APV/baro-VNAV JOB AID

APPLICATION TO CONDUCT APV/baro-VNAV OPERATIONS

1. Introduction

This Job Aid was developed by the Latin American Regional Safety Oversight Cooperation System (SRVSOP) to provide States, operators, and inspectors with guidance on the process to be followed by an operator in order to obtain an APV/baro-VNAV authorization.

2. Purpose of the Job Aid

2.1 To give operators and inspectors information on the main APV/baro-VNAV reference documents.

2.2 To provide tables showing the contents of the application, the associated reference paragraphs, the place in the application of the operator where APV/baro-VNAV elements are mentioned and columns for inspector comments and follow-up on the status of various elements of APV/baro-VNAV.

3. Actions Recommended for the inspector and operator

Some recommendations for use of the Job Aid follow:

3.1 At the pre-application meeting with the operator, the inspector reviews the “basic events of the APV/baro-VNAV approval process” described in Part 1 of this Job Aid, in order to provide an overview of the approval process events.
3.2 The inspector reviews this Job Aid with the operator in order to establish the form and content of the APV/baro-VNAV approval application.
3.3 The operator uses this Job Aid as a guide to collect the documents/annexes of the APV/baro-VNAV application.
3.4 The operator inserts in the Job Aid references showing in what part of its documents are the APV/baro-VNAV programme elements located.
3.5 The operator submits the Job Aid and the application to the inspector (documents/annexes).
3.6 The inspector indicates in the Job Aid whether an item is in compliance or needs corrective action.
3.7 The inspector informs the operator as soon as possible when a corrective action by the operator is required.
3.8 The operator provides the inspector with the revised material when so requested.
3.9 The CAA provides the operator with the operational specifications (OpSpecs) or a letter of authorisation (LOA), as applicable, when the tasks and documents have been completed.

4. Structure of the Job Aid

5. Main sources of documents, information, and contacts

Advisory Circular CA 91-010 - Approval of aircraft and operators for approach procedures with vertical guidance/barometric vertical navigation (APV/baro- VNAV) operations is available on the ICAO/SAM Regional Office web page (www.lima.icao.int) through the SRVSOP link.

6. Main reference documents

Reference documents	Titles
Annex 6	Operation of aircraft
ICAO Doc 9613	Performance-based navigation (PBN) manual – Attachment A - Barometric VNAV
ICAO Doc 9905	Required navigation performance authorization required (RNP AR) procedure design manual
ICAO Doc 8168 Volume I	Part II, Section 4, Chapter 1 – APV/baro-VNAV approach procedures
ICAO Doc 8168 Volume II	Part III, Section 3, Chapter 4 – APV/baro-VNAV
EASA AMC 20-27	Airworthiness approval and operational criteria for RNP APPROACH (RNP APCH) operations including APV BARO-VNAV operations
FAA AC 90-105	Approval guidance for RNP operations and barometric vertical navigation en the U.S. National Airspace System - Appendix 4 - Use of barometric VNAV
AC 20-129	Airworthiness approval of vertical navigation (VNAV) systems for use in the U.S. national airspace system (NAS) and Alaska
AC 20-138A	Airworthiness approval of Global navigation satellite system (GNSS) equipment
TSO-C106	Air data computer

PART 1: GENERAL INFORMATION

Basic events in APV/baro-VNAV approval process

	Action by the operator	Action by the CAA
1	Establishes the need to obtain the APV/baro-VNAV authorization.	
2	Reviews the AFM, AFM supplement or Type Certificate Data Sheet (TCDS), or other appropriate documents (*e.g.,* service bulletins (SB), service letters (SL), etc.) to determine the eligibility of the aircraft for APV/baro-VNAV operations. The operator contacts the aircraft or avionics manufacturer, if necessary, to confirm APV/baro-VNAV or higher eligibility of the aircraft.	
3	Contacts the CAA to schedule a pre-application meeting to discuss the operational approval requirements.	
4		During the pre-application meeting, establishes: • the form and contents of the application; • the documents that support APV/baro-VNAV approval • the date in which the application will be submitted for evaluation • if necessary, conduct a validation flight observed by the CAA
5	submits the application at least 60 days before start-up of APV/baro-VNAV operations.	
6		Reviews the application of the operator.
7	Once the amendments to manuals, programmes, and documents have been approved or accepted, provides training to flight crews, flight dispatchers, and maintenance personnel, and conducts a validation flight, if required by the CAA.	Only if required, participates in the validation flight.
8		Once the operational and airworthiness requirements have been met, issues the operational approval in the form of OpSpecs for LAR 121 or 135 or equivalent operators, or an LOA for LAR 91 or equivalent operators, as appropriate.

Notes related to the approval process

1. **Responsible authority**

   a. **Commercial air transport (LAR 121 and/or 135 or equivalent regulations).-** The **State of registry** determines that the aircraft meets the airworthiness requirements. The **State of the operator** issues the APV/baro-VNAV approval (*e.g.,* OpSpecs).

   b. **General aviation (LAR 91 or equivalent regulation).-** The **State of registry** determines that the aircraft meets airworthiness requirements and issues the operational approval (*e.g.,* an LOA).

2. The CAA does not need to issue an LOA or equivalent document for each individual area of operation in the case of LAR 91 operators.

3. LAR 121 and/or 135 operators with APV/baro-VNAV approval must list this approval in the OpSpecs.

4. Related sections of the Latin American Aeronautical Regulations (LAR) or equivalent regulations

   a. LAR 91 Sections 91.1015 and 91.1640 or equivalents

   b. LAR 121 Section 121.995 (b) or equivalent

   c. LAR 135 Section 135.565 (c) or equivalent

5. Related ICAO Documents

   a. Annex 6 to the Convention on International Civil Aviation – Operation of aircraft

   b. Annex 10 to the Convention on International Civil Aviation – Aeronautical telecommunications

   c. Annex 15 to the Convention on International Civil Aviation – Aeronautical information services

   d. ICAO Doc 9613 – Performance-based navigation (PBN) manual

   e. ICAO Doc 8168 Volume I and II – Procedures for air navigation services – Aircraft operations

PART 2: INFORMATION ON THE IDENTIFICATION OF AIRCRAFT AND OPERATORS

NAME OF THE OPERATOR: _____

Aircraft manufacturer, model, and series	Registration numbers	Serial numbers	APV/baro-VNAV system Number, manufacturer, and model	RNP navigation specification

DATE OF PRE-APPLICATION MEETING _____

DATE ON WHICH THE APPLICATION WAS RECEIVED _____

DATE ON WHICH THE OPERATOR INTENDS TO BEGIN APV/baro-VNAV OPERATIONS _____

IS THE CAA NOTIFICATION DATE APPROPRIATE? YES _____ NO _____

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PART 3 – OPERATOR APPLICATION (ANNEXES AND DOCUMENTS)

Annex	Title of Annex/document	Indication of inclusion by the operator	Comments by the Inspector
A	**Operator letter requesting APV/baro-VNAV authorization**		
B	**Airworthiness documents showing aircraft eligibility for APV/baro-VNAV.** **Eligibility based on the AFM or AFM supplement** AFM, AFM revision, AFM supplement, or Type certificate data sheet (TCDS) showing that the RNAV/RNP navigation system is eligible for APV/baro-VNAV. **Eligibility not based on the AFM or AFM supplement** The applicant will request the CAA to assess the baro-VNAV equipment to determine its eligibility.		
C	**Aircraft modified to meet APV/baro-VNAV standards. Documentation on aircraft inspection and/or modification, if applicable.** Maintenance records documenting the installation or modification of aircraft systems (*e.g.,* FAA Form 337 – major repairs and alterations).		
D	**Maintenance procedures** • For aircraft with established maintenance procedures for APV/baro-VNAV systems, the list of references of the document or programme. • For recently installed RNAV/RNP systems, the maintenance procedures for their review.		
E	**Minimum equipment list (MEL) (only for operators conducting operations based on a MEL):** MEL showing provisions for APV/baro-VNAV systems.		
F	**Training** **1. LAR 91 operators or equivalent: Training methods:** Training at home, LAR 142 training centres, or other training courses, course completion		

Annex	Title of Annex/document	Indication of inclusion by the operator	Comments by the Inspector
	records. **2. LAR 121 and/or 135 operators or equivalent:** Training programmes (training curricula) for flight crews, flight dispatchers, and maintenance personnel.		
G	**Operating policies and procedures** **1. LAR 91 operators or equivalent:** Operations manual (OM) or sections to be attached to the application, corresponding to APV/baro-VNAV operating procedures and policies. **2. LAR 121 and/or 135 operators or equivalent:** Operations manual and checklists.		
H	**Navigation database** Details of the navigation data validation programme.		
I	**Withdrawal of APV/baro-VNAV approval** Indication of the need to follow up on navigation error reports submitted and the possibility of withdrawal of APV/baro-VNAV approval.		
J	**Validation flight plan:** Only if required by the CAA**.**		

CONTENTS OF THE APPLICATION TO BE SUBMITTED BY THE OPERATOR

____ **DOCUMENTATION SHOWING APV/baro-VNAV COMPLIANCE OF THE AIRCRAFT/NAVIGATION SYSTEMS**

____ **OPERATING PROCEDURES AND POLICIES**

____ **SECTIONS OF THE MAINTENANCE MANUAL RELATED TO THE RNAV/RNP SYSTEM (if not previously reviewed)**

Note 1: Documents may be grouped in a single folder or may be sent as individual documents.

PART 4: CONTENT OF THE OPERATOR APPLICATION FOR APV/baro-VNAV OPERATIONS

#	Contents of the APV/baro-VNAV application by the operator	Reference paragraphs CA 91-010	In what Annexes/Documents of the operator can the application contents be located Note: The operator must update this column to reflect the contents of the application	Comments and/or recommendations by the inspector	Follow-up by the inspector: Item status and date
1	**Operator request letter** Statement of intent to obtain APV/baro-VNAV authorization..	Paragraph 11.1 b) 1) Appendix 2, paragraph e)	Annex A		
2	**Description of aircraft equipment**	Paragraph 11.1 b) 3)	Annex B		
3	**Eligibility of APV/baro-VNAV systems** Airworthiness documents establishing the eligibility of the APV/baro-VNAV navigation systems, their approval status, and a list of the aircraft for which the approval is being requested.	Paragraph 11.1 b) 2)	Annex B Annex C		
4	**Training programme** **1. LAR 121 or 135 operators or equivalent: Training programmes:** Operators will develop an initial and periodic training programme for flight crews, flight dispatchers, if applicable, and maintenance personnel. **2. LAR 91 operators or equivalent:**	Paragraph 11.1 b) 5) Paragraph 11.1	Annex F		

#	Contents of the APV/baro-VNAV application by the operator	Reference paragraphs CA 91-010	In what Annexes/Documents of the operator can the application contents be located Note: The operator must update this column to reflect the contents of the application	Comments and/or recommendations by the inspector	Follow-up by the inspector: Item status and date
	Training methods: The following methods are acceptable for these operators: Training at home, LAR 142 training centres, or other training courses.	b) 5) Note			
5	**Operating procedures** **1. LAR 121 and/or 135 operators or equivalent:** Operations manual and checklists. **2. LAR 91 operators or equivalent:** Operations manual or section of the operator application documenting APV/baro-VNAV policies and procedures.	Paragraph 11.1 b) 4) Paragraph 11.1 b) 6)	Annex G		
6	**Maintenance procedures** • For aircraft with established maintenance practices for APV/baro-VNAV navigation systems, the operator will provide document references. • For newly installed APV/baro-VNAV systems, the operator will provide maintenance practices for review.	Paragraph 11.1 b) 7)	Annex D		

#	Contents of the APV/baro-VNAV application by the operator	Reference paragraphs CA 91-010	In what Annexes/Documents of the operator can the application contents be located Note: The operator must update this column to reflect the contents of the application	Comments and/or recommendations by the inspector	Follow-up by the inspector: Item status and date
7	**Update of the minimum equipment list (MEL)** Applicable to operators conducting operations according to a MEL.	Paragraph 11.1 b) 8)	Annex E		
8	**Navigation data validation programme**	Paragraph 11.1 b) 10) Appendix 1	Annex F		
9	**Withdrawal of APV/baro-VNAV approval** Indication of the need for follow-up on the navigation error reports and the possibility of withdrawal of the APV/baro-VNAV approval.	Paragraph 16 d)	Annex H		
10	**Validation flight plan, only if required** The validation flight plan will be presented only if required.	Paragraph 11.1 b) 9)	Annex I		

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PART 5 – GUIDE TO DETERMINE THE ELIGIBILITY OF APV/baro-VNAV AIRCRAFT

#	Topics	Reference paragraphs CA 91-006	Location in the Annexes of the operator	Comments and/or recommendations by the inspector	Follow-up by the inspector: Item status and date
1	**APV/baro-VNAV equipment requirements** RNAV/RNP equipment with a certified performance of 0.3 NM or lower, with 95% probability, which includes:	Paragraph 10.1.2 a)	Annex B		
	a) Global navigation satellite systems (GNSS) certified for approach operations; or	Paragraph 10.1.2 a) 1)			
	b) Multi-sensor systems that use inertial reference units (IRU) in combination with dual distance measuring equipment (DME/DME) or certified GNSS systems; or	Paragraph 10.1.2 a) 2)			
	c) RNP systems approved for RNP 0.3 operations or lower.	Paragraph 10.1.2 a) 3)			
2	**Equipment whose input is used by RNAV/RNP systems may include:**	Paragraph 10.1.4	Annex B		
	a) An air data computer: FAA Technical Standard Order (TSO)-C 106.	Paragraph 10.1.4 a)			
	b) An air data system: Aeronautical Radio, Incorporated (ARINC) 706, Mark 5 Air Data System.	Paragraph 10.1.4 b)			

#	Topics	Reference paragraphs CA 91-006	Location in the Annexes of the operator	Comments and/or recommendations by the inspector	Follow-up by the inspector: Item status and date
	c) A pressure altimeter system of the following types: DO-88 altimetry, ED-26 MPS for airborne altitude measurements and coding systems, ARP-942 pressure altimeter systems, ARP-920 design and installation of pilot static systems for transport aircraft.	Paragraph 10.1.4 c)			
	d) Integrated systems with type certification that provide an air data system capability comparable to the one described in paragraph 2 b).	Paragraph 10.1.4 d)			
3	Aircraft eligibility	Paragraph 10.4			
	a) RNP system capability Aircraft that meet the performance and functional requirements of SRVSOP CA 91-008 (RNP APCH) or CA 91.009 (RNP AR APCH) or equivalent are eligible for conducting RNP operations.	Paragraph 10.4 a)			
	b) VNAV barometric capability An aircraft is eligible for baro-VNAV operations when the AFM or AFM supplement indicates that the VNAV system has been approved under AC 20-129 or AC 20-138	Paragraph 10.4 b)			

#	Topics	Reference paragraphs CA 91-006	Location in the Annexes of the operator	Comments and/or recommendations by the inspector	Follow-up by the inspector: Item status and date
	c) Aircraft approved to conduct RNP AR APCH operations according to CA 91-009 are eligible for APV/baro-VNAV approaches. No additional assessment is required.	Paragraph 10.4 b) Note			
4	**Approval of aircraft** a) Eligibility based on the AFM or AFM supplement b) Eligibility not based on the AFM or AFM supplement.	Paragraph 10.5 Paragraph 10.5 a) Paragraph 10.5 b)	Annex B		
5	**Modified aircraft**	Paragraph 10.6			
6	**Functional requirements and their explanation** a) Required functions b) Recommended functions	Paragraph 10.3 Paragraph 10.3.1 Paragraph 10.3.2	Annex B		
7	**Maintenance requirements**	Paragraph 11.1 7)	Annex B		
8	**Navigation database** Details of the navigation data validation programme	Paragraph 15 Appendix 1	Annex B		

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PART 6 - BASIC PILOT PROCEDURES FOR APV/baro-VNAV OPERATIONS

	Topics	Reference paragraphs CA 91-006	Location in the Annexes of the operator	Comments and/or recommendations by the CAA	Follow-up by the Inspector
	Operating procedures	Paragraph 12	Annex G		
1	**Cold temperature corrections**.- Pilots are responsible for any correction for cold temperature required in all published minimum altitudes/heights. This includes: 1) Altitudes/heights for initial and intermediate segments; 2) The DA/H; and 3) Subsequent missed approach altitudes/heights.	Paragraph 12.1 a)			
2	**Altimeter setting**.- APV/baro-VNAV operations will only be conducted when: 1) there is a current and local source for altimeter setting; and 2) QNH/QFE is properly selected in the altimeter of the aircraft.	Paragraph 12.1 b)			
3	**Action to be taken at the DA**.- The flight crew is expected to operate the aircraft along the published vertical path, and to execute a missed approach procedure when reaching the DA, unless it has in view the visual references required to proceed with the approach.	Paragraph 12.1 c)			
4	**Temperature limitation**.- Because of the pronounced effect of non-standard temperature on baro-VNAV operations, instrument approach procedures will contain a temperature limitation below which the use of a vertical	Paragraph 12.1 d)			

	navigation decision altitude (VNAV DA) based on baro-VNAV is not authorised. The temperature limitation will be shown through a note in the instrument approach procedure. If the aircraft system is capable of temperature compensation, the crew must follow the operator procedures based on the manufacturer instructions.				
5	**VNAV path mode selection**.- The flight crew must know the correct selection of the vertical mode(s) that command vertical navigation via the published flight path. Other vertical modes, such as vertical speed are not applicable to baro-VNAV approach.	Paragraph 12.1 e)			
6	**Restriction to using a remote source for altimeter setting**.- The use of baro-VNAV up to a DA is not authorised if the altimeter setting is issued from a remote source. For APV/baro-VNAV operations, a current altimetry setting is required for the landing aerodrome. When minima related to a remote altimetry setting are shown, the VNAV function can be used, but only up to the published lateral navigation minimum descent altitude (LNAV MDA).	Paragraph 12.1 f)			
7	**Manual adjustments**.- If manual adjustments to stored altitude information are necessary, *e.g.,* cold temperature adjustments, the flight crew must make appropriate adjustments to the procedure altitudes and revert to use of the temperature adjusted LNAV MDA.	Paragraph 12.1 g)			

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