SAM/IG/4
WP/13
02/10/09

International Civil Aviation Organization
South American Regional Office

FOURTH WORKSHOP/MEETING OF THE SAM IMPLEMENTATION GROUP (SAM/IG/4)
REGIONAL PROJECT RLA/06/901

Lima, Peru, 19 to 23 October 2009

Agenda Item 3: Implementation of performance-based navigation (PBN) in the SAM Region

(Presented by Brazil)

Summary

This working paper presents the draft PBN Implementation Plan for Brazil, as per Conclusion SAM/IG/3-3, with a view to contribute with the harmonization of the SAM PBN implementation national plans.

References:

- Resolution 36/23 of the ICAO 36th Assembly
- GREPECAS/15 Report
- Third Workshop/Meeting (SAM/IG/3) Report

1 Background

1.1 Resolution A36-23 requires that the Planning and Implementation Regional Groups (PIRG) AND States develop their national PBN implementation Plans for 2009, with a view to:

a) Implement RNAV and RNP operations (where required) for en-route operations (oceanic and continental) and terminal control areas (TMA), as per established deadlines and to intermediary frameworks; and

b) Implement approach procedures with vertical guidance (APV) Baro-VNAV or SBAS-based , for all runway ends operating IFR, either as primary approach or backup for precision approaches until 2016, with the following intermediary frameworks: 30% until 2010 and 70% until 2014.

1.2 At a regional level the GREPECAS PBN Task Force has developed action plans for PBN, en-route, TMA and approach implementation, which could be used by States in the preparation of their national PBN implementation plans. Also, keeping in mind the need for harmonization of the CAR/SAM Regions national plans, as well as the requirement to develop a PBN implementation regional plan, GREPECAS/15 has formulated Conclusion 15/38, encouraging CAR/SAM States/Territories to develop their national PBN implementation plans for December 2009, and present them to the corresponding Regional Offices.

1.3 Also, within the environment of the CAR/SAM Regions, the ATM Authorities and Planners meetings (APATM), developed a CAR/SAM PBN Roadmap, which contains the general guidelines for PBN implementation in the CAR/SAM Regions, in all flight phases. The mentioned roadmap was approved by GREPECAS Conclusion 14/46 and was amended by GREPECAS/15, in order to include APV Baro-VNAV based approaches. Approval of this modification is included in paragraph 3.6.23 of the GREPECAS/15 final report.

1.4 PBN implementation in the South Region is supported by Regional Project RLA/06/901. Within the framework of this Project, the SAM/IG Meetings are being carried out, where the SAM PBN Implementation Group was created (SAM/PBN/IG). The SAM/PBN/IG has developed the PBN implementation programme for en-route operations, which establishes the deliverables, with the necessary dates for RNAV 5 implementation in November 2010, approved by Conclusion SAM/IG/2-1. Taking into consideration the need for a regional harmonization of PBN implementation for en-route operations, the coordination and execution of the RNAV5 implementation tasks are being developed by the SAM/PBN/IG, with the support of Regional Project RLA/06/901. The action plan models for PBN implementation in TMA and Approach, taking into consideration SAM States requirements, were also prepared by the SAM/PBN/IG.

1.5 With a view to enable a harmonization of the SAM States national plans, before their submission to the ICAO Regional Office, the SAM/IG/3 Meeting formulated Conclusion SAM/IG/3-3, requesting the presentation of national PBN implementation plans at the SAM/IG/4 Meeting.

2 Analysis

2.1 PBN implementation en-route, oceanic and continental airspaces, will be carried out according to the action plans established in the corresponding implementation groups (SAT Group and SAM/PBN/IG).

a) PBN implementation in the main Brazilian TMAs will be based on ATC simulation (in real and accelerated time), envisaging to ensure concrete benefits for aircraft operators and navigation services providers.

b) Implementation of RNAV (GNSS) approach procedures with Baro-VNAV, in all thresholds operating IFR up to December 2011, with the objective to avoid CFIT.

c) RNAV SID implementation in all thresholds operating IFR up to December 2011, with the aim to optimise existing trajectories, and to be used as a back-up for the non-operation of ground NAVAIDS.

2.2 The PBN draft Plan attached as **Appendix A** to this working paper. The final version of the plan depends on the discussions to be held during SAM/IG/4 Meeting, envisaging harmonization of the SAM National Plans, as well as a determination of priorities and dates for implementation of RNAV (GNSS) approach procedures, RNAV-ILS and RNAV-SID, in function of the flight inspection capacity and charts publication.

3 Suggested action

3.1 The Meeting is invited to:

a) Take note of the information provided in this working paper; and

b) Consider the content of the implementation plan in **Appendix A** to this working paper to recommend actions that ensure harmonization of SAM National Plans.

APPENDIX A

PBN Implementation Plan

BRAZIL

Version 1

INDEX

1. Objective

This PBN implementation plan has the following objectives:

a) To provide a top level strategy for short-term (by 2010) and medium-term (2011-2015) implementation of navigation applications in Brazil. This strategy is based on PBN, Area Navigation (RNAV) and Required Performance Navigation (RNP) concepts, which will be applied to aircraft operations through all flight phases: route (oceanic and continental), TMA (SID and STAR) and IFR approach, according to the implementation objectives provided in Resolution 36/23 of the 36th ICAO Assembly.

b) To ensure that the implementation of the CNS/ATM system navigation portion is based on clearly established operational requirements;

c) To avoid unnecessarily imposing the mandate for multiple equipment on board or multiple systems on the ground;

d) To avoid the need for aircraft and operators multiple approvals for intra- and interregional navigation;

2. Background

Resolution A36-23 requires that Planning and Implementation Regional Groups (PIRG) and the States develop their national PBN implementation plans for 2009, pursuing the following objectives:

a) To put into effect RNAV and RNP operations (wherever required) for en route operations (oceanic and continental) and terminal control areas (TMA), according to established deadlines and intermediate milestones; and

b) To put into effect approach procedures with vertical guidance (APV), based on Baro-VNAV or SBAS, for all runway extremes operating IFR, either as primary approach or as support for precision approaches by 2016, with the following intermediate milestones: 30% by 2010 and 70% by 2014.

On a regional level, the GREPECAS PBN Working Group has developed action plans for implementing PBN en route, TMA and approach, which could be used by the States in their national PBN implementation plans. Besides that, taking into consideration the need of harmonizing the national plans of CAR/SAM Regions, as well as the request for development of a Regional PBN Implementation Plan, the GREPECAS/15 meeting has formulated Conclusion 15/38, encouraging all CAR/SAM States/Territories to develop their national PBN implementation plans by 2009 and present them to the corresponding Regional Offices.

Also in the scope of CAR/SAM Regions, the ATM Authorities and Planners Meetings (AP/ATM) have developed a CAR/SAM PBN Roadmap, which contains the general guidelines for PBN implementation within CAR/SAM Regions, through all flight phases. The previously mentioned roadmap was approved by GREPECAS conclusion 14/46 and was modified by GREPECAS/15, in order to include the APV approaches based on Baro-VNAV. The approval of that change is included in section 3.6.23 of the GREPECAS/15 meeting final report.

The PBN implementation in the South American Region is supported by the RLA 06/901 Project. Within the scope of that Project, the SAM Implementation Group (SAM/IG) is holding its meetings and, in the context of those meetings, the PBN Implementation Group in SAM Region (SAM/PBN/IG) has been made up. The SAM/PBN/IG has developed the PBN Implementation Programme for En route Operations, which establishes the deliverables, with the corresponding dates, necessary to the implementation of RNAV-5 by November 2010, approved by conclusion SAM/IG/2-1. Considering the need of a regional harmonization of the PBN implementation for en route operations, the coordination and execution of the RNAV-5 implementation tasks are being developed by the SAM/PBN/IG, always with the support of 06/901 Project. The models of action plans for PBN implementation in TMAs and Approach, taking into account the requirements of SAM States, were also prepared by the SAM/PBN/IG.

The RLA/99/901 Project also supports the PBN implementation within the SAM Region by means of creating a Data Base on Air Navigation Capability of the Aircraft Fleet flying in the SAM Region, as well as developing the Advisory Circulars (AC) and working plans for the approval of aircraft and operators who request to carry out PBN operations. Those are fundamental activities for the PBN planning and implementation process, particularly the advisory circulars, taking into consideration that they are a mechanism that extremely facilitates the publication of national regulations for the approval of aircraft and operators operating in PBN airspace.

On national level, the publication of the National ATM Operational Concept, on May 5th, 2008, has established the strategic planning of the Airspace Control Department (DECEA), with a view to obtain benefits to the ATM Community, in the short and medium term, based on either the air navigation infrastructure related to ATM (CNS, AIS, MET, etc.), and on the navigation capability of existing and expected aircraft, apart from analyzing the aspects that allow to carry out a safe, orderly and most favorable cost-benefit implementation. One of the pillars of the National ATM Operational Concept is the PBN, which is a basic requirement to obtain many benefits to the ATM community.

In line with the publication of the National ATM Operational Concept, the DECEA has published on May 5th, 2009, the National ATM System Implementation Programme, composed of 33 projects, which objective is to establish actions, terms and priorities that shall be met in order to obtain the objectives of the National ATM Operational Concept, taking into account the ICAO Global and Regional planning. One of the main projects of the already mentioned programme is the PBN Implementation Project that will be presented in this plan. It is important to emphasize that the PBN Implementation Project includes only the short-term implementation, by 2010.

3. Introduction

After the RVSM implementation, on January 20th, 2005, the main tool for the optimization of airspace infrastructure is the implementation of the Performance Based Navigation (PBN), which will provide the necessary conditions for the utilization of the RNAV and RNP capabilities by a significant portion of airspace users in the CAR/SAM Regions.

The current planning by the Regional Planning and Implementation Groups is based on the Air Navigation Plans and on the CNS/ATM Regional Plans. Those plans, nowadays, are mostly made up of tables that do not contain the necessary details for the implementation of each of the CNS and ATM elements. For this reason, the CAR/SAM PBN Roadmap has been developed.

Consequently, in view of the need for detailed navigation planning, it was deemed advisable to call for preparation of a national PBN implementation plan by each State, to provide proper guidance and direction to the domestic air navigation service provider(s), airspace operators and users, regulating agency, as well as foreign operators who operate or plan to operate in the State. This guidance should address the planned evolution of navigation, as one of the key systems supporting air traffic management, and describe the RNAV and RNP navigation applications that should be implemented in at least the short and medium term.

The PBN implementation in Brazil will be based on the following principles:

a) Continued application of conventional air navigation procedures during the transition period, to guarantee availability by users that are not RNAV- and/or RNP-equipped;

b) Development of airspace concepts, applying airspace modeling tools as well as real-time and accelerated simulations, which identify the navigation applications that are compatible with the aforementioned concept;

c) Conduct of cost-benefit analyses to justify the implementation of the RNAV and/or RNP concepts in each particular airspace;

d) Conduct of operational safety assessments to ensure the application and/or maintenance of the established target levels of safety.

The current plan is a dynamic document that shall be updated, at least, once a year, in order to reflect the implementation progress as well as to include fresh achievements necessary to embrace new operational requirements.

4. Strategic Objectives

4.1 En route

4.1.1 Oceanic and Remote Continental

Within the oceanic airspace under Brazil's jurisdiction RNAV-10 is applied, which is a navigation application that currently meets the most important key performance areas in the region, namely Operational Safety, Efficiency and Environmental Protection.

Taking into consideration the increasing demand for air traffic in the region, it will be necessary to implement the RNP-4, seeking to maintain or improve the operational safety, the environmental protection and the air operations efficiency within this airspace.

4.1.2 Continental

The PBN implementation for en route operations within the continental airspace under Brazil's jurisdiction will be accomplished according to the SAM regional strategy that will meet the following strategic objectives:

a) Operational Safety – Nowadays there is no formal airworthiness certification and operational approval for flights operating in RNAV routes within SAM Region. The application of the RNAV-5, which is the less demanding navigation specification, in terms of on board equipment, will allow a formalization and harmonization of the RNAV use in new and existing RNAV routes, as well as the necessary conditions for a complete restructuration of the route network. In this way, it will be possible to develop a less complex route network, reducing the controller workload and, consequently, increasing the operational safety.

b) Capability – Taking into account the reduction of airspace complexity and the resulting decrease of controller workload, there will be an enhancement in the ATC capability of the sectors, allowing the flight of a larger number of aircraft.

c) Profitability – The PBN implementation will allow a greater number of aircraft to fly their optimum flight profiles, offering users a better cost-effectiveness ration.

d) Efficiency – The RNAV application will improve operational efficiency, considering that it will allow:
   - Improvement of airspace management, by means of repositioning the intersections.
   - Better use of the available airspace, through a route structure that allow the establishment of:
     - More direct routes (double and parallels, if necessary) to accommodate a more intense air traffic flow.

- Bypass route for aircraft overflying TMAs of high density traffic.
- Alternative or contingency routes.
- Establishment of standby flight optimum positions.
- Optimized feeder routes.

- Reduction of the distances to be flown, resulting in fuel saving.
- Reduction of the radio navigation aids number.

e) Environmental Protection – As a consequence of the increase in efficiency and fuel saving, there will be a reduction of noxious gas emissions into the atmosphere. Besides, the application of specific procedures can contribute to the reduction of aeronautical noise (ex. Continuous Descent Approach – CDA).

f) Access and Equity – The PBN implementation shall not prevent the flight of unapproved aircraft within a given airspace, unless absolutely mandatory.

g) Global Interoperability – The RNAV application, as provided for in the PBN Manual, will guarantee the global interoperability, through the application of standard navigation specification, avoiding the need to obtain several aircraft and operators approval in order to fly in airspaces that use the same navigation application.

h) ATM Community Participation – The success of the PBN implementation will depend on the effective ATM community participation, aiming at guaranteeing that the operational requirements of both airspace users and service providers are met. Apart from the SAM/IG meetings, Working Groups will also be set up in order to identify the requirements of the domestic aircraft operators.

4.2 Terminal Control Areas (SID and STAR) and Approach

The Basic RNP1 and/or RNAV1 implementation in main TMAs and the RNP APCH with Baro-VNAV implementation in all thresholds used for IFR operation will meet, mainly, the following Strategic Objectives:

a) Operational Safety – The Basic RNP1 and/or RNAV-1 application in TMAs will allow the separation among arrivals and departures paths, avoiding aircraft conflicts. The use of the RNP APCH with APV/Baro-VNAV will reduce the risk of the Collision Flight into Terrain (CFIT).

b) Capability – The use of SID/STAR RNAV-1 and/or Basic RNP1 will allow reducing radar vectors utilization, consequently, the reduction of the airspace complexity and controller workload, will enable an increase of the ATC capacity of the sectors and allow the flight of a larger number of aircraft.

c) Profitability – The PBN implementation will allow a larger number of aircraft to fly their optimum flight profiles, mainly through the use of the CDA, offering users a better cost-effectiveness ratio.

d) Efficiency – The Basic RNP1 and/or RNAV-1 application will conduct to a better operational efficiency, taking into account that the establishment of well-defined arrival and departure points will make it possible to restructure the TMA incoming/outgoing routes, thereby reducing flight time. The interaction between STAR and Approach will offer the necessary conditions to the establishment of optimum arrival and departure paths, from route phase to final approach.

e) Environmental Protection – As a consequence of the efficiency enhancement and fuel saving, there will be a reduction in noxious gas emissions into the atmosphere. Besides, the application of the CDA will contribute to reduce aeronautical noise.

f) Access and Equity – The implementation of the RNAV (GNSS) with Baro-VNAV approach procedure in airports that don't have ILS will improve the access to the aerodromes, during adverse meteorological conditions. The PBN implementation shall not prevent the flight of unapproved aircraft in a given airspace, unless absolutely necessary, depending on the air traffic density.

g) Predictability – Basic RNP1 e RNAV-1 navigation precision will make aircraft paths more foreseeable, facilitating the separation among aircraft and reducing the need for air traffic controller intervention in the case of eventual aircraft diversions from their expected paths. The predictability will also be improved by the STAR and Approaches integration.

h) Global Interoperability – The RNAV and RNP use, as provided for in the PBN Manual, will guarantee global interoperability, through the application of standard navigation specification, avoiding the need to obtain several aircraft and operators approvals in order to fly in airspaces that use the same navigation application.

i) ATM Community Participation – The success of the PBN implementation will depend on the effective ATM community participation, aiming at guaranteeing that the operational requirements of both airspace users and service providers are met. Working Groups will be set up.

4.3 Short Term Implementation (by 2010)

4.3.1 Oceanic

The use of RNP-10 (RNAV-10) within the EUR/SAM Corridor, since October 2001, provides enough airspace capacity to allow the aircraft to fly their optimum profiles, in short term. For this reason, it is not expected any PBN implementation in the oceanic airspace under Brazil's jurisdiction in short term.

4.3.2 Continental

The implementation of RNAV-5 in SAM Region, expected for November 2010, simultaneously with version 1 of the ATS SAM route network, which is part of the SAM Network Optimization Programme, approved by Conclusion SAM/IG/3-1, will enable the optimization of airspace infrastructure. The implementation of the SAM ATM route network, within the continental airspace, shall be accomplished by means of a top down strategy, with the objective of identifying the main regional air traffic flows, as well as the deficiencies of the route network and the sectorization of the engaged ATC unities. From such identification, it will be possible to conceive a regional/national integrated network that meets both airspace users' and ATS providers' requirements. That network shall consider the need of sectorization, integration of the airports not served by it, usage of no permanent routes and connectivity among the TMAs. In this way, the PBN implementation for en route operations will be accomplished according to the Action Plan RNAV-5 SAM, enclosed as Appendix "A".

4.3.3 Terminal Control Areas (Departures and Arrivals)

The PBN implementation in the TMAs with a greater air traffic flow will be based in accelerated and real time simulation, considering the comparison of several possible implementation scenarios, aiming at obtaining the best cost-benefit ration both for aircraft operators and air navigation services providers, seeking, still, a reduction in the airspace complexity and, consequently, a reduction in the pilot and air traffic controllers workload.

In the short term, the Brazilian administration has planned the PBN implementation in the Brasilia, Recife, Rio de Janeiro and Sao Paulo TMAs. The PBN Implementation in TMA will be started with the PBN Implementation Project in Brasilia and Recife, which tentative implementation date is April 8th 2010. That project was based on the action plan approved in the SAM/IG/2 Meeting. The objective of the PBN implementation project in the Brasilia/Recife TMAs, apart from the PBN implementation, properly said, is to gain experience in less complex airspaces, of intermediate density, characterized by Brasilia and Recife TMAs. The PBN Implementation Project in Brasilia and Recife TMAs is enclosed as Appendix "B".

The PBN Implementation Project in Rio de Janeiro and São Paulo TMAs is the final stage of development and its implementation tentative date is November 2010. The implementation project in the Rio de Janeiro and São Paulo TMAs has as a goal to implement the PBN in the two main Brazilian TMAs, as in terms of airspace density as of complexity. Besides, the short distance between the two TMAs (200 NM) and the interrelation among the air traffic flows and them, make it necessary that the implementation Project be developed in order to guarantee the airspace infrastructure and IFR procedures harmonization of both TMAs.

The STAR RNAV and SID RNAV can be used by aircraft and operators approved for one of the following navigation specifications: RNAV2, RNAV1 and Basic RNP1.

The STAR RNAV and SID RNAV also can be executed by aircraft and operators approved for those kind of procedures with the application of the GNSS.

The RNAV5 approved aircraft and operators, except those that use RNAV systems based on VOR/DME, can use the STAR RNAV, limiting its descent to the minimum flight altitude of the FIR, until airspace limit be reached by the sector minimum altitude (MSA), foreseen in the in-use approach procedure at the time of the operation. As from that limit, the aircraft can be authorized to descend down to the minimum altitude of the corresponding sector.

The RNAV5 approved aircraft and operators, except those that use RNAV systems based on VOR/DME, can use the SID RNAV, initially, making use of a “conventional” SID based on VOR or NDB, and, when crossing the minimum flight level in the FIR where the operation is taking place, being directed to intercept a SID RNAV.

Aircraft operation in the STAR RNAV and SID RNAV based on the RNAV navigation specification RNAV (RNAV5, RNAV2 and RNAV1) will be conditioned to the use of ATS Surveillance Systems by the engaged ATC unities. Only Basic RNP1 approved aircraft shall continue using the STAR RNAV and SID RNAV, in case the ATS Surveillance Systems are unavailable.

In the specific case of Recife TMA, there will be no enough DME coverage to meet the requirements due to RNAV2 and RNAV1, with the use of the navigation system based on DME/DME. In that case, the operators who intend to use the STAR RNAV and SID RNAV, applying the RNAV2 or RNAV 1 navigation specifications, shall, mandatory, to use the GNSS.

The Brazilian administration will begin a partial application of Amendment Nº 1 to the 15th Edition of the PANS-ATM (Doc 4444), with applicability as of November 15th 2012, from April 8th, 2010, starting with the insertion of some alphanumeric codes related to the RNAV and RNP approval, essential to the PBN implementation. The purpose will be to show the PBN approval in the flight progress strips and in the targets shown on radar screen, allowing the air traffic controller to identify PBN approved aircraft and the type of navigation specifications that can be used by a particular aircraft.

In this way, the aircraft and operators approval status for any type of RNAV and/o RNP navigation specification shall be indicated in the Flight Plan Form (FPL), by means of inserting letter “R” in box 10 of the FPL.

In the specific case of the Repetitive Flight Plan (RPL), the above mentioned approval status shall be indicated by means of inserting letter “R” in box “Q” of the RPL, as follows: EQPT/R.

The PBN approval status shall be detailed in box 18 of the FPL or in box “Q” of the RPL, through the insertion of the following alphanumeric characters, limited to a maximum of 8 codes or 16 characters, preceded by the PBN/ designator:

RNAV Specifications	
Code	Navigation Specification
B1	RNAV 5 – All sensors allowed
B2	RNAV 5 GNSS
B3	RNAV 5 DME/DME
B5	RNAV 5 INS or IRS
C1	RNAV 2 – All sensors allowed
C2	RNAV 2 GNSS
C3	RNAV 2 DME/DME
C4	RNAV 2 DME/DME/IRU
D1	RNAV 1 – All sensors allowed
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 sensors allowed
O2	Basic RNP 1 GNSS
O3	Basic RNP 1 DME/DME
O4	Basic RNP 1 DME/DME/IRU
S1	RNP APCH

The operators and aircraft approval status for GNSS use will be indicated, by inserting letter “G” in box 10 of the FPL.

In the case of Repetitive Flight Plan (RPL), the above mentioned approval status shall be indicated by inserting letter “G” in box “Q” of the RPL, as follows: EQPT/G.

Aircraft and operators non approved for RNAV and/or RNP navigation specifications can keep flying in the Brasilia, Recife, Rio de Janeiro and São Paulo TMAs, by means of using “conventional” procedures (VOR/DME or NDB) or by means of using radar vectors by the engaged ATC unities in the aircraft operation. Nevertheless, the ATC unities can be bind to authorize the operation of those aircraft out of their optimum flight profiles, either through the increase of the distance to be flown or through the uses of altitude restrictions.

Apart from the Brasilia, Recife, Rio de Janeiro and São Paulo TMAs, it will be published, by the end of 2011, 309 SID RNAV in 120 airports of the country, which corresponds to 89 % of the airports operating IFR, according to the Programme enclosed as Appendix C, seeking an optimization of departure paths and an alternative in case the radio navigation aids based on the ground are unavailable. The remaining 11% are airports with low air traffic flow, which do not justify the SID RNAV implementation until there is an increase in the air transportation demand.

The STAR will only be implemented in airports with a higher air traffic flow, where the corresponding ATC simulations take place.

4.3.4 Approach

The Approach Implementation Programme by Aerodrome has the objective of issuing RNAV (GNSS) approach procedures for all thresholds operating IFR, with the possibility of using vertical navigation (LNAV/VNAV), through the utilization of Baro-VNAV. Besides that, in the airports that have ILS equipment, it will be published RNAV/ILS approach procedures in order to facilitate the interface between the arrival and the approach. It is expected that at the end of 2010, 50% of the thresholds that operates IFR already have APV Baro-VNAV procedures. The remaining 50% shall be contemplated by the end of 2011. The Approach Implementation Programme by Aerodrome is enclosed as Appendix D to the current plan. By the end of 2011 it will be published 264 RNAV (GNSS) con Baro/VNAV procedures, in 124 airports, which corresponds to 92 % of the airport operating IFR. It will also be published 34 RNAV/ILS procedures. Considering the importance of the APV procedures in order to avoid CFIT, the remaining airports will be contemplated by 2014.

The RNAV approach procedures can be performed by aircraft and operators approved for the RNP APCH Navigation Specification.

The RNAV approach procedures can be also used by aircraft and operators approved for performing those kinds of procedures with the application of the GNSS.

The use of the portion LNAV/VNAV of the RNAV (GNSS) procedures will demand the specific approval of aircraft and operators for Baro-VNAV.

4.4 Medium term (2011-2015)

4.4.1 En route

4.4.1.1 Oceanic and remote continental

In medium term (by 2015) it is expected the RNP4 implementation, taking into account that the fleet navigation capacity indicates that it would be possible to start an aircraft and operators approval process. The RNP 4 application, together with the ADS-C/CPDLC applications, implemented in July 30th, 2009, will enable the implementation of the 30NM horizontal separation. Nowadays, it is possible to reach a percentage of 92% of aircraft connected to the ADS-C/CPDLC system of the ACC-AO, since effectively equipped users connect themselves to the ground system.

Taking into account that the EUR/SAM Corridor is an homogeneous airspace, the RNP4 application within that airspace will depend on the participation of both users and Air Navigation Services Providers in charge of the engaged FIRs (Atlantic, Canarias, Dakar and Sal), by means of a proper planning to be carried out in the scope of the Improvement of Air Traffic Services of South Atlantic Working Group (SAT).

4.4.1.2 Continental

As provided for in the CAR/SAM PBN Roadmap, route operations shall evolve from RNAV-5 towards RNP-2, seeking the leveraging of the fleet navigation capacity improvement, with a larger use of the GNSS, which will allow a spacing reduction among routes. The RNP-2 implementation for route operations shall be analyzed in a regional scope, aiming at a harmonic application, based on the results reached through the RNAV-5 implementation, the increase of the air transportation demand, as well as the evolution of the fleet navigation capacity.

4.4.2 Terminal Areas (Departures and Arrivals)

In continuity to the PBN implementation in Brazilian TMAs with a major air traffic flow, it will be carried out accelerated and real time simulations in the Belo Horizonte, Curitiba, Porto Alegre and Salvador TMAs, seeking the SID and STAR RNAV harmonic implementation by 2012. At the end of those studies, it shall be defined new priorities for other TMAs, where the air traffic demand have sufficiently increased to justify the use of simulation techniques in order to define the best scenario to be implemented. In the same way, as of 2012 new studies will be already necessary in order to verify the need of reviewing the SID/STAR procedures implemented in the Brasilia, Recife, Rio de Janeiro and Sao Paulo TMAs, seeking to adapt the air circulation in those airspaces to the increase of air traffic and the eventual improvements of the fleet navigation capacity. In the specific case of the Rio de Janeiro and São Paulo TMAs, new studies will be necessary in order to determine the viability and operation requirements to establish an excluding airspace in those TMAs for PBN approved aircraft.

4.4.3 Approach

Regarding the RNAV (GNSS) and RNAV (ILS) approach procedures, it is expected that all thresholds operating IFR be contemplated by the end of 2012, as already mentioned in section 5.1.3.

APPENDIX A to PBN Implementation Plan – Brazil

SHORT-TERM EN-ROUTE PBN ACTION PLAN (RNAV-5)
(GPIs 1, 4, 5, 7, 8, 10, 11, 12, 16, 21, 23)

1. Airspace concept	**Start**	**End**	**Responsible party**	**Remarks**
1.1 Establish and prioritize strategic objectives (safety, capacity, environment, etc.)	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901)	Completed
1.2 Collect traffic data in order to understand traffic flows in a given airspace	June/2008	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901)	In process
1.3 Analyze the navigation capacity of the aircraft fleet	June/2008	SAM/IG/4	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States IATA	In process. Survey sent to States
1.4 Analyze ground-based means of communication, navigation (VOR, DME) and surveillance to meet navigation specifications and the navigation reversal mode	June/2008	SAM/IG/3	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States	In process
1.5 Optimize airspace structure, reorganizing the network or implementing new routes based on the strategic objectives of the airspace concept, taking into account airspace modeling, ATC simulations (fast time and/or real time), live tests, etc.	SAM/IG/2	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901) States IATA	Initial study presented in WP/04

2. Develop a performance measurement plan	**Start**	**End**	**Responsible party**	**Remarks**
2.1 Draft a plan to measure performance, including gas emissions, safety, efficiency, etc.	SAM/IG/2	SAM/IG/5	SAM/PBN/IG Project RLA/06/901	In process
2.2 Implement the performance measurement plan	Nov/2010	Permanent	SAM/PBN/IG (Project RLA/06/901) States IATA	No activity has been initiated
3 Safety assessment	**Start**	**End**	**Responsible party**	**Remarks**
3.1 Prepare safety assessment execution using a qualitative methodology through the application of SMS	SAM/IG/2	SAM/IG/5	CARSAMMA Project RLA/06/901 Regional Office	RLA/06/901 in order to provide guidance material to CARSAMMA The utilization of qualitative methodology initially defined through the application of SMS processes

4 Establish a collaborative decision-making process (CDM)	**Start**	**End**	**Responsible party**	**Remarks**
4.1 Coordinate planning and implementation requirements with air navigation service providers, regulators, users, aircraft operators and military authorities	SAM/IG/2	SAM/IG/4	SAM/PBN/IG States	States have published an initial AIC
4.2 Establish the implementation date	SAM/IG/1	SAM/IG/4	SAM/PBN/IG States	States must analyze the feasibility of the tentative date in coordination with domestic operators and military authorities
4.3 Establish the documentation format in the SAM PBN website	SAM/IG/1	SAM/IG/2	SAM Regional Office	Completed
4.4 Report planning and implementation progress to the corresponding Regional Office. Conclusion to present national plans at SAM/IG/4	SAM/IG/2	SAM/IG/4	SAM/PBN/IG States	
5 ATC automated systems	**Start**	**End**	**Responsible party**	**Remarks**
5.1 Assess PBN implementation in ATC automated systems, taking into account amendment 1 to the PANS/ATM (FPLSG). Note: It is not a requirement for RNAV5 implementation	June/2008	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901)	Completed According to the programme presented in ICAO guidelines (WP/09), it is not a requirement

4 Establish a collaborative decision-making process (CDM)	**Start**	**End**	**Responsible party**	**Remarks**
5.2 Implement necessary changes in automated ATC systems	SAM/IG/2	TBD	States	Completed
6 Aircraft and operator approval	**Start**	**End**	**Responsible party**	**Remarks**
6.1 Analyze aircraft and operator approval requirements (pilots, dispatchers and maintenance personnel) in keeping with the PBN manual, and develop the necessary documentation.	June/2008	SAM/IG/2	Regional Project RLA/99/901- Regional Safety Oversight Cooperation System	Completed
6.2 Publish national regulations for the implementation of the RNAV-5 navigation specification	SAM/IG/2	SAM/IG/4	States	States should publish in October 2009
6.3 Begin the approval of aircraft and operators	SAM/IG/3	SAM/IG/5	States	
6.4 Establish and keep up to date a registry of approved aircraft and operators	SAM/IG/3	Permanent	CARSAMMA States Regional Office	Secretariat should send communication to CARSAMMA requesting data required for the registration data base
6.5 Verify the operation of the continuous monitoring programme (aircraft and procedures)	Nov/2010	Permanent	States	

7	Standards and procedures	Start	End	Responsible party	Remarks
7.1	Assess and, if applicable, publish the regulations on the use of GNSS.	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901) States	Completed
7.2	Finalize WGS-84 implementation	TBD	TBD	States	States which have not done so, should provide the information
7.3	Develop an AIC model to report PBN implementation plans	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901)	Completed
7.4	Publish the AIC reporting PBN implementation plans	SAM/IG/2	SAM/IG/4	States	States should publish on 9 April 2009
7.5	Develop an AIP Supplement model containing applicable standards and procedures, including the corresponding in-flight contingencies	SAM/IG/4	SAM/IG/5	SAM/PBN/IG (Project RLA/06/901)	
7.6	Publish the AIP Supplement containing applicable standards and procedures, including the corresponding in-flight contingencies	SAM/IG/5	SAM/IG/6	States	
7.7	Review the Procedural Handbook of the ATS units involved	SAM/IG/5	SAM/IG/6	States	
7.8	Update the letters of agreement between ATS units	SAM/IG/5	SAM/IG/6	States	
7.10	Submit a proposal of amendment to Doc. 7030, if necessary	SAM/IG/5	SAM/IG/6	SAM Regional Office	

7.11 Review practices and procedures to improve fuel consumption management and environmental protection	SAM/IG/1	Permanent	SAM/PBN/IG (Project RLA/06/901)	
8. Training	**Start**	**End**	**Responsible party**	**Remarks**
8.1 Develop a training and documentation programme for operators (pilots, dispatchers and maintenance personnel)	SAM/IG/4	SAM/IG/5	Regional Project RLA/99/901	
8.2 Develop a training and documentation programme for air traffic controllers and AIS operators	SAM/IG/4	SAM/IG/5	SAM/PBN/IG (Project RLA/06/901)	
8.3 Develop a training programme for regulators (aviation safety inspectors)	SAM/IG/4	SAM/IG/5	RLA/99/901 States	
8.4 Conduct training programmes	SAM/IG/5	SAM/IG/6	States	
8.5 Conduct seminars for operators, explaining plans and expected operational and economic benefits	SAM/IG/1	SAM/IG/4	States	
9. Implementation decision	**Start**	**End**	**Responsible party**	**Remarks**
9.1 Assess the available operational documentation (ATS, OPS/AIR)	July/2010	N/A	States	
9.2 Assess the percentage of aircraft and operators (non-exclusionary airspace)	July/2010	N/A	States	
9.3 Analyze the results of the safety assessment	July/2010	N/A	States	
9.4 Publish trigger NOTAM	Nov/2010	N/A	States	
10. Performance monitoring system	**Start**	**End**	**Responsible party**	**Remarks**
10.1 Develop a post-implementation en-route operations monitoring programme	SAM/IG/4	SAM/IG/5	SAM/PBN/IG (Project RLA/06/901)	

10.2 Implement a post-implementation en-route operations monitoring programme	Nov/2010	Nov/2011	States	
Pre-operational implementation date	Nov/2010	N/A		
Definitive implementation date	Nov/2011	N/A		

APPENDIX B to PBN Implementation Plan – Brazil

PBN Implementation Project for Brasilia and Recife TMA´s

Deliverable	Start	End	Responsible
1 Airspace Concept	**07/04/08**	**11/12/09**	
1.1 Establish and prioritize strategic objectives (safety, capacity, environment, etc.)	15/12/08	31/03/09	SDOP
1.2 Collect traffic data in order to understand traffic flows in TMA airspace	07/04/08	11/12/09	SDOP
1.3 Analyze the navigation capacity of the aircraft fleet in the TMA	03/11/08	30/11/09	SDOP;ANAC
1.4 Analyze ground-based means of communication, navigation (VOR, DME) and surveillance to meet navigation specifications and navigation reversal mode	15/12/08	18/09/09	SDOP;GEIV
1.5 Develop new sectorization for Brasilia and Recife TMA´s	17/03/09	30/04/09	SDOP;CINDACTA 1; CINDACTA 3
1.6 Develop SID, STARS and Approach Procedures, based on strategic objectives of the Airspace Concept	08/09/08	30/04/09	SDOP;CINDACTA 1;CINDACTA 3
1.7 Execute Fast Time Simulation (FTS)	26/03/09	11/09/09	SDOP;ICEA
1.8 Execute Real Time Simulation (RTS)	26/03/09	11/09/09	SDOP;ICEA
1.9 Evaluate SID, STAR and approach procedures in Flight Simulator of main airlines	17/08/09	28/08/09	SDOP; Airlines
1.10 Analyze and consolidate the FTS and RTS results	14/09/09	30/09/09	SDOP
2. Develop a performance measurement plan	**31/08/09**	**29/04/11**	
2.1 Draft a plan to measure performance, including gas emissions, safety, efficiency, etc. States	31/08/08	25/09/09	SDOP

2.2 Implement the performance measurement plan	01/03/10	29/04/11	SDOP;ICEA
3 Safety assessment	02/03/09	20/11/2009	
3.1 Determine the methodology to be used to assess airspace safety and route spacing, based on the navigation specification, taking into account airspace modeling, ATC simulations (fast time and/or real time), live tests, etc.	02/03/09	29/05/09	SDOP
3.2 Develop a data collection programme to assess airspace safety	05/10/09	16/10/09	SDOP
3.3 Prepare the final airspace safety assessment	19/10/09	20/11/09	SDOP
4 Establish a collaborative decision-making process (CDM)	16/04/09	30/03/11	
4.1 Coordinate planning and implementation requirements with air navigation service providers, regulators, users, aircraft operators and military authorities	16/04/09	01/03/11	SDOP
4.2 Establish the implementation date	02/11/09	27/11/09	SDOP
4.3 Establish the documentation format in the DECEA PBN website	03/09/09	30/09/09	SDOP
4.4 Report planning and implementation developments to the corresponding Regional Office	20/04/09	30/03/11	SDOP
5 ATC automated systems	**26/02/09**	**29/1/2010**	
5.1 Assess PBN implementation in ATC automated systems, taking into account amendment 1 to the PANS/ATM (FPLSG).	26/02/09	03/04/09	SDOP;SDTI; CISCEA

5.2 Implement the necessary changes in ATC automated systems	12/10/09	29/01/10	SDOP;CISCEA; SDTE
6 Aircraft and operator approval			ANAC
6.1 Analyze aircraft and operator approval requirements (pilots, dispatchers and maintenance personnel), in keeping with the PBN manual, and develop the necessary documentation.	----------	----------	ANAC
6.2 Publish national regulations for the implementation of the RNAV-1 navigation specification	----------	----------	ANAC
6.3 Begin the approval of aircraft and operators	----------	----------	ANAC
6.4 Establish and keep up to date a registry of approved aircraft and operators	----------	----------	ANAC
6.5 Verify the operation of the continuous monitoring programme (aircraft and procedures)	----------	----------	ANAC
7 Standards and procedures	7/4/2008	11/2/2010	
7.1 Assess and, if applicable, publish the regulations on the use of GNSS.	7/4/2008	9/4/2009	SDOP
7.2 Develop an AIC model to report PBN implementation plans	27/4/2009	11/9/2009	SDOP
7.3 Publish the AIC reporting PBN implementation plans	24/9/2009	24/9/2009	SDOP
7.4 Ground validation and in-flight inspection of SIDs and/or STARs	5/10/2009	6/11/2009	SDOP;GEIV; CINDACTA 1; CINDACTA 3
7.5 Assess the results and make the necessary changes	9/11/2009	25/11/2009	SDOP
7.6 Develop an AIP Supplement model containing applicable standards and procedures, including the corresponding in-flight contingencies	17/8/2009	16/10/2009	SDOP; CINDACTA 1; CINDACTA 3
7.7 Publish the AIP Supplement containing applicable standards and procedures, including the corresponding in-flight contingencies.	7/12/2009	11/2/2010	ICA
7.8 Develop Draft Procedural Handbook of the ATS units involved	19/10/2009	18/12/2009	CINDACTA 1; CINDACTA 3

7.9 Develop Draft letters of agreement between ATS units	19/10/2009	18/12/2009	CINDACTA 1; CINDACTA 3
7.10 Review Draft Procedural Handbook of the ATS units involved and Draft Letter of agreement between ATS units	21/12/2009	29/1/2010	SDOP
8 Training	**01/02/10**	**26/03/10**	
8.1 Develop a training and documentation programme for operators (pilots, dispatchers and maintenance personnel)	----------	----------	ANAC
8.2 Develop a training and documentation programme for air traffic controllers and AIS operators	01/02/10	12/02/10	SDOP; CINDACTA 1; CINDACTA 3
8.3 Develop a training programme for regulators (aviation safety inspectors)	----------	----------	ANAC
8.4 Conduct training programmes	15/02/10	26/03/10	SDOP; CINDACTA 1; CINDACTA 3
8.5 Conduct seminars for operators, explaining plans and expected operational and economic benefits	01/02/10	12/03/10	SDOP
9 Implementation decision	**15/3/2010**	**25/3/2010**	
9.1 Assess the available operational documentation (ATS, OPS/AIR)	15/3/2010	19/3/2010	SDOP / ANAC / ACFT Operators
9.2 Assess the percentage of approved aircraft and operators (non-exclusionary airspace)	15/3/2010	19/3/2010	SDOP / ANAC
9.3 Analyze the results of the safety assessment States	15/3/2010	19/3/2010	SDOP
9.4 Publish trigger NOTAM	24/3/2010	25/3/2010	SDOP
10 Performance monitoring system	2/11/2009	29/4/2011	
10.1 Develop a post-implementation monitoring programme for TMA operations	2/11/2009	26/3/2010	SDOP; CINDACTA 1; CINDACTA 3

10.2 Implement a post-implementation monitoring programme for TMA operations	8/4/2010	29/4/2011	SDOP; CINDACTA 1; CINDACTA 3
Pre-operational implementation date	08/04/10		
Definitive implementation date	08/04/11		

Appendix C – RNAV SID and RNAV STAR implementation schedule by aerodrome

Airport	RNAV SID	RNAV STAR	Priority	Tentative Date
Alcântara-MA	2		TBD	TBD
Alta Floresta-MT	2		TBD	TBD
Altamira-PA	1		TBD	TBD
Amapá-AP	1		TBD	TBD
Anápolis-GO	2		TBD	TBD
Aracaju-SE	2		TBD	TBD
Araraquara-SP	1		TBD	TBD
Araxá-MG	1		TBD	TBD
Assis-SP	1		TBD	TBD
Bacacheri-PR	4		TBD	TBD
Bagé-RS	1		TBD	TBD
Barbacena-MG	1		TBD	TBD
Barra do Garças-MT	2		TBD	TBD
Barretos-SP	1		TBD	TBD
Bauru-SP	3		1	TBD
Belém-PA	12		TBD	TBD
Belo Horizonte-MG	7		TBD	TBD
Boa Vista-RR	4		TBD	TBD
Bom Jesus da Lapa-BA	1		TBD	TBD
Brasília-DF	10	12	TBD	TBD
Cabo Frio-RJ	1		1	TBD
Caçador-SC	1		TBD	TBD
Cachimbo-PA	1		TBD	TBD
Caldas Novas-MG	1		TBD	TBD
Campina Grande-PB	1		TBD	TBD
Campinas-SP	3	3	TBD	TBD
Campo Grande-MS	4		TBD	TBD
Campos dos Goitacazes-RJ	4		TBD	TBD
Canoas-RS	3		TBD	TBD
Carajás-PA	1		TBD	TBD
Carolina-MA	1		TBD	TBD

Airport	RNAV SID	RNAV STAR	Priority	Tentative Date
Cascavel-PR	1		TBD	TBD
Caxias do Sul-RS	2		1	TBD
Chapecó-SC	2		1	TBD
Conceição do Araguaia-PA	1		TBD	TBD
Confins-MG	8		TBD	TBD
Corumbá-MS	2		TBD	TBD
Criciúma-SC	2		1	TBD
Cruzeiro do Sul-AC	1		1	TBD
Cuiabá-MT	6		TBD	TBD
Curitiba-PR	4		TBD	TBD
Eduardo Gomes-AM	8		TBD	TBD
Fernando de Noronha-PE	1		TBD	TBD
Florianópolis-SC	4		TBD	TBD
Fortaleza-CE	3		TBD	TBD
Foz do Iguaçú-PR	4		TBD	TBD
Galeão-RJ	11	8	1	NOV 2010
Goiânia-GO	3		TBD	TBD
Guajará Mirim-RO	1		TBD	TBD
Guarapuava-PR	1		TBD	TBD
Guaratinguetá-SP	2		TBD	TBD
Guarulhos-SP	4	10	1	NOV 2010
Ilhéus-BA	2		TBD	TBD
Imperatriz-MA	1		TBD	TBD
Ipatinga-MG	2		TBD	TBD
Itaituba-PA	1		TBD	TBD
Jacareacanga-AM	1		TBD	TBD
João Pessoa-PB	2		TBD	TBD
Joinville-SC	2		1	TBD
Juazeiro do Norte-CE	2		1	TBD
Juiz de Fora-MG	3		TBD	TBD
Lages-SC	1		TBD	TBD
Lagoa Santa-MG	4		TBD	TBD
Londrina-PR	2		1	TBD
Macapá-AP	2		TBD	TBD
Maceió-AL	2		TBD	TBD
Marabá-PA	1		1	TBD

Airport	RNAV SID	RNAV STAR	Priority	Tentative Date
Marília-SP	1		TBD	TBD
Maringá-PR	3		TBD	TBD
Minaçu-GO	1		TBD	TBD
Monte Dourado-PA	1		TBD	TBD
Montes Claros-MG	1		TBD	TBD
Mossoró-RN	1		TBD	TBD
Natal-RN	3		TBD	TBD
Navegantes-SC	2		1	TBD
Oipaoque-AP	1		TBD	TBD
Palmas-TO	2		TBD	TBD
Parnaíba-PA	1		TBD	TBD
Passo Fundo-RS	2		TBD	TBD
Paulo Afonso-BA	1		TBD	TBD
Pelotas-RS	1		TBD	TBD
Petrolina-PE	2		1	TBD
Piraçununga-SP	4		TBD	TBD
Poços de Caldas-MG	1		TBD	TBD
Ponta Pelada-AM	8		TBD	TBD
Ponta Porã-MS	1		TBD	TBD
Porto Alegre-PA	6		TBD	TBD
Porto Nacional-TO	2		TBD	TBD
Porto Seguro-BA	2		TBD	TBD
Porto Trombetas-PA	2		TBD	TBD
Porto Velho-RO	4		TBD	TBD
Presidente Prudente-SP	1		1	TBD
Recife-PE	4	4	1	ABR 2010
Ribeirão Preto-SP	2		TBD	TBD
Rio Branco-AC	6		TBD	TBD
S.G. da Cachoeira-AM	1		TBD	TBD
Salvador-BA	4		TBD	TBD
Santa Cruz-RJ	2		TBD	TBD
Santa Maria-RS	4		TBD	TBD
Santarém-PA	4		TBD	TBD
Santo Ângelo-RS	1		TBD	TBD
Santos Dumont-RJ	7	8	1	NOV 2010
São José do Rio Preto-SP	3		TBD	TBD
São José dos Campos-SP	4		TBD	TBD

Airport	RNAV SID	RNAV STAR	Priority	Tentative Date
São Luís-MA	4		TBD	TBD
São Paulo-SP	5	8	1	NOV 2010
Tabatinga-AM	2		TBD	TBD
Tefé-AM	1		TBD	TBD
Teresina-PI	3		TBD	TBD
Tiriós-AM	1		TBD	TBD
Toledo-PR	1		TBD	TBD
Torres-RS	1		TBD	TBD
Tucuruí-PA	1		TBD	TBD
Uberaba-MG	3		TBD	TBD
Uberlândia-MG	2		TBD	TBD
Uruguaiana-RS	1		TBD	TBD
Varginha-MG	2		TBD	TBD
Vilhena-RO	1		TBD	TBD
Vitória da Conquista-BA	2		TBD	TBD
Vitória-ES	4		1	FEV 2010
TOTAL	**309**	**53**		

Appendix D – RNAV Approach Procedures Implementation schedule by aerodrome

Airport	RNAV ILS IAC	LNAV/VNAV IAC	Priority	Tentative Date
Afonsos-RJ		2	TBD	TBD
Alcântara-MA		2	TBD	TBD
Alta Floresta-MT		2	TBD	TBD
Altamira-PA		2	TBD	TBD
Amapá-AP		2	TBD	TBD
Anápolis-GO	1	2	TBD	TBD
Aracaju-SE		2	TBD	TBD
Araçatuba-SP		2	TBD	TBD
Araraquara-SP		2	TBD	TBD
Araxá-MG		2	TBD	TBD
Assis-SP		2	TBD	TBD
Bacacheri-PR		2	TBD	TBD
Bagé-RS		2	TBD	TBD
Barbacena-MG		2	TBD	TBD
Barra do Garças-MT		2	TBD	TBD
Barretos-SP		2	TBD	TBD
Bauru-SP		2	1	TBD
Belém-PA	1	4	TBD	TBD
Belo Horizonte-MG		2	TBD	TBD
Boa Vista-RR	1	2	TBD	TBD
Bom Jesus da Lapa-BA		2	TBD	TBD
Brasília-DF	8	4	1	ABR 2010
Cabo Frio-RJ		2	1	TBD
Caçador-SC		2	TBD	TBD
Cachimbo-PA		2	TBD	TBD
Caldas Novas-MG		2	TBD	TBD
Campina Grande-PB		2	TBD	TBD
Campinas-SP	1	2	1	NOV 2010
Campo Grande-MS	1	2	TBD	TBD
Campos dos Goitacazes-RJ		2	TBD	TBD
Canoas-RS		2	TBD	TBD
Carajás-PA		2	TBD	TBD
Carolina-MA		2	TBD	TBD

Airport	RNAV ILS IAC	LNAV/VNAV IAC	Priority	Tentative Date
Cascavel-PR		2	TBD	TBD
Caxias do Sul-RS		2	1	TBD
Chapecó-SC		2	1	TBD
Conceição do Araguaia-PA		2	TBD	TBD
Confins-MG	1	2	TBD	TBD
Corumbá-MS		2	TBD	TBD
Criciúma-SC		2	1	TBD
Cruzeiro do Sul-AC		2	1	TBD
Cuiabá-MT	1	2	TBD	TBD
Curitiba-PR	2	4	TBD	TBD
Eduardo Gomes-AM	1	2	TBD	TBD
Fernando de Noronha-PE		2	TBD	TBD
Florianópolis-SC	1	2	TBD	TBD
Fortaleza-CE	1	2	TBD	TBD
Foz do Iguaçú-PR	1	2	TBD	TBD
Galeão-RJ	3	4	1	NOV 2010
Goiânia-GO		2	TBD	TBD
Guajará Mirim-RO		2	TBD	TBD
Guarapuava-PR		2	TBD	TBD
Guaratinguetá-SP		2	TBD	TBD
Guarulhos-SP	4	4	TBD	TBD
Ilhéus-BA		2	TBD	TBD
Imperatriz-MA		2	TBD	TBD
Ipatinga-MG		2	TBD	TBD
Itaituba-PA		2	TBD	TBD
Jacareacanga-AM		2	TBD	TBD
João Pessoa-PB		2	TBD	TBD
Joinville-SC		2	1	TBD
Juazeiro do Norte-CE		2	1	TBD
Juiz de Fora-MG		2	TBD	TBD
Lages-SC		2	TBD	TBD
Lagoa Santa-MG		2	TBD	TBD
Lins-SP		2	TBD	TBD
Londrina-PR		2	1	TBD
Macapá-AP		2	TBD	TBD
Maceió-AL		2	TBD	TBD

Airport	RNAV ILS IAC	LNAV/VNAV IAC	Priority	Tentative Date
Marabá-PA		2	1	TBD
Marília-SP		2	TBD	TBD
Maringá-PR		2	TBD	TBD
Minaçu-GO		2	TBD	TBD
Monte Dourado-PA		2	TBD	TBD
Montes Claros-MG		2	TBD	TBD
Mossoró-RN		2	TBD	TBD
Natal-RN	1	6	TBD	TBD
Navegantes-SC		2	1	TBD
Oipaoque-AP		2	TBD	TBD
Palmas-TO		2	TBD	TBD
Parnaíba-PA		2	TBD	TBD
Passo Fundo-RS		2	TBD	TBD
Paulo Afonso-BA		2	TBD	TBD
Pelotas-RS		2	TBD	TBD
Petrolina-PE		2	1	TBD
Piraçununga-SP		2	TBD	TBD
Poços de Caldas-MG		2	TBD	TBD
Ponta Pelada-AM		2	TBD	TBD
Ponta Porã-MS		2	TBD	TBD
Porto Alegre-PA	1	2	TBD	TBD
Porto Nacional-TO		2	TBD	TBD
Porto Seguro-BA		2	TBD	TBD
Porto Trombetas-PA		2	TBD	TBD
Porto Velho-RO	1	2	TBD	TBD
Presidente Prudente-SP		2	1	TBD
Recife-PE	1	2	1	ABR 2010
Ribeirão Preto-SP		2	TBD	TBD
Rio Branco-AC	1	2	TBD	TBD
S.G. da Cachoeira-AM		2	TBD	TBD
Salvador-BA	2	2	TBD	TBD
Santa Cruz-RJ		2	TBD	TBD
Santa Maria-RS	1	4	TBD	TBD
Santarém-PA		2	TBD	TBD
Santo Ângelo-RS		2	TBD	TBD
Santos Dumont-RJ		2	1	NOV 2010
São José do Rio Preto-SP		2	TBD	TBD

Airport	RNAV ILS IAC	LNAV/VNAV IAC	Priority	Tentative Date
São José dos Campos-SP	1	2	TBD	TBD
São Luís-MA	1	2	TBD	TBD
São Paulo-SP	2	2	1	FEV 2010
Tabatinga-AM		2	TBD	TBD
Tefé-AM		2	TBD	TBD
Teresina-PI		2	TBD	TBD
Tiriós-AM		2	TBD	TBD
Toledo-PR		2	TBD	TBD
Torres-RS		2	TBD	TBD
Tucuruí-PA		2	TBD	TBD
Uberaba-MG		2	TBD	TBD
Uberlândia-MG		2	TBD	TBD
Uruguaiana-RS		2	TBD	TBD
Varginha-MG		2	TBD	TBD
Vilhena-RO		2	TBD	TBD
Vitória da Conquista-BA		2	TBD	TBD
Vitória-ES		2	1	FEV 2010
TOTAL	**40**	**264**		