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When replying please quote:

Ref.: NT-NT4-4.44, NS2-35— **EMX0699**

23 September 2014

To: States, Territories and International Organizations

Subject: **Invitation – ICAO NAM/CAR/SAM Performance-Based Navigation (PBN) Approach Procedure Design Workshop - Special Implementation Project (SIP) Mexico City, Mexico, 17 – 28 November 2014**

Action

Required: Register participation by **17 October 2014**

Sir/Madam:

Further to the ICAO Assembly – 38th Session results, Assembly Resolution A37-11 remains outstanding on Performance-Based Navigation (PBN) world implementation. In this regard, I have the honour to invite your Administration/Organization to participate in the PBN Approach Procedure Design Workshop to be convened at the ICAO NACC Regional Office, Mexico City, Mexico, from **17 to 28 November 2014**.

Pilots, air traffic controllers and officers with fundamental knowledge on PBN airspace and/or Instrument Approach Procedure (IAP) design of States/Territories of the ICAO NAM/CAR/SAM Regions and representatives of invited international organizations are expected to attend. The working languages of the meeting will be English and Spanish, and simultaneous interpretation will be provided if sufficient participants of both languages provide timely registration.

The Syllabus for the event is at **Attachment A**. Due to the limited available seat to his event you are kindly requested to complete and return the Registration Form enclosed in the **Attachment B** by e-mail for each participant by **17 October 2014**.

The list of suggested hotels, ICAO NACC Regional Office location, hotel sector maps, as well as other useful information are available on the “*Visiting Our Office?*” Section of the ICAO NACC Regional Office website (http://www.icao.int/NACC/Pages/visitors_info.aspx). Participants are encouraged to make reservations directly with the hotel(s) in a timely manner.

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All event documentation will be placed in the Meetings Section of the following web page: <http://www.icao.int/NACC/Pages/default.aspx> as it becomes available. Taking into consideration the availability of documentation in electronic format, no hard copies will be distributed during the event.

Furthermore, in accordance with the 2013-2016 Activities Plan of the Regional Technical Cooperation Project for the Caribbean Region – *Implementation of Performance-Based Air Navigation Systems for the CAR Region (RLA/09/801)*, and, specifically, with the Sub-Project 1. **Implement a PBN Airspace Concept for the CAR Region**, I am pleased to inform you that this event is offering one fellowship to each Project Member¹.

The fellowship includes Daily Subsistence Allowance (DSA) to cover lodging and expenses; your Administration shall provide the candidate with the air ticket to/from Mexico City, Mexico, and ensure that the candidate has the necessary travel documents, vaccinations, and visa prior to departure. The duly completed Fellowship Nomination Form must be received in this Regional Office no later than **27 October 2014**. Guide for ICAO Fellowship Holders, form and additional information are published at Project RLA/09/801 website: <http://www.icao.int/NACC/Pages/edocs-tc.aspx>

Regarding fellowships offered to the Eastern Caribbean States through ECCAA, please note that the candidate appointment decision should be made between your Administration and ECCAA. Once coordination has been completed, the nomination form of the candidate representing the Eastern Caribbean States **should be sent to this Regional Office by ECCAA**.

If you require any further information regarding the event, please contact Mr. Victor Hernández, Regional Officer, Air Traffic Management and Search and Rescue (vhernandez@icao.int) and/or Mrs. Ana Valencia, Assistant, (avalencia@icao.int).

Accept, Sir/Madam, the assurances of my highest consideration.

A digital signature in black ink, overlaid on a blue circular seal of the International Civil Aviation Organization (ICAO). The seal contains the text 'Firma Digital' on the left and 'Digital Signature' on the right. The signature is written in a cursive style.

Loretta Martin
Regional Director
North American, Central American and
Caribbean (NACC) Regional Office

Enclosure:

As indicated

N:\NT - Air Navigation (Worldwide)\NT 4-4.44 - PBN Approach Procedure Design Course\1411-SIP-DesignandPublishingApproach\EMX0699ATM-States-PBNAirspaceRedesignApproval-Invitation.docx

¹ **RLA/09/801 Project Member States** are: Bahamas, Barbados, Cuba, Curaçao, Dominican Republic, Haiti, Jamaica, Mexico, OECS States through ECCAA (Antigua and Barbuda, Grenada, Saint Kitts and Nevis, Saint Lucia and Saint Vincent and the Grenadines), Trinidad and Tobago and Central American States through COCESNA (Belize, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua).



ICAO NAM/CAR/SAM PERFORMANCE-BASED NAVIGATION (PBN) APPROACH PROCEDURE DESIGN WORKSHOP

ATTACHMENT A

TITLE

ICAO NAM/CAR/SAM PERFORMANCE-BASED NAVIGATION (PBN) APPROACH PROCEDURE DESIGN WORKSHOP FOR RNAV 1/ RNP 1, RNP APCH AND BARO-VNAV SPECIFICATIONS

WORKSHOP DURATION

10 class days (two weeks)

NUMBER OF PARTICIPANTS:

A maximum of 20 trainees

WHEN AND WHERE

ICAO NACC Regional Office, Mexico City, Mexico, 17-28 November 2014. English - Spanish interpretation will be provided. Access to required ICAO Documents (9613, 8168, 4444, 9906, 9905) in electronic format on the ICAO website through controlled access by State/Territory designated Focal Points.

INSTRUCTORS

Armando Hernandez Napoles and Ruddy Abdel Romo Seguí are PANS OPS instructors from Instituto de Aeronáutica Civil de Cuba (IACC) and are both involved in the PBN Instrument Approach Procedure implementation project in Cuba.

OBJECTIVES

The purpose of the workshop is to apply procedure design criteria to development of approach procedures for a select set of the navigation specifications as established in ICAO Doc 9613, *Performance-based Navigation (PBN) Manual*, and related Standards and Recommended Practices (SARPs). The general concept will include procedure design criteria associated with specific navigation subjects such as Area Navigation (RNAV 1), Required Navigation Performance (RNP 1), Required Navigation Performance Approach (RNP APCH) and Barometric Vertical Navigation (Baro-VNAV) applications.

Main Objective 1:

Performance conditions	Maps and other documents containing validated data will be provided
Expected result	The trainee will design a RNP 1 or RNAV 1 SID procedure based on Global Navigation Satellite System (GNSS) sensor use
Criteria	In accordance with Doc 8168, <i>PANS OPS/611</i>

Main Objective 2:

Performance conditions	Maps and other documents containing validated data will be provided
Expected result	The trainee will design a STAR RNP 1 or RNAV 1 procedure based on GNSS sensor use
Criteria	In accordance with Doc 8168, <i>PANS OPS/611</i>



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Main Objective 3:

Performance conditions	Maps and other documents containing validated data will be provided
Expected result	The trainee will design a Non-precision Approach (NPA) procedure (Lateral Navigation (LNAV)), based on RNP APCH operations
Criteria	In accordance with Doc 8168, <i>PANS OPS/611</i>

Main Objective 4:

Performance conditions	Maps, data and all related documentation with a complete design procedure will be provided
Expected result	The trainee will design and document a RNAV-1 SID and STAR RNP 1, an NPA RNP(LNAV), and an RNP APV Baro VNAV (LNAV/VNAV) approach procedure for validation, publication and traceability
Criteria	Accurately, in a reasonable time, and in accordance with Doc 8168, PANS OPS/611, Annex 4, Annex 15, <i>Quality Assurance Manual for Flight Procedure Design</i> (Doc 9906) and <i>Performance-based Navigation (PBN) Manual</i> (Doc 9613)

PARTICIPANTS

Prerequisites:

Students should have fundamental knowledge of PBN airspace design or approach procedure design such as:

- Non-RNAV SID, STAR and NPA procedures as well as Instrument Landing System (ILS) procedures (Reference Doc 8168 *PANS-OPS /611*, Volume II, Part I and Part II)
 - Performance Based Navigation (PBN) as in:
 - completion of the ICAO Web-based PBN training (<http://icao.int/pbn>); or
 - attendance at an ICAO PBN Airspace Design Seminar
 - Air Traffic Management (ATM) as in ICAO Doc 4444 (PANS-ATM)
 - Navigation systems, aircraft performance and geography
e.g., knowledge at a level obtained with any Instrument Rated (IR) pilot’s license or 5 years of experience in air traffic control services
 - Annex 15 (Aeronautical Information Services/AIS)
 - Aerodrome - Students must be familiar with Annex 14, obstacle limitation surfaces and aerodrome reference codes requirements
 - Geodesy (WGS-84)
 - Charting
 - Annex 4 with regard to SID, STAR and approach charts

This training workshop does not use a specific procedure design software and therefore trainees will design procedures manually. For that reason, students should bring a ruler, protractor, compass, and calculator with scientific functions, as well as their own updated regulatory documents, e.g., Doc 8168, PANS-OPS/611.



ICAO NAM/CAR/SAM PERFORMANCE-BASED NAVIGATION (PBN) APPROACH PROCEDURE DESIGN WORKSHOP

ASSESSMENT

Sample of prerequisite exercises will be performed in advance

An initial assessment will be conducted before the workshop through a sample of elementary exercises that will be checked by the instructors prior to the workshop. Those exercises will be sent to the attendees a month and a half before the workshop, to be returned 10 days prior to the workshop for evaluation.

Progress tests will be conducted during the workshop.

Eventually, the presentation of the project will enable assessment of the capacity of the trainee to meet the main objectives through application of the criteria to procedure designs and, as a secondary objective, demonstration of trainee capacity to summarize, write a technical report and present a procedure design study.

TOPICS COVERED

Performance-Based Navigation (PBN) Manual (Doc 9613) Airspace Concept:

- General overview
- Description of navigation specifications
- Avionics, aircraft equipment and airworthiness regulations
- Which application for which airspace?
- Performance – notions of accuracy, precision, continuity, availability

GNSS:

- Aircraft-Based Augmentation System (ABAS)
- Satellite-Based Augmentation System (SBAS) in a PBN context
- Ground-Based Augmentation System (GBAS) in a PBN context

Quality Assurance Manual for Flight Procedure Design (Doc 9906)

- Document and store procedure for traceability
- Data origin
- Procedure design process

Procedure design criteria (PANS-OPS, Volume II, Part III, Sections 1, 2):

- Underlying criteria
- General criteria such as:
 - Minimum length of segments
 - Turn protection
 - T or Y concept
 - Terminal Arrival Altitude (TAA)

Procedure construction (PANS-OPS, Volume II, Part III, Section 3 and Doc 9905)

- Departure criteria applicable for Basic-RNP 1 and RNAV 1/2
- Standard arrival for RNP 1 and RNAV 1/2
- Approach procedures for RNP AR and RNP APCH operations
- APV baro VNAV procedures

Document management for validation and publication (PANS-OPS, Volume II, Part III, Section 5)

- Charting and coding



ICAO NAM/CAR/SAM PERFORMANCE-BASED NAVIGATION (PBN) APPROACH PROCEDURE DESIGN WORKSHOP

MEANS

- Theoretical lectures: Presentation and explanation of the rules and principles described in ICAO SARPs
- Laboratory exercises
Lectures are followed by practical exercises, scheduled on a daily basis, that illustrate the elementary application of criteria in a simplified environment in order to reinforce theoretical input.
- Comprehensive On-the-Job Training (OJT) Project:
Part of the second week will be focused on OJT final project in teams up to four to design an RNAV 1 SID and STAR, an NPA RNP APCH and an RNP APV Baro-VNAV approach procedure based on simulated conditions of an actual airport environment. The design is conducted step by step under assistance and tutorials from instructors. The project also includes the design of draft SID and STAR charts and instrument approach charts, a technical report and coding instructions.



ICAO NAM/CAR/SAM PERFORMANCE-BASED NAVIGATION (PBN) APPROACH PROCEDURE DESIGN WORKSHOP

TIME SCHEDULE

First Week: 17-21 November 2014
ICAO NACC Regional Office, Mexico City, Mexico

	8:30 – 9:30		9:45 – 12:00		13:00 – 14:30		14:45 – 15:30	15:30 – 16:15
MONDAY 17	Registration Opening RNAV Principles GNSS Concept	Coffee Break	PBN Concept Navigation Specification PBN Applications	LUNCH	Design Principle Waypoints Path Terminator	Coffee Break	Minimum Stabilization Distance Descent Gradient	Exercises
	8:00 – 9:30		9:45 – 12:00		13:00 – 14:30		14:45 – 15:30	15:30 – 16:15
TUESDAY 18	Transversal Longitudinal Tolerance System Errors		Tolerance and Semi-Width Areas Calculation		Areas Protection Merging Methodology Exercise		Turn Construction Flyby Waypoints	Turn Protection (FB) Exercises
	8:00 – 9:30		9:45 – 12:00		13:00 – 14:30		14:45 – 15:30	15:30 – 16:15
WEDNESDAY 19	Turn Construction FlyOver Waypoints		Turn Protection (FO) Exercises		RNP APCH NPA Alignment VSS (VSS Exercises)		Final Approach OCH Computation Intermediate Approach	Initial Approach T / Y Bar concept (Exercises T/Y)
	8:00 – 12:00		13:00 – 14:30	14:45 – 15:30	15:30 – 16:15			
THURSDAY 20	RNP APCH NPA Exercises		Missed Approach Obstacles Clearance	Arrival Procedures Underlying Principles Protection Areas	Obstacles Clearance Terminal Arrival Altitude (TAA)			
	8:00 – 9:30	9:45 – 12:00	13:00 – 14:30	14:45 – 16:15				
FRIDAY 21	General Progress Test # 1	Coffee Break	Departure Procedures Nominal Trajectory Areas	Straight and Turning Departures	Departure Exercise RNP 1 Specification Application			



ICAO NAM/CAR/SAM PERFORMANCE-BASED NAVIGATION (PBN) APPROACH PROCEDURE DESIGN WORKSHOP

TIME SCHEDULE

Second Week: 24-28 November 2014
ICAO NACC Regional Office, Mexico City, Mexico

	8:00 – 9:30		9:45 – 12:00		13:00 – 14:30		14:45 – 15:30	15:30 – 16:15
MONDAY 24	RNP APV Baro-Vnav Obstacle Assessment Surface (OAS)	Coffee Break	Final Approach Surface (FAS) / Temperature Correction	LUNCH	RNP APB Baro VNAV Obstacles Clearance OCH Computation	Coffee Break	RNP APCH APV Baro-VNAV Exercises	
	8:00 – 9:30		9:45 – 12:00		13:00 – 16:15			
TUESDAY 25	General Progress Test #2		Holding Criteria Coding Issues		On-The-Job Application SID/STAR (RNAV1 o RNP 1) NPA / APV RNP APCH			
	8:00 – 12:00		13:00 – 16:15					
WEDNESDAY 26	On-The-Job Application SID/STAR (RNAV1 o RNP 1) NPA / APV RNP APCH		On-The-Job Application SID/STAR (RNAV1 o RNP 1) NPA / APV RNP APCH					
	8:00 – 12:00		13:00 – 16:15					
THURSDAY 27	On-The-Job Application SID/STAR (RNAV1 o RNP 1) NPA / APV RNP APCH		On-The-Job Application SID/STAR (RNAV1 o RNP 1) NPA / APV RNP APCH					
	8:00 – 12:00		13:00 – 15:30	15:30 – 16:00	16:00 – 16:15			
FRIDAY 28	Presentation/ Assessment of Project		Presentation/ Assessment of Project	Jury Deliberation	Assessment Result Debriefing			