SAM/IG/4
NE/21
16/07/09

Organización de Aviación Civil Internacional
Oficina Regional Sudamericana

CUARTO TALLER/REUNIÓN DEL GRUPO DE IMPLANTACIÓN SAM (SAM/IG/4)
PROYECTO REGIONAL RLA/06/901

Lima, Perú, 19 al 23 de octubre de 2009

Cuestión 3 del Orden del Día: **Implantación de la navegación basada en la performance (PBN) en la Región SAM**

Planificación de la implantación PBN en las TMA Brasilia, Recife, Rio de Janeiro y São Paulo

(Presentada por Brasil)

Resumen

En esta Nota de Estudio se presenta la AIC que será publicada por la Administración Brasileña en 19/11/2009, informando la planificación de la implantación PBN en las TMA Brasilia, Recife, Rio de Janeiro y São Paulo.

Referencias:

- Informe de la Reunión SAM/IG/3
- Borrador del Plan de Acción Brasileño (NE 13)

1 Antecedentes

1.1 La Reunión SAM/IG/2 tomó nota que el Proyecto Regional RLA/06/901 desarrolló un Modelo de Implantación PBN en TMA y Aproximación, a fin de permitir una mejor comprensión de las actividades y resultados esperados. El objetivo fue definir claramente los productos a ser entregados, a fin de desglosar el gran volumen de trabajo en actividades específicas. Estas actividades serán utilizadas como fundamento para la elaboración del cronograma de los programas.

1.2 De esa manera, la Reunión SAM/IG/2 adoptó los nuevos Modelos de Plan de Acción para TMA y Aproximación, que incorporaron los resultados del Seminario sobre PBN (Lima, 17-20 junio 2008). Los cambios efectuados en los modelos de Plan de Acción no modificaron la esencia del plan de acción anterior. En ese sentido, la Reunión SAM/IG/2 formuló la **Conclusión SAM/IG/2-4.**

1.3 La actividad 7.5 (Elaborar modelo de AIC para notificar la planificación de la implantación de la PBN) y la actividad 7.6 (Publicar la AIC notificando la planificación de implementación PBN) son requeridas en los modelos de plan de implantación PBN en TMA, teniendo en cuenta la necesidad de que los operadores de aeronaves realicen las actividades necesarias para la aprobación de aeronavegabilidad y operaciones.

1.4 El Proyecto de Implantación PBN en TMA, previsto en el Plan de Implantación PBN de Brasil, que es presentado en la NE/13, prevé, de igual manera, las actividades 7.3 y 7.4, que son destinadas a la elaboración y publicación de la AIC PBN en TMA.

2 Análisis

2.1 La AIC que notifica la implantación de la PBN en las TMA Brasilia, Recife, Rio de Janeiro y São Paulo, se adjunta a la presente nota de estudio como **Apéndice A (versión inglés solamente).**

2.2 La AIC, además de la notificación de implantación PBN, tiene como objetivo ya iniciar el desarrollo de los procedimientos de aplicación de las diversas especificaciones de navegación, en un espacio aéreo con vigilancia ATS.

2.3 Obviamente, la aplicación PBN depende de la aprobación de aeronaves y operadores para una o más especificaciones de navegación que pueden ser utilizadas en un espacio aéreo específico. En el caso de las TMA Brasilia, Recife, Rio de Janeiro y Sao Paulo, las SID/STAR podrán ser ejecutas con las siguientes especificaciones de navegación: RNAV-2, RNAV-1 y RNP1-Básica. Las Aproximaciones podrán ser utilizadas con las especificaciones de navegación RNP APCH con o sin la aplicación de Baro-VNAV.

2.4 Teniendo en cuenta que actualmente ya existen aeronaves y operadores aprobados para empleo del GNSS para llegada, salida y aproximación, tales aprobaciones también serán aceptas para la utilización de los nuevos SID, STAR y procedimientos de aproximación.

2.5 Considerando que habrá algunas TMA que podrán no tener una cobertura DME adecuada para atender las especificaciones de navegación RNAV-2 y RNAV-1, y que existen algunas aeronaves que no poseen GNSS, las SID y STAR podrán ser ejecutadas por aeronaves y operadores aprobados para RNAV-5, bajo las siguientes condiciones:

a) STAR RNAV – La aeronave será autorizada a descender hasta el nivel mínimo de vuelo en la FIR (FL 110 en las FIR Brasilia y Curitiba; FL 080 en las FIR Amazónica y Recife). Al ingresar en la área de la Altitud Mínima de Sector (MSA), la aeronave podrá continuar ese descenso hasta la MSA. El descenso por debajo de la MSA solamente será autorizado con el empleo de vectores radar.

b) SID RNAV – La aeronave ejecutará, inicialmente, una salida “convencional”. Al cruzar la altitud mínima de vuelo en la FIR correspondiente, la aeronave podrá ser autorizada a interceptar una SID RNAV.

2.6 Otro aspecto a resaltar es la aplicación anticipada de algunas porciones de la Enmienda 1 al DOC. 4444, cuya fecha prevista de vigencia es Noviembre de 2012. Con la necesidad de que el

Controlador de Transito Aéreo tenga el conocimiento del status de aprobación de aeronaves y operadores para las diversas especificaciones de navegación, la Administración Brasileña ha contratado los cambios necesarios en los sistemas automatizados ATC, con miras a presentar en la Faja de Progresión de Vuelo y en el "Target" Radar las informaciones esenciales al ATC. De esa forma, será necesario que los operadores de aeronaves inserten los códigos correspondientes en las casillas 10 y 18 del FPL. Además, los operadores de aeronaves también deberán insertar las mencionadas informaciones en el RPL. Teniendo en cuenta que la enmienda 1 al Doc. 4444 no abarca enmienda en el formulario RPL, la Administración Brasileña ha decidido adoptar, preliminarmente, los mismos códigos empleados en la implantación RVSM.

3. **Acción Sugerida**

3.1 Se invita a la reunión a

a) Tomar nota de la información proporcionada en esa nota de estudio.

b) Discutir la necesidad de armonizar la adopción de especificaciones de navegación en espacios aéreos que emplean vigilancia ATS.

c) Discutir la necesidad de armonizar la adopción anticipada de la enmienda 1 al Doc. 4444.

* * * * * *

APÉNDICE A

BRASIL **AIC**
DEPARTAMENTO DE CONTROLE DO ESPAÇO AÉREO **A**
DIVISÃO DE GERENCIAMENTO DA NAVEGAÇÃO AÉREA **xx/09**
AV GENERAL JUSTO, 160 – 2º AND. - CASTELO
20021-130-RIO DE JANEIRO – RJ **19 NOV 2009**

TEL: 021 3814-8237 AFTN: SBRJYNYI ADM: PAME FAX: 021 2101-6252 TELEX: 2137113 COMAER BR

PERFORMANCE BASED NAVIGATION IMPLEMENTATION IN THE BRASILIA, RECIFE, RIO DE JANEIRO AND SAO PAULO TMAs

1 PRELIMINARY ARRANGEMENTS

1.1. PURPOSE

The purpose of this Aeronautical Information Circular (AIC) is to present information in respect of a planning to change the air traffic flow for the implementation of Performance Based Navigation (PBN) in the Brasília, Recife, Rio de Janeiro and Sao Paulo TMAs.

1.2 SCOPE

The arrangements established by this AIC apply to all those who make use of the Standard Instrument Arrival Routes (STAR), IFR Standard Instrument Departure Charts (SID) and IFR Instrument Approach Charts (IAC), based on the Area Navigation (RNAV) and/or Required Navigation Performance (RNP), at Brasília, Recife, Rio de Janeiro and Sao Paulo TMAs, while on duty.

2. PERFORMANCE BASED NAVIGATION

2.1. Performance-Based Navigation specifies the RNAV system performance requirements to aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

2.2. The performance requirements are defined in terms of accuracy, integrity, continuity, availability and necessary functionalities for the operation proposed by an airspace concept. The performance requirements are identified in the navigation specifications, which identify the equipments and sensors that could be used to satisfy such requirements.

2.3. There is RNP specification and RNAV specification. The RNP specification has the monitoring and alert performance on-board of the aircraft, and it is assigned as RNP “X”, where X is the accuracy value associated with the navigation performance. The RNAV specification does not have monitoring and alert performance on-board of the aircraft, and in the same way, it is assigned as RNAV “X”.

2.4. The navigation based in performance depends on:

a) The RNAV system installation on-board the aircraft, which is being approved to meet the functional and navigation performance requirements, specified to RNAV and/or RNP operations in a specific airspace;

b) The fulfillment, by the flight crew, of the operational requirements established by the RNAV operation regulating entity;

c) One explicit concept of airspace, which includes RNAV and/or RNP operations; and

d) The availability of one infrastructure that promotes adequate air navigation.

The PBN main benefits are:

a) Increase airspace safety, through the continuous and stabilized descending procedures implementation, with vertical guidance, significantly reducing events of controlled flight into terrain (CFIT);

b) Reduction in the aircraft flight time, through the implementation of optimum flight trajectory, independent of the ground air navigation, reducing the fuel consumption and, consequently, reducing the emissions to the environment;

c) Utilization of the RNAV and/or RNP capacity already installed in a significant portion of aircraft fleet that flight within Brazilian airspace;

d) Trajectory optimization, in any meteorological condition, making possible to prevent critical conditions of terrain and environment, such as aircraft noise, through the use of RNAV and/or RNP trajectories;

e) Implementation of more precise trajectory, approach, take-off, and landing, reducing the dispersion and giving more predicable traffic flow;

f) Delay reduction in airspace and airports with high density air traffic, with the increase in the ATC capacity, due to the implementation of parallel routes, new points in the TMA and approach procedures with lower operational minimum;

g) Potential reduction in the parallel routes separation in order to accommodate more air traffic in the same flow;

h) Work load reduction for the air traffic controller and pilot. The use of RNAV and/or RNP trajectory will reduce the necessity of radar vectors, and consequently, the time used in the pilot/controller communications.

2.5. The ICAO Manual on Performance-Based Navigation (Doc. 9613) establishes various different navigation specifications that can be applied globally. Given the air traffic characteristics for Brasilia, Recife, Rio de Janeiro and São Paulo TMAs, several navigation specifications will be applied in order to allow a greater number of aircraft equipped with RNAV systems, as described below.

3. AIR NAVIGATION PROCEDURES AT BRASILIA, RECIFE, RIO DE JANEIRO AND SAO PAULO TMAS

3.1. The new air navigation procedures for Brasilia and Recife TMAs (STAR, SID and IAC), based on RNAV, shall be published on 11 February 2010 and shall be implemented starting in 08 April 2010.

3.2. The new air navigation procedures for Rio de Janeiro and Sao Paulo TMAs (STAR, SID and IAC), based on RNAV, shall be published on 23 September 2010 and shall be implemented starting in 18 November 2010.

3.3. The procedures for the air navigation included in 3.1 and 3.2 must be accomplished only by operators and aircraft approved by State of Registry or by State of Operator, according to each case. The process for the Brazilian operators and aircraft approval is established by the National Civil Aviation Agency.

3.4. The use of the navigation specifications and the navigation systems described on this AIC must observe the occasional restrictions prescribed for the approval granted to aircraft and operator, issued by the Civil Aviation Authorities.

3.5. Standard Instrument Arrival Routes (STAR) and Standard Instrument Departures (SID), based on Area Navigation (RNAV)

3.5.1. The RNAV STAR and RNAV SID may be accomplished by the aircraft and operator since they are approved for one, or more, of the following navigation specifications: RNAV2, RNAV1 and Basic RNP1.

3.5.2. RNAV STAR and RNAV SID may also be accomplished by aircraft and operator approved for the accomplishment of such procedures using the GNSS.

3.5.3. Aircraft approved for RNAV 5, except those that use RNAV systems based on VOR/DME, may use the RNAV STAR. They will limit their descent to the minimum flight altitude at the FIR up to reaching the airspace limit comprised by the minimum sector altitude (MSA), prescribed at the IFR approach procedure in use at the moment of the operation. Thence, the aircraft may be authorized to descend until the minimum sector altitude.

3.5.4. Aircraft approved for RNAV5, except those that use RNAV systems based on VOR/DME, may use at first a conventional exit based on VOR or NDB. Thence, when crossing the minimum flight level at the FIR where the operation is accomplished, they may be forwarded to intercept a RNAV SID.

3.5.5. The operation of aircraft within the RNAV STAR and RNAV SID, based on the RNAV (RNAV5, RNAV2 and RNAV1) navigation specifications will be conditioned to the use of the ATS Surveillance System by the involved ATC units. Only aircraft and operator approved for the Basic RNP1 navigation specification may remain using the RNAV STAR and RNAV SID, when the ATS Surveillance System is unavailable.

3.5.6. In the specific case of Recife TMA, there will be no enough DME coverage to attend the requirements prescribed for RNAV2 and RNAV1, using the navigation system based on DME/DME. Under those circumstances, operators intending to use the RNAV STAR and RNAV SID, applying both RNAV2 and RNAV1 navigation specifications, must compulsorily use the GNSS.

3.6. RNAV Approach Procedures

3.6.1. The RNAV approach procedures may be accomplished by the aircraft and operator since they are approved for the RNP APCH Navigation Specification.

3.6.2. The RNAV approach procedures may also be accomplished by the aircraft and operator since they are approved for the accomplishment of such procedures using the GNSS.

3.6.3. Brasilia and Recife Aerodromes will be provided with RNAV/ILS and RNAV/Baro-VNAV procedures. The conduction of such procedures will also require the specific aircraft and operator approval.

3.7. Identification of STAR, SID and Approach Procedures

3.7.1. RNAV STAR and RNAV SID that allow the use of the RNAV5, RNAV2 and RNAV1 navigation specifications will be identified as RNAV STAR or RNAV SID.

3.7.2. RNAV STAR and RNAV SID, based on the Basic RNP1, with application of GNSS or under the approval of the aircraft and operator for the use of GNSS at SID/STAR, must be identified as RNAV STAR (GNSS) or RNAV SID (GNSS).

3.7.3. The RNAV approach procedures, based on the APCH RNP navigation specification or under the approval of the aircraft and operator for the use of GNSS for IFR approach, will be identified as RNAV (GNSS).

3.8. Completion of the Flight Plan

3.8.1. The status of operator and aircraft approval relating to any type of RNAV and /or RNP navigation specifications must be indicated on the Filed Flight Plan (FPL), by inserting the letter “R” in item 10 of the Flight Plan form.

3.8.2. For the specific case of the Repetitive Flight Plan (RPL), the above mentioned approval must be indicated by inserting the letter “R” in item “Q” of the RPL, as follows: EQPT/R.

3.8.3. The approval status of PBN must be detailed in item 18 of the FPL or in item “Q” of the RPL, by inserting the following alphanumeric codes, not exceeding 8 codes , or 16 characters, preceding the designator PBN/:

RNAV Specifications	
Code	Navigation Specification
B1	RNAV 5 – All permitted sensors
B2	RNAV 5 GNSS
B3	RNAV 5 DME/DME
B5	RNAV 5 INS ou IRS
C1	RNAV 2 – All permitted sensors
C2	RNAV 2 GNSS
C3	RNAV 2 DME/DME
C4	RNAV 2 DME/DME/IRU
D1	RNAV 1 – All permitted sensors
D2	RNAV 1 GNSS
D3	RNAV 1 DME/DME

D4	RNAV 1 DME/DME/IRU
RNP Specifications	
Code	Navigation Specification
O1	Basic RNP 1 – All permitted sensors
O2	Basic RNP 1 GNSS
O3	Basic RNP 1 DME/DME
O4	Basic RNP 1 DME/DME/IRU
S1	RNP APCH

3.8.4. The status of operator and aircraft approval relating to the use of the GNSS must be indicated by inserting the letter "G" in item 10 of the Flight Plan form.

3.8.5. For Repetitive Flight Plan (RPL), the above mentioned approval status must be indicated by inserting the letter "G" in item "Q" of the RPL, as follows: EQPT/G.

4. PBN OPERATIONS WITHIN THE BRASILIA, RECIFE, RIO DE JANEIRO AND SAO PAULO TMAs

4.1. Aircraft and operator without RNAV and/or RNP navigation specifications approval may still fly within the Brasilia, Recife, Rio de Janeiro and Sao Paulo TMAs after the implementation dates mentioned on the items 3.1 and 3.2 by using the conventional procedures (VOR/DME or NDB) or under radar vectoring used by the ATC units involved by the aircraft operations. However, sometimes, the involved ATC units may authorize the operation of such aircraft out of their optimum flight profile by increasing the distance to be flown or by using altitude restrictions.

.

4.2. Updated documentation and information about PBN implementation at Brasilia, Recife, Rio de Janeiro and Sao Paulo TMAs may be found at the following website of the Department of Airspace Control : http://www.decea.gov.br/cns-atm .

4.3. Additional information could be obtained through the following contacts:

Air Navigation Management Division:

- Tel: ++55-21-21016273;
- Fax: ++55-21-21016233;
- Email: **dgna@decea.gov.br.**

5. FINAL ARRANGEMENTS

5.1 Non-expected circumstances which may nevertheless be detected shall be revised by the current Chief of Airspace Control Department Sub-department of Operations.