



ICAO

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North American, Central American and Caribbean Office

WORKING PAPER

NACC/WG/4 — WP/23
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**Fourth North American, Central American and Caribbean Working Group Meeting
(NACC/WG/4)**

Ottawa, Canada, 24 to 28 March 2014

- Agenda Item 3: Follow-up on the progress of the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (NAM/CAR RPBANIP)**
3.2 NAM/CAR Regional Performance-Based Air Navigation Implementation Plan: Update, review and progress

PROGRESS ON THE IMPLEMENTATION OF PBN AIR SPACE CONCEPT

(Presented by the Secretariat)

EXECUTIVE SUMMARY	
This working paper presents a report of the activities and achievements in the PBN implementation in the NAM/CAR Regions.	
Action:	Suggested Action is in paragraph 4
<i>Strategic Objectives:</i>	<ul style="list-style-type: none">• Safety• Air Navigation Capacity and Efficiency• Economic Development of Air Transport• Environmental Protection
<i>References:</i>	<ul style="list-style-type: none">• Doc 9854 – Global Air Traffic Management Operational Concept• Doc 9750, Global Air Navigation Plan• Doc 9613, Performance-based Navigation (PBN) Manual- 4th Edition• ICAO Assembly Resolutions A37-19 and A37-11• Doc 9931 – Continuous Descent Operations (CDO) Manual (advanced edition);• NACC/DCA/4 Meeting Final Report• NAM/CAR Regional Performance Based Air Navigation Implementation Plan (RPBANIP NAM/CAR) http://www.mexico.icao.int/RegionalGroups/NACCWG.html• Results of the PBN Airspace Design Workshop, Miami, Florida, 11-22 March 2013

1. Introduction

1.1 The Third NACC/DCA Meeting through Decision 3/3 approved the NAM/CAR Performance Based Air Navigation Implementation Plan (NAM/CAR RPBANIP). Strategies are reflected as Regional Performance Objectives (RPO) in the NAM/CAR RPBANIP that maintains systemic implementation approach, identifying operational improvements on a short and medium term.

1.2 The Third Meeting of the NACC/WG through Conclusion 3/1 recognized the need to implement an airspace concept to harmonize PBN implementation, in order to improve the Airspace Organization and Management (AOM). The integral implementation of a PBN Airspace Concept support the NAM/CAR Performance Based Air Navigation Implementation Plan (NAM/CAR RPBANIP) approved by the NACC/DCA/4 Meeting, as established in the ICAO Doc 9613, *PBN Manual*, and Doc. 9854, *Global ATM Operational Concept*.

2 Analysis

2.1 Up to date, 100% of NAM/CAR States and Territories presented their PBN implementation action plans. In addition, according to the Assembly Resolution A37-11 the CAR Region developed a PBN airspace concept. The **Appendix** to this working paper shows the targets of the PBN implementation progress of approach procedures in the NAM/CAR Regions. Particular PBN achievements are:

- RNP 10 and RNAV routes implemented WATRS oceanic airspace, the Gulf of Mexico, Houston and Miami Oceanic FIRs. RNAV
- Random routes also implemented in the Piarco FIR.
- RNAV 5 routes implemented in the continental upper airspace.
- 60% of international aerodromes implemented instrument approach procedures with vertical guide (APV), (BARO-VNAV and/or GNSS augmentation) as the primary approach or as a back-up for precision approaches.
- 60% of international aerodromes implemented SIDs/STARs with PBN navigation specifications and continuous descent and continuous climb operations criteria (CDO/CCO).
- The analysis of the RNP 10 and the 11 new RNAV routes in the Gulf of Mexico (GoMEX Project, 10th January 2013) shows total fuel savings of more than 712,066 kg, resulting in economic savings for \$1.5M dollars per month (about \$18M annually).
- According to Resolution A37-19, all States should submit benefits accomplished in reducing CO₂ emissions with PBN implementation by using the online IFSET tool. The estimation of indicators should be based on operational improvements obtained in air traffic management, operational efficiency, use of infrastructure and alternative fuels.

2.2 Based on the progress previously presented and considering that objectives, scope and metrics established, the RPOs 1, 2 and 3 have been standardized in order to accelerate PBN implementation. It is expected that this standardization improve the coordination activities to implement a PBN airspace concept for the CAR Region.

2.3 The implementation of a PBN airspace concept requires coordination of a multidisciplinary team to analyse the AOM. The airspace organization is related to flight, radio communication and service requirements provided, as specified in Annex 11, Appendix 4, Table of ATS Airspace Classes, and management is related to Air Traffic Control (ATC) management techniques, which together are an elementary component of the *ATM Operational Concept*, ICAO Doc 9854.

2.4 To achieve implementation of a comprehensive PBN airspace concept, States are required to implement RNAV 5/2 routes in the continental upper airspace, establish new RNAV routes or realign existent RNAV routes, and delete conventional routes, which tack is similar with the proposed new RNAV routes or are not used.

2.5 It is also required publication of Continuous Descent Operations (CDO) and Continuous Climb Operations (CCO) criteria in Standard Instrument Departures (SIDS) and Standard Instrument Arrivals (STARs) terminal areas with Area Navigation/Required Navigation Performance (RNAV/RNP) navigation specifications. In addition, pursuant to Assembly Resolution A37-11, States are required to publish RNP approach procedures.

2.6 To assist States in PBN implementation, the ICAO NACC Regional Office organized two events together with IATA and CANSO, the Regional PBN Airspace Concept Workshop in Miami, United States, from 11 to 22 March 2013, and the Regional PBN Operational Approval (Train the Trainer) Course, Miami, United States, from 11 to 15 March 2013, in order for them to be able within a year to run an equivalent course for inspectors and flight operations regulatory staff in their State/Territory.

2.7 Participants from Costa Rica, El Salvador, Honduras, Jamaica, Mexico, Trinidad and Tobago, Turks and Caicos Islands and COCESNA provided presentations to implement a new PBN airspace project with clear dates and milestones. The ICAO NACC Regional Office will continue working in coordination to provide assistance in accordance with particular needs.

2.8 The participants in the workshop agreed to implement a PBN airspace concept following the NAM/CAR RPBANIP regional objectives. The outcome of the workshop is as follows:

- Significant improvements have been achieved for the ATS route network in the CAR Region.
- For airspace redesign, States shall follow ICAO standards.
- States should develop training programmes for all staff concerned (Civil Aviation Authority (CAA), ATS, airlines, etc.) for a better understanding on PBN fundamentals.
- States should develop and implement PBN approval processes PBN and recognize other State's PBN operational approval as described in the ICAO Doc 9613, *Performance-based Navigation (PBN) Manual*.
- States should promote collaborative efforts for PBN with all stakeholders.
- States should ensure the high quality of the aeronautical information and data associated to the publication of PBN aeronautical charts.
- Very High Frequency (VHF) omnidirectional radio range and distance measuring equipment (VOR/DME) have sufficient coverage for en-route, terminal and approach procedures. However, States shall review their navigation infrastructure (DME/DME, VOR, etc.) coverage for PBN implementation in the terminal areas.

- States should revise restricted areas based on the Flexible Use of Airspace (FUA) in order to improve safety, efficiency and airspace capacity for aircraft operations according to necessities of the civil and military users; and
- States should coordinate effective PBN implementation with the ICAO NACC Regional Office.

2.9 IATA also reported that approximately 90% of the aircraft fleet operating in the region has different RNAV/RNP capabilities. However, despite the progress made in PBN implementation works, only approximately 30% of air operators use PBN routes and procedures due mainly to the lack of PBN training programmes. Therefore, civil aviation authorities should make greater efforts to encourage verification of air operators’ operational approval conditions.

2.10 As to the feasibility of regional implementation, SBAS technical and operational benefits, the SACCSA project reported that this is positive. However, there are associated costs and other capabilities that should be analyzed on an evolutionary medium and long term for the CAR/SAM Regions. Meanwhile IATA has reported that no prospects for new SBAS equipment or on SBAS board avionics upgrade in the medium term exist.

2.11 Concerning the WAAS analysis, Mexico is testing 5 stations to be used in the airspace under their jurisdiction. The extension of the WAAS system requirements for the CAR Region will be reviewed in the medium term. In relation to the improvement of the communications and surveillance infrastructure, a specific RPO has been agreed according to the PBN airspace concept implementation requirements in the CAR Region.

3. Conclusion

3.1 While significant progress has been made in the PBN implementation, the need to increase the number of qualified human resources, improve training programmes, as well as improve PBN operational approval programmes has been identified. In this regard, it is necessary for States to review and improve their own PBN implementation projects with the assistance of the ICAO NACC Regional Office.

4. Suggested Action

4.1 The Meeting is invited to:

- a) take note of the information presented in this working paper;
- b) review and update PBN implementation Project activities; and
- c) recommend other actions as deemed necessary.

APPENDIX**PBN IMPLEMENTATION TARGETS**

(Assembly Resolution A37-11)

1. Urges all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN concept laid down in the *Performance-based Navigation (PBN) Manual* (Doc 9613);

2. Resolves that:

a) States complete a PBN implementation plan as a matter of urgency to achieve:

1) implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones;

2) implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS), including LNAV only minima, for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014; and

3) implementation of straight-in LNAV only procedures, as an exception to 2) above, for instrument runways at aerodromes where there is no local altimeter setting available and where there are no aircraft suitably equipped for APV operations with a maximum certificated take-off mass of 5 700 kg or more;

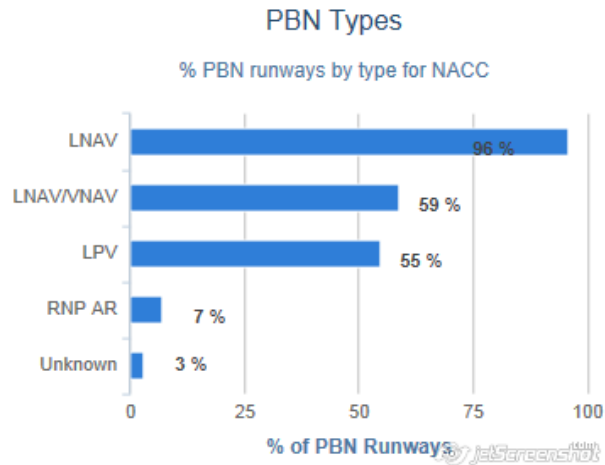
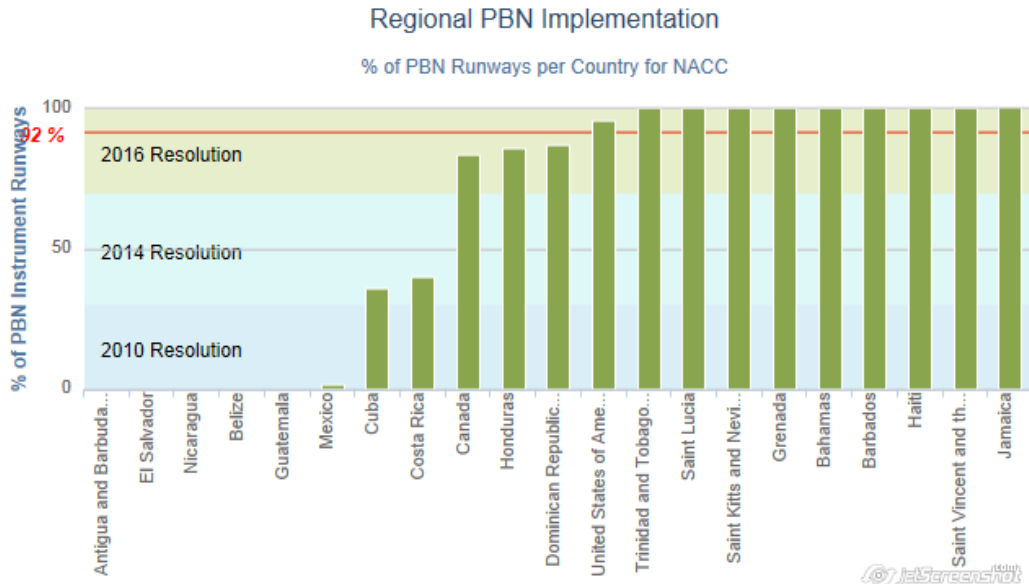
b) ICAO develop a coordinated action plan to assist States in the implementation of PBN and to ensure development and/or maintenance of globally harmonized SARPs, Procedures for Air Navigation Services (PANS) and guidance material including a global harmonized safety assessment methodology to keep pace with operational demands;

3. Urges that States include in their PBN implementation plan provisions for implementation of approach procedures with vertical guidance (APV) to all runway end serving aircraft with a maximum certificated take-off mass of 5 700 kg or more, according to established timelines and intermediate milestones

Stage	Operational improvement
Stage I (2010 2011)	<u>Review of ATS route network in the CAR Region</u> <ul style="list-style-type: none"> • Review of CNS infrastructure, for RNP approach procedures • Realignment and implementation of new RNAV routes in the upper airspace based on RNAV 5/2, as required • Implementation of RNAV routes in the lower airspace based on RNAV 1, RNAV 2 and RNP 1, as required • Implementation of approach procedures RNP APV (BARO-VNAV in accordance with the ICAO Assembly Resolution A37-11)
Stage II (2011 2012)	<u>Review and interface of the ATS routes network in the CAR/SAM Regions</u> <ul style="list-style-type: none"> • Realignment and implementation of new RNAV routes in the interface of the upper airspace between the CAR and SAM Regions, based on RNAV 5 or RNAV 2, as applicable • Implementation of CDO in international airports, as required

Stage	Operational improvement
Stage III (2012 2014)	<ul style="list-style-type: none"> • Delete conventional ATS routes in the upper and lower airspace, as required • Implementation of random routes, by airspace altitude stratum • Review of the upper airspace configuration • Review of the lower airspace configuration • Implementation of flexible use of airspace (FUA) • Implementation of dynamic emerging ATC management techniques

IMPLEMENTATION OF PBN APPROACH PROCEDURES IN NAM CAR REGIONS



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