International Civil Aviation Organization
Organisation de l'aviation civile internationale
Organización de Aviación Civil Internacional
Международная организация гражданской авиации
منظمة الطيران المدني الدولي
国际民用航空组织

LT 1/4.3.24-SA456 Lima, 24 September 2014

To: Mr. Jean-Michel Boivin, Regional Director of Civil Aviation, West Indies and French Guiana
Mr. Zulficar Mohamed, Director General, Civil Aviation Authority, Guyana
Mr. Falisie Jozef Pinas, Minister of Transport, Communication and Tourism, Suriname

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

Action required: Register participation by **17 October 2014**

Sir/Madam,

I have the honour to refer to ICAO Assembly Resolution A37-11, on Performance-Based Navigation (PBN) world implementation, which further to the 38th Assembly's Session, remains outstanding. In this regard, I have the honour to invite your Administration 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 and 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 this event you are kindly requested to complete and return the Registration Form enclosed in the **Attachment B** by e-mail to this Regional Office (icaosam@icao.int), for each participant, by **17 October 2014**.

**Av. Víctor Andrés Belaúnde No.147**
**Centro Empresarial Real**
**Vía Principal No.102**
**Edificio Real 4, piso 4**
**San Isidro**
**Lima 15073 – Perú**

**Apartado 4127**
**Lima 100, Perú**
**Tel.: +51 1 611-8686**
**Fax.: +51 1 611-8689**

**Email: GREPECAS: infogrepecas@icao.int**
**Email: icaosam@icao.int**
**Web page: www.icao.int/SAM**

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.

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.

If you require any further information regarding the event, please contact Mr. Julio de Souza Pereira, SAM ATM/SAR Regional Officer (jpereira@icao.int), Mr. Roberto Arca, SAM ATM/SAR/AIM Regional Officer (rarca@icao.int), and/or their assistant, Mrs. Ursula Danuser (udanuser@icao.int).

Accept, Sir, the assurances of my highest consideration.

Franklin Hoyer
Regional Director
ICAO South American Office
Lima

**Enclosure**
*As indicated*

cc: Mr. Olivier Jouans, Regional Director of ATM services, West Indies and French Guiana
Mrs. Thelma Douglas Pinas, Permanent Secretary, Ministry of Transport, Communication and Tourism, Suriname
Mr. Robby Venlo, acting Director of Civil Aviation Department, Suriname
Mr. Brian De Souza, acting Director, CASAS, Suriname
ICAORD, Mexico

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, *PANS OPS/611* |

**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, *PANS OPS/611* |

**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, *PANS OPS/611* |

**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, *Quality Assurance Manual for Flight Procedure Design* (Doc 9906) and *Performance-based Navigation (PBN) Manual* (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.

## 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.

**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.

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# 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<br>Opening<br>RNAV Principles<br>GNSS Concept** | ***Coffee Break*** | **PBN Concept<br>Navigation Specification<br>PBN Applications** | ***LUNCH*** | **Design Principle<br>Waypoints<br>Path Terminator** | ***Coffee Break*** | **Minimum Stabilization Distance<br>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<br>Longitudinal Tolerance<br>System Errors** | | **Tolerance and Semi-Width Areas Calculation** | | **Areas Protection<br>Merging Methodology<br>Exercise** | | **Turn Construction<br>Flyby Waypoints** | **Turn Protection (FB)<br>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<br>FlyOver Waypoints** | | **Turn Protection (FO)<br>Exercises** | | **RNP APCH NPA<br>Alignment<br>VSS<br>(VSS Exercises)** | | **Final Approach<br>OCH Computation<br>Intermediate Approach** | **Initial Approach<br>T / Y Bar concept<br>(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<br>Obstacles Clearance** | | **Arrival Procedures<br>Underlying Principles<br>Protection Areas** | **Obstacles Clearance<br>Terminal Arrival<br>Altitude (TAA)** |
| | **8:00 – 9:30** | | **9:45 – 12:00** | | **13:00 – 14:30** | | **14:45 – 16:15** | |
| **FRIDAY 21** | **General Progress<br>Test # 1** | ***Coffee Break*** | **Departure Procedures<br>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** |

ATTACHMENT/ADJUNTO B

*International Civil Aviation Organization*
*Organización de Aviación Civil Internacional*
**ICAO NAM/CAR/SAM Performance-Based Navigation (PBN) Approach Procedure Design Workshop - Special Implementation Project (SIP)**
**Taller NAM/CAR/SAM de la OACI sobre Diseño de procedimientos de aproximación de Navegación basada en la performance (PBN) del Proyecto Especial de Ejecución (SIP)**
Mexico City, Mexico, 17 – 28 November 2014 / Ciudad de México, México, 17 – 28 de noviembre de 2014

## REGISTRATION FORM / FORMULARIO DE REGISTRO

| | | |
|---|---|---|
| **1.** | **NAME**<br>**NOMBRE** | |
| **2.** | **POSITION**<br>**CARGO** | |
| **3.** | **ORGANIZATION**<br>**ORGANIZACIÓN** | |
| **4.** | **COUNTRY**<br>**PAÍS** | |
| **5.** | **TELEPHONE**<br>**TELÉFONO** | |
| **6.** | **E-MAIL**<br>**CORREO-E** | |

*Please send this form to: / Por favor envíe este formulario a:*
*E-mail:* icaosam@icao.int

**Av. Víctor Andrés Belaúnde No.147**
**Centro Empresarial Real**
**Vía Principal No.102**
**Edificio Real 4, piso 4**
**San Isidro**
**Lima 15073 – Perú**

**Apartado 4127**
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**Tel.: +51 1 611-8686**
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**Email: icaosam@icao.int**
**Web page: www.icao.int/SAM**