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International Civil Aviation Organization
South American Regional Office

SECOND WORKSHOP/MEETING OF SAM IMPLEMENTATION GROUP (SAM/IG/2)
REGIONAL PROJECT RLA/06/901

Lima, Perú, 3 to 7 de November, 2008

Agenda
Item 3: **Standards and procedures for performance-based navigation operations approval**

Operation Approval related to RNAV 5

(Presented by SRVSOP Technical Committee)

Summary

In this working paper a proposal of Advisory Circular (CA) related to aircraft and operators approval for RNAV 5 operations and a proposal of Job Aid related to that approval are presented, with the purpose to support the en-route PBN implementation in SAM Region.

References:

- Regional Project RLA/99/901
- SAM/IG/1 Report

1 Background

1.1 During the First Workshop/Meeting of SAM Implementation Group (SAM/IG/2) (Lima, 21 to 25 April, 2008), the Meeting examined regional action plan corresponding to RNAV 5 implementation for the en-route operations, made the changes which considered relevant, established starting and ending dates for each activity and adopted it as a guidance to be followed by the States.

1.2 In Item 7 of said Plan related to the aircrafts and operators, the following activities were agreed to be carried out.

a) evaluate regulations related to GNSS use, taking in consideration its application in the RNAV navigation specification;

b) analyze aircraft and operators approval requirements (pilots, dispatchers and maintenance personnel), as showed in PBN Manual, and prepare the necessary documentation:

c) publish the operational approval process;

d) start aircraft and operators approval process;

e) establish and maintain an approved aircraft and operator updated register; and

f) check the operation according to continuous monitoring program (aircraft and procedures)

2 Discussion

2.1 RNAV 5 in route operations implementation in SAM Region, demands the participation of all States and also to harmonize requirements and procedures of this type of operations.

2.2 Before authorizing RNAV 5 operations, States should include in their national regulations the rules related to this navigation specification and also develop procedures accordingly for aircraft and operators approval.

2.3 At present, Project RLA/99/901 is developing Latin American Aeronautic Regulations and respective manuals for operations and airworthiness inspectors, with the purpose to establish requirements and common procedures in the region.

2.4 In this context, Regional Cooperation System for Safety Oversight of Project RLA/99/901 is entrusted to develop an Advisory Circular (CA) and Job Aid for aircraft and operators RNAV 5 operational approval. The AC proposal is showed in Appendix A and Job Aid proposal in Appendix B of this Working Paper.

3 Suggested action

3.1 The meeting invites to:

a) Take notes of information supplied in this Working Paper; and

b) Review and make amendments to Advisory Circular and Job Aid as convenient, and adopt them as a guidance documents in the region.

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Appendix A

ADVISORY CIRCULAR

AC : 91-002
DATE : 27/10/08
REVISION : Original
ISSUED BY : SRVSOP

SUBJECT: AIRCRAFT AND OPERATORS APPROVAL FOR RNAV 5 OPERATIONS

1. PURPOSE

This advisory circular (AC) provides acceptable means of compliance of LAR requirements in respect to aircraft and operators approval for RNAV 5 operations.

An operator may use alternative means of compliance, as far as those means are acceptable for their respective Civil Aviation Authority (CAA).

This AC also provides guidance for operators that use the stand-alone GPS as the primary means of navigation in RNAV 5 operations (where the stand-alone GPS equipment provides the only RNAV capability installed onboard the aircraft).

2. LATIN AMERICAN AERONAUTICAL REGULATIONS (LAR) RELATED SECTIONS

LAR 91: Sections 91.880 (b) and 91.1650

LAR 121: Section 121.995 (b)

LAR 135: Section 135.570 (b)

3. RELATED DOCUMENTS

Doc 9613	Performance based navigation manual (PBN) and its related documentation
AMC 20-4	Airworthiness approval and operational criteria for the use of navigation systems in European airspace designated for Basic RNAV operations and its related documentation
AC 90-96A	Approval of U.S. operators and aircraft to operate under instrument flight rules (IFR) in European airspace designated for basic area navigation (B-RNAV) and precision area navigation (P-RNAV) and its related documentation
CO 1/98	Resolution for operational approval and criteria for the use of navigation systems in European airspace designated for Basic RNAV operations

4. DEFINITIONS AND ABREVIATIONS

4.1 Definitions

a) **Navigation specifications**.- A set of aircraft and air crew requirements, needed to support performance based navigation operations within a defined airspace. There are two kinds of navigation specifications: RNAV and RNP. A RNAV specification does not include requirements for on-board performance monitoring and alerting. A RNP specification includes requirements for on-board performance monitoring and alerting.

b) **Performance based navigation (PBN)**.- Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

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

c) **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 do not meet the definition of performance-based navigation.

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

e) **Area navigation route**.- An Air traffic services (ATS) route established for the use of aircraft capable of employing area navigation.

f) **Global positioning system (GPS)**.- The United States Global navigation Satellite System (GNSS) is a satellite-based radio navigation system which utilizes precise range measurements to determine position, velocity and time in anywhere in the world. The GPS is composed by three elements: space, control, and user. The space element is formed of at least 24 satellites in 6 orbital planes. The control element consists of 5 monitor stations, 3 ground antennas, and a master control station. The user element consists of antennas and receivers that provide positioning, velocity and precise timing to the user.

g) **RNAV System**.- Area navigation system, 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. A RNAV system may be included as part of the Flight Management System (FMS)

h) **Receiver Autonomous Integrity Monitoring (RAIM)**.- A technique used within a GPS receiver/processor to determine the integrity of its navigation signals using only GPS signals, or GPS signals augmented with barometrical altitude data. This determination is achieved by a consistency check among redundant pseudo-orange measurements. At least one additional satellite needs to be available in respect to the number of satellites that are needed to obtain the navigation solution.

4.2 Abreviaturas

a)	CAA	Civil Aviation Authority
b)	ADF	Automatic direction finder
c)	AIRAC	Aeronautical information regulation and control
d)	AC	Advisory circular (FAA)
e)	AFM	Aircraft flight manual
f)	AMC	Aceptable means of compliance
g)	ATS	Air traffic services
h)	CA	Advisory circular (SRVSOP)
i)	CDI	Course deviation indicator
j)	CDU	Control display unit
k)	CO	Operacional Circular (Spain)
l)	DME	Distance measuring equiment
m)	DOP	Dilution of precision
n)	EASA	European Aviation Safety Agency
o)	FAA	Federal Aviation Administration

p)	FDE	Fault detection and exclusion
q)	FTE	Flight technical error
r)	GNSS	Global navigation satélite system
s)	GPS	Global positioning system
t)	HSI	Heading situation indicator
u)	IFR	Instrument flight rules
v)	INS	Inertial navigation system
w)	IRS	Inertial referente system
x)	IRU	Unidad de referencia inercial
y)	LAR	Latin American Regulations
z)	LORAN C	Long range navigation
aa)	MEL	Minimum equipment list
bb)	NDB	Non-directional beacon
cc)	ND	Navigation display
dd)	NOTAM	Notice to airmen
ee)	ICAO	Internacional Civil Aviation Orgatization
ff)	OM	Operations manual
gg)	PBN	Performance based navigation
hh)	PF	Pilot flying
ii)	PNF	Pilot not flying
jj)	POH	Pilot operating handboock
kk)	RAIM	Receiver autonomous integrity monitoring
ll)	RNAV	Area navigation
mm)	SA	Selective availability
nn)	TACAN	Tactical air navigation
oo)	TCDS	Type certificate data sheet
pp)	TLS	Target level of safety
qq)	TSO	Technical standard order
rr)	VOR	Very hight frecuency (VHF) omni-directional radio range

5. INTRODUCTION

5.1 In January 1998, the European Air Safety Agency (EASA) published the document related to the acceptable means of compliance (AMC 20-4) which replaced the Temporary guidance Leaflet No. 2 (TGL No. 2) issued by former JAA. This AMC contains acceptable means of compliance related to airworthiness approval and operational criteria for the use of navigation systems in European air space designated for basic area navigation operations (Basic RNAV or B-RNAV).

5.2 In the same manner, the Federal Aviation Administration (FAA) of the United States (U.S.) replaced the AC 90-96 of March 1998 by AC 90-96A issued in January 2005. This new circular provides guidance material in regards to the airworthiness and operational approval for operators of U.S. registered civil aircraft operating in European air space designated for Basic area navigation (B-RNAV) and Precision area navigation (P-RNAV).

5.3 Both current documents, AMC 20-4 and AC 90-96A, require similar operational and functional requirements.

5.4 In the context of the terminology adopted in the Performance based navigation manual (PBN manual) of the International Civil Aviation Organization (ICAO), B-RNAV requirements are termed RNAV 5.

5.5 The basis of specifications developed by EASA and FAA are supported on the capacity of RNAV equipments incorporated in the early 70s.

5.6 Since RNAV 5 operations implementation is accomplish in areas where there is no surveillance, such implementation requires an increase in route spacing to assure compliance of the Target level of safety (TLS).

5.7 RNAV 5 specification does not require an alert to the pilot in the event of excessive navigation errors, neither requires two RNAV Systems, thus, the potential for loss of RNAV capability requires the aircraft to be provided of an alternative navigation source.

5.8 The performance level selected for RNAV operations allows a wide range of RNAV systems to be approved for these operations, including INS with a two hour limit after its last alignment/position update performed on the ground, when they do not have a function for automatic radio updating of aircraft position.

5.9 Although RNAV 5 specification does not include requirements for on-board performance monitoring and alerting, it does require that the on-board equipment keeps a lateral and longitudinal navigation accuracy on route of $\pm$ 5 NM or better during 95% of the total flight time.

6. NAVAID INFRASTRUCTURE

6.1 RNAV 5 systems allow an aircraft to navigate along 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 both methods.

6.2 RNAV operations are based in the use of RNAV equipment that automatically determines aircraft position in the horizontal plane using inputs from one or a combination of the following types of position sensors, together with the means to establish and follow a desired path:

a) VOR/DME;

b) DME/DME;

c) INS o IRS;

d) LORAN C; and

e) GNSS or GPS

Note.- the application of the sensors is subject to the limitations contained in this AC.

6.3 It is acceptable to exist gaps in the navigation aid coverage, although, if this occurs, it must be considered route spacing and obstacle clearance surfaces for the expected increase in lateral track keeping errors during the “dead reckoning” phase of flight.

7. AIRWORTHINESS AND OPERATIONAL APPROVAL

7.1 In order to the operator receives an RNAV 5 authorization, this must comply with two types of approval:

a) Airworthiness approval in charge of the State of registry; and

b) Operational approval required by the State of the operator.

7.2 Compliance with airworthiness requirements by themselves does not constitute the operational approval.

8. AIRWORTHINESS APPROVAL

8.1 Aircraft equipment

a) An aircraft may be considered eligible for an RNAV 5 approval if it is equipped with one or more navigation systems approved and installed in accordance with the guide included in this document.

b) An aircraft capacity to perform RNAV 5 operations can be demonstrated or reached in the following cases

1) First case: Demonstrated capacity in the manufacturing process and declared in the Aircraft flight manual (AFM) or in the AFM supplement or in the Type certificate data sheet (TCDS) or in the Pilot operating handbook (POH).

2) Second case: Capacity reached in-service:

i. Through an evaluation of the navigation system of the aircraft which allows to determine its eligibility.

8.2 Eligibility based on AFM or AFM supplement or TCDS or POH. To determine eligibility of the aircraft in function of AFM or AFM supplement, TCDS or POH, aircraft RNAV 5 capacity must have been demonstrated in production (aircraft in manufacturing process or new construction).

a) **Aircraft RNAV 5 systems eligibility.**

1) An aircraft may be considered eligible for RNAV 5 operations, if AFM or AFM supplement or TCDS or POH shows the appropriate instruments flight rules (IFR) navigation system installation has received airworthiness approval in accordance with this AC or AMC 20-4 or with one of the following FAA documents:

i. AC 90-96, AC 90-45A, AC 20-121A, AC 20-130, AC 20-138 o AC 25-15

2) Airworthiness approval guidance included in this AC provides aircraft navigation performance equivalent to EASA AMC 20-4 and FAA AC 90-96A.

3) Once aircraft eligibility has been established, operator approval will proceed, according to paragraph 9 of this AC.

b) **LAR 91 aircraft approval**

1) LAR 91 operators should revise the AFM or AFM supplement or TCDS or POH to assure that the aircraft navigation system is eligible to perform RNAV 5 operations, according to describe on paragraph 8.2 a) 1) of this AC.

2) After having determined eligibility of the navigation system, LAR 91 operators will present respective documents to the AAC.

3) A letter of authorization (LOA) is not required when the aircraft eligibility has been determined based on the AFM or AFM supplement or TCDS or POH.

4) In case LAR 91 operators are not able to determine, based on the AFM or AFM supplement or TCDS or POH, whether the Aircraft system has been installed and approved according with an appropriate CA or AC or AMC, they will proceed according to paragraph 8.3. of this document.

c) **LAR 121 and/or 135 aircraft approval**

1) LAR 121 and/or 135 operators will present the following documents to AAC:

i. Sections of the AFM or AFM supplement or TCDS that document airworthiness approval in accordance with this AC or with mentioned documents in paragraph 8.2 a) 1) of the this document.

2) These operators will ensure that the aircraft navigation system will meet the functions required in paragraph 8.6 of this CA.

3) In case a LAR 121 and/ or 135 operator is not able to determine, based on the AFM or AFM supplement or TCDS, whether the system has been installed and approved according to an appropriate CA or AC or AMC, it will proceed in accordance with to the steps established in the following paragraph.

8.3 Eligibility not based on AFM or TCDS or AFM Supplement or POH – RNAV 5 capacity reached during service.

a) *Determination of the aircraft eligibility through evaluation of its navigation equipment.*

1) The operator makes a request for assessment of aircraft RNAV equipment for eligibility to the airworthiness inspection Direction or equivalent CAA entity. The operator, together with the request, will provide the following:

i. RNAV system make, model and part number;

ii. evidence that the equipment meets lateral and longitudinal navigation accuracy on route of ± 5 NM or better during 95% of the total flight time. This can be determined through the evaluation of system design. Evidence of meeting the requirements of another AC can be used for this purpose.

iii. proof that the system meets the required functions for RNAV 5 operations described in this CA on paragraph 8.6.

iv. crew operating procedures and bulletins; and

v. any other pertinent information required by the CAA.

2) in case the airworthiness inspection Direction or CAA equivalent entity is not able to determine RNAV equipment eligibility, evaluation request together with supporting documents will be forward to the aircraft certification Direction or equivalent entity from the State of registry. In any case, aircraft certification Division or equivalent will inform to airworthiness inspection Direction or CAA equivalent entity about the eligibility of the proposed equipment to perform RNAV 5 operations.

3) *LAR 91 Operators*.- Once the CAA has determined the aircraft equipment is eligible for RNAV 5 operations, the airworthiness inspection Direction or CAA equivalent entity will issue a letter of finding documenting that the aircraft RNAV equipment is eligible to perform those operations.

4) *LAR 121 or 135 operators*.- The CAA will verify aircraft RNAV system eligibility including the required functions on paragraph 8.6 of this AC.

8.4 Limitations on the design and/or use of navigation systems.- Although the following navigation systems offer RNAV capability, these present limitations for their use in RNAV 5 operations.

a) **Inertial navigation systems/Inertial reference systems (INS/IRS)**

1) Inertial systems may be used either as a stand alone inertial navigation system (INS) or as an inertial reference (IRS) acting as part of a multi-sensor RNAV system where inertial sensors provides augmentation to the basic position sensors as well as a reversionary position data source when out of cover of radio navigation sources.

2) INS without a function for automatic radio updating of aircraft position and approved in accordance with FAA AC 25-4, when complying with the functional criteria of paragraph 8.6 of this AC, may be used only for a maximum of two (2) hours from the last alignment/position update performed on ground. Consideration may be given to specific INS configurations (e.g. triple mix) where either equipment or aircraft manufacturer's data justifies extended use from the last position update.

3) INS without automatic radio updating of aircraft position, including those systems where manual selection of radio channels is performed in accordance with flight crew procedures, must be approved n accordance with FAA AC 90-45A or AC 20-130A or any other equivalent document.

b) **VHF omni-directional radio range (VOR)**

1) VOR accuracy can typically meet accuracy requirements for RNAV 5 up to 60 NM from the navigation aid and Doppler VOR up to 75 NM. Specific regions within the VOR coverage may experience larger due to propagation effect (e.g. multipath). Where such errors exist this can be accommodated by prescribing areas where the affected VOR may not be used.

c) **Distance measuring equiment (DME)**

1) DME signals are considered sufficient to meet requirements of RNAV 5 wherever the signals are received and there is no closer DME on the same channel, regardless of the published coverage volume. Where the RNAV 5 system does not take account of published "Designated operational coverage" of the DME, the RNAV system must execute data integrity checks to confirm that the correct DME signal is being received.

d) **Long Range Navigation (LORAN C)**

1) Use of Loran-C, in compliance with FAA AC 20-121A, is considered an acceptable means to comply with RNAV 5 in those areas and on routes with acceptable Loran-C coverage. Loran-C users must refer to the AFM or POH to determine if operational use of the Loran system is limited to a specified Loran-C Operational Area.

e) **Global navigation satellite system (GNSS)**

1) **Global positioning system (GPS)**

i. The use of GPS to perform RNAV 5 operations is limited to equipment approved in accordance with the TSO-C 129(), TSO-C-145() and TSO-C-146() from FAA or ETSO-129(), ETSO-145() and ETSO-146() from EASA or equivalent documents which include the minimum systems functions specified in the present CA on Paragraph 8.6.

ii. The integrity of GPS system must be provided by the receiver autonomous integrity monitoring (RAIM) or an equivalent means within a multi-sensor navigation system. The equipment must be approved in accordance with the AMC 20-5 or equivalent document. In addition, stand-alone GPS equipment must include the following functions according to the TSO-C 129A or ETSO-129A criteria:

- Pseudorange step detection; and
- Health word checking

iii. Compliance with these two requirements can be determined the following way:

- A statement in the AFM or POH indicating the GPS equipment meets the criteria for primary means of navigation in oceanic and remote airspace; or
- a placard on the GPS receiver certifying it meets TSO-C 129A, TSO-C-145A and TSO-C-146A from FAA or ETSO-129A, ESTO-145A and ESTO-146A from EASA; or
- a CAA letter of design approval for the applicable equipment. Operators should contact the avionic equipment's manufacturer to determine if the equipment complies with these requirements and ask if a letter of design approval is available. Manufacturers may obtain this letter by submitting appropriate documentation to the certifications offices of the States of aircraft design or manufacturer. Operators will keep the letter of design approval within the AFM or POH as evidence of the RNAV 5 eligibility. Any limitations included in the letter of design approval should be reflected in a letter of finding to LAR 91 operators or in the operations specifications (OpSpecs) for LAR 121 and/or 135 operators.

iv. Traditional navigation equipment (e.g., VOR, DME and automatic direction finder (ADF)) must be installed and operative, so as to provide an alternative navigation means of navigation.

v. Where approval for RNAV 5 requires the use of traditional navigation equipment as a back up in the event of loss of GPS, the required navigation aids as defined in the approval (e.g. VOR, DME and/or Non directional beacon (NDB)) must be installed and serviceable.

2) **Stand-alone GPS equipment**

i. Stand-alone GPS equipment approved in accordance with guidance provided in this AC, may be used in RNAV 5 operations, subject to the limitations included in this document. Such equipment must be operated in accordance with procedures acceptable to the CAA. The flight crew must receive appropriate training for use the stand-alone GPS equipment regarding normal and contingency procedures detailed in the Paragraph 10 of this AC.

8.5 RNAV-5 system requirements

a) Accuracy

1) The navigation performance of aircraft approved for RNAV 5 requires a track keeping accuracy equal to or better than ± 5 NM during the 95% of the flight time. This value includes signal source error, airborne receiver error, display system error and flight technical error (FTE).

2) This navigation performance assumes the necessary coverage provided by satellite or ground based navigation aids is available for the intended route to be flown.

b) Availability and integrity

The minimum level of availability and integrity required for RNAV 5 systems can be met by a single installed system comprising by:

1) one sensor or a combination of the following sensors: VOR/DME, DME/DME, INS or IRS, LORAN C and GNSS or GPS;

2) RNAV computer;

3) control display unit (CDU); and

4) navigation display(s) [(e.g. navigation display (ND), horizontal situation indicator (HSI) or course indicator deviation (CDI)].

provided that the system is monitored by the flight crew and that in the event o a system failure the aircraft retains the capability to navigate relative to ground based navigation aids (e.g. VOR, DME and NDB).

8.6 Functional requirements

a) *Required Functions*.- The following system functions are the minimum required to conduct RNAV 5 operations:

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

2) In addition, where the minimum flight crew is two pilots, indication of the aircraft position relative to track to be displayed to the pilot not flying (PNF) on a navigation display situated in his primary field of view.

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

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

5) Storage of a minimum of 4 waypoints; and

6) Appropriate failure indication of the RNAV system, including the sensors failure.

b) *RNAV 5 navigation displays*

1) Navigation data must be available for display either on a display forming part of the RNAV equipment or on a lateral deviation display (e.g. CDI, (E)HSI, or a navigation map display).

2) These displays must be used as primary flight instruments for the navigation of the aircraft, for maneuver anticipation and for failure/status/integrity indication. They should meet the following requirements:

i. The displays must be visible to the pilot when looking forward along the flight path.

ii. The lateral deviation display scaling should be compatible with any alerting and annunciation limits, where implemented.

iii. The lateral deviation display must have a scaling and full-scale deflection suitable for the RNAV 5 operation.

9. OPERATIONAL APPROVAL

9.1 *Requirements to obtain the operational approval*.- To obtain the operational approval, the operator will comply with the following steps considering the operational procedures established in Paragraph 10 of this AC.

a) *Airworthiness approval*.- The Aircraft must have the corresponding airworthiness approvals as mentioned in Paragraph 8 of this CA.

b) *Documentation*.- The operator will present to the AAC the following documents:

1) The application for RNAV 5 operational approval;

2) Amendments to the operations manual (OM) which must include operations procedures according to what is described in Paragraph 10 of this CA, for crews and dispatchers, if applicable;

3) Amendments, when applicable, of maintenance manuals and programs which must have the maintenance procedures for the new equipment, as well as the training of the maintenance associated personnel;

4) A copy of the AFM parts, or AFM supplement or TCDS or POH, to verify the airworthiness approval for RNAV 5 for each affected aircraft;

5) The amendments to the Minimum Equipment List (MEL), which must identify the minimum necessary equipment to comply with RNAV 5; and

6) Training programs or amendments to the operator's training program for crews and flight dispatchers, if applicable, according to what is described in Paragraph 11 of this document;

c) *Training*.- Once the amendments to manuals, programs and documents have been accepted or approved, the operator will provide required training to its personnel.

d) *Validation flights*.- The AAC may perform a validation flight, if determines it is necessary in the interest of safety.

9.2 *Authorization issuance to perform RNAV 5 operations*.- Once the operator has successfully completed the operational approval process, the AAC will issue the operator, when applicable, the corresponding authorization to perform RNAV 5 operations.

a) *LAR 91 operators*.- The AAC does not require issuing a letter of authorization (LOA) to LAR 91 operators, when aircraft eligibility is based on AFM or AFM supplement or TCDS, or POH.

b) LAR 121 and/or 135 operators.- For LAR 121 and/or LAR 135 operators, the AAC will issue the corresponding OpSpecs, which will show RNAV 5 authorization.

10. OPERATION PROCEDURES

10.1 *Flight planning.*

a) Before operating on a RNAV 5 route, the operator will ensure that:

1) The aircraft counts on a RNAV 5 approval;

2) Routes correspond to the authorization;

3) The necessary equipment to operate RNAV 5 work correctly and are not degraded;

4) Navigation aids based on space or ground are available;

5) The crews check the contingency procedures.

b) *Stand-alone GPS equipment.* During the planning phase the following procedures must be accomplish in regards to the stand-alone GPS equipment:

1) An aircraft can depart without further action in the following cases, when:

i. all satellites are scheduled to be in service; or

ii. one satellite is scheduled to be out of service in case of GPS equipment that includes barometrical altitude.

2) The availability of GPS integrity RAIM shall be confirmed for the intended flight (route and time) through the use of a prediction program either ground-based or incorporated in the on-board system, following the criteria established in Appendix 1 of the CAA, when:

i. any satellite is scheduled to be out of service; or

ii. more than one satellite is scheduled to be out of service in case of GPS equipment that includes barometric altitude.

3) This prediction is required for any route and route segment RNAV 5 based upon the use of GPS.

4) The specified route of flight, including trajectory to any alternative aerodrome will be defined by a series of waypoints and by the estimated time of pass over them for a speed or series of speed, which at the same time will be in function of the intensity and previous wind direction.

5) Taking in consideration that during flight may occur deviations in regards to the specified ground speedy, prediction must be done using different speeds within the predictable margin for them.

6) Prediction program must be executed with a maximum anticipation of two hours preview to the flight departure. The operator will confirm that data about the state of the constellation and GPS ephemerides, have been updated with the latest information distributed by notice to airmen (NOTAM).

7) In order to get exact prediction, the program will allow manual de-selection of satellites considered non operative, as well as selection of those back to service condition during the flight time.

8) The operator will not dispatch or release a flight in case of continuous prediction loss of RAM higher than 5 minutes to any part of the previewed route. In this event, flight can be delayed, cancelled or re-routed in which RAM requirements may be accomplished.

c) *ATS – ICAO flight plan*.- At the time to file the ATS flight plan, authorized aircraft operators on RNAV 5 route, will insert corresponding code on flight plan form's box 10 (equipment), as defined within ICAO Doc 7030 for these operations.

10.2 Preview flight procedures at the aircraft.- The crew will perform on the aircraft the following procedures preview to the flight:

a) check registrations and forms to be sure that maintenance actions have been taken in order to correct defects in the equipment; and

b) check data base validation (current AIRAC cycle), if it is installed.

10.3 *En route operations*.

a) The crew will assure the aircraft correct functioning of its navigation system during its operation in a RNAV 5 route, confirming that:

1) necessary RNAV 5 equipment have not degraded during flight;

2) route corresponds to the authorization;

3) aircraft navigation accuracy is pertinent for RNAV 5, assuring this through pertinent cross check; and

4) others navigation aids (for example VOR, DME y ADF) must be selected in a way to permit a cross check or immediate reversion in the event of a RNAV capacity loss.

10.4 *Contingency procedures*.

a) Flight crews must familiarize with the following general provisions:

1) An aircraft must not enter or continue the operations in airspace designated as RNAV 5, according to the present ATC authorization, if because of a failure or degradation the navigation systems falls under RNAV 5 requirements, the pilot will obtain as soon as possible an amended authorization;

2) According to ATC instructions, operations will continue in regards to the present ATC authorization, or when not possible, will be requested a revised authorization to return to the VOR/DME conventional navigation;

3) in the event of communications failure, the flight crew must continue with the flight plan, in accordance with the published lost communication procedures; and

4) in any case, the crew must follow contingency procedures established for every operation region, and obtain an ATC authorization as soon as possible.

b) Stand-alone GPS equipment.

1) The operating procedures must identify the flight crew actions required in the event of RAIM function loss or exceedance of integrity alarm limit (erroneous position). This procedures must include:

i. In case of loss of the RAIM detection function.- The flight crew may continue navigating with the GPS equipment. The flight crew should attempt to cross-check the aircraft position with the information provided for the ICAO conventional navaids: VOR, DME and ADF, in order to confirm the existence of a required level of precision. In other case, the crew must revert to an alternative navigation means;

ii. In the event of an observed failure (including the failure of a satellite impacting the performance of the navigation systems based on GPS), the flight crew must revert to an alternative means of navigation.

iii. In case of exceedance of the alarm limit.- The flight crew must revert to an alternative means of navigation.

2) *On-board equipment availability VOR, DME, TACAN or ADF*.- The operator must have installed on the aircraft the VOR, DME, TACAN or ADF on-board equipment capacity according to the applied rules of operation LAR 91, 121 and 135. This capacity must be available along the intended route of flight to assure the availability of navigation alternative means in case of a GPS/RNAV system failure.

c) Any incidence registered in flight must be notified to the AAC in a maximum time of seventy two hours, unless justified cause.

11. NAVIGATION ERROR REPORTS FOLLOW UP PROCESS

a) The operator will establish a process to receive, analyze and do a follow up of the navigation error reports which allow determine the appropriate corrective action.

b) Repetitive navigation error occurrences, attributed to a specific part of the navigation equipment must be analyzed in order to correct its cause.

c) The nature and severity of the error may result in temporary withdrawn of the authorization to use the navigation equipment until the cause of the problem has been identified and rectified.

12. INSTRUCTION PROGRAM

a) The training programs for flight crews and flight dispatchers, if correspond, must be reviewed and approved by the AAC. The operator will included at least the following modules:

1) Required equipments, capacities, limitations and operation of these equipments in RNAV 5 airspace.

2) The routes and airspace for which the RNAV system is approved to operate.

3) The navaid limitations in respect of the operation of the RNAV system to be used for the RNAV 5 operation.

4) Contingency procedures for RNAV failures.

5) The Radio/Telephony Phraseology for the airspace in accordance to Doc 4444 and Doc 7030 as appropriate.

6) The flight planning requirements for the RNAV operation.

7) RNAV requirements as determined from chart depiction and textual description.

8) RNAV 5 en route procedures;

9) Methods to reduce navigation errors through dead-reckoning techniques.

10) RNAV system-specific information, including:

i. Levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation.

ii. Functional integration with other aircraft systems.

iii. Monitoring procedures for each phase of flight (for example, monitor PROG or LEGS page).

iv. Types of navigation sensors (for example, DME, IRU, GNSS) utilized by the RNAV system and associated system prioritization/weighting/logic.

v. Turn anticipation with consideration to speed and altitude effects.

vi. Interpretation of electronic displays and symbols.

11) RNAV equipment operating procedures, as applicable, including how to perform the following actions:

i. Verify currency of aircraft navigation data.

ii. Verify successful completion of RNAV system self-tests.

iii. Initialize RNAV system position.

iv. Fly direct to a waypoint.

v. Intercept a course/track.

vi. Be vectored off and rejoin a procedure.

vii. Determine cross-track error/deviation.

viii. Remove and reselect navigation sensor input.

ix. When required, confirm exclusion of a specific navigation aid or navigation aid type.

x. Perform gross navigation error check using conventional navigation aids.

b) Training program on the GPS as a primary means of navigation.

1) Besides the training modules describe on the previous paragraphs, operators' training programs which use RNAV systems based on GPS as a primary navigation means will include modules described in Appendix 2.

Appendix 1

GPS integrity monitoring (RAIM) prediction program

Where a GPS integrity monitoring (RAIM) prediction program is used as a means of compliance with paragraph 5.2 (a) of this document, it should meet the following criteria:

a) The program should provide prediction of availability of the integrity monitoring (RAIM) function of the GPS equipment, suitable for conducting RNAV 5 operations in designated European airspace.

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

c) The program should use either a RAM algorithm identical to that used in the airborne equipment or an algorithm based on assumptions for RAIM prediction that give a ore conservative result.

d) The program should calculate AIM availability based on a satellite mask angle of no less than 5 degrees, except where use of lower mask angle has been demonstrated to be acceptable to the authority.

e) The program should have the capability to manually designate GPS satellites which have been notified as being out of service for the intended flight.

f) The program should allow the user to select:

   1) the intended route and declared alternates; and

   2) the time and duration of the intended flight.

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Appendix 2

Training program on the GPS as a primary means of navigation

The training programs for flight crews that use RNAV 5 systems based on the GPS as a primary means of navigation, will include a segment with the following training modules:

a) GPS system components and operating principles.- Understanding of the GPS system and its operating principles:

   1) GPS system components: control segment, user segment, and space segment;
   2) on-board equipment requirements;
   3) GPS satellite signals and pseudo-random code;
   4) positioning principle;
   5) receiver clock error;
   6) masking function;
   7) performance limitations of the different types of equipment;
   8) WGS84 coordinate system;

b) Navigation system performance requirements.- Define the following terms in relation to the navigation system and evaluate the degree of compliance by the GPS system of the requirements associated with the following terms:

   1) precision;
   2) integrity;
      i. means to improve GPS integrity: RAIM and FDE
   3) availability;
   4) service continuity

c) Authorizations and documentation.- Requirements applicable to pilots and navigation equipment for GPS operation:

   1) pilot training requirements;
   2) aircraft equipment requirements;
   3) AFM system certification criteria and limitations;
   4) GPS-related NOTAMs.

d) GPS system errors and limitations.- Cause and magnitude of typical GPS errors:

   1) ephemerides;
   2) clock;
   3) receiver;
   4) atmospheric/ionospheric;
   5) multi-reflection;
   6) selective availability (SA);
   7) total typical error associated to the C/A code;
   8) effect of the dilution of precision (DOP) on the position;
   9) susceptibility to interference;
   10) comparison of vertical and horizontal errors; and
   11) path-tracking precision. Collision avoidance.

e) Human factors and GPS.- Limitations on the use of GPS equipment due to human factors. Operating procedures that offer protection against navigation errors and loss of awareness of the real situation due to the following causes:

1) mode errors;

2) data entry errors;

3) data checks and validation, including independent cross-checking procedures;

4) automation-induced relaxation;

5) lack of standardization of GPS equipment;

6) information processing by humans and situational awareness.

f) GPS equipment – Specific navigation procedures.- Knowledge of the appropriate operating procedures for GPS in the typical navigation tasks for each specific type of equipment in each type of aircraft that includes:

1) selection of the appropriate operating mode;

2) review of the different types of information contained in the navigation database;

3) forecast of the availability of the RAIM function;

4) procedure for entering and checking the waypoints defined by the user;

5) procedure for entering, retrieving and checking flight plan data;

6) interpretation of the typical information shown on the GPS navigation display: LAT/LONG, distance and heading to the waypoint, CDI;

7) interception and maintenance of the GPS-defined routes;

8) in-flight determination of ground speed (GS), estimated time of arrival (ETA), time and distance to the waypoint;

9) indication of waypoints over flight;

10) use of the “DIRECT TO” function;

11) use of the “NEAREST AIRPORT” function;

12) use of the GPS in GPS or DME/GPS arrival procedures.

g) Verification of GPS equipment.- For each type of equipment in each aircraft, the following operational and start-up checks must be conducted at the appropriate time:

1) constellation status;

2) RAIM and FDE functional status;

3) dilution of precision (DOP) status;

4) currency of the instrument flight rules (IFR) database;

5) receiver operating condition;

6) CDI sensitivity;

7) position indication.

h) GPS messages and warnings.- For each type of equipment in each aircraft, timely action must be recognized and taken in face of GPS messages and warnings, including the following:

1) loss of RAIM function;

2) 2D/3D navigation;

3) dead-reckoning navigation mode;

4) database not updated;

5) loss of the database;

6) GPS equipment failure;

7) barometric data entry failure;

8) power failure;

9) prolonged parallel displacement; and

10) satellite failure.

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Appendix 3

RNAV 5 approval process

a) The RNAV 5 approval process is comprised of two types of approvals: the airworthiness approval and the operational approval, even though, they have different requirements, both must be considered under one process only.

b) This process constitutes a well-arrange method, which is used by the CAA to ensure the applicants comply with the established requirements.

c) The approval process is conformed by the following phases:

1) Phase one: Pre-application

2) Phase two: Formal application

3) Phase three: Analysis of the documentation

4) Phase four: Demonstration and inspection

5) Phase five: Approval

d) *In Phase One - Pre-aplication*, the CAA holds a meeting with the operator (the pre-aplication meeting), in which the operator will be informed about all the requirements that he needs to comply during the approval process.

e) *In Phase Two - Formal application*, the operator submits the formal application with all applicable documents.

f) *In Phase Three - Analysis of the documentation*, the CAA reviews the submission and evaluates the navigation equipment in order to determine the method of approval (aircraft equipment eligibility). As a result of this evaluation the CAA may accept or return the Formal Application with the documentation.

g) *In Phase Four - Demonstration and inspection*, the operator will accomplish the training program and the validation flight if this is required by the CAA, otherwise the process will advance to the next phase.

h) *In phase Five - Approval*, the CAA issues the RNAV 5 authorization, once the operator has completed the airworthiness and operations requirements. For LAR 121 and/or 135 operators, the AAC will issue the OpSpecs. For LAR 91, a LOA is nor required if the aircraft eligibility has been determined based on the AFM or POH or associated documentation.

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Appendix B

RNAV 5 JOB AID

OPERATOR APPLICATION TO CONDUCT RNAV 5 OPERATIONS

1. Introduction

This job Aid was developed by the Regional Cooperation System for Safety Oversight (SRVSOP) to provide guidance to States, operators and inspector on the process for operators to obtain RNAV 5 authorization.

2. Purposes of this Job Aid

2.1 Provide RNAV 5 reference documents for operators and inspectors.
2.2 Provide a series of tables that show: the content of an application, related reference paragraphs, location in operator application where RNAV 5 elements are addressed and columns for the inspector to comment on, and track the status of various RNAV 5 elements.

3. Recommended inspector and operator actions

The following are suggestions on how the Job Aid can be used:

3.1 Inspector reviews the basic events in the RNAV 5 approval process in Part 1 with the operator in the pre-application meeting to provide an overview of approval process events.
3.2 Inspector reviews this Job Aid with the operator to establish the form and content of the operator application for RNAV 5 authority.
3.3 Operator uses the Job Aid as guide to assemble documents/exhibits for its application for RNAV 5.
3.4 Operator annotates Job Aid to show location of RNAV 5 program elements in the operator exhibits/documents.
3.5 Operator submits Job Aid and RNAV 5 operator application (exhibits/documents) to inspector
3.6 Inspector annotates Job Aid to show task or document “complete/satisfactory” or “open/further operator action required”.
3.7 Inspector informs the operator as soon as possible, when further operator action is required.
3.8 Operator provides inspector, when requested, with revised material.
3.9 The CAA issues operations specifications (OpSpecs) or Letter of Authorization (LOA) as applicable, to operator when required tasks and documents are completed.

4. Job Aid organization

5. Primary source of documents, information and contacts

For accessing to the Advisory Circular CA 91-002, enter to the ICAO/SAM Regional Office Webpage (www.lima.icao.int) under SRVSOP.

6. Primary documents of reference

Documents of reference	Subjects
ICAO Doc 9613	Performance based navigation manual
AMC 25-11	Electronic display system
AMC 20-5	Acceptable means of compliance for airworthiness approval and operational criteria for the use of the NAVSTAR Global positioning system (GPS)
AC 20-121A	Airworthiness approval of LORAN C for use en the U.S National Airspace System
AC 20-130()	Airworthiness approval of multi-sensor navigational system for use in the U.S. National Airspace System
AC 20-138	Airworthiness approval of NAVSTAR Global Positioning System (GPS) for use as a VFR and IFR Supplemental navigation system
AC 25-4	Inertial navigation system (INS)
AC 25-15	Approval of FMS in transport category airplanes
AC 90-45A	Approval of areas navigation systems for use in the U.S. National Airspace System
ETSO-C115b	Airborne area navigation equipment using multi sensor input
ETSO-C129A	Airborne supplemental navigation equipment using the Global positioning system (GPS)
ETSO-C145	Airborne navigation sensors using the Global positioning system (GPS) augmented by wide area augmentation system (WAAS)
ETSO-C146	Stand-alone airborne navigation equipment using the Global positioning system (GPS) augmented by the wide area augmentation system (WAAS)

TSO-C115, any version	Airborne area navigation equipment using multi-sensor inputs
TSO-C129/C129A	Airborne supplemental navigation equipment using the global positioning system (GPS)
TSO-C145A	Airborne navigation sensors using the Global positioning system (GPS) augmented by the wide area augmentation system (WAAS)
TSO-C146A	Stand-alone airborne navigation equipment using the Global positioning system (GPS) augmented by the wide area augmentation system (WAAS)
RTCA/DO-200A	Standards for processing aeronautical data
RTCA/DO-201A	Standards for aeronautical information
RTCA/DO-208	Minimum operational performance standards for airborne supplemental navigation equipment using Global positioning system (GPS)
RTCA/DO-229C	Minimum operational standards for Global positioning system/Wide area augmentation system airborne equipment
RTCA/DO-236A	Minimum aviation system performance standards: Required navigation performance for area navigation
RTCA/DO-178B	Software consideration in airborne systems and equipment certification

PART 1: GENERAL INFORMATION

Basic events in RNAV 5 authorization process

	Operator actions	CAA actions (inspectors)
1	Establishes need to obtain authority for RNAV 5 operations.	
2	Reviews AFM, AFM Supplement or Type Certificate Data Sheet (TCDS) or others appropriate documents (e.g., Service Bulletins, Service Letters) to determine Aircraft eligibility for RNAV 5. Operator contacts airplane or avionics manufacturer, if necessary, to confirm airplane eligibility for RNAV 5.	
3	Contacts to the AAC to arrange a pre-application meeting to discuss requirements for operational approval. .	
4		During pre-application meeting, establishes: • form and content of operator application; • the date when operator application should be submitted for evaluation
5	Submits operator application to the AAC at least 60 days in advance of the planned start of RNAV 5 operations.	
6		Reviews operator application
7	Once the amendments to the manuals, programs and documents have been accepted or approved, the operator provides training to the flight crew, flight dispatchers and maintenance personnel and performs a validation flight in case of that flight is required by the AAC.	
8		Issues operational approval in the form of OpSpecs for LAR 121 and/or 135 operators (see Appendix A of LAR 119). For LAR 91 operators, is not required to issue a Letter of Authorization (LOA) for individual areas of operations and also, when the aircraft eligibility is based on the AFM, AFM supplement, TCDS or POH.

Notes related with the approval process

1. **Responsible Authority.**

   a. **Commercial Air Transport - LAR 121 and/or 135 operators.- The State of registry** makes the determination that the Aircraft meets the applicable RNAV 5 requirements. The State of Operator issues operating authority (e.g., OpSpecs).

   b. **General aviation - LAR 91 operators.-** The **State of registry** makes determination that aircraft meets the applicable RNAV 5 requirements and issues operating authority.

2. Sections related to the Latin America Aeronautics Regulations (LAR)

   a. LAR 91 Sections 91.880 (b) y 91.1660 (Annex 6 Part II, Seventh Edition, Paragraph 2.5.2.2)

   b. LAR 121 Section 121.995 (Annex 6, Part I, Paragraph 7.2.2)

   c. LAR 135 Section 135.570 (b) (Annex 6, Part I, Paragraph 7.2.2)

3. Others related ICAO documents

   a. Annex 2 – Rules of the air

   b. Doc 4444 – Procedures for Air Navigation Services – Air Traffic Management.

PART 2: AIRCFRAT AND OPERATORS IDENTIFICATION INFORMATION

OPERATOR NAME: _____

Aircraft make, model and series	Registration number(s)	Serial number(s)	RNAV navigation systems: Number, manufacturer and model	Navigation specification requested

DATE OF PRE-APPLICATION MEEETING_____

DATE APPLICATION RECEIVED:_____

DATE OPERATOR PLANS TO START RNAV 5 OPERATIONS_____

¿IS THE NOTIFICATION TIME TO CAA ADEQUATE? YES _____ NO _____

PART 3: CONTENT OF OPERATOR APPLICATION FOR RNAV 5

#	Content of operator application for RNAV 5	Reference paragraphs CA 91-002	Where found in operator exhibit/documents Note: operator should update this column to reflect the content of its application	Inspector recommendation and /or comments	Inspector Tracking: Item status and date
1	**Application letter** Application letter to obtain RNAV 5 authority	Paragraph 9.1 b) 1) Appendix 3, Paragraph e)	Exhibit A		
2	**Airworthiness documents to determine Aircraft eligibility** Airworthiness documents that establish the aircraft and the navigation system have been approved for RNAV 5 operations.	Paragraphs 8.1, 8.2 y 8.3			
3	**RNAV 5 system requirements** 1. One (1) RNAV system comprising of: • one or a combination of the following navigation sensors: VOR/DME, DME/DME, INS o IRS, LORAN C y GNSS o GPS; • an area navigation (RNAV) computer; • a control display unit (CDU); and • a navigation display(s) or instrument(s) (e. g., navigation display (ND), heading situation	Paragraph 8.5 b)			

#	Content of operator application for RNAV 5	Reference paragraphs CA 91-002	Where found in operator exhibit/documents Note: operator should update this column to reflect the content of its application	Inspector recommendation and /or comments	Inspector Tracking: Item status and date
	indicator (HSI) o course deviation indicator (CDI).				
4	**Availability of the conventional navigation equipment on board the aircraft when the GPS stand-alone is used** When GPS stand-alone equipment is used, the traditional navigation equipment (e. g., VOR, DME, TACAN o ADF), must be installed and operational in the aircraft, so as to provide an alternative means of navigation.	Paragraph 8.4 e) 1) iv.			
5	**Training** **1. LAR 91 operators: Methods of training:** The following methods are acceptable for these operators: In-house training, LAR 142 training center or others courses of training. **2. LAR 121 or 135 operators: Training program:** The LAR 121 or 135 operators shall develop an initial and recurrent training program for flight crew, flight dispatchers and maintenance personnel. **3. GPS stand-alone:** When the	Paragraphs 9.1 b) 6), 9.1 c) Paragraph 11			

#	Content of operator application for RNAV 5	Reference paragraphs CA 91-002	Where found in operator exhibit/documents Note: operator should update this column to reflect the content of its application	Inspector recommendation and /or comments	Inspector Tracking: Item status and date
	operator used a GPS stand-alone to conduct RNAV 5 operations, shall developed an initial and a recurrent training program for flight crew, flight dispatchers and maintenance personnel, if required.	Paragraph 8.4 e) 2)			
6	**Operational policies and procedures** **1. LAR 91 operators:** Operations manual or sections of operator´s application, documenting RNAV 5 operational policies and procedures. **2. LAR 121 and/or 135 operators:** Operations manual and check list. **3. GPS stand-alone used as a primary means of navigation:** Operations manual	Paragraph 9.1 b) 2) Paragraph 10 Paragraph 10. b)			
7	**Maintenance practices** • For Aircraft with established RNAV or GPS stand-alone maintenance practices, the operator shall provide document references. • For newly installed RNAV or GPS stand-alone, the operator shall provide maintenance practices for review.	Paragraph 9. b) 3)			

#	Content of operator application for RNAV 5	Reference paragraphs CA 91-002	Where found in operator exhibit/documents Note: operator should update this column to reflect the content of its application	Inspector recommendation and /or comments	Inspector Tracking: Item status and date
8	**Minimum equipment list (MEL) updates, if applicable** Only applicable if operator conducts operations under an MEL	Paragraph 9. b) 5)			
9	**Removal of RNAV 5 operating authority** Indication of the necessity to follow up action after navigation error reports, and the potential for removal of RNAV 5 operating authority.	Paragraph 12			

PART 4 – OPERATOR APLICATION (EXHIBITS/DOCUMENTS)

Exhibit	Document title	Operator indication of inclusion	Inspector comments
A	**Application letter for RNAV 5 authorization**		
B	**1. For aircraft manufactured RNAV 5 compliant: Airworthiness documents that show RNAV 5 approval:** • AFM, AFM Supplement, TCDS o POH. **2. For in-service aircraft which eligibility can not be determined based on the AFM, AFM Supplement; TCDS o POH:** • Operator letter requesting assessment of aircraft RNAV equipment.		
C	**For INS or IRU only equipped aircraft: RNAV 5 time limit and area of operation.** • Documentation establishing the RNAV 5 time limit and area of operations or routes for which the specific aircraft/navigation system is eligible. (Not applicable to GPS equipped aircraft).		
D	**Maintenance program** • For aircraft with established RNAV 5 or GPS stand-alone maintenance practices, provide list of document or program references.		
E	**Minimum Equipment List (MEL) (Only for operators operating under an MEL):** • MEL showing provisions for RNAV 5 equipment or GPS stand-alone.		
F	**Training**		

Exhibit	Document title	Operator indication of inclusion	Inspector comments
	1. LAR 91 operators: Methods of training: The following methods are acceptable for these operators: In-house training, LAR 142 training center or others courses of training. **2. LAR 121 or 135 operators: Training program:** The LAR 121 or 135 operators shall provide initial and recurrent training program for flight crew, flight dispatchers and maintenance personnel. **3. GPS stand-alone:** When the operator used a GPS stand-alone to conduct RNAV 5 operations, shall provide an initial and a recurrent training program for flight crew, flight dispatchers and maintenance personnel, if required.		
G	**Operational policies and procedures** **1. LAR 91 operators:** Operations manual or sections of operator´s application, documenting RNAV 5 operational policies and procedures. **2. LAR 121 and/or 135 operators:** Operations manual and check list. **3. GPS stand-alone used as a primary means of navigation:** Operations manual		
H	**Removal of RNAV 5 operating authority** Indication of the necessity to follow up action after navigation error reports, and the potential for removal of RNAV 5 operating authority.		
I	**Plan for validation flight:** Only if required by the CAA		

APLICATION CONTENT TO BE SUBMITED BY THE OPERATOR

____ **AIRCRAFT/RNAV 5 SYSTEM COMPLIANCE DOCUMENTATION**

____ **OPERATIONAL POLICY/PROCEDURES**

____ **MAINTENANCE MANUAL SECTIONS RELATED TO RNAV 5 SYSTEM OR GPS STAND-ALONE (if not previously reviewed)**

Note 1: Exhibits/documents may be included in a binder or submitted as a stand-alone documents

PART 5 – GUÍDE FOR DETERMINING AIRCRAFT ELIGIBILTY

#	Subjects	Reference paragraphs CA 91-002	Location in operator exhibits	CAA Recommendations and comments	Inspector tracking item status and date
1	RNAV system requirement	Paragraphs 5.7, 6.2, 8.1 a) y 8.5 b).			
2	Aircraft eligibility 1. For aircraft manufactured RNAV 5 compliant 2. For in-service aircraft which eligibility can not be determined based on the AFM, AFM Supplement; TCDS o POH:	Paragraphs 8.2 Paragraph 8.3 a)			
3	GPS stand-alone used as a primary means of navigation	Paragraph 8.4 e) 1) iii. (first paragraph)			
4	Multi-sensor navigation system that incorporate GPS with integrity provided by RAIM or equivalent means	Paragraph 8.4 e) 1) ii.			
5	GPS stand-alone with integrity provided by RAIM	Paragraph 10. b) 2.			
6	GPS stand-alone that include the following functions: • Pseudorange step detection; and • Health word cheking	Paragraph 8.4 e) 1) ii.			
7	Availability of conventional navigation	Paragraph 8.4 e) 1)			

#	Subjects	Reference paragraphs CA 91-002	Location in operator exhibits	CAA Recommendations and comments	Inspector tracking item status and date
	equipments when GPS stand-alone is used	iv.			
8	Aircraft requirements: RNAV 5 navigation systems	Paragraph 8.4			
9	RNAV 5 system requirement • Precision • Availability and integrity	Paragraph 8.5			
10	RNAV 5 system functional requirements • Required functions • RNAV 5 navigation displays	Paragraph 8.6			
11	Navigation data base	Paragraph 10. d)			

PART 6 – BASIC PILOT PROCEDURES FOR RNAV 5 OPERATIONS

Subjects	Reference paragraphs CA 91-002	Locations in operator exhibit	CAA recommendations and/or comments	Inspector tracking: Item status and date
Operating procedures	Paragraph 10	Exhibit G		
Flight planning	Paragraph 10.1			
Verify aircraft is approved for RNAV operation	Paragraph 10.1 a) 1)			
Verify RNAV system required to meet RNAV 5 navigation specifications for the route and area are operational	Paragraph 10.1 a) 3)			
Verify that space-based or ground-based navigation aids required for RNAV 5 operations are available	Paragraph 10.1 a) 4)			
Revise i.e. contingencia procedures	Paragraph 10.1 a) 5)			
Indicate approval for RNAV 5 operations by annotating block 10 (Equipment) of the ICAO flight plan as defined within ICAO Doc 7030 for these operations	Paragraph 10. c)			
Verify the availability of GPS integrity RAIM for the intended flight (route and time), through the use of a prediction program either ground-based or provided as an equipment function or from an	Paragraph 10 b)			

Subjects	Reference paragraphs CA 91-002	Locations in operator exhibit	CAA recommendations and/or comments	Inspector tracking: Item status and date
alternative method that is acceptable to the authority, in the following cases: • when any GPS satellites are scheduled to be out of service; or • more than one satellite is scheduled to be out of service for GPS equipment that incorporate pressure altitude aiding.				
The operator shall not dispatch or release a flight in the event of predicated continuous loss of RAIM of more than 5 minutes for any part of the intended flight. In this case the flight may be delayed, cancelled or re-routed.	Paragraph 10 b) 7)			
Pre-flight procedures at the aircraft				
Review maintenance logs and forms for RNAV 5 status.	Paragraph 10.2 a)			
Verify navigation data base currency (current AIRAC cycle), if this data base is installed.	Paragraph 10.2 b)			
En route procedures				
Verify RNAV equipment required for RNAV 5 operation has not been degraded	Paragraph 10.3 a) 1)			

Subjects	Reference paragraphs CA 91-002	Locations in operator exhibit	CAA recommendations and/or comments	Inspector tracking: Item status and date
in flight				
Verify the route of flight correspond to the clearance	Paragraph 10.3 a) 2)			
Verify aircraft precision navigation is suitable for RNAV 5 operations through pertinent cross-checks.	Paragraph 10.3 a) 3)			
Verify others navigation aids (e. g., VOR, DME and ADF) are selected, so as to allow immediate cross-checking or reversion in the event of loss of GPS navigation capability.	Paragraph 10.3 a) 4)			
Contingency procedures	Paragraph 10.4			
The aircraft must not enter or continue operations in airspace designated as RNAV 5, in accordance with a current clearance of ATC, if due to a failure or degradation, the navigation system is downgraded under the RNAV 5 requirements, in this event, the pilot will obtain when it is possible a amended clearance.	Paragraph 10.4 a) 1)			
In accordance with ATC instructions, the operations may continue in compliance with ATC current authorization or when it is not possible, the pilot may request an	Paragraph 10.4 a) 2)			

Subjects	Reference paragraphs CA 91-002	Locations in operator exhibit	CAA recommendations and/or comments	Inspector tracking: Item status and date
amended clearance to return to conventional VOR/DME navigation.				
In all cases, the flight crew must follow the contingency procedures establish for each region and obtain an ATC clearance as soon as possible.	Paragraph 10.4 a) 3)			
Contingency procedures in the event of loss of GPS navigation capability				
The contingency procedures should identify the flight crew actions required in the event of the GPS stand-alone equipment indicating a loss of the integrity monitoring detection (RAIM) function or exceedance of integrity alarm limit (erroneous position).	Paragraph 10.4 b) 1)			
Whatever contingency registered in flight must be notify to the AAC within 72 hours, unless the delay is justify.	Paragraph 10.4 b) 3)			

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