Transport Canada Transports Canada

Advisory Circular

Subject:	**Required Navigation Performance Authorization Required Approach (RNP AR APCH): Special Authorization/Specific Approval and Guidance**

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1.0 Introduction

(1) Subject to paragraph (3), this Advisory Circular (AC) provides the conditions and associated guidance applicable to the Special Authorization/Specific Approval (SA) for RNP AR APCH. It describes an acceptable means of demonstrating compliance with regulations and standards. This AC on its own does not change, create, amend or permit deviations from regulatory requirements.

(2) Operators are expected to follow the means of compliance described in this AC in all respects.

(3) The conditions of the associated SA appear in Appendix A of this AC:

(a) For air operators, the conditions published in Appendix A of this AC constitute part of the air operator certificate (AOC). As such, compliance with these conditions is mandatory.

(b) For private operators, the conditions published in Appendix A of this AC constitute part of the private operator registration document (PORD). As such, compliance with these conditions is mandatory.

1.1 Purpose

(1) The purpose of this AC is to provide air operators with information pertaining to the Special Authorization/Specific Approval to conduct Required Navigation Performance Authorization Required Approach (RNP AR APCH). This approval is issued by Transport Canada Civil Aviation (TCCA) to Canadian air operators holding a Private Operator Registration Document (PORD) issued under subpart 604, or an Air Operator Certificate (AOC) issued under subparts 702, 703, 704 and 705 of the *Canadian Aviation Regulations* (CARs). Until a Standard on RNP AR APCH is published in the *Commercial Air Services Standards* (CASS), the content of this AC will constitute the conditions to be met to obtain the Special Authorization/Specific Approval for RNP AR APCH.

1.2 Applicability

(1) This AC is applicable to:

(a) Canadian air operators holding an AOC issued under subparts 702, 703, 704 and 705 of the CARs, or a Private Operator Registration Document (PORD) issued under subpart 604 of the CARs;

(b) pilots, flight dispatchers, flight followers and other operations personnel employed by the operators listed above;

(c) TCCA inspectors with certification and safety oversight responsibilities;

(d) individuals and organizations that exercise privileges granted to them under an External Ministerial Delegation of Authority; and

(e) Original Equipment Manufacturer (OEM) for an Operational Evaluation activity for RNP AR APCH.

(2) All flight operations personnel should be aware of the Special Authorization/Specific Approval RNP AR APCH requirements.

(3) Operators are required to utilize this AC to assist them in reviewing this topic and to determine the applicability of its contents to their specific aircraft types and operating conditions.

(4) This information is also provided to the aviation industry at large for information and guidance purposes.

1.3 Description of changes

(1) Appendix B 1.4.3(1)(f), 1.4.4(2) - Clarification of the number of RNP AR approaches required for initial and recurrent training.

(2) Section 1.0(1) - Introductory language was updated.

(3) Section 2.1(2) and Appendix D D.2 - 704 and 705 authorities were updated to align with 702/703 (navigation system authorizations).

2.0 References and requirements

2.1 Reference documents

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

(a) *Aeronautics Act* (R.S., 1985, c. A-2)

(b) Subpart 604 of the *Canadian Aviation Regulations* (CARs) — Private Operator Passenger Transportation

(c) Subpart 702 of the CARs — Aerial Work Operations

(d) Subpart 703 of the CARs — Air Taxi Operations

(e) Subpart 704 of the CARs — Commuter Operations

(f) Subpart 705 of the CARs — Airline Operations

(g) Standard 722 of the *Commercial Air Services Standards* (CASS) — Aerial Work

(h) Standard 723 of the CASS — Air Taxi

(i) Standard 724 of the CASS — Commuter Operations

(j) Standard 725 of the CASS — Airline Operations

(k) AC 700-016 Compliance with Regulations and Standards for Engine Inoperative Obstacle Avoidance

(l) AC 700-027 Radius to Fix (RF) Path Terminator

(m) AC 700-049 Missed Approaches with Published Climb Gradients: Special Authorization and Guidance

(n) AC 803-001 Transport Canada Publication TP308/GPH209 - Change 8.0 Criteria for the Development of Instrument Procedures

(o) Transport Canada Publication (TP) 308/GPH 209 — Criteria for the Development of Instrument Procedures AC 803-001

(p) International Civil Aviation Organization (ICAO) Doc. 9613, Performance Based Navigation (PBN) Manual, Volume II Part C Implementing RNP AR APCH

(q) ICAO Doc. 7030, Regional Supplementary Procedures

(r) Federal Aviation Administration (FAA) AC 90-101A, Approval Guidance for RNP Procedures with AR

(s) FAA AC 20-138D Airworthiness Approval of Positioning and Navigation Systems

(t) European Aviation Safety Agency (EASA) AMC 20-26, Airworthiness Approval and Operational Criteria for RNP Authorisation Required (RNP AR) Operations

(u) EUROCAE ED-75/RTCA DO-236 Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation; It is intended that the following reference materials be used in conjunction with this document:

(i) Radio Technical Commission for Aeronautics (RTCA) DO-229 Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment

(ii) U.S. CFR 14 Part 121 Appendix G Doppler radar and Inertial Navigation System (INS)

(iii) Canada Air Pilot (CAP)

(iv) Canada Flight Supplement (CFS)

(v) Transport Canada Advisory Circular; AC 700-049 Issue 01, dated 2018-07-18 or later revision; Missed Approaches with Published Climb Gradient: Special Authorization and Guidance; In support of requirement to consider missed approaches with non-standard climb gradient. See Appendix B (16) Non-standard climb gradient

(w) Transport Canada Publication TP 4711, Air Operator Certification Manual - Volume 3 - Operations Specifications

(2) The table below lists the regulatory authorities under which the Special Authorization/Specific Approval for RNP AR APCH is issued to air operators.

For operations conducted under the following Subparts of the CARs	The SA is pursuant to the following provisions
604	Paragraph 604.50(a) of the CARs
702	Subparagraph 702.08(g)(vii) of the CARs
703	Subparagraph 703.08(g)(ix.1) of the CARs
704	Subparagraph 704.08(g)(vi) of the CARs
705	Subparagraph 705.08(g)(vi) of the CARs

2.2 Cancelled documents

(1) Not applicable.

(2) By default, it is understood that the publication of a new issue of a document automatically renders any earlier issues of the same document null and void.

2.3 Definitions and abbreviations

(1) The following **definitions** are used in this document:

(a) **Accuracy:** A measure of the total navigation system to track the aircraft position within a certain horizontal radial distance for at least 95 percent of the total flight time.

Note: There is a high level of accuracy and integrity that must be accompanied by navigation systems that operate RNP AR.

(b) **Air Navigation Services:** Air navigation services include:

(i) aeronautical communication services;

(ii) aeronautical information services;

(iii) aeronautical radio navigation services;

(iv) air traffic control services;

(v) aviation weather services;

(vi) emergency assistance services; and

(vii) flight information services.

(c) **Air Navigation Services Provider:** An independent entity established for the purpose of operating and managing air navigation services, and empowered to manage and use the revenues it generates to cover its costs. In Canada, this function is normally performed by NAV CANADA.

(d) **Aircraft-based Augmentation System (ABAS):** A system which augments and/or integrates the information obtained from other Global Navigation Satellite System (GNSS) elements with information available on board the aircraft. The most common form of ABAS is the Receiver Autonomous Integrity Monitoring (RAIM).

(e) **Area Navigation (RNAV):** A method of navigation which permits aircraft operation on any desired flight path within the coverage of ground or space-based 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 as other operations that are not contemplated in the definition of performance-based navigation.

(f) **Barometric Aiding (Baro-aiding):** A method of augmenting the Global Positioning System (GPS) integrity solution in Receiver Autonomous Integrity Monitoring (RAIM) by using a barometric altitude input source. Baro-aiding requires four satellites and a barometric altimeter to detect an integrity anomaly (the current altimeter setting may need to be entered into the receiver as described in the operating manual). Baro-aiding satisfies the RAIM requirement in lieu of a fifth satellite.

(g) **Barometric Vertical Navigation (baro-VNAV):** A function of certain RNAV systems which presents computed vertical guidance to the pilot referenced to a specified vertical path. The computed vertical guidance is based on barometric altitude information and is typically computed as a geometric path between two waypoints or an angle based on a single waypoint.

(h) **Fault Detection and Exclusion (FDE):** A Receiver Autonomous Integrity Monitoring (RAIM) algorithm that can automatically detect and exclude a faulty satellite from the position solution when measurements from six or more satellites are available. Wide Area Augmentation System (WAAS) equipment uses FDE for integrity whenever a WAAS signal is not available to permit continued operation from en-route through approach operations.

(i) **Galileo:** Galileo is Europe’s global navigation satellite system which is inter-operable with GPS and GLONASS.

(j) **Global Navigation Satellite System (GNSS):** A generic term used by ICAO to define any global position, speed, and time determination system that includes:

(i) one or more main satellite constellations, such as GPS and GLONASS etc.

(ii) aircraft receivers; and

(iii) several integrity monitoring systems. These can include:

(A) Aircraft-Based Augmentation Systems (ABAS);

(B) Satellite-Based Augmentation Systems (SBAS), such as the Wide Area Augmentation Systems (WAAS); and

(C) Ground-Based Augmentation Systems (GBAS), such as the Local Area Augmentation System (LAAS).

(k) **Global Positioning System (GPS):** The United States operated satellite-based radio navigation system that uses precise distance measurements to determine the position, speed, and time in any part of the world. The GPS is made up by three elements: the spatial, the control, and the user elements. The GPS spatial segment nominally consists of at least 24 satellites in 6 orbital planes. The control element consists of 5 monitoring stations, 3 ground antennas, and one main control station. The user element consists of antennas and receivers that provide the user with position, speed, and precise time.

(l) **GLONASS:** The satellite-based radio navigation system operated for the Russian government by the Russian Space Forces.

(m) **Integrity:** A measure of the trust that can be placed in the correctness of the information supplied by the total system. Integrity includes the ability of a system to provide timely and valid warnings to the user (alerts).

Note: There is a high level of accuracy and integrity that must be accompanied by navigation systems that operate RNP AR APCH.

(n) **Navigation specification:** A set of requirements needed to implement and support performance based navigation within a defined airspace.

(i) **RNAV specification:** A navigation specification based on area navigation that does not include the requirement for on-board performance monitoring and alerting, designated by the prefix RNAV (e.g., RNAV 5, RNAV 1).

(ii) **RNP specification:** A navigation specification based on area navigation that includes the requirement for on-board performance monitoring and alerting, designated by the prefix RNP (e.g., RNP 4, RNP APCH).

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

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

Note: Recognizing the extent of existing airspace designations and operational approvals under RNP 10 designation, it is anticipated that any new airspace designations and aircraft approvals will continue to use the “RNP 10” term while the required PBN application will now be known as “RNAV 10.”

(q) **RNP System:** An area navigation system that includes on-board performance monitoring and alerting.

(r) **Radius to Fix (RF) Path Terminator:** A specific fixed-radius curved path in a terminal and approach procedure intended to be applied where an accurate repeatable and predictable ground path is required. Also known as RF leg.

(s) **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 between 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.

(t) **Satellite-Based Augmentation System (SBAS):** A wide coverage augmentation system in which the user receives augmentation information from a satellite-based transmitter. The Wide Area Augmentation System (WAAS) is a form of SBAS.

(u) **Specific Approval**: An approval which is documented in the Operations Specifications section of the Air Operator Certificate or in the list of specific approvals for subpart 604 operations.

(v) Special Authorization: Previous name for a Specific Approval.

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

(x) **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.

(y) **Technical Standard Order (TSO):** A minimum performance standard for specified materials, parts, and appliances used on civil aircraft.

(z) **Total System Error (TSE):** The difference between the true position and the desired position. This error is equal to the sum of the vectors of the path definition error (PDE), the flight technical error (FTE), and the navigation system error (NSE).

(i) Flight Technical Error (FTE): The FTE is the accuracy with which an aircraft is controlled as measured by the indicated aircraft position with respect to the indicated command or desired position.

(ii) Navigation System Error (NSE): The difference between the true position and the estimated position.

(iii) Path Definition Error (PDE): The difference between the defined path and the desired path at a given place and time.

(aa) **World Geodetic System 1984 (WGS 84):** The most recent geocentric reference system definition developed by the United States Department of Defense (World Geodetic System Committee).

(2) The following **abbreviations** are used in this document:

(a) **AAIM:** Aircraft Autonomous Integrity Monitoring

(b) **ABAS:** Aircraft-Based Augmentation System

(c) **AC:** Advisory Circular

(d) **AFM**: Aircraft Flight Manual

(e) **AIRAC:** Aeronautical Information Regulation and Control

(f) **ANSP:** Air Navigation Service Provider

(g) **ATC:** Air Traffic Control

(h) **DA:** Decision Altitude

(i) **FAF:** Final Approach Fix

(j) **FAP:** Final Approach Point

(k) **FTE:** Flight Technical Error

(l) **GNSS:** Global Navigation Satellite System

(m) **GPS:** Global Positioning System

(n) **GPWS:** Ground Proximity Warning System

(o) **HIL:** Horizontal Integrity Limit

(p) **INS:** Inertial Navigation System

(q) **MAHF:** Missed Approach Holding Fix

(r) **MAP:** Missed Approach Point

(s) **NAVAID:** Navigational Aid

(t) **NOTAM:** Notice to Airmen

(u) **NSE:** Navigation System Error

(v) **OCS:** Obstacle Clearance Surface

(w) **OEM:** Original Equipment Manufacturer

(x) **PANS OPS:** Procedures for Air Navigation Services for aircraft operations

(y) **PBN:** Performance Based Navigation

(z) **PDE:** Path Definition Error

(aa) **QNH:** Local Altimeter Setting

(bb) **RAIM:** Receiver Autonomous Integrity Monitoring

(cc) **RF:** Radius to Fix

(dd) **RNAV:** Area Navigation

(ee) **RNP:** Required Navigation Performance

(ff) **ROC**: Required Obstacle Clearance

(gg) **SA**: Specific Approval/Special Authorization

(hh) **SBAS:** Satellite-Based Augmentation System

(ii) **SID:** Standard Instrument Departure

(jj) **STAR:** Standard Terminal Arrival

(kk) **TAWS:** Terrain Awareness and Warning System

(ll) **TCCA:** Transport Canada Civil Aviation

(mm) **TERPs:** Terminal Instrument Procedures

(nn) **TSE:** Total System Error

(oo) **TSO:** Technical Standard Order

(pp) **VPA:** Vertical Path Angle

(qq) **WAAS:** Wide Area Augmentation System

3.0 Background

3.1 General

(1) The material described in this Advisory Circular (AC) is based on International Civil Aviation Organization (ICAO) Doc 9613 Performance Based Navigation (PBN) Manual, Volume II Part C Implementing RNP AR APCH.

(2) This AC does not establish all the requirements that may be specified for a given Required Navigation Performance Authorization Required Approach (RNP AR APCH) instrument procedure. Some of these requirements are established in other documents, such as the Transport Canada Publication (TP) TP 308/GPH 209 Criteria for the Development of Instrument Procedures (available via AC 803-001 or by request to TCCA) and ICAO Doc 7030 – Regional Supplementary Procedures. Although operational approval is normally related to equipment, procedures and training requirements, operators must consider other regulatory requirements before conducting RNP AR APCH operations.

(3) The ICAO standard for waypoint definition is use of World Geodetic System 1984 (WGS 84) as the reference datum. Canada uses WGS 84 or equivalent in the definition of approach waypoints.

(4) RNP AR APCH approaches provide an unprecedented level of flexibility in construction of approach procedures. These approaches include unique capabilities that require special aircraft and aircrew authorization similar to Category II/III approaches. Furthermore, RNP AR APCH approaches have reduced lateral obstacle evaluation areas and vertical obstacle clearance surfaces.

(5) RNP AR APCH operations are often implemented in situations where it is not possible to install conventional landing approach aids or where a conventional RNP APCH does not meet the operational requirement. While RNP AR APCH approaches are utilized at locations where terrain prevents the use of other approach techniques, they are also used at locations where there may be airspace limitation or where an operational advantage can be obtained (i.e., close in capture of ILS approaches to shorten track distances and increase runway capacity).

(6) RNP AR APCH authorization is required for the conduct of RNP AR APCH procedures. An RNP AR APCH authorization is based on Global Navigation Satellite System (GNSS) as the primary Navigation Aid (NAVAID) infrastructure.

(7) RNP AR APCH approaches shall not be used in areas of known navigation signal (GNSS) interference. Canada does not permit the use, including as a reversionary form of navigation, of radio updating (i.e., DME/DME, VOR/DME) or INS as the primary source of positioning for the purpose of continuing an RNP AR APCH procedures.

Note: Most modern RNP systems will prioritize inputs from GNSS over Distance Measuring Equipment (DME/DME) positioning. Although VHF Omni-directional Radio (VOR) /DME positioning is usually performed within a flight management computer when DME/DME positioning criteria cannot be met, avionics and infrastructure variability pose serious challenges to standardization.

(8) When the aircraft's vertical path is dependent on barometric vertical navigation (Baro-VNAV), current local barometric pressure settings must be provided to support RNP AR APCH procedures. Failure to set the altimeter sub-scale with the local altimeter setting (QNH) may compromise vertical obstacle protection provided by the procedure.

(9) RNP AR APCH procedures require additional levels of scrutiny, control and authorization. The increased risks and complexities associated with these procedures are mitigated through more stringent RNP criteria, advanced aircraft capabilities and increased flight crew member training.

(10) Due to the unique requirements for RNP AR APCH operations and the need for flight crew procedures that are specific to each particular aircraft and navigation system, RNP AR APCH

operational support documentation should be obtained from the design approval holder. The documentation should describe the navigation capabilities of the applicant's aircraft in the context of RNP AR APCH operations, and provide all the assumptions, limitations and supporting information necessary for the safe conduct of RNP AR APCH operations. Such documentation is intended to support the operational approval requirements.

(11) Operators should use the design approval holder recommendations when developing their procedures and applying for approval. Operator contingency procedures must, as a minimum, incorporate the design approval holder contingency procedures. Installation of equipment is not sufficient by itself to obtain approval for use on RNP AR APCH instrument procedures.

(12) The RNP AR APCH instrument approach procedures:

(a) are based on the GNSS;

(b) use the WGS 84 coordinates in the creation of procedures;

(c) meet the requirements of Annex 15 to the Convention on International Civil Aviation in the navigation data published for the routes and procedures; and

(d) require the navigation standard (e.g., RNP AR APCH) on all the appropriate charts.

(13) RNP AR APCH procedures can be built with various levels of RNP lateral containment values on the initial, intermediate, final and missed approach segments.

(a) Although these procedural limitations dictate the allowable performance that can be used in accomplishing an approach, they may be lower than the operator's capabilities.

(i) An operator's capability is set out in the limitation attached to the Special Authorization/Specific Approval RNP AR APCH they hold (i.e.: as listed on an AOC or PORD under "Description")

(14) An operator's capabilities and limitations in conducting RNP AR APCH procedures are based upon:

(a) manufacturer's equipment and installation capabilities, as defined and certified in the approved AFM and any Supplementary certificates;

(b) established company procedures, as contained in the TC approved COM and SOP;

(c) crew training and experience; and

(d) daily operational considerations.

Note: RNP AR APCH procedures may include RF legs and as such the authorization granted by TCCA for RNP AR APCH includes the authorization for RF Legs. This does not alleviate the operator of the requirement to ensure the aircraft systems will support this feature (see AC 700-027 Radius to Fix (RF) Path Terminator). However, the Special Authorization/Specific Approval for RF Legs alone is not authorization for RNP AR APCH.

3.2 Application and structure of this Advisory Circular

(1) This Advisory Circular (AC) provides the conditions and associated guidance applicable to the Special Authorization/Specific Approval RNP AR APCH.

(2) To accomplish the above stated objectives, the AC is structured in the following sections:

(a) **Main Body**: Provides background information and general guidance.

(b) **Appendix A**: Stipulates the conditions which operators must meet to be issued the RNP AR APCH Special Authorization/Specific Approval. Compliance with these conditions is mandatory for operators and pilots conducting RNP AR APCH approach.

(c) **Appendix B**: Provides specific guidance with respect to the conditions provided in Appendix A. To facilitate cross-reference, the guidance in Appendix B utilizes the same numbering as the conditions in Appendix A.

(d) **Appendix C**: Features a compliance checklist for the conditions appearing in Appendix A. This compliance checklist has been developed to assist operators in confirming that they are in compliance with the conditions of the Special Authorization/Specific Approval RNP AR APCH. It also serves as an aid to Transport Canada Civil Aviation (TCCA) personnel for certification and safety oversight purposes.

(e) **Appendix D**: Provides a list of the provisions in the Canadian Aviation Regulations (CARs) and Commercial Air Service Standards (CASS) that are applicable to air operators conducting RNP AR APCH approaches.

(3) This AC uses mandatory terms such as “must” and “is/are required” so as to convey the intent of the PBN manual, and of other regulatory requirements where applicable. The term “should” is to be understood to mean that the proposed method of compliance must be used, unless another method of compliance has been approved.

4.0 Transport Canada Civil Aviation approval

(1) A Canadian operator should apply to their Principal Operations Inspector to request the SA for **RNP AR APCH**.

5.0 Information management

(1) Not applicable.

6.0 Document history

(1) AC 700-024, **Issue 03**, RDIMS 16639777 (E), 16649764 (F), dated 2023-04-01 — Required Navigation Performance Authorization Required Approach (RNP AR APCH): Special Authorization/Specific Approval and Guidance

(2) AC 700-024, **Issue 02**, RDIMS 10305910 (E), 10310215 (F), dated 2015-01-22 — Required Navigation Performance Authorization Required Approach (RNP AR APCH)

(3) AC 700-024, **Issue 01**, RDIMS 7563867 (E), 7991632 (F), dated 2013-03-22 — Required Navigation Performance Authorization Required Approach (RNP AR APCH)

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Appendix A — Conditions for RNP AR APCH

Authority

The Special Authorization/Specific Approval Required Navigation Performance Authorization Required Approach (RNP AR APCH) is issued pursuant to paragraph 604.50(a), and subparagraphs 702.08(g)(vii), 703.08(g)(ix.1), 704.08(g)(xi) and 705.08(g)(xi) of the *Canadian Aviation Regulations* (CARs). It authorizes the operator to conduct RNP AR APCH approaches.

Conditions

This authority is granted subject to the following conditions:

1.0 Operator requirements

1.1 Prerequisite Special Authorization/Specific Approval

1.1.1 The conduct of RNP AR APCH instrument approaches requires the following authorization:

(a) Special Authorization/Specific Approval **RNP AR APCH**.

1.2 Documentation

1.2.1 The operator's Company Operations Manual (COM), or private operator equivalent, will address the conduct of RNP AR APCH approaches. The contents of the COM will include, but are not limited to:

(a) the conditions as stipulated in Appendix A of this Advisory Circular (AC) and associated guidance;

(b) any safety information respecting RNP AR APCH which the operator deems appropriate.

1.3 Operational procedures

1.3.1 The operator must establish procedures with respect to the following in order to conduct RNP AR APCH approaches:

(a) Pre-flight considerations;

(b) In-flight considerations;

(c) Contingency Procedures.

1.3.2 The operator shall develop and use Standard Operating Procedures (SOPs) applicable to the Special Authorization/Specific Approval RNP AR APCH.

1.4 Ground and flight training (initial and recurrent)

1.4.1 The operator must provide training for flight crew members, dispatchers and maintenance personnel in RNP AR APCH procedures and concepts as they apply to the responsibilities of these personnel.

1.4.2 **Ground training syllabus:**

(1) The following personnel require RNP AR APCH ground training:

(a) Flight Crew Members: all pilots who will conduct RNP AR APCH procedures;

(b) Operational Control Personnel: all dispatchers involved in the planning and operational control of flights intended to conduct RNP AR APCH procedures; and

(c) Maintenance Personnel: maintenance personnel involved in the routine or detailed checks of RNP AR APCH avionics.

1.4.3 **Flight training syllabus:**

(1) Flight training programs must cover the proper execution of RNP AR APCH procedures in accordance with OEM documentation and requirements identified in the Operational Evaluation Report.

1.4.4 **Recurrent training:**

(1) Flight crew Recurrent training for RNP AR APCH must occur at least every second training event but not less than once per year.

1.4.5 **Training evaluation:**

(1) The operator must evaluate the knowledge of each individual flight crew member involved in RNP AR APCH procedures, prior to that flight crew member commencing RNP AR APCH operations.

2.0 Aircraft requirements

2.1 Type certification requirements

2.1.1 The aircraft utilized to conduct RNP AR APCH approaches must have an aircraft certification approval in accordance with aircraft certification/airworthiness requirements of:

(a) FAA AC 20-138 (D) or later

(b) FAA AC 90-101 (A) or later; or

(c) EASA AMC 20-26.

Note: AC 90-101 is useful background information but not intended to achieve full airworthiness approval on its own.

2.2 Continued airworthiness

2.2.1 The operator of aircraft approved to perform RNP AR APCH operations must ensure that the navigation system is maintained according to the design approval holder's instructions for continuing airworthiness (ICAs), including any software updates.

2.3 Aircraft eligibility

2.3.1 The aircraft must be equipped with a fully functional Class A Terrain Awareness Warning System (TAWS).

2.4 Navigation database

2.4.1 Operators must ensure the navigation database is up to date.

2.4.2 Initial data validation:

(1) In order to validate the integrity of the database and the ability of the RNP system to operationally execute the procedure as intended, the operator must do an initial data validation of every RNP AR APCH procedure before flying the procedure in instrument meteorological conditions (IMC).

2.4.3 Data updates:

(1) Upon receipt of each navigation data update, and before using the navigation data in the aircraft, the operator must compare the update to the validated procedure.

2.4.4 Data suppliers:

(1) Suppliers must have a Letter of Acceptance (LOA), or equivalent regulatory acceptance, for processing and supplying navigation updates.

2.4.5 Aircraft modifications:

(1) If an aircraft system required for RNP AR APCH is modified (e.g., software change), the operator is responsible for the validation of RNP AR APCH procedures using the navigation database and the modified system.

2.5 Monitoring program

2.5.1 Operators must have an RNP monitoring program to ensure continued compliance and to identify any negative trends in performance.

2.5.2 Operators must collect and periodically review data items to identify potential safety concerns.

Appendix B — Specific guidance for the conditions of the SA – RNP AR APCH

B.1 Overview

(1) The matrix below provides specific guidance corresponding to the conditions specified for the Special Authorization/Specific Approval (SA) **RNP AR APCH,** which appears in Appendix A of the AC.

Condition in Appendix A (Paragraph No.)	Guidance information
1.0 Operator requirements	
1.1 Prerequisite for Special Authorization/Specific Approval	
1.1.1 The conduct of RNP AR APCH instrument approaches requires the following authorization: (a) Special Authorization/Specific Approval **RNP AR APCH**.	All conditions of the applicable SA must be met; the conditions appear in Appendix A of this AC. The SA forms the basis upon which a foreign National Aviation Authority (NAA) may authorize, within their jurisdiction, a Canadian air operator or private operator to conduct instrument approaches designated as RNP AR APCH.
1.2 Documentation	
1.2.1 The operator's Company Operations Manual (COM), or private operator equivalent, will address the conduct of RNP AR APCH approaches. The contents of the COM will include, but is not limited to: (a) the conditions as stipulated in Appendix A of this Advisory Circular (AC) and associated guidance; (b) any safety information respecting RNP AR APCH which the operator deems appropriate.	Operators are to examine the aircraft manufacturer documentation of RNP AR APCH approaches in accordance with this AC as to provide recommended procedures and practices. In addition, the Operational Evaluation Report may have also identified required procedures and training area of special emphasis (TASE).
1.3 Operational procedures	
1.3.1 The operator must establish procedures with respect to the following in order to conduct RNP AR APCH approaches: (a) Pre-flight considerations	**(1) Minimum equipment list (MEL)** If a MEL in respect to an operator's aircraft has been approved by the Minister, the operator must: • establish guidance, restrictions and procedures (as required) in the MEL for use in the event of RNP AR APCH equipment unavailability, and • amend its Maintenance Program accordingly.

	The MEL should be developed/revised to address the equipment requirements for RNP AR APCH instrument approaches. • Guidance for these equipment requirements is available from the aircraft manufacturer. • The required equipment may depend on the intended navigation accuracy and whether the missed approach requires an RNP less than 1.0 Nautical Mile (nm). For example, GNSS and autopilot are typically required for high navigation accuracy. • Dual equipment is typically required when conducting an approach requiring an RNP value less than 0.3 nm and/or where the missed approach has an RNP less than 1.0 nm. • The Aircraft Flight Manual (AFM) RNP AR APCH Supplement outlines the certification capability and the equipment required. The navigation system limitations are listed in the RNP AR APCH Equipment List Prior to Approach. This list outlines the dual equipment required to begin the approach and equipment required to continue the approach. The AFM RNP AR APCH equipment list required describes aircraft configurations or modes of operations: • for RNP value of 0.3 and MAP 1.0; • for RNP values less than 0.3 and MAP less than 1.0. **(2) TAWS** An operable Class A terrain awareness warning system (TAWS) is required for all RNP AR APCH procedures. **(3) Autopilot and flight director** RNP AR APCH procedures with lateral navigation accuracy less than RNP 0.3 nm or with RF legs require the use of an autopilot or flight director driven by the RNP system in all cases. Thus, the autopilot/flight director must be serviceable and able to track the lateral and vertical paths defined by the procedure. When the dispatch of a flight is predicated on flying an RNP AR APCH procedure requiring the autopilot at the destination and/or alternate, the

	operator must determine that the autopilot is operational. **(4) Dispatch RNP availability prediction** The operator must have a predictive performance capability which can forecast whether or not the specified RNP will be available at the time and location of a desired RNP AR APCH operation. • This capability can be a ground service and need not be resident in the aircraft's avionics equipment. The operator must establish procedures requiring use of this capability as both a pre-flight dispatch tool and as a flight-following tool, where required, in the event of reported failures. The RNP assessment must consider the specific combination of the aircraft capabilities (sensors and integration). (a) RNP assessment when GNSS updating • This predictive capability must account for known and predicted outages of GNSS satellites or other impacts on the navigation system's sensors. • The prediction programme should not use a mask angle below 5 degrees, as operational experience indicates that satellite signals at low elevations are not reliable. • The prediction must use the actual GNSS constellation with the integrity monitoring algorithm (Receiver Autonomous Integrity Monitoring (RAIM), Aircraft Autonomous Integrity Monitoring (AAIM) etc.) identical to that used in the actual equipment. • For RNP AR APCHs with high terrain, use a mask angle appropriate to the terrain. (b) RNP AR APCH operations must have GNSS updating available prior to commencement of the procedure. **(5) NAVAID exclusion** The operator must establish procedures to exclude NAVAID facilities in accordance with NOTAMs (e.g., DMEs, VORs, localizers). **(6) Navigation database currency** During system initialization, flight crew members of aircraft equipped with an RNP capable system must confirm that the navigation database is current.

	Navigation databases are expected to be current for the duration of the flight. If the AIRAC cycle will change during flight, operators and flight crew members must establish procedures to ensure the accuracy of the navigation data, including the suitability of the navigation facilities used to define the routes and procedures for the flight. An outdated database must not be used to conduct the RNP AR APCH operation unless it has been established that any amendments to the database has no material impact on the procedure. If an amended chart is published for the procedure, the database must not be used to conduct the operation.
1.3.1 (b) In-flight considerations	**(1) Modification of the flight plan**. Flight crew members are not authorized to fly a published RNP AR APCH procedure unless it is retrievable by the procedure name from the aircraft navigation database and conforms to the charted procedure. The lateral path must not be modified, with the exception of: (a) Accepting a clearance to go direct to a fix in the approach procedure, that is before the FAF/FAP and that does not immediately precede an RF leg. (b) Changing the altitude and/or airspeed waypoint constraints on the initial, intermediate, or missed approach segments (e.g., to apply cold temperature corrections or comply with an Air Traffic Control (ATC) clearance/instruction). **(2) Required list of equipment**. The flight crew members must have a required list of equipment for conducting RNP AR APCH operations or alternate methods to address in-flight equipment failures prohibiting RNP AR APCHs (e.g., a quick reference handbook). **(3) RNP management**. The flight crew member's operating procedures must ensure the navigation system uses the appropriate navigation accuracy throughout the approach. If multiple lines of minima associated with different navigation accuracies are shown on the approach chart, the flight crew members must confirm that the desired navigation accuracy is entered in the

	RNP system. If the navigation system does not extract and set the navigation accuracy from the on- board navigation database for each leg of the procedure, then the flight crew member's operating procedures must ensure that the smallest navigation accuracy value (i.e., highest degree of accuracy) required to complete the approach or the missed approach is selected before initiating the procedure (e.g., before the initial approach fix (IAF)). Different segments may have different navigation accuracy requirements, which are annotated on the approach chart. **(4) GNSS updating**. All RNP AR APCH instrument approach procedures require GNSS updating of the navigation position solution. The flight crew members must verify that GNSS updating is available prior to commencing the RNP AR APCH procedure. If GNSS updating is lost at any time during an RNP AR APCH procedure, the flight crew members must abandon the RNP AR APCH procedure unless the flight crew members have the visual references in sight required to continue the approach. See section 1.3.1 (c) Appendix B Contingency Procedures of this AC for more information. **(5) Radio Updating**. Initiation of any RNP AR APCH procedure is based on the availability of GNSS updating. • DME/DME and VOR updating are not authorized for use as the primary form of positioning during RNP AR APCH procedures. • The flight crew members must comply with the operator's procedures for inhibiting specific facilities. **(6) Procedure confirmation**. The flight crew members must confirm that the correct procedure has been selected. • This process includes confirmation of the waypoint sequence, reasonableness of track angles and distances, and any parameters that can be altered by the flight crew

	members, such as altitude or speed constraints. A procedure must not be used if the validity of the navigation database is in doubt. • A navigation system textual display or navigation map display must be used. **(7) System cross-check.** For approaches with navigation accuracy less than RNP 0.3 nm, the flight crew members must monitor the lateral and vertical guidance provided by the navigation system by ensuring it is consistent with other available data and displays that are provided by an independent means. **Note**: This cross-check may not be necessary if the lateral and vertical guidance systems have been developed consistent with a hazardous (severe-major) failure condition for misleading information and if the normal system performance supports airspace containment. **(8) Approach procedures**. (a) Procedures with RF Legs An RNP AR APCH procedure may require the ability to execute an RF leg to avoid terrain or obstacles. • This requirement will be noted on the approach chart. As not all aircraft have this capability, flight crew members must be aware of whether they can conduct these procedures. (b) Indicated Airspeed Limitations When flying an RNP AR APCH approach with RF legs, flight crew members must not exceed the maximum airspeeds shown in Table 1 throughout the RF approach segment being flown. For example, a Category C A320 must slow to 140 KIAS at the FAF/FAP or may fly as fast as 165 KIAS if using Category D minima. A missed approach prior to DA may require the segment speed for that segment be maintained.

Table 1 - **Maximum approach segment airspeed by category**

Indicated airspeed (knots)					
Approach Segment	**Indicated airspeed by aircraft category**				
	CAT A	**CAT B**	**CAT C**	**CAT D**	**CAT E**
Initial and Intermediate (IAF to FAF)	150	250	250	250	310
Final (FAF to DA)	90	120	140	165	250
Missed approach (DA to MAHF)	110	150	240	265	310
Airspeed restriction*	As specified				

***RNP AR APCH** procedure design may use airspeed restrictions unique to the procedure, and published on the approach plate, to reduce the design turn radius regardless of aircraft category. Operators, therefore, need to ensure they comply with the limiting speed for planned RNP AR APCH operations under all operating configurations and conditions.

Note: The above speeds apply only to procedures designed according to TP308/GPH209. The speed limits applicable to procedures designed according to PANS-Ops are not necessarily the same, and operators intending to conduct RNP AR approach activities using such procedures must train flight crew members accordingly.

This is crucial for RNP AR APCH having RF legs.

- This will require appropriate emphasis in training, as it differs from other types of approaches.
- This may require aircraft to remain in specific configuration as to respect the required airspeed, hence delaying clean up.

SOPs specific to RNP AR APCH with RF legs must be developed to include considerations appropriate to that type of approach.

(9) Navigation system with temperature compensation

For aircraft with temperature compensation capabilities, approved operating procedures may allow flight crew members to disregard the temperature limits on RNP AR APCH procedures if the operator provides flight crew member training on the use of the temperature compensation function.

Temperature compensation by the system is applicable to the baro-VNAV guidance and is not

	a substitute for the flight crew members correcting, as required, for the cold temperature effects on minimum altitudes such as DA and MSA. Flight crew members should be familiar with the effects of the temperature compensation on intercepting the compensated path. **(10) Navigation system without temperature compensation.** For aircraft without temperature compensation capabilities, the operation must occur within the temperature limits (TLim) published on the approach chart. Despite being uncompensated, the baro-VNAV path in the final segment will provide the required obstacle clearance. The flight crew members must correct, as required, for the cold temperature effects on minimum altitudes such as IAF, IF, FAF/FAP, DA, MA and MSA. In below ISA temperatures the baro-VNAV path will cross the FAF/FAP at an altitude below the temperature-corrected FAF/FAP crossing altitude. It is permissible to follow the baro-VNAV path from the temperature-corrected intermediate segment altitude. **(11) GNSS vertical navigation**. When using augmented GNSS vertical guidance on RNP AR APCH operations (e.g., SBAS or GBAS), the temperature limits for the procedure do not apply. However, the flight crew members must still correct, as required, for the cold temperature effects on minimum altitudes such as DA and MSA. **(12) Altimeter setting**. RNP AR APCH instrument approach procedures use barometric data to drive vertical guidance. The flight crew members must ensure that the current local altimeter setting (QNH) is set prior to the FAF/FAP. The use of remote altimeter settings is not permitted. **(13) Altimeter cross-check**. The intent of this check is to detect a gross error or a bias error in an altimeter system.

	The flight crew members must complete an altimetry cross-check ensuring both pilots' altimeters agree within 100 ft (±30 m) **not later than the FAF/FAP** after receiving the current local altimeter setting at the airport of intended landing. Do not continue the procedure if the altimetry crosscheck fails. If the altimetry cross-check fails, then the procedure must not be conducted. This operational cross- check is not necessary if the aircraft automatically compares the altitudes to within 100 ft (30 m). (**14) Lateral and vertical path deviation monitoring** (a) Flight crew members must use a lateral deviation indicator and/or flight director in lateral navigation mode on RNP AR APCH procedures. Flight crew members of aircraft with a lateral deviation indicator must ensure that lateral deviation indicator scaling (full-scale deflection) is suitable for the navigation accuracy associated with the various segments of the RNP AR APCH procedure. All flight crew members are expected to maintain approach procedure centrelines, as depicted by on-board lateral deviation indicators and/or flight guidance during all RNP AR APCH operations described in this AC, unless authorized to deviate by ATC or under emergency conditions. For normal operations, cross-track error/deviation (the difference between the RNP system computed path and the aircraft position relative to the path) should be limited to ±½ x the navigation accuracy associated with the procedure segment. • Brief lateral deviations from this standard (e.g., overshoots or undershoots) during and immediately after turns, up to a maximum of 1 x the navigation accuracy of the procedure segment are tolerable. (b) The vertical deviation must be within 75 ft (22 m) during the final approach segment, noting that transients in excess of 75 ft (22 m) above the vertical path are acceptable (e.g., configuration changes or energy management actions).

	Vertical deviation should be monitored above and below the glide path. While being above the glide path provides margin against obstacles on the final approach, continued intentional flight above the vertical path can result in a go-around decision closer to the runway and reduce the margin against obstacles in the missed approach. (c) Pilots must execute a missed approach if the lateral deviation exceeds 1 × RNP or the vertical deviation exceeds 75 ft (22 m) below the vertical path, unless the flight crew members have the visual references in sight required to continue the approach. (i) Some aircraft navigation displays do not incorporate lateral and vertical deviations scaled for each RNP AR APCH operation in the primary field of view. Where a moving map, low-resolution vertical deviation indicator (VDI), or numeric display of deviations are to be used, flight crew member training and procedures must ensure the effectiveness of these displays. Typically, this involves the demonstration of the procedure with a number of trained flight crews and inclusion of this monitoring procedure in the recurrent RNP AR APCH training programme. (ii) For installations that use a CDI for lateral path tracking, the AFM or aircraft qualification guidance should state which navigation accuracy and operations the aircraft supports and the operational effects on the CDI scale. The flight crew members must know the CDI full-scale deflection value. The avionics may automatically set the CDI scale (dependent on the phase of flight) or the flight crew members may manually set the scale. If the flight crew members manually select the CDI scale, the operator must have procedures and training in place to assure the selected CDI scale is appropriate for the intended RNP operation. The deviation limit must be readily apparent, given the scale (e.g., full-scale deflection). **Note:** For dual RNP systems that independently display lateral and vertical paths, the approach must be discontinued when either system

	indicates a deviation that exceeds the above thresholds. (**15) VNAV altitude transitions** The Aircraft Barometric VNAV system provides fly-by vertical guidance, and may result in a path that starts to intercept the vertical path prior to the FAF/FAP. The small vertical displacement which may occur at a vertical constraint (e.g., the FAF/FAP) is considered operationally acceptable, and may provide a smoother transition to the next flight path vertical segment. This momentary deviation below the published minimum procedure altitude is acceptable provided the deviation is limited to no more than 100 ft (30 m) and is a result of a normal VNAV capture. This applies to "level off" and "altitude acquire" segments following a climb or descent or vertical climb or descent segment initiation or joining of climb or descent paths with different gradients. (**16) Non-standard climb gradient**. When an approach procedure specifies a non-standard climb gradient, the operator and flight crew members must ensure the aircraft is capable of complying with the published climb gradient at the aircraft landing weight under ambient atmospheric conditions. For specific guidance, please see Advisory Circular AC 700-049 Missed Approaches with Published Climb Gradients: Special Authorization and Guidance and AC 700-016 Compliance with Regulations and Standards for Engine Inoperative Obstacle Avoidance. (**17) Go-around or missed approach** (a) Where possible, the missed approach will require a navigation accuracy value of RNP 1.0 nm. The missed approach portion of these procedures is similar to a missed approach of an RNP APCH approach. Where necessary, a navigation accuracy value less than RNP 1.0 nm (i.e., a higher degree of accuracy) will be used in the missed approach. **Operators must receive approval to conduct:** - RNP AR approach less than 0.3, and - RNP AR Missed approach with RNP less than 1.0, as indicated on their Special Authorization/Specific Approval.

	(b) In some aircraft, activating take-off/go-around (TOGA) during the initiation of a go-around or missed approach, may cause a change in lateral navigation mode or functionality (i.e., TOGA disengages the autopilot and flight director from LNAV guidance) and track guidance may revert to track-hold function. In such cases, LNAV guidance to the autopilot and flight director should be re-engaged as quickly as possible. (c) The flight crew member procedures and training must address the impact on navigation capability and flight guidance if the flight crew member initiates a go-around while the aircraft is in a turn. When initiating an early go-around, the flight crew members must ensure adherence to the published track unless ATC has issued a different clearance. The flight crew members should also be aware that RF legs are designed for a maximum ground speed. Initiating an early go-around at speeds higher than those considered in the design may cause the aircraft to diverge throughout the turn and require flight crew member intervention to maintain the path. **Note:** Consideration should be given to aircraft configuration during approach and any configuration changes associated with a go around (e.g., engine failure, flap retraction, reengagement of lateral navigation).
1.3.1 (c) Contingency procedures	(1) Operator contingency procedures must, as a minimum, incorporate the manufacturer contingency procedures. (2) **Contingency procedures — failure while en-route:** The aircraft RNP capability is dependent on operational aircraft equipment and GNSS. The flight crew members must be able to assess the impact of equipment failure or inadequate GNSS constellation configuration on the ability to conduct RNP AR APCH procedures, and take appropriate action. (3) **Contingency procedures — failure on approach:**

	The operator's contingency procedures need to address at least the following conditions: (a) Failure of the RNP system components, including those affecting lateral and vertical deviation performance (e.g., failures of a GNSS sensor, the flight director or automatic pilot); (b) Loss of navigation signal in-space (loss or degradation of external signal); and (c) Identification of hazards and special procedures unique to a particular approach.
1.3.2 The operator shall develop and use Standard Operating Procedures (SOPs) applicable to the Special Authorization/Specific Approval **RNP AR APCH**	Commercial Air Operators and Private Operators SOPs shall establish the processes, practices and procedures specific to, and not limiting to: • pre-flight considerations and procedures, • in-flight considerations and procedures, • normal and abnormal procedures; • contingency procedures.
1.4 Ground and flight training (initial and recurrent)	
1.4.1 The operator must provide training for flight crew members, dispatchers, flight followers and maintenance personnel in RNP AR APCH procedures and concepts as they apply to the responsibilities of these personnel.	(1) A thorough understanding of the operational procedures and best practices is critical to the safe operation of aircraft during RNP AR APCH operations. The flight crew member training must provide sufficient detail on the aircraft's navigation and flight control systems to enable the flight crew members to identify failures affecting the aircraft's RNP capability and the appropriate abnormal/emergency procedures. Training must include both knowledge and skill assessments of the flight crew members and dispatchers. Each operator is responsible for the training of all personnel for the specific RNP AR APCH operations exercised by the operator. (2) Each operator is responsible for the training of all personnel for the specific RNP AR APCH operations exercised by the operator. The operator must include training on the different types of RNP AR APCH procedures and required equipment. These requirements and procedures must be included in their company operations manual and training manuals (as applicable). This material must cover all aspects of the operator's

	RNP AR APCH operations including the content of the Special Authorization/Specific Approval. An individual must have completed the appropriate ground and/or flight training programs, as applicable, and, in the case of flight crew members, the evaluation program before engaging in RNP AR APCH operations. (3) The flight training syllabus must include training and qualification content representative of the type of RNP AR APCH operations the operator conducts during line-oriented flying activities. RNP AR APCH procedures are eligible for inclusion in an operator's Advance Qualification Programs (AQP). The operator may conduct required flight training and qualification in flight training devices, aircraft simulators, and other enhanced training devices as long as these training devices accurately replicate the operator's equipment and RNP AR APCH operations, and are approved by TCCA. (4) An operator may use restricted RNP approach procedures for the purpose of satisfying the RNP AR APCH training and evaluation requirements. Approval to use restricted RNP approach procedures for this purpose must be received prior to their use. • The operator must submit the proposed approach procedure with supporting rationale for equivalency to the POI, or private operator equivalent. • A determination will be made by TCCA AARTF as to the eligibility of the proposed approach. (5) Operators must address initial flight crew member RNP AR APCH training and checking during initial, transition, upgrade, recurrent, differences, or stand-alone training and checking programs. The qualification standards assess each flight crew member's ability to properly understand and use RNP AR procedures (RNP AR APCH initial evaluation). The operator must also conduct a recurrent qualification program to ensure their flight crew members maintain appropriate RNP AR APCH knowledge and skills.

	(6) Operators may address RNP AR APCH operation topics separately on initial training, when it is not practical to combine it with the aircraft training curriculum, or integrate them with other curriculum elements where practicable. For example, an RNP AR APCH flight crew member qualification may focus on a specific aircraft during transition, upgrade or differences courses. General training may also address RNP AR APCH qualification (e.g., during recurrent training or checking events such as recurrent proficiency check/proficiency training, line oriented evaluation or special purpose operational training). A separate, independent RNP AR APCH qualification program may also address RNP AR APCH training. (7) Operators may receive credit towards the requirements of this Special Authorization/Specific Approval for elements of RNP training already conducted as part of an existing training program (e.g., RNAV 1 and 2, RNP APCH). • Such operators must receive approval from their principal operations inspector or equivalent. • In such cases, the operator must include flight crew member training on the differences between RNP AR APCH procedures and the operation(s) associated with the common training elements.
1.4.2 Ground training syllabus (1) The following personnel require RNP AR APCH ground training: (a) Flight crew members: all pilots who will conduct RNP AR APCH procedures; (b) Operational control personnel: all dispatchers, flight followers involved in the planning and operational control of flights intended to conduct RNP AR APCH procedures; and (c) Maintenance personnel: maintenance personnel involved in the routine or detailed checks of RNP AR APCH avionics.	

Table 2 - **Ground training of personnel**

Ground training modules (described below)	**Flight crew members**	**Operational control personnel**	**Maintenance personnel**
General knowledge	X	X	X
ATC and flight planning	X	X	
Equipment and procedures	X		X
MEL operating provisions	X	X	X

(1) The ground training syllabus must address the following subjects in an approved RNP AR APCH training program during the initial introduction of an operator's personnel to RNP AR APCH operations:

(a) General knowledge:

(i) The definition of RNP AR APCH;

(ii) The differences between RNAV and RNP;

(iii) The types of RNP AR APCH procedures and familiarity with the chart depiction of these procedures;

(iv) The importance of specific equipment during RNP AR APCH operations e.g., prior to the start of the approach and during the approach;

(v) The requirement for GNSS for all RNP AR APCH procedures;

(vi) The RNP AR APCH regulatory requirements (Appendix A of this AC) and procedures including any restrictions associated with the Special Authorization/Specific Approval (e.g., RF legs not authorized);

(vii) The RNP AR APCH availability (considering aircraft equipment capabilities);

(b) ATC and flight planning:

	(i) The prefixes and suffixes to be used on flight plans; (ii) Any ATC procedures applicable to RNP AR APCH operations; (iii) The use of GPS RAIM (or equivalent) forecasts and the effects of RAIM availability on RNP AR APCH procedures; (iv) The use of WAAS NOTAMs if the aircraft avionics are WAAS capable; (v) The impact of a failure of any avionics or a known loss of ground- or space-based systems on the remainder of the flight plan. (c) Equipment and procedures: (i) The RNP terminology, symbology, operation, optional controls, and display features including any items unique to an operator's implementation or systems; (ii) Airspeed chart limitations associated with RNP AR APCH, including maximum airspeeds throughout RF leg segments; (iii) How bank angle restrictions, wind and groundspeed impact the ability to remain on the course centerline, particularly on an RF leg; (iv) The equipment required prior to the start of the approach and during the RNP AR APCH approach; (v) The consideration and implication of interrupting the approach prior to the MAP, including prior to or after the FAF/FAP, and in RF legs (possibility of maintaining configuration due to speed restriction); (vi) The description of failure alerts; (vii) The equipment used in RNP operations and any limitations on the use of the equipment during those operations; (viii) The programming and displaying of RNP and aircraft specific displays (e.g., actual navigation performance (ANP display)); (ix) How to enable and disable the navigation updating modes related to RNP; (x) The navigation accuracy appropriate for different phases of flight, including RNP

	AR APCH procedures, and how to select the navigation accuracy, if required; (xi) When and how to terminate RNP navigation and transfer to traditional navigation due to the loss of RNP and/or required equipment; (xii) How to determine database currency and whether it contains the navigational data required for use of GNSS waypoints; (xiii) An explanation of the different components that contribute to the total system error and their characteristics; (xiv) Temperature compensation: Flight crew members operating avionics systems with compensation for altimetry errors introduced by deviations from ISA may disregard the temperature limits on RNP AR APCH procedures if they have received approved training from the operator on the use of the temperature compensation function and the compensation function is utilized by the flight crew members. However, the training must also recognize that the temperature compensation by the system is applicable to the VNAV guidance and is not a substitute for the flight crew correcting, as required, for the cold temperature effects on minimum altitudes such as DA and MSA; (xv) The normal and abnormal flight crew operating procedures, responses to failure alerts, and any equipment limitations, including related information on RNP modes of operation; (xvi) The approved flight operations manual(s) must contain the contingency procedures for loss or degradation of RNP capability. (d) MEL Operating Provisions: (i) The MEL requirements supporting RNP AR APCH operations.
1.4.3 Flight training syllabus (1) Flight training programs must cover the proper execution of RNP AR APCH procedures in accordance with the Original Equipment Manufacturer (OEM)'s documentation.	(1) The operational training must include: (a) RNP AR APCH procedures and limitations; (b) standardization of the set-up of the cockpit's electronic displays during an RNP AR APCH procedure;

Flight crew members are required to complete initial flight training for each operating capacity for which they will be authorized (as pilot flying and pilot monitoring).	(c) recognition of the aural advisories, alerts and other annunciations that can impact compliance with an RNP AR APCH procedure; (d) timely and correct responses to loss of RNP AR APCH capability in a variety of scenarios, within the group of the RNP AR APCH procedures which the operator plans to use; (e) the unique characteristics of RNP AR APCH procedure contingencies (i.e., RF legs, RNP missed approach); and (f) A minimum of four RNP AR APCH procedures must be completed by each crew member (two as pilot flying and two as pilot monitoring). One of the RNP AR APCH procedures must be flown to a landing. (2) This training must address the following specific elements: (a) briefing all RNP AR APCH procedures and the important role cockpit resource management (CRM) plays in successfully completing an RNP AR APCH procedure; (b) verifying that each pilot's altimeters agree within ±100 feet not later than the FAF/FAP after receiving the current local altimeter setting at the airport of intended landing. Do not continue the procedure if the altimetry crosscheck fails, including any operational limitations associated with the source(s) for the altimeter setting, and the cross-checking of the altimeters approaching the FAF/FAP; (c) using aircraft radar, TAWS, GPWS, or other avionics systems to support the flight crew member's track monitoring, and weather and obstacle avoidance; (d) determining the source of positioning information, and confirming that GNSS has been given priority over all others (i.e., DME/DME, VOR/DME); (e) confirming and correcting, as applicable, the required RNP accuracy value; (f) recognizing alerts associated with the loading and use of improper navigation accuracy data for a desired segment of an RNP AR APCH procedure; (g) coupling the autopilot/flight director to the navigation system's lateral guidance on RNP

	AR APCH procedures requiring an RNP of less than RNP 0.3 nm; (h) recognizing the effect of wind on aircraft performance during RNP AR APCH procedures and the need to remain within RNP containment area, including any operational wind limitation and aircraft configuration essential to safely complete an RNP AR APCH procedure; (i) identifying any bank angle restrictions or operational limitations on RNP AR APCH procedures (e.g., temperature limitations); (j) recognizing the potentially detrimental effect on the ability to comply with an RNP AR APCH procedure when reducing the flap setting, reducing the bank angle, increasing airspeed, or having an engine inoperative; • Training shall include One Engine Inoperative (OEI) scenarios. (k) understanding that aircraft are expected to maintain the standard speeds associated with the applicable category, and that RNP AR APCH aircraft category airspeeds associated with RF legs, as published in Table 1 of this AC, are different from aircraft category airspeeds published in the Canada Air Pilot (CAP GEN). The speed limits found in Table 1 are applicable to procedures designed according to TERPs. Operators intending to conduct RNP AR APCH procedures not designed to TERPs criteria, such as PANS OPS, must train flight crew members on the speed limits applicable to RF legs included in those procedures; (l) understanding the relationship between RNP and the appropriate approach minima line on an approved published RNP AR APCH; (m) Missed Approach: (i) responding to the loss of GNSS during a procedure; (ii) identifying the events triggering a missed approach when using the aircraft's RNP capability; (iii) missed approach operational and aircraft configuration considerations when initiated prior to the miss approach point

	(MAP) with respect to RF legs, airspeed restrictions. (iv) recognizing the effect of activating TOGA while in a turn; (v) monitoring of and the impact on go-around decision and operation; (vi) following flight crew contingency procedures for a loss of RNP capability during a missed approach. Due to the lack of navigation guidance, the training should emphasize the flight crew contingency actions that achieve separation from terrain and obstacles.
1.4.4 Recurrent training (1) Flight crew recurrent training for RNP AR APCH must occur at least every second training event but not less than once per year. Flight crew members are required to complete recurrent training for each operating capacity for which they will be authorized (as pilot flying and pilot monitoring).	(1) The operator should incorporate recurrent RNP training that employs the unique RNP AR APCH approach characteristics of the operator's approved procedures (i.e., RF legs, RNP missed approach) as part of the overall program. (2) A minimum of two RNP AR APCH approaches must be flown by each pilot (one as pilot flying and one as pilot monitoring), with one culminating in a landing and one culminating in a missed approach. The RNP AR APCH approaches shall employ unique AR characteristics procedures (i.e., RF legs, RNP missed approach). (3) For operational control and maintenance personnel, recurrent RNP AR APCH training should be as per appropriate approved company manuals.
1.4.5 Training evaluation (1) The operator must evaluate the knowledge of each individual flight crew member (as pilot flying and pilot monitoring) involved in RNP AR APCH procedures, prior to that flight crew member commencing RNP AR APCH operations.	(1) Initial evaluation of RNP AR APCH knowledge and procedures: Flight crew members must demonstrate a satisfactory level of competency in procedures and specific aircraft performance requirements for RNP AR APCH operations. Flight crew member assessment may be conducted as: (a) An evaluation during a proficiency check or practical test event by an AQP evaluator, an Approved Check Pilot (ACP) or Transport Canada Inspector using an approved simulator or training device which accurately replicates the operator's equipment; or (b) An evaluation, using an approved simulator which accurately replicates the operator's

	equipment, by an AQP evaluator, an ACP or Transport Canada Inspector during line-oriented flight training (LOFT)/line-oriented evaluation (LOE) programs which incorporate RNP operations that employ the unique RNP AR APCH characteristics of the operator's approved procedures. **Note**: The AQP evaluator or ACP mentioned above must have completed the RNP AR APCH training and evaluation. (2) Initial evaluation content: Specific elements that must be addressed in this evaluation module are: (a) Demonstrate the use of any RNP limits that may impact various RNP AR APCH procedures; (b) Demonstrate the application of radio-updating procedures, such as enabling and disabling ground-based radio updating of the flight management computer (FMC) (i.e., DME/DME and VOR/DME updating) and knowledge of when to use this feature. **Note:** If the aircraft's avionics do not include the capability to disable radio updating, then the training must ensure the flight crew is able to accomplish the operational actions that mitigate the lack of this feature; (c) Demonstrate knowledge of the operational limit for deviation below the desired flight path on an RNP AR APCH procedure and how to accurately monitor the aircraft's position relative to the vertical flight path; (d) Demonstrate the ability to monitor the actual lateral and vertical flight paths relative to the programmed flight path and complete the appropriate flight crew procedures when exceeding a lateral or vertical FTE limit; (e) Demonstrate the ability to read and adapt to a RAIM (or equivalent) forecast, including forecasts predicting a lack of RAIM availability; (f) Demonstrate the proper set-up of the FMC, the weather radar, TAWS, and moving map for the various RNP AR APCH operations and scenarios the operator plans to implement;

	(g) Demonstrate the use of flight crew briefings and checklists for RNP AR APCH operations with emphasis on CRM; (h) Demonstrate knowledge of and ability to perform an RNP AR APCH missed approach procedure in an operational scenario (i.e., loss of navigation or failure to acquire visual conditions); (i) Demonstrate speed control during segments requiring speed restrictions to ensure compliance with an RNP AR APCH procedures; (j) Demonstrate competent use of RNP AR APCH plates, briefing cards, and checklists; and (k) Demonstrate the ability to complete a stable RNP AR APCH operation including bank angle, speed, and track control. (3) Recurrent Evaluation/Check: Recurrent evaluation or check for RNP AR APCH should occur during or following each training event where training for RNP AR APCH was conducted, and may be conducted by an AQP evaluator, an ACP, or a Transport Canada Inspector.
2.0 Aircraft requirements	
2.1 Certification standards	
2.1.1 The aircraft utilized to conduct RNP AR APCH approaches must have an aircraft certification approval in accordance with aircraft certification/airworthiness requirements of: (a) FAA AC 20-138 (D); or later (b) FAA AC 90-101(A); or later; or; (c) EASA AMC 20-26 **Note**: AC 90-101 is useful background information but not intended to achieve full airworthiness approval on its own.	(1) The aircraft eligibility is determined through demonstration of compliance against the relevant airworthiness criteria and the criteria contained in this AC. The design approval holder will demonstrate compliance, and the approval will be documented in manufacturer documentation. The design approval holder must contact TCCA Aircraft Certification to coordinate a demonstration of compliance. (2) In addition to the specific criteria below, the aircraft must comply with: (a) FAA AC 20-138 (D) - or later versions of this document. (3) An aircraft may meet the aircraft eligibility and equipment requirements for Special Authorization/Specific Approval by indicating in its Aircraft Flight Manual compliance with FAA AC

	90-101(A), EASA AMC 20-26 or TCCA AC 700-024 for the purpose of demonstrating its ability to conduct RNP AR APCH operations. **Note:** the above should be highlighted in the AFM as to state they meet the RNP AR APCH requirements.
2.2 Continued airworthiness	
2.2.1 The operator of aircraft approved to perform RNP AR APCH operations must ensure that the navigation system is maintained according to the design approval holder's instructions for continuing airworthiness (ICAs), including any software updates.	(1) Each operator who applies for RNP AR APCH operational approval is required to incorporate the RNP AR APCH equipment inspection requirements specified by the design approval holder, and amend the aircraft maintenance schedule as required. This requirement is designed to ensure that navigation systems continue to meet the RNP AR APCH approval criteria. **Note:** If the aircraft was delivered by the aircraft manufacturer with RNP AR APCH capability, the maintenance requirements may already exist in the maintenance schedule. (2) Maintenance for the affected aircraft is required to include the maintenance practices listed in the maintenance manuals of the aircraft manufacturer and its components, and must consider: (a) that the equipment involved in the RNP AR APCH operation is required to be maintained according to the instructions for continuing airworthiness (ICAs) from the component design approval holder; (b) that any amendment or change of navigation system affecting in any way RNP AR APCH initial approval, must be submitted to the Principal Maintenance Inspector (PMI) and reviewed for acceptance or approval of such changes prior to its implementation; and (c) that any repair that is not included in the approved/accepted maintenance documentation, and that could affect the integrity of navigation performance, is required to be forwarded to the PMI or regional airworthiness office for acceptance for approval thereof prior to conducting any further RNP AR APCH procedures.
2.3 Aircraft eligibility	

2.3.1 The aircraft must be equipped with a fully functional Class A Terrain Awareness Warning System (TAWS).	(1) The TAWS: (a) should be updated to have the most current version of its functional software; (b) should be updated to the most current version of the terrain and obstacle database; (c) must meet the altitude accuracy alerting criteria of TSO-C151b (or later version): (i) without any pilot action or input; (ii) independent of altimeter setting on the altimeter(s); and (iii) independent of temperature and pressure deviations from the International Standard Atmosphere (ISA); (d) should use a navigation source that is independent of the navigator/FMS position (usually the GNSS position can be considered independent of the navigation source if used directly by TAWS, and is not the same position as that used by the flight crew and autoflight systems).
2.4 Navigation database	
2.4.1 Operators must ensure the navigation database is up to date.	(1) The procedure stored in the navigation database defines the lateral and vertical path. **Note:** Navigation database updates occur every 28 days, and the navigation data in each update is critical to the integrity of RNP AR APCH procedures. Given the reduced obstacle clearance associated with these approaches, validation of navigation data warrants special consideration. This section provides guidance for the operator's procedures for validating the navigation data associated with RNP AR APCH procedures: (a) The operator must identify a responsible manager for the database updating process within their procedures; (b) The operator must document a process for accepting, verifying and loading navigation data into the aircraft; (c) The operator must place their documented data process and database management under a Quality Assurance program; (d) The operator must have a procedure in place to prevent flight crew members from using an

	RNP AR APCH procedure which is accessible to flight crew members in the on-board database, but which has not been validated.
2.4.2 Initial data validation (1) In order to validate the integrity of the database and the ability of the RNP system to operationally execute the procedure as intended, the operator must do an initial data validation of every RNP AR APCH procedure before flying the procedure in instrument meteorological conditions (IMC).	(1) As a minimum, the operator must: (a) Compare the navigation data for the procedure(s) to be loaded into the flight management system with the published procedure; (b) Once the procedure is validated, retain and maintain a copy of the validated navigation data for comparison to subsequent data updates.
2.4.3 Data updates (1) Upon receipt of each navigation data update, and before using the navigation data in the aircraft, the operator must compare the update to the validated procedure.	(1) This comparison must identify and resolve any discrepancies in the navigation data. **Note:** If there are significant changes (any change affecting the approach path or performance) to any portion of a procedure and source data verifies the changes, the operator must revalidate the amended procedure, prior to its use, in accordance with initial data validation.
2.4.4 Data suppliers (1) Data suppliers must have a Letter of Acceptance (LOA), or equivalent regulatory acceptance, for processing and supplying navigation updates.	(1) For example, see FAA AC 20-153, and EASA Conditions for the issuance of LOA for navigation data Suppliers by the Agency. (2) An LOA recognizes the data supplier as one whose data quality, integrity and quality management practices are consistent with the criteria of DO-200A/ED-76. **Note:** If an operator switches data providers, all RNP AR APCH procedures must undergo initial data validation before use.
2.4.5 Aircraft modifications (1) If an aircraft system required for RNP AR APCH is modified (e.g., software change), the operator is responsible for the validation of RNP AR APCH procedures using the navigation database and the modified system.	(1) This may be accomplished without any direct evaluation if the manufacturer verifies that the modification has no effect on the navigation database or path computation. **Note:** If no such assurance from the manufacturer is available, the operator must conduct an initial data validation using the modified system, noting which flight control computers, FMS operations and display software changes are particularly critical.
2.5 Monitoring program	
2.5.1 Operators must have an RNP monitoring program to ensure continued compliance and to identify any negative trends in performance.	(1) TCCA may consider any anomaly reports in determining remedial action. Repeated navigation error occurrences attributed to a specific piece of

	navigation equipment may result in the cancellation of the approval for use of that equipment. (2) Information that indicates the potential for repeated errors may require modification of an operator's training program. Information that attributes multiple errors to a particular flight crew member may necessitate remedial training or license review.
2.5.2 Operators must collect and periodically review data items to identify potential safety concerns.	(1) Data should include: (a) total number of RNP AR APCH procedures conducted; (b) number of satisfactory approaches by aircraft/system (satisfactory if completed as planned without any navigation or guidance system anomalies); (c) reasons for unsatisfactory approaches, such as: (i) UNABLE REQ NAV PERF, NAV ACCUR DOWNGRAD, or other RNP messages during approaches; (ii) excessive lateral or vertical deviation; (iii) TAWS warning; (iv) autopilot system disconnect; (v) navigation data errors; and (vi) pilot report of an anomaly. (d) Crew comments

Appendix C — Compliance checklist

C.1 Overview

(1) The matrix has been developed to assist operators in ensuring that they are in compliance with the conditions specified for the Special Authorization/Specific Approval (SA) **RNP AR APCH** (Appendix A)

(2) This matrix also serves as an aid for TCCA personnel for the purposes of certification and safety oversight.

(3) This matrix provides:

(a) A reference to the specific condition in the SA;

(b) The assessment of compliance (to be made by the air operator/TCCA personnel); and

(c) An area to record the details of the air operator's/private operator's means of compliance. (This can include such things as the applicable references in the company operations manual, etc.)

(4) This matrix can be reproduced locally.

Requirement		Compliance (Y/N)	Means of compliance (references / documentation)
1.0 Operator requirements	**Paragraph 1.1.1** The conduct of Special Authorization/Specific Approval RNP AR APCH		
	Paragraph 1.2.1 COM contents		
	Paragraph 1.3.1(a) The conduct of RNP AR APCH – Pre-flight considerations		
	Paragraph 1.3.1(b) The conduct of RNP AR APCH – In-flight considerations		

	Paragraph 1.3.1(c) The conduct of RNP AR APCH – Contingency Procedures		
	Paragraph 1.3.2 SOP development		
	Paragraph 1.4.1 Training program		
	Paragraph 1.4.2 Ground training syllabus		
	Paragraph 1.4.3 Flight training syllabus		
	Paragraph 1.4.4 Recurrent training		
	Paragraph 1.4.5 Training evaluation		
2.0 Aircraft requirements	**Paragraph 2.1.1** Certification standards – certification approval		
	Paragraph 2.2.1 Continued airworthiness - navigation system		

	Paragraph 2.3.1 Aircraft eligibility - TAWS		
	Paragraph 2.4.1 Navigation database updates		
	Paragraph 2.4.2 Initial data validation		
	Paragraph 2.4.3 Data base validation (procedure)		
	Paragraph 2.4.4 Data suppliers		
	Paragraph 2.4.5 Aircraft modifications		
	Paragraph 2.5.1 RNP AR APCH monitoring program		
	Paragraph 2.5.2 Data items - review		

Appendix D — Applicable regulations

D.1 Overview

(1) The following table contains some of the *Canadian Aviation Regulations* (CARs) and *Commercial Air Service Standards* (CASS) that are applicable to air operators conducting RNP AR APCH approaches.

Caution: The regulations listed below are not necessarily complete and up to date; they will not necessarily be updated. Air operators and pilots are responsible for compliance with all relevant provisions.

D.2 CAR Part VI Subpart 4, Part VII, Subparts 2, 3, 4 and 5

Subject	Provisions in the CARs	Provisions in the CASS
Instrument Procedures — GNSS	Section 604.50	N/A
Contents of an Air Operator Certificate	Subparagraphs 702.08(g)(vii), 703.08(g)(ix.1), 704.08(g)(vi) and 705.08(g)(vi)	Sections 722.08(3), A723.08(3), H723.08(2), 724.08(3) and 725.08(3)
Company Operations Manual	Sections 702.82, 703.105, 704.121 and 705.135	Sections 722.82, 723.105, 724.121 and 725.135
Standard Operating Procedures (SOPs)	Sections 702.84, 703.107, 704.124 and 705.138	Sections 722.84, 723.107, 724.124 and 725.138
Flight Crew Member Qualifications	Sections 702.65, 703.88, 704.108 and 705.106	Sections 722.65, 723.88, 724.108 and 725.106
Training Program (Pilots)	Sections 702.76, 703.98, 704.115 and 705.124	Sections 722.76, 723.98, 724.115 and 725.124
Training and Qualification Records	Sections 702.77, 703.99, 704.117 and 705.127	N/A
Safety Management System	Sections 107.01, 107.02, 107.03, 107.04 604.183, 604.202, 604.203, 705.151, 705.152, 705.153, 705.154 and 706.15	N/A