International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
First Meeting of the Communications, Navigation and Surveillance / Air Traffic Management Subgroup (CNS/ATM/SG/1)
(Lima, Peru, 15-19 March 2010)

Agenda Item 2: Review of Global and CAR/SAM CNS/ATM Developments

FORESEEN EVOLUTION OF AIR NAVIGATION IN THE HAVANA FIR

(Presented by Cuba)

SUMMARY

This paper provides information about new elements related to air navigation in the Havana FIR.

References:

- Resolutions of the 36th Session of the ICAO Assembly;
- Final report of the GREPECAS/15 meeting; and
- Final report of the Tenth Meeting of Directors General of Civil Aviation of the Central Caribbean.

1. Introduction

1.1 At its 36th Session, the ICAO Assembly, through Resolution A36-23, urged all States to implement Air Traffic Service (ATS) routes and RNAV and RNP approach procedures according to the PBN concept of ICAO, and determined that the States and Regional Planning and Implementation Groups should develop a PBN implementation plan.

1.2 The GREPECAS/15 meeting, held in Rio de Janeiro on 13-17 October 2008, adopted Conclusion 15/38 “NATIONAL PBN IMPLEMENTATION PLANS”, according to which CAR/SAM States/Territories must develop their National PBN Implementation Plans and submit them to their corresponding Regional Offices.

1.3 The Tenth Meeting of the Directors General of Civil Aviation of the Central Caribbean held in the Cayman Islands from August 18 to 21, 2009 adopted Conclusion 10/8 “PBN IMPLEMENTATION IN NATIONAL AIR NAVIGATION SYSTEMS” where the Central Caribbean States//Territories must inform about their national plan and the progress made for the implementation of PBN achieved in the national air navigation systems.

1.4 The GREPECAS/15 meeting adopted Conclusion 15/45 REVISION OF THE PLAN FOR DECOMMISSIONING NDB STATIONS” whereby the States /Territories/International Organisations must review and complete the information in the Regional Plan for Decommissioning NDB Stations in the CAR/SAM Regions.

1.5 This working paper shows the level of compliance with, and status of implementation of Resolution A36-23 of the ICAO Assembly and Conclusions 15/38 and 15/45 of the GREPECAS/15 meeting, by Cuba. It also provides information about strategies and considerations of the Aeronautical Authority of Cuba with respect to air navigation in the Havana FIR.

2. PBN Training

2.1 On 8-19 June 2009, the Institute of Civil Aeronautics of Cuba sponsored a course on the Design and Construction of RNAV Procedures, conducted by two professors of the National School of Civil Aviation (ENAC) of France. Several States and organisations of the ICAO CAR Region participated.

2.2 As a result of this course, civil aviation in Cuba now has a team of six specialists in design and construction of RNAV procedures. These specialists were selected from the group of thirteen PANS –OPS specialists who graduated in Cuba in 2005.

3. Draft Resolution on GNSS navigation in the Havana FIR

3.1 In order to create the necessary environment for PBN implementation in Cuba, the Aeronautical Authority has worked on the creation of a new Resolution on GNSS Navigation in the Havana FIR. This new Resolution is currently undergoing final revision by the Legal Department of the Institute of Civil Aeronautics of Cuba, and shall published through an AIC in Spanish and English in 2010.

3.2 This new Resolution will specify the operational requirements to be met by air operators for the use of GNSS navigation in the Havana FIR, specifications for VFR and IFR flights, non-precision approach procedures, flight plan and procedures for GNSS operation with loss of RAIM.

4. National Plan for PBN implementation in the Havana FIR

4.1 In compliance with ICAO Resolution A36-23, GREPECAS Conclusion 15/38, and Conclusion 10/8 of the Tenth Meeting of Director Generals of Civil Aviation of the Central Caribbean, the Aeronautical Authority of Cuba has established a National Plan for PBN Implementation. This Plan appears in **Appendix** A to this working paper.

4.2 In compliance with GREPECAS Conclusion 15/38, the Aeronautical Authority of Cuba appointed Mirta Crespo Frasquieri, Director of Air Navigation of the Institute of Civil Aeronautics of Cuba (IACC), as its contact point for the coordination of the national implementation of PBN. E-mail: mirta.crespo@iacc.avianet.cu, telephone (537) 838 – 1121, Fax: (537) 834 4571.

5. Execution of the National Plan for PBN implementation in the Havana FIR

5.1 The National PBN Team has been created in Cuba, made up by six specialists graduated from the last course on the Design and Construction of RNAV Procedures. This group meets on a monthly basis and carries out extended meetings periodically, with the participation of domestic airline representatives (they even has one representative from American Airlines), airdrome specialists, CNS, MET, AIS/MAP, military authorities, among others.

5.2 This National PBN Team developed the project for new RNAV/5 routes in the Havana FIR. This project will be submitted soon to the consideration of the ICAO NACC Regional Office.

5.3 Work is also underway for the implementation in 2010 of the first APV BaroVNAV procedures at international airports corresponding to the initial 30% as foreseen in A36-23.

6. Implementation of ILS/DME systems to replace 75 MHz radiobeacons

6.1 The Aeronautical Authority of Cuba has deemed it appropriate to eliminate the external and intermediate 75 MHz radiobeacons associated to the ILS system, and to replace them with DME systems associated to the ILS glide path radio range.

6.2 In Cuba, there are five ILS Systems, two of which have associated DMEs, at the Jardines del Rey and Santiago de Cuba airports. The implementation of the next DMEs for the remaining three ILS is foreseen in a period of three years.

6.3 The advantages of this solution found by the Aeronautical Authority of Cuba are the following:

a) Crews are provided with more precise distance information on an ongoing basis during all the approach procedure.
b) Maintenance and operation costs of two OM and MM aeronautical stations are eliminated.
c) The external makers are located outside the airport perimeter, and occasionally in intricate places. In this station, the transportation costs for maintenance and service due to outages, air conditioning and an auxiliary power generator are eliminated.
d) 100W DME systems of the same technological line as the DME systems associated to VORs are introduced, thus providing an efficient service in case of outages. The technical personnel that take care of these systems were trained in the factory.

7. Implementation of the National Plan for NDB Deactivation

7.1 The Aeronautical Authority of Cuba has established and submitted to the International Civil Aviation Organization a national Plan for NDB Deactivation. **Appendix B** to this working paper shows the update to the National Plan for NDB Deactivation in Cuba.

7.2 Under this Plan, five NDB stations have already been eliminated: UHA, VA, UCA, UNV and K. It is foreseen that three additional NDB stations will be eliminated in 2010. It has been verified that the elimination of these radio aids have not affected air navigation in the Havana FIR.

7.3 To date, the eliminated NDBs correspond to airports where there were two NDBs (one NDB and one L) existed in the same position as the external and intermediate markers. Consideration has also been given to the elimination of NDBs that only covered en-route functions in domestic airways, and NDBs at international airports that have VOR/DME and ILS systems.

7.4 However, Cuba is still studying the possibility of eliminating NDBs at domestic airports where there is no other radio aid and IFR operations need to be maintained.

8. Conclusions

8.1 The Aeronautical Authority of Cuba considers that the new air navigation elements introduced and those to be introduced in the short term in the Havana FIR will considerably enhance safety assurance, while improving the efficiency of air operations and reducing environmental impact.

8.2 It is also important to maintain and revitalise the operation of the National PBN Team, and to promote seminars or training activities to strengthen State preparedness for Performance-Based Air Navigation (PBN).

9. Suggested Action

9.1 The Meeting is invited to:

a) Take note of the contents of this working paper; and

b) Support the actions contained in Resolution A36-23 and GREPECAS Conclusions 15/38 and 15/45.

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APPENDIX A

NATIONAL PLAN FOR THE IMPLEMENTATION OF PERFORMANCE-BASED NAVIGATION (PBN) IN THE HAVANA FIR

Legend:

- CACSA: *Corporación de la Aviación Civil de Cuba S.A.*

(Cuba Civil Aviation Corporation)

- DAD: *Dirección de Aeródromo del IACC*

(IACC Airdrome Bureau)

- DAN – IACC: *Dirección de Aeronavegación del Instituto de la Aeronáutica Civil de Cuba*.

(Air Navigation Bureau of the Institute of civil Aeronautics of Cuba)

- DIA: *Dirección de Ingeniería y Aeronavegabilidad del IACC*

(IACC Engineering and Airworthiness Bureau)

- DOSA: *Dirección de Operaciones y Seguridad Aeronáutica del IACC*

(IACC Aeronautical Operations and Safety Bureau*)*

- ECASA: *Empresa Cubana de Aeropuertos y Servicios Aeronáuticos*

(Cuban Airport and Aviation Service Company)

- LITA: *Laboratorio de Investigaciones del Tránsito Aéreo*

(Air Traffic Research Laboratory)

- USNA: *Unidad de Servicios a la Navegación Aérea*

(Air Navigation Service Unit)

NATIONAL ACTION PLAN FOR PBN IMPLEMENTATION IN THE HAVANA FIR				
		Start	**End**	**Responsible Party**
1	**Airspace concept**	**Jan. 2009**	**2014**	
1.1	Establish and prioritise strategic objectives, safety, capacity, environment, etc).	Jan. 2009	Oct. 2009	DAN IACC
1.2	Collect traffic data to understand traffic flows in the airspace in: - Havana FIR - Havana TMA and Santiago TMA	Sep. 2009	Oct. 2009	Havana ACC, LITA

1.3	Analyse the navigation capacity of the aircraft fleet that operates in: - Havana FIR - Havana TMA and Santiago TMA - Airports	Sep. 2009	Mar. 2010	DAN and DIA IACC
1.4	Analyse the means of communication, navigation (VOR, DME) and ground surveillance for navigation specifications and review the method of compliance.	Sep. 2009	Oct. 2009	DAN – IACC, USNA and ECASA communication
1.5	Optimise airspace structure, reorganising the network or implementing new routes based on the strategic objectives of the airspace concept, ATC simulations (fast time and/or real time), live tests, etc.	Oct. 2009	Dec. 2009	DAN / MINFAR / ACC / PBN Team
1.6	Optimise airspace structure, through the implementation of new SIDs and STARs, based on the strategic objectives of the airspace concept, taking into account airspace model, simulations, ATC (fast time and/or real time), live tests, etc.: - First stage with 30% of airports. - Second stage with the remaining airports.	Jan. 2010 Aug. 2010	May. 2010 2014	DAN – IACC and USNA (MUHA/MUVR/MUCL) ECASA UT Cayo Coco (MUCM/MUCC) ECSA UT Holguín (MUHG/MUCU) Remaining airports
1.7	Design instrument approach procedures (NPA/APV Baro-VNAV), based on the strategic objectives of the airspace concept, taking into account airspace models, ATC simulations (fast and/or real time), real analysis, etc. - First stage with 30% of the airports. - Second stage with the remaining airports.	Jan. 2010 Aug. 2010	May. 2010 2014	PBN Team
2.	**Develop a performance measuring plan**	**Oct. 2009**	**Aug. 2010**	
2.1	Design a performance measuring plan, including gas emissions, safety, efficiency, etc.	Oct. 2009	Dec. 2009	DAN, DIA, DOSA, DAD IACC
2.2	Direct and apply the performance measuring plan.	Jan. 2010	Aug. 2010	DAN, DIA, DOSA, DAD IACC and service providers
3	**Safety Assessment**	**Jan. 2010**	**Dec. 2010**	
3.1	Determine the methodology to be used to assess airspace safety and route spacing, depending on the navigation specification. (Considering airspace model, ATC simulations (fast time and/or real time), live tests, etc.)	Jan. 2010	Mar. 2010	DAN IACC LITA
3.2	Prepare a data collection programme for airspace safety assessment	Apr. 2010	Jun. 2010	Havana ACC, LITA Havana and Santiago TMAs
3.3	Prepare preliminary airspace safety assessment	Jul. 2010	21 Oct. 2010	Havana ACC, LITA Havana and Santiago TMAs
3.4	Prepare final airspace safety assessment	21 Oct. 2010	Dec. 2010	Havana ACC, LITA Havana and Santiago TMAs
4 Establish a Collaborative Decision-Making process (CDM)		**Oct. 2009**	**Dec. 2011**	

4.1 Coordinate planning and implementation needs with air navigation service providers, regulators, users, aircraft operators and military authorities	Oct. 2009	Dec. 2009	IACC Aviation Bureaux / MINFAR / Service providers / PBN Team
4.2 Establish date of implementation	Oct. 2009	Dec. 2011	DAN IACC
4.3 Report planning and implementation progress to the corresponding Regional Office	Jan. 2010	Dec. 2011	DAN IACC
5 ATC Automated Systems	**Oct. 2009**	**2014**	
5.1 Assess PBN implementation in ATC automated systems, considering Amendment 1 to PANS/ATM, related to changes in the flight plan format.	Oct. 2009	Nov. 2012	ATS and COM ECASA (LITA, RADCOM)
5.2 Implement the necessary changes in ATC automated systems, including ATC simulators. - Routes - 30% SIDs, STARs, IAP - 70% SIDs, STARs, IAP	21 Oct. 2010	 3/6/2010 21/10/2010 2014	ATS and COM ECASA
5.3 Manage ATS and AIS changes	Jun. 2010	2014	ATS and AIS
6 Approval of Aircraft and Operators	**Oct. 2009**	**Dec. 2011**	
6.1 Take note of the national implementation programme and of the navigation specifications required.	Oct. 2009	Dec. 2009	DIA and DOSA IACC
6.2 Analyse the requirements for the approval of aircraft, crews, and operators for navigation specifications to be implemented, according to the contents of the ICAO PBN Manual.	Jan. 2010	Aug. 2010	DIA and DOSA IACC
6.3 Publish national regulations for the implementation of the required ICAO navigation specifications.	Jan. 2010	Jun. 2010	DIA and DOSA IACC
6.4 Aircraft and operator approval for each type of procedure and navigation specification.	Jan. 2010	Jun. 2010	DIA and DOSA IACC
6.5 Establish and keep an updated record of approved aircraft and operators.	Jan. 2010	Jun. 2010	DIA and DOSA IACC
6.6 Verify operations with a continuous monitoring programme.	Oct. 2010	Dec. 2011	DIA and DOSA IACC
7 Standards and Procedures	**Sep. 2009**	**Dec. 2010**	
7.1 Evaluate regulations for the use of GNSS.	Sep. 2009	Dec. 2009	DAN IACC
7.2 Publish the AIC including applicable standards and procedures.	Jan. 2010	Feb. 2010	DAN IACC
7.3 Develop and publish the AIC informing about PBN implementation planning.	Mar. 2010	Apr. 2010	DAN IACC
7.4 Review the ATM MAC, Volume I, and all related RACs.	Sep. 2009	Sep. 2010	DAN IACC ECASA
7.5 SID and/or STAR Inspection /Validation and instrument approach procedures flight	Apr. 2010	May. 2010	DAN IACC
7.6 Compile and file procedure validation records.	Jun. 2010	Jul. 2010	DAN IACC

7.7	Update letters of agreement between ATS units.	Aug. 2010	Sep. 2010	ECASA
7.8	Provide procedures to accommodate non-RNAV/RNP aircraft, when applicable.	Jan. 2010	Jun. 2010	PBN Team
7.9	Identify transition areas and procedures, if necessary.	Jan. 2010	Jun. 2010	PBN Team
7.10	Carry out ATC simulations to identify the workload/operational factors, if necessary, and report simulation activities to the Air Navigation Committee.	Aug. 2010	Dec. 2010	ECASA
8	**Training**	**Apr. 2010**	**Dec. 2010**	
8.1	Develop a training and documentation programme for operators (pilots, dispatchers and maintenance).	Apr. 2010	May. 2010	DAN and DOSA IACC PBN Team
8.2	Develop a training and documentation programme for air traffic controllers and AIS operators.	Apr. 2010	May. 2010	DAN IACC PBN Team
8.3	Develop a training programme for regulators (aviation safety inspectors) and civil aviation managers.	Apr. 2010	May. 2010	DAN and DOSA IACC PBN Team
8.4	Carry out training programmes. - Training course for service provider instructors.	Jun. 2010	Oct. 2010	DCAP CACSA PBN Team
8.5	Hold seminars for operators, indicating plans and operational and economic benefits expected.	Oct. 2010	Dec. 2010	DCAP CACSA PBN Team
9	**Implementation Decision**	**Jan. 2010**	**Feb. 2011**	
9.1	Evaluate the operational documents available (ATS, OPS/AIR).	Apr. 2010	Jun. 2010	DAN, DIA and DOSA IACC
9.2	Evaluate the percentage of approved aircraft and operators (equipment involved).	Jan. 2010	Mar. 2010	DIA and DOSA IACC
9.3	Review results of the safety assessment.	Jan. 2011	Feb. 2011	DAN, DIA and DOSA IACC
10	**Performance Monitoring System**	**Sep. 2010**	**Dec. 2010**	
10.1	Develop an operations post-implementation monitoring programme in: - FIR - TMA - APP	Sep. 2010	Oct. 2010	DAN, DIA, DOSA, DAD IACC
10.2	Implement an operations post-implementation monitoring programme in: - FIR - TMA - APP	Nov. 2010	Dec. 2010	DAN, DIA, DOSA, DAD IACC
Pre-operational implementation date		**26 Aug. 2010**	**21 Oct. 2010**	**DAN IACC ECASA**
Final implementation date		**21 Oct. 2010 (30%) 2014 (70%)**		**DAN IACC ECASA**

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APPENDIX B / APENDICE B

CUBA NDB NATIONAL DEACTIVATION PLAN (2008-2020)
PLAN NACIONAL DE DESACTIVACION DE NDB (2008-2020) DE CUBA

Adminsitration/Site Administración/Lugar	ID	Function Función	Deate to Deactivate/ Fecha a Desactivar	Remarks/Observaciones		
				Coordinates/ Coordenadas	Frec. (kHz)	Status/ Estado
1	2	3	4	5	6	7
Ciego de Ávila/Máximo Gómez	UCA	A/L/E	2006	215922.01N/ 0785218.88W	390.00	Eliminated/ Eliminado
Santiago de Cuba/A. Maceo Intl.	K	A/L	2008	195807.68N/ 0755607.25W	348.00	Eliminated/ Eliminado
Varadero/J. G. Gómez Intl.	VA	A/L	2008	225918.70N 0813029.24W	430.00	Eliminated/ Eliminado
Habana/José Martí Intl.	UHA	A/L/T	2008	225558.18N 0822932.00W	348.00	Eliminated/ Eliminado
Nuevas	UNV	E	2009	212358.00N 0771357.00W	256.00	Eliminated/ Eliminado
Cayo Coco/J. del Rey Intl.	UCC	A/L	2010-2015	222804.41N 0781824.64W	382.00	In process of elimination/ En proceso de eliminación
Santiago de Cuba/A. Maceo Intl.	UCU	A/L/T	2010-2015	195822.36N 0754915.30W	339.00	In process of elimination/ En proceso de eliminación
Varadero/J. G. Gómez Intl.	V	A/L	2010-2015	230111.80N 0812729.31W	420.00	In process of elimination/ En proceso de eliminación
Habana/José Martí Intl.	A	A/L	2015-2020	225825.56N 0822556.01W	339.00	In use/En uso
Cayajabo	UCY	T	2010-2015	225129.00N 0825110.00W	380.00	In use/En uso
Zaragoza	UZG	T	2010-2015	225606.00N 0820219.00W	283.00	In use/En uso
Baracoa/Gustavo Rizo	UBA	A/L/E	2015-2020	202210.14N 0743122.26W	278.00	In use/En uso
Bayamo/C. M. Céspedes	UBY	A/L/E	2015-2020	202338.02N 0763709.04W	268.00	In use/En uso
Cayo Largo del Sur/Vilo Acuña Intl.	UCL	A/L	2015-2020	213615.02N 0813144.58W	230.00	In use/En uso
Cayo Las Brujas	UBR	A/L	2015-2020	223711.90N 0790841.97W	315.00	In use/En uso
Ciego de Avila/Máximo Gómez	UCV	A/L	2015-2020	220057.96N 0784848.81W	360.00	In use/En uso
Cienfuegos/Jaime González	UCF	A/L	2015-2020	220650.00N 0802531.21W	212.00	In use/En uso
Guantánamo/Mariana Grajales	UGT	A/L/E	2015-2020	200444.23N 0750929.87W	300.00	In use/En uso
Las Tunas/Hnos Almejeiras	UVT	A/L	2015-2020	205919.01N	296.00	In use/En uso

				0765619.63W		
Manzanillo/Sierra Maestra	M	A/L	2015-2020	201657.25N 0770636.94W	244.00	In use/En uso
Moa/Orestes Acosta	UMO	A/L/E	2015-2020	203819.90N 0745715.58W	212.00	In use/En uso
Nueva Gerona/Rafael Cabrera	D	A/L	2015-2020	214918.06N 0824757.65W	278.00	In use/En uso
	UNG	A/L	2015-2020	214524.21N 0825241.37W	412.00	In use/En uso
Playa Baracoa	UPB	A/L	2015-2020	230123.43N 0823450.67W	250.00	In use/En uso
Trinidad/Alberto Delgado	UTD	A/L/E	2015-2020	214726.10N 0795928.25W	300.00	In use/En uso
Las Tunas/Hnos Ameijeiras	UVT	A/L	2015-2020	205919.01N 0765619.63W	296.00	In use/En uso
Camaguey/I. Agramonte Intl.	UCM	A/L	Until the end of the technological useful life, even if it goes beyond 2020	212325.28N 0775544.66W	370.00	In use/En uso
	C	A/L		212448.58N 0775157.11W	402.00	In use/En uso
Holguín/Frank País Intl.	HG	A/L		204613.84N 0761954.61W	220.00	In use/En uso
	UHG	A/L		204349.85N 0762235.03W	353.00	In use/En uso
Santa Clara/A. Santamaría	USC	A/L		222850.56N 0795936.33W	240.00	In use/En uso
	U	A/L		222900.00N 0795936.33W	287.00	In use/En uso

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