



International Civil Aviation Organization

North American, Central American and Caribbean Office (NACC)

**Seventh Central American Air Navigation Experts Working Group Meeting
(CA/ANE/WG/7)**

Ninth Central Caribbean Working Group Meeting (C/CAR/WG/9)

ICAO NACC Regional Office, Mexico City, Mexico, 5 to 9 March 2012

Agenda Item 3

Air Navigation Matters

3.2 Follow-up on the implementation of the NAM/CAR Regional Performance Based Air Navigation Plan (RPBANIP) in Central America and the Central Caribbean

RESULTS ON THE IMPLEMENTATION OF A PBN AIRSPACE CONCEPT

(Presented by the Secretariat)

SUMMARY	
This working paper presents the update of the strategy on the PBN implementation and the progress on the implementation of an airspace concept in the CAR Region.	
References:	
<ul style="list-style-type: none">• GREPECAS/15 Final Report• Final Report on the Fourth Meeting of North American, Central American and Caribbean Directors of Civil Aviation (NACC/DCA/4)• Final Report on the Third North American, Central American and Caribbean Working Group Meeting (NACC/WG/3)	
Strategic Objective	<i>This working paper is related to Strategic Objective A.</i>

1. Introduction

1.1 For the PBN implementation, a regional strategy was adopted by the GREPECAS/15. The updated strategy is presented in **Appendix A** to this working paper.

1.2 The Fourth Meeting of North American, Central American and Caribbean Directors of Civil Aviation (NACC/DCA/4) supported Conclusion 3/1 of the NACC/WG/3, which is included on **Appendix B** to this working paper for ease of reference, for the implementation of a PBN airspace concept in the CAR Region. The information relating to this implementation is available at the following link in the ICAO NACC Regional Office website (<http://www.mexico.icao.int/ATM.html#PBN>)

2. Discussion

2.1 The continuous increase of operations demands a larger demand of the operators and service providers to increase the airspace capacity and the access to airports through the performance-based navigation (PBN) for the phases on en-route flight, on descend or in approach procedures when the aircraft must comply with certain navigation specifications.

2.2 The objective of implementing PBN is to obtain operational and economical benefits for the service providers and the users and to boost the use of emergent capabilities of the aircraft capabilities. PBN is recognized for being the cornerstone for the evolution towards GNSS navigation.

2.3 Most of the States have already adopted norms for the design procedures and aircraft and operation approvals for the implementation of the RNAV and RNP in route, in TMA and in the approach phases. This standards are related to the use of GNSS, the certification and the of aircraft operation approval.

2.4 The States, Territories and International Organizations on the CAR Region should revise the airspace structure to implement PBN routes that provide the best operational advantages for users and ATS providers, in relation to the operational ATS airspace capacity, fuel consumption, as well as the preservation of the global environment through the reduction of gas.

2.5 The implementation of a PBN airspace looks for the harmonization of the navigation specifications in the different airspaces. Taking into consideration the international traffic flows to/from NAM/SAM Regions, improvements should be analyzed for the implementation of RNAV routes according to the aircraft navigation capacity.

2.6 Likewise, PBN training should be boosted and the relation between RNAV and RNP functionalities, as well as avoiding multiple operational approvals for flights in airspaces with similar navigation specifications.

2.7 The implementation strategy of a PBN airspace concept covers the criteria harmonization of the approval/certification criteria of the aircraft and operators. Furthermore, the application of a determined airspace navigation specification must be verified, such as the infrastructure of the navigation radio aids, the provision of Air Traffic Services, the security evaluation, etc.

PBN Implementation in terminal areas and approach procedures

2.8 The implementation of a PBN Airspace concept also applies to terminal areas and approach procedures.

2.9 RNP navigation specifications on the approach procedures require integrity and continuity. The RNAV navigation specification does not require integrity and continuity.

2.10 Doc 8168 provides implementation criteria for PBN precision and not precision approach. The advantage of an implementation of a PBN airspace concept facilitates criteria for airspace planning with a large range of options for each specific situation.

2.11 In this case, the RNP navigation specifications could be applied in multiples of 0.1 NM (RNP 0.1, 0.3, etc.) making the implementation possible according to the operational needs of each airspace regarding the existing obstacles, the complexity of the airspace and the separation between aircrafts, the fleet's navigation capability and the configuration of runways at the airports.

2.12 The implementation of SID/STAR RNAV requires a clear definition of the navigation specifications that should be implemented in the terminal areas with the purpose of linking the RNAV routes and the respective instrument approach procedures. The ATS providers should also analyze the implementation of continuous descend operations (CDO).

2.13 **Appendix C** to this working paper shows the airports where PBN approach procedures have already been implemented. The Meeting should review and update this information.

3. Suggested Actions

3.1 The Meeting is invited to:

- a) take note of the information contained in this Working Paper;
- b) review and update the implementation strategy on Appendix A to this working paper;
- c) support the implementation of a PBN airspace that assigns navigation specifications on the already implemented or soon to be implemented routes;
- d) analyze and recommend the terminal areas where continuous descend operations (CDO) could be implemented, and
- e) analyze and update the information on Appendix C to this working paper regarding the airports which have already implemented instrument approach procedures for RNP

ATM Implementation Work Programme - Appendix / Apéndice al Programa de Trabajo de Implementación ATM

ID	Task Name/Tarea	Start/Inicio	Finish/Término	2007		2008		2009		2010		2011		2012		2013		2014
				H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
1	Implementation of performance based navigation (PBN) / Implantación de la navegación basada en la performance (PBN)	Fri 28/12/01	Sat 31/12/16															
2	Develop a regional strategy for the implementation of performance based navigation (PBN) / Desarrollar una estrategia regional para la implantación de la navegación basada en la performance (PBN)	Sun 26/08/07	Mon 24/11/08															
3	Develop a national action plan for the implementation of performance based navigation (PBN) / Desarrollar un plan de accion nacional para la implantación de la navegación basada en la performance (PBN)	Thu 10/07/08	Fri 31/07/09															
4	Develop a PBN roadmap for en-route, TMA and approach / Desarrollar hoja de ruta PBN para ruta, TMA y aproximación	Mon 10/07/06	Fri 31/08/07															
5	Develop and implement a PBN airspace concept / Desarrollar e implementar un concepto de espacio aereo PBN	Thu 10/07/08	Thu 14/11/13															
6	Analyze and enhance air communication, navigation and surveillance infrastructure in accordance with PBN requirements / Analizar y mejorar la infraestructura de comunicaciones, navegacion y vigilancia acorde a los requisitos PBN	Fri 13/07/07	Sat 31/12/16															
7	Collect aircraft navigation capability data /Recolectar datos de la capacidad de navegacion de las aeronaves	Fri 13/07/07	Mon 31/12/12															
8	Implement collaborative desicion making (CDM) process in coordination with stakeholders / Establecer un proceso de toma de decisiones en colaboracion (CDM) en coordinacion con los involucrados	Mon 16/07/07	Fri 28/12/12															
9	Develop PBN Safety Assessment Programme / Desarrollar un Programa de Evaluación de Seguridad Operacional PBN	Mon 16/07/07	Fri 28/12/12															
10	Conduct ATC simulations (fast time and/or real time), Live Trials, etc., as required / llevar a cabo simulaciones ATC, (en tiempo acelerado o en tiempo real), pruebas reales, etc., segun sea requerido.	Mon 16/07/07	Fri 28/12/12															
11	Publish regulations and procedures for aircraft and operators approval / Publicar reglamentaciones y procedimientos nacionales para aprobacion de aeronaves y operadores	Mon 16/07/07	Fri 31/12/10															
12	Publish GNSS regulations / Publicar reglamentaciones GNSS	Mon 16/07/07	Fri 28/12/12															
13	Finalize WGS-84 implementation / Finalizar la implementacion WGS-84	Mon 16/07/07	Fri 28/12/12															
14	Publish AIP Supplement including applicable PBN standards and procedures / Publicar suplemento AIP incluyendo normas y procedimientos PBN aplicables	Mon 16/07/07	Fri 28/12/12															
15	Update Letters of Agreement between ATC units / Actualizar cartas de acuerdo entre unidades ATC	Mon 16/07/07	Fri 28/12/12															
16	Develop PBN proposal for amendment to the applicable regional documentation / Desarrollar propuesta de enmienda PBN a la documentacion regional aplicable	Mon 16/07/07	Fri 28/12/12															

ATM Implementation Work Programme / Programa de implementacion ATM Date / Fecha: 03/05/10	Task		External Tasks		Manual Task	
	Milestone		Project Summary		Duration-only	
	Summary		Group By Summary		Manual Summary Rollup	
	Rolled Up Task		Inactive Task		Manual Summary	
	Rolled Up Milestone		Inactive Task		Start-only	
	Rolled Up Progress		Inactive Milestone		Finish-only	
	Split		Inactive Summary		Progress	

ATM Implementation Work Programme - Appendix / Apéndice al Programa de Trabajo de Implementación ATM

ID	Task Name/Tarea	Start/Inicio	Finish/Término	2007		2008		2009		2010		2011		2012		2013		2014
				H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	
17	Evaluate and implement PBN requirements for ATC Automated Systems, considering the new ICAO Flight Plan Format / Evaluar e implementar los requisitos de los sistemas automatizados ATC, considerando el nuevo formulario de plan de vuelo de la OACI	Mon 16/07/07	Fri 28/12/12															
18	Develop Training programme for Pilots, ATCOs, operators and regulators / Desarrollar un programa de Capacitacion para Pilotos, ATCOs, operadores y reguladores	Mon 16/07/07	Fri 28/12/12															
19	Implement PBN programme for oceanic, continental and terminal areas in accordance with PBN roadmap / Implementar progama PBN para areas oceanica, continental segun el mapa de ruta PBN	Mon 16/07/07	Fri 30/12/16															
20	Optimize the airspace structure through implementation of RNAV Routes in the upper airspace based on RNAV-5 / Optimizar la estructura del espacio aereo superior mediante la implementacion de rutas RNAV en el espacio aereo superior en base a RNAV-5	Fri 28/12/01	Fri 28/12/12															
21	Implement SIDs/STARS in terminal areas based on RNAV/1-2 and RNP1 specifications / Implementar SIDs/STARS en areas terminales en base a especificaciones RNAV/1-2 y RNP1	Fri 28/12/01	Fri 28/12/12															
22	Design and implement PBN APV approach procedures in accordance with Assembly Resolution A37-11 / Diseñar e implementar procedimientos de aproximacion PBN segun la Resolucion de la Asamblea A37-11	Mon 16/07/07	Fri 30/12/16															
23	Develop a performance measurement programme / Desarrollar un plan de medicion de la performance	Mon 16/07/07	Fri 30/12/16															
24	Monitor System Performance / Monitorear la performance del sistema	Mon 16/07/07	Fri 30/12/16															

ATM Implementation Work Programme / Programa de implementacion ATM
Date / Fecha: 03/05/10

Task		External Tasks		Manual Task	
Milestone		Project Summary		Duration-only	
Summary		Group By Summary		Manual Summary Rollup	
Rolled Up Task		Inactive Task		Manual Summary	
Rolled Up Milestone		Inactive Task		Start-only	
Rolled Up Progress		Inactive Milestone		Finish-only	
Split		Inactive Summary		Progress	

APPENDIX B

CONCLUSION 3/1 IMPLEMENTATION OF A PBN AIRSPACE CONCEPT IN THE CAR REGION

That CAR States and Territories and COCESNA implement a PBN airspace concept, in accordance with the PBN Airspace Concept for the CAR Region (<http://www.mexico.icao.int/ATM.html#PBN>) with the following milestones:

- a) publish by **30 November 2011**:
 - i) RNAV 5 navigation specifications for RNAV routes that have been implemented or are in the process of being implemented in the upper airspace; and
 - ii) RNAV 1 specifications, as required, for RNAV routes that has been implemented or are in the process of being implemented in the terminal areas (TMA);
- b) implement:
 - i) realignment improvements or new RNAV routes in the lower airspace, in accordance with the air navigation regional agreements;
 - ii) continuous descent operations (CDO) in terminal areas (TMA) as required;
 - iii) PBN approach procedures, in compliance with ICAO Assembly Resolution A37-11;
- c) complete the NDB deactivation in coordination with other States with adjacent ATS units, by **31 January 2018**;
- d) develop by **31 January 2012** a national data collection programme on PBN implementation results; and
- e) inform the ICAO NACC Regional Office **by 31 December 2011** on the progress achieved and newly identified needs in accordance with items a), b), c) and d) above for a harmonized implementation of a PBN airspace concept in the CAR Region.

PBN Implementation Progress in the CAR Region and Bermuda (06.01.11) /Avances de implementación PBN en la Region CAR y Bermuda (06.01.11)

FIR	RNP/RNAV Approach Procedures & SIDS/STARS									RNAV Routes / Rutas RNAV
	Procedimientos de Aproximacion RNP/RNAV & SIDS/STARS									
	State, Territory / Estado, Territorio (#Aerodromes / #Aerodromos)	Aerodrome / Aeródromo	RWY / Pista	SIDS	STARs	APPs (RNP)	TOTAL	AIP issued / Publicacion en AIP	Remarks / Notas	
CENTRAL AMERICA	BELIZE (1)	MZBZ	07/25							
	COSTA RICA (4)	MROC	07/25	2	2		4	Feb-10	RNAV (GNSS)	
		MRPV	09/27							
		MRLB	07/25							
		MRLM	14/32			1	1	Jun-09	RNAV (GPS)	
	EI SALVADOR (2)	MSLP	07/25	3	3	3	11	Dec-09	RNAV (GNSS)	
		MSSS	15/33 - 08/26							
	GUATEMALA (2)	MGGT	01/19	3	6		9	Nov-05	RNAV	
		MGTK	10/28							
	HONDURAS (5)	MHTG	02/20	5	3	6	14	Nov-10	RNAV (GNSS)	
		MHSC	17/35			2	2	Nov-10	RNAV (GPS)	
		MHLC	06/24							
		MHLM	04/22	4	6	1	11	Jan-09	RNAV (GNSS)	
	MHRO	06/24	4	5	1	10	Jan-09	RNAV (GNSS)		
NICARAGUA (1)	MNMG	09/27								
CURACAO	ARUBA (1)	TNCA	11/29			2	2	Mar-08	RNAV (GPS)	
	BONAIRE (1)	TNCB	10/28							
	CURACAO (1)	TNCC	11/29							
HAVANA	CUBA (10)	MUCM	07/25							
		MUCC	08/26							
		MUCL	12/30							
		MUCF	02/20							
		MUHA	06/24							
		MUHG	05/23							
		MUMZ	08/26							
	MUCU	10/28 - 01/19								

FIR	RNP/RNAV Approach Procedures & SIDS/STARS									RNAV Routes / Rutas RNAV
	Procedimientos de Aproximacion RNP/RNAV & SIDS/STARS									
	State, Territory / Estado, Territorio (#Aerodromes / #Aerodromos)	Aerodrome / Aeródromo	RWY / Pista	SIDS	STARs	APPs (RNP)	TOTAL	AIP issued / Publicacion en AIP	Remarks / Notas	
		MUSC	08/26							
		MUVR	06/24							
KINGSTON	CAYMAN ISLANDS, UK (2)	MWCB	09/27			2	2	Jan-10	RNAV (GNSS)	
		MWCR	08/26			2	2	Feb-10	RNAV (GNSS)	
	JAMAICA (2)	MKJP	12/30	3		2	5	Aug-08	RNAV GNSS	
		MKJS	07/25	4		2	6	Jun-06	RNAV GNSS	
MEXICO	MEXICO (66)	MMMX	05/23-L/R						CDO	
		MMTO	15/33	2	2		4	Feb-11	RNAV (GNSS)	
NASSAU	BAHAMAS (8)	MYNN	14/32 - 09/27	10		3	13	Nov-08	RNAV (GPS)	
		MYGF	06/24	7		2	9	Jul-09	RNAV (GPS)	
		MYEH	07/25	4		1	5	May-09	RNAV (GPS)	
		MYSM	10/28	1	1	1	3	Jan-10	RNAV (GPS)	
		MYEF	12/30	2		2	4	Jan-10	RNAV (GPS)	
		MYEM	15/33	2		2	4	May-09	RNAV (GPS)	
		MYAT	14/32	2		2	4	Feb-10	RNAV (GPS)	
		MYSM	10/28	1	1	1	3	Jan-10	RNAV	
NAT	BERMUDA, UK (1)	TXKF	12/30			4	4	Nov-09	RNAV (GNSS)	
PORT AU PRINCE	HAITI (2)	MTPP	10/28	5		2	7	Jul-05	RNAV (GPS)	
		MTCH	05/23	12		2	14	Jul-05	RNAV (GPS)	
	ANGUILLA, UK (1)	TQPF	10/28			2	2	Mar-05	RNAV (GPS)	
	ANTIGUA & BARBUDA (2)	TAPH								
		TAPA	07/25							
	BARBADOS (1)	TBPB	09/27	2		2	4	May-09	RNAV (GPS)	

FIR	RNP/RNAV Approach Procedures & SIDS/STARS									RNAV Routes / Rutas RNAV
	Procedimientos de Aproximacion RNP/RNAV & SIDS/STARS									
	State, Territory / Estado, Territorio (#Aerodromes / #Aerodromos)	Aerodrome / Aeródromo	RWY / Pista	SIDS	STARs	APPs (RNP)	TOTAL	AIP issued / Publicacion en AIP	Remarks / Notas	
PIARCO	DOMINICA, UK (1)	TDCF	09/27			2	2	Jun-11	RNAV (GNSS)	
	FRANCE (5)	TFFM	09/27							
		TFFR	11/29			1	1	Apr-09	RNAV (GNSS)	
		TFFF	09/27		4	2	6	Jan-09	RNAV GNSS	
		LVFM	12/30							
		LFVP	08/26			2	2	Sep-05	RNAV GNSS	
	GRENADA (1)	TGPZ								
	MONTserrat, UK (1)	TRPG								
	ST. KITTS & NEVIS (1)	TKPK	07/25	1		2	3	Jun-11	RNAV (GNSS)	
	ST. LUCIA (2)	TLPC	09/27			2	2	Jun-11	RNAV (GNSS)	
		TLPL	10/28							
	ST. VINCENT & THE GRANADINES (2)	TVSV	07/25							
		TVSC	13/31			2	2	Jan-09	RNAV GNSS	
TRINIDAD & TOBAGO (2)	TTPP	10/28			2	2	Aug-09	RNAV GNSS		
	TTCP	11/29			2	2	Jan-09	RNAV (GPS)		
SANTO DOMINGO	DOMINICAN REPUBLIC (7)	MDSD	17/35	11	14	4	29	Feb-10	RNAV (GNSS)	
		MDPC	09/27	8	10	4	22	Jun-09	RNAV (GNSS)	
		MDPP	08/26	10	10	4	24	Jun-09	RNAV (GNSS)	
		MDLR	11/29	10	10	4	24	Jun-09	RNAV (GNSS)	
		MDST	11/29	8	12	4	24	Mar-10	RNAV (GNSS)	
		MDJB	01/19	8	12	4	24	Mar-10	RNAV (GNSS)	
		MDCY	07/25	8	12	4	24	Mar-10	RNAV (GNSS)	

FIR	RNP/RNAV Approach Procedures & SIDS/STARS								RNAV Routes / Rutas RNAV
	Procedimientos de Aproximacion RNP/RNAV & SIDS/STARS								
	State, Territory / Estado, Territorio (#Aerodromes / #Aerodromos)	Aerodrome / Aeródromo	RWY / Pista	SIDS	STARs	APPs (RNP)	TOTAL	AIP issued / Publicacion en AIP	
SAN JUAN - MIAMI	BRITISH VIRGIN I., UK (1)	TUPJ	07/25						
	PUERTO RICO, US (6)	TJBQ	08/26			1	1	Oct-09	RNAV (GPS)
		TJIG	09/27			1	1	Apr-08	RNAV (GPS)
		TJMZ	09/27			1	1	Oct-05	GPS
		TJPS	12/30			2	2	Mar-09	RNAV (GPS)
		TJSJ	08/26-10/28	7	10	3	20	May-09	RNAV (GPS)
		TJVQ	09/27	1		1	2	Feb-10	RNAV (GPS)
	ST. EUSTATIUS, NL (1)	TNCE	07/25						
	ST. MAARTEN (1)	TNCM	10/28	1	3	1	5	Jun-09	RNAV GNSS
	TURKS & CAICOS I., UK (5)	MBAC	07/25	4		2	6	Feb-10	RNAV (GNSS)
		MBGT	11/29			2	2	Feb-10	RNAV (GNSS)
		MBMC	10/28	7		2	9	Dec-08	RNAV (GNSS)
		MBPV	10/28	3		2	5	Feb-10	RNAV (GNSS)
		MBSC	11/29			2	2	Feb-10	RNAV (GNSS)
	VIRGIN ISLANDS, US (2)	TIST	10/28			1	1	Nov-06	RNAV (GPS)
		TISX	10/28			2	2	Nov-06	RNAV (GPS)
TOTAL			165	126	118	411			