts and especially:

1. Use of the 'CF' path terminator;

2. Use of the 'TF' path terminator; and

3. Fly-by and fly-over waypoints.

(2) Use of the RNAV equipment including:

(a) Retrieving a procedure from the database,

(b) Verification and sensor management,

(c) Tactically modifying the flight plan,

(d) Addressing discontinuities, and

(e) Entering associated data such as:

1. Wind,

2. Altitude/Speed constraints, and

3. Vertical Profile/Vertical Speed.

(f) Flying the procedure,

(g) Use of Lateral Navigation Mode and associated lateral control techniques,

(h) Use of Vertical Navigation Mode and associated vertical control techniques,

(i) Use of automatic pilot, flight director and auto-throttle at different stages of the procedure, and

(j) The implications of system malfunctions not RNAV related (e.g., hydraulic failure or engine failure).

5. FLIGHT PLANS. Trinidad and Tobago-registered aircraft filing flight plans into P-RNAV designated airspace are expected to meet the P-RNAV airspace requirements. Operators should indicate approval for P-RNAV operations by annotating block 10 (Equipment) of the ICAO flight plan as required in ICAO Doc 7030. If there are any other flight plan annotations required by individual States, operators should make appropriate annotations.

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APPENDIX 3 INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) FLIGHT PLANNING

ICAO Flight Plan (FPL) Item 10 (a), Area Navigation (RNAV) Equipment Information

The implementation of RNAV for en route applications requires the mandatory carriage of Basic Area Navigation (B-RNAV) for instrument flight rules (IFR) operations. The ECAC-agreed concept for the RNAV implementation will allow for three types of terminal area procedures, with respect to the minimum airborne Navigation (NAV) equipment fit required, namely:

a) Precision Area Navigation (P-RNAV),

b) B-RNAV, or

c) Non-RNAV.

It is a fundamental requirement for air traffic control (ATC) to be able to distinguish, systematically, between the various levels of RNAV equipment fit, such that the assignment of Standard Instrument Departure (SID)s/standard terminal automation replacement system (STAR)s can be accomplished in a systematic, efficient and unambiguous manner, without the creation of undue additional controller workload.

The FPL is the vehicle that supports this requirement. The automated processing of the FPL Item 10 information will be fundamental to enabling the systematic display, to all relevant ATC control positions, of the individual aircraft RNAV level of equipage.

Flight planning provisions, in respect of ECAC RNAV equipment carriage requirements, were developed with the following considerations:

a) Consistency with the ICAO required navigation performance (RNP) concept;

b) Consistency with the conclusions reached by ICAO in respect of filing of information with respect to B-RNAV, namely:

- That B-RNAV equipment shall form part of the standard equipment fit and shall therefore be indicated through the use of the letter S in item 10

- The requirement for the letter R to also be inserted in item 10, in conjunction with the letter S, filed in respect of B-RNAV

c) Consistency with the mandatory carriage requirements of B-RNAV for en route operations

d) Consistency with exemptions to B-RNAV carriage requirements, granted to operators of State aircraft;

e) The fact that P-RNAV is not mandatory for en route or terminal operations;

f) The fact that an aircraft certification with respect to P-RNAV also represents certification with respect to B-RNAV;

g) The fact that P-RNAV will be required for designated RNAV terminal area procedures; and

h) That P-RNAV is a transitory step to a possible eventual mandatory requirement for the carriage of RNP-RNAV.

Apply the following when filing RNAV equipment information for flights operating within ECAC airspace:

	Item 10	Item 18
Aircraft not equipped with RNAV (State a/c)	**--**	**STS/NONRNAV**
Aircraft equipped with B-RNAV	**SR**	**--**
Aircraft equipped with P-RNAV	**PSR**	**--**

NOTE: It is expected that ICAO will agree to a dedicated letter to indicate, in Field 10 of the FPL, that an aircraft is approved for P-RNAV operations. European plans call for the use of the letter "P" in ICAO Doc 7030.