International Civil Aviation Organization
CAR/SAM REGIONAL PLANNING AND IMPLEMENTATION GROUP (GREPECAS)
Sixth Meeting of the CNS Committee of the GREPECAS ATM/CNS Subgroup (CNS/COMM/6)
Santo Domingo, Dominican Republic, 30 June to 4 July 2008

Agenda Item 2: **Development of Navigation Systems**

2.1 Review of the regional GNSS implementation plan

PROPOSAL OF AMENDMENT TO THE REGIONAL AIR NAVIGATION PLAN – TABLE CNS/3 OF FASID

(Presented by the Secretariat)

Summary

This working paper presents a proposal of amendment to the Regional Air Navigation Plan -- Table CNS/3 -- so that it will reflect the plans for the use of ABAS systems within GNSS requirements to support en-route, terminal, and non-precision approach operations.

References:

- Report of the CAR/SAM RAN/3 meeting (Buenos Aires, Argentina, 5-15 October 1999)
- CAR/SAM Regional Air Navigation Plan, Volumes I and II
- Report of the GREPECAS/14 meeting (San José, Costa Rica, 16-20 April 2007)
- Report of the third meeting of the GNSS Task Force (Lima Peru, 2-3 June 2008)
- Report of the I meeting of the NACC Working Group (Trinidad and Tobago, 21-23 June 2007)
- Reports of the II Meeting of the NACC Working Group (Ocho Rios, Jamaica, 12-16 May 2008)

Strategic objectives:	*This working paper is related to Strategic objective D.*

1. Introduction

1.1 The CAR/SAM RAN /3 Meeting held in Buenos Aires, Argentina, from 5 to 15 October 1999 reviewed and updated the table of radio navigation aids for the CAR/SAM Regions (Table CNS 3) prepared by the CAR/SAM Regional Planning and Implementation Group (GREPECAS).

1.2 In this regard, the CAR/SAM RAN/3 meeting formulated Recommendation 10/2 - *Aeronautical Radio Navigation Aids Plan* to ensure that Table CNS 3 is included in Volume II of the new Air Navigation Plan, the document on facilities and services in the CAR/SAM Regions (FASID).

1.3 Table CNS 3 revised by the CAR/SAM RAN/3 meeting stipulates the radio navigation aids that should be provided for each CAR/SAM State and Territory to satisfy approach (PA1, PA2 and PA3 precision and NPA non-precision), landing, terminal area, en-route, and surface movement operations.

1.4 For the first time, Table CNS 3, reviewed and updated by the CAR/SAM RAN/3 meeting, introduces navigation satellite systems (GNSS) requirements by introducing the ground-based augmentation system (GBAS) and the satellite-based augmentation system (SBAS) to cover the operations cited in paragraph 1.3.

1.5 The CAR/SAM RAN/3 meeting also reviewed the planning principles for aeronautical navigation radio aids by, for the first time, introducing guidelines for the transition of navigation satellite systems (GNSS).

1.6 To this end, it formulated Recommendation 10/1 – *Planning principles for radio navigation aids,* to ensure their addition to Volume I, Part IV, Attachment H of the new Air Navigation Plan (Basic Plan), which basically contains the general planning and guidance criteria for its implementation.

2. Analysis

2.1 The GNSS elements considered in FASID Table CNS 3 are the ground-based augmentation system (GBAS) and the satellite-based augmentation system (SBAS). According to Table CNS 3, GBAS systems would be implemented for categories I, II and III precision approach and landing operations, and SBAS systems for en route, terminal, non-precision and landing operations.

2.2 Insofar as the implementation of GBAS systems is concerned, Brazil is the only country in the CAR/SAM Regions that has installed a GBAS system for trial purposes at the Río de Janeiro international airport. These trials are aimed at ensuring an operating and commissioned GBAS by 2010.

2.3 As regards the implementation of an SBAS system in the CAR/SAM Regions, Regional Project RLA/03/902 (SACCSA) is continuing to make the necessary studies to determine its technical and financial feasibility.

2.4 In the meantime, ever since the mid nineties, CAR/SAM States and Territories have been approving the use of GPS as supplementary, and in some cases primary, aid basically for en route air navigation operations. Today almost all of the CAR/SAM States and Territories have published an AIC approving GPS use.

2.5 Furthermore, a significant number of CAR/SAM States, Territories and International Organisations have implemented and published GNSS non-precision (NPA) procedures in their AIPs for lateral navigation operations (LNAV), using aircraft-based augmentation systems (ABAS), specifically GPS with RAIM.

2.6 In this regard, the GREPECAS/14 meeting held in San José, Costa Rica, on 16-20 April 2007, took note that, for the implementation of GNSS non-precision (NPA) procedures for lateral navigation operations (LNAV), CAR/SAM States/Territories/International Organisations should use GPS with RAIM, the WAAS signal-in-space or other available SBAS systems, together with the appropriate avionics and the continuous availability and accessibility of those signals that their providers should guarantee.

2.7 The GREPECAS/14 meeting also approved the PBN roadmap for the CAR/SAM Regions through Conclusion 14/46 - *CAR/SAM PBN roadmap*, which established a short- (up to 2010) and medium-term (2011-2015) implementation strategy. PBN short- and medium-term implementation would rest mainly on aircraft-based augmentation systems.

2.8 In this sense, during its I and II meetings, the NACC Working Group examined Table CNS 3 and noted that GNSS, GBAS and SBAS augmentations would be included in this Plan. As GNSS was gradually introduced, NDB and VOR stations would be phased out, but in the short term, GNSS would continue to be used in combination with stand-alone systems and conventional ground radio aids. Accordingly, the WG mentioned that it would be advisable to amend the Plan to reflect the plans to use ABAS (GPS+RAIM, etc.) as a GNSS element for the provision of navigation services.

2.9 CAR/SAM States, Territories and International Organisations, in response to GREPECAS Conclusion 14/56 (*Phase out of NDB stations),* informed of their plans for the phase out of NDB stations, stating that the main reason for this phase out was the existence of procedures with other aids, such as VOR/DME and aircraft-based augmentation systems.

2.10 The third meeting of the GNSS Task Force, held in Lima on 2-3 June 2008, taking into account ICAO SARPs and guidelines and the capacity/development of aircraft operating in CAR/SAM airspace, formulated draft Conclusion 03/04 – *Use of basic GNSS in the short term,* urging States, Territories and International Organisations to complete the development and approval of non-precision operations based on aircraft-based augmentation systems.

2.11 Taking into account the aforementioned aspects, it can be noted that the current Air Navigation Plan does not contemplate the planning of aircraft-based GNSS augmentation systems. Therefore, in the light of the need to plan for the use of aircraft-based augmentation systems in the short and medium terms in order to meet PBN requirements, the CAR/SAM Regional Air Navigation Plan should be amended.

2.12 The proposal of amendment of Table CNS 3 is shown as an **Appendix** to this working paper. The amendment consists of the addition of a new column under GNSS requirements that would contain ABAS requirements.

2.13 CAR/SAM States and Territories are already planning their operational requirements at their specified locations, taking into account the use of aircraft-based augmentation systems (ABAS). For this reason and in the light of the aforementioned aspects, the following draft conclusion is submitted to the consideration of the Meeting:

DRAFT
CONCLUSION CNS/6/X - AMENDMENT TO THE REGIONAL AIR NAVIGATION PLAN – TABLE CNS/3 OF FASID

> That ICAO consider amending the format of Regional Air Navigation Plan Table CNS 3 of the FASID by adding a new column under GNSS requirements to reflect the planning of ABAS requirements, as shown in the Appendix to this working paper, as well as the update of Attachment H to Volume I, Part IV of the Air Navigation Plan (Doc. 8733), which basically contains general planning and guidance criteria for its implementation.

2 Suggested action

2.1 The Meeting is invited to:

a) take note of the information contained in this paper ;

b) analyse the considerations about the proposal of amendment of the Regional Air Navigation Plan, Table CNS 3, which is presented in section 2 of this working paper;

c) examine draft conclusion CNS/6/XX with a view towards its approval; and

d) analyse any other considerations that the Meeting may deem appropriate.

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APPENDIX / APENDICE

TABLE CNS 3 / TABLA CNS 3

TABLE OF RADIO NAVIGATION AIDS TABLA DE AYUDAS PARA LA RADIONAVEGACIÓN

EXPLANATION OF THE TABLE

Column

1 Name of the country, city and aerodrome and, for route aids, the location of the installation.

2 The designator number and runway type:

NINST C Visual flight runway
NPA C Non precision approach runway
PA1 C Precision approach runway, Category I
PA2 C Precision approach runway, Category II
PA3 C Precision approach runway, Category III

3 The functions carried out by the aids appear in columns 4 to 8 and 10 to 12.

A/L C Approach and landing
T C Terminal
E C En route

4 ILS CInstrument landing system. Roman numerals I, II and III indicate the acting category of the ILS I, II or III. (I) indicates that the facility is implemented.

The letter AD@ indicates a DME requirement to serve as a substitute for a marker beacon component of an ILS.

Note.C Indication of the category refers to the performance standard to be achieved and maintained, in accordance with pertinent specifications in ICAO Annex 10, and not to specifications of the ILS equipment, since both specifications are not necessarily the same.

An asterisk (*) indicates that the ILS requires a Category II signal, but without the reliability and availability which redundant equipment and automatic switching provide.

5 Radio beacon localizer, be it associated with an ILS or to be used as an approach aid at an aerodrome.

6 Radiotelemetrical equipment. When an AX@ appears in column 6 in line with the VOR in column 7, this indicates the need that the DME be installed at a common site with the VOR.

7 VOR C VHF omnidirectional radio range.

8 NDB C Non-directional radio beacon.

9 The distances and altitude to which the VOR or VOR/DME signals are required, indicated in nautical miles (NM) or thousands of feet, or the nominal coverage recommended of the NDB, indicated in nautical miles.

10, 11,12 GNSS C global navigation satellite system (includes ABAS ,GBAS and SBAS).

ABAS (aircraft based augmentation system) implementation planned to be used for route navigation, for terminal and for non precision approach. Filling this column indicates when navigation services are allowed through the single use of, GPS + RAIM or GPS +RAIM with any other onboard supporting equipment.

GBAS (ground-based augmentation system) implementation planned to be used in precision approach and landing CAT I, CAT II, CAT III.

SBAS (satellite-based augmentation system) implementation planned to be used for route navigation, for terminal, for non precision approach and landing. An AX@ indicates service availability; exact location of installation will be determined.

Note. C GPS receiver is under standard rules and ABAS (aircraft-based augmentation system).

13 Remarks

Note.C Columns 5 to 12 use the following symbols:

D C DME required but not implemented.
DI C DME required and implemented.
X C Required but not implemented.
XI C Required and implemented.

EXPLICACIÓN DE LA TABLA

Columna

1 Nombre del país, ciudad y aeródromo y, para las ayudas en ruta, el emplazamiento de la instalación.

2 Número de designador y tipo de pista:

NINST C Pista de vuelo visual
NPA C Pista de aproximación que no es de precisión
PA1 C Pista de aproximación de precisión, Categoría I
PA2 C Pista de aproximación de precisión, Categoría II
PA3 C Pista de aproximación de precisión, Categoría III

3 La función efectuada por las ayudas figura en las Columnas 4 a 8 y 10 a 12.

A/L C Aproximación y aterrizaje
T C Terminal
E C En ruta

4 ILS C Sistema de aterrizaje por instrumentos. Los números romanos I, II y III indican la categoría de actuación del ILS, I, II o III. (I) indican que la instalación está en servicio.

La letra AD@ indica que se requiere un DME para sustituir a un componente de radiobaliza de un ILS.

Nota.C La indicación de la categoría se refiere a la norma de performance que ha de alcanzarse y mantenerse, de conformidad con las especificaciones pertinentes del Anexo 10 de la OACI, y no con las especificaciones del equipo ILS, ya que ambas especificaciones no son necesariamente las mismas.

Un asterisco (*) indica que el ILS requiere una señal de Categoría II, pero sin la fiabilidad y disponibilidad que proporcionan el equipo de reserva y la conmutación automática.

5 Localizador de radiofaro, asociado a un ILS o para utilizarlo como ayuda de aproximación en un aeródromo.

6 Equipo radiotelemétrico. Cuando figura una AX@ en la Columna 6 junto con el VOR de la Columna 7, quiere decir que el DME debe instalarse en un sitio común con el VOR.

7 VOR C Radiofaro omnidireccional en VHF.

8 NDB C Radiofaro no direccional.

9 Las distancias y altitud a las cuales se requieren señales VOR o VOR/DME indicadas en millas marinas (NM) o miles de pies, o la cobertura nominal recomendada del NDB indicada en millas marinas.

10, 11.12 GNSS sistema mundial de navegación por satélite (incluye ABAS, GBAS y SBAS).

ABAS (sistema de aumentación basado en aeronave) según lo previsto, se utilizará en navegación en ruta, terminal, y aproximaciones que no son de precisión. Llenando esta columna indica cuando los servicios de navegacion son permitidos a través del uso del GPS + RAIM o GPS + RAIM con cualquier otro sistema de apoyo abordo.

GBAS (sistema de aumentación basado en tierra) según lo previsto se utilizará en las aproximaciones y aterrizajes de precisión de CAT I, CAT II y CAT III.

SBAS (sistema de aumentación basado en satélites) según lo previsto, se utilizará en navegación en ruta, terminal, y aproximaciones y aterrizajes que no son de precisión. La AX@ indica disponibilidad de servicio; se determinará el emplazamiento exacto de la instalación.

*Nota.*C *El receptor GPS se ajusta a reglas uniformes y ABAS (sistema de aumentación basado en la aeronave).*

13 Observaciones

*Nota.*C *En las Columnas 5 a 12 se utilizan los símbolos siguientes:*

D C DME requerido pero no en servicio.
DI C DME requerido y en servicio.
X C Requerido pero no en servicio.
XI C Requerido y en servicio.

Station/Territory Estación/Territorio	Rwy type Tipo de pista	Function Función	ILS	L	DME	VOR	NDB	Coverage Cobertura	GNSS			Remarks Observaciones
									ABAS	GBAS	SBAS	
1	2	3	4	5	6	7	8	9	10	11	12	13

- END / FIN -