International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Second Meeting of the Programmes and Projects Review Committee (PPRC/2)
Lima, Peru, 16-18 July 2013

Agenda Item 3: Review of the GREPECAS Programmes and Projects

3.1 Projects under the PBN Programme

FOLLOW-UP ON THE ACTIVITIES OF PROJECT A1 (PBN IMPLEMENTATION) AND PROJECT A2 (AIR NAVIGATION SYSTEM IN SUPPORT OF PBN)

(Presented by the Secretariat)

SUMMARY

This working paper presents a report on implementation activities related to the projects under the PBN programme and their associated projects, "PBN implementation" and "Air navigation system in support of PBN", approved at GREPECAS/16 for the CAR and SAM Regions.

References:

- Doc 9750, Global Air Navigation Plan.
- Doc 9859, ICAO PBN Manual, 4th Edition.
- Report of the GREPECAS/16 meeting.
- Report of the First Meeting of the Programmes and Projects Review Committee (PPRC/1) (Mexico City, Mexico, 25-27 April 2012).

Strategic Objectives	*This working paper is related to strategic objectives:* *A - Safety* *C - Environmental protection and sustainable development of air transport*

1. Introduction

1.1 Pursuant to GREPECAS Decisions 16/45 and 16/47, the programme entitled *"Performance-Based Navigation (PBN)"* was structured with the following associated projects:

a) PBN operational implementation; and
b) Air navigation systems in support of PBN.

2. Discussion

CAR Region

Project A1 "PBN Implementation"

2.1 All NAM/CAR States and Territories have submitted their action plans. Furthermore, and pursuant to ICAO Assembly Resolutions A36-23 and A37-11, the CAR Region developed a PBN airspace concept consistent with GREPECAS Programmes A1 and A2.

2.2 The States have gradually implemented a PBN airspace concept. As a result of PBN implementation in the CAR Region, the following has been achieved to date:

- RNP 10 and random RNAV routes have been implemented in WATRS oceanic airspace, the Gulf of Mexico, and the Houston and Miami Oceanic FIRs. Random RNAV routes have been also implemented in the Piarco FIR.
- RNAV 5 routes in the upper continental airspace.
- 60% of aerodromes have instrument approach procedures with vertical guidance (APV), (BARO-VNAV and/or GNSS augmentation) whether as primary approach or as support to precision approaches.
- 60% of international airports have implemented SIDs/STARs with PBN navigation specifications and continuous descent and climb (CDO/CCO) criteria.
- The States use the IFSET electronic tool to send to ICAO Headquarters in Montreal the estimated fuel savings resulting from operational improvements. The analysis conducted in January 2013 of RNP 10 implementation in the upper airspace of the Gulf of Mexico indicates total fuel savings of 712,066 kg, resulting in cost savings of approximately $1,491,807 per month.

Project A2 "Air Navigation System in support of PBN"

2.3 Regarding the feasibility of regional application, technical aspects and operational benefits of SBAS, the SACCSA project has informed that they are favourable. However, there are associated costs and other capabilities that shall be analysed considering the medium- and long-term evolution in the CAR/SAM Regions. In turn, IATA has informed that no consideration has been given to new equipment or updating of on-board avionics in the medium term. Thus, we must wait for ICAO guidance material on this matter.

2.4 With respect to the WAAS analysis, Mexico is testing 5 stations for use in the airspace under its jurisdiction. The extension of WAAS requirements to the CAR Region will be analysed in the medium term. Regarding improvements to the communications and surveillance infrastructure, a specific RPO has been agreed, based on the requirements for the implementation of a PBN airspace concept in the CAR Region.

2.5 Based on the aforementioned developments and taking into account that several tasks have been finalised in keeping with the established objectives, scope, and metrics, it is necessary to merge projects A1 and A2 for the CAR Region, as shown in **Appendix A** to this working paper. This would also be aimed at expediting PBN implementation through improved communication with a single Project Coordinator.

SAM Region

Project A1 "PBN Implementation"

2.5 The SAM/IG/11 meeting analysed the status of the SAM PBN Implementation Programme, as well as the SAM ATS route network optimisation programme and its relationship with Project A1-GREPECAS PBN Operational implementation.

2.6 Both programmes of the SAM Region seek to improve the airspace structure of the Region and are related to each other. The PBN implementation programme has focused its efforts on following the PBN Roadmap and its timetable, initially preparing the fleet operating in the Region for its operational approval to fly in an environment with an RNAV 5 navigation specification and, then, based

on operational and airworthiness requirements, establishing more precise specifications, such as the implementation of RNAV 2 or RNP 2 or other, as necessary.

2.7 This PBN implementation process allows for the optimisation of the route network through rationalisation, that is, through on-going network assessment and, to the extent possible, the elimination or replacement of conventional and/or RNAV routes that are not being used by civil aviation, realigning the existing routes, implementing ATS routes as direct as possible, implementing parallel routes in selected airspaces, and reducing spacing between route centrelines.

2.8 The SAM PBN implementation project has 3 clearly distinct areas of application: ATS routes, basically in the upper airspace, terminal areas, and the design of RNAV/RNP procedures.

2.9 Since PBN implementation on routes affects all flight Information Regions (FIR), it is coordinated at regional level, although implementation corresponds to the States.

2.10 However, PBN implementation in TMAs and their restructuring, as well as the implementation of new RNAV/RNP approach procedures, have always been considered to be activities that correspond to the States, although, clearly, the implementation of SIDs and STARs, as well as CDO and CCO procedures have a direct and significant impact on the ATS route network structure.

2.11 In this sense, in the area of PBN implementation in TMAs and approach procedures, projects RLA/06/901 and RLA/99/901, through the SAM Implementation Group (SAM/IG), have focused their efforts on the development of PBN implementation plan models for TMAs and approaches, the issuance of the corresponding advisory circulars for operational approval, and the development of guidance material to be used by States in the execution of their projects.

2.12 The RNAV/RNP procedure design courses provided by a group of experts of the Region, as well as the courses and workshops on RNAV/RNP operational approval were supplemented by a workshop on PBN-based airspace design, conducted in Miami, United States, on 11-22 March 2013, sponsored by ICAO-IATA-CANSO and Project RLA/06/901.

2.13 In turn, the ATS route network optimisation programme, with the support of the States, among other important tasks, implemented Version 01 in March 2011, introducing 15 new RNAV routes, realigning 19 routes, and eliminating 18 conventional and RNAV routes that were not being used.

2.14 Regarding ATS route network optimisation Phase 2, Version 01 of the SAM ATS route network optimisation programme, new paths were proposed to reduce the nautical miles on said paths and, thus, reduce fuel and CO2 emissions. This implementation has been delayed due to the restructuring of airspace in some States, and the route package has expanded with the recent inclusion of Colombia and Ecuador into the project.

2.15 Using the ICAO IFSET tool to conduct an initial, very conservative analysis of this route optimisation Version 02, it is estimated that a reduction of 1440500 kg could be achieved in one month of operations in the scenario assessed, which represents 1.536% of the total currently used and, in terms of CO2 emissions, a reduction of 4.547.658,5 kg could be achieved, equivalent to 0.920% of the total currently emitted. If the amount of fuel saved is converted to litres, and calculating the price of a litre of fuel in $ 1.57, savings would amount to USD2.713.902 per month, which is equivalent to a reduction of CO2 emissions into the atmosphere of approximately 54.572 tonnes in one year.

2.16 A more accurate calculation will be made at the ATSRO/5 meeting to be held on 1-5 July 2013, where the routes to be optimised in this phase will be agreed upon.

2.17 In this regard, when analysing GREPECAS Project A1 –PBN Operational implementation, the SAM/IG/11 meeting recognised that PBN implementations for en route, TMA and approach operations were closely related, and that PBN implementation should be considered as a tool for optimising the airspace in South America. In this regard, it also recognised that tasks could overlap in some cases, so consideration should be given to the possibility of merging the two projects -PBN implementation and ATS route network optimisation- into a single programme for the optimisation of the South American airspace.

2.18 Furthermore, the scope of the implementation project contemplates planning in three different phases: Phase 1 –Implementation of RNAV5 (finalised); Phase 2 –Implementation of Version 01 of the SAM ATS route (finalised) and Phase 3 –Implementation of Version 02 of the SAM ATS route network (underway).

Achievement of goals based on Project A1 indicators/metrics

- Reduction of CO2 emissions, in tonnes, for each route optimisation version
- Percentage of RNAV and/or RNP SIDs/STARs implemented at international airports
- Percentage of continuous descent and climb operations implemented at international airports

Reduction of CO2 emissions in each SAM route optimisation version

Year	Route Optimisation Programme	Annual reduction of CO2	Reduction of fuel burn, in kg.
2012	**Version 01** of the Route Optimisation Programme	**22. 600. 000 Kg.**	**7.752.000 Kg.**
2013	**Version 02** of the Route Optimisation Programme	**Estimates foreseen in paragraph 2.15 of this working paper**	**Estimates foreseen in paragraph 2.15 of this working paper**

2.19 Bolivia, Brazil, Chile, Colombia, Uruguay, and Venezuela have responded to the 2013 survey on the status of PBN implementation. Considering 100% as the total number of international airports, the percentage implemented at least 1 procedure has been estimated for the various international airports as follows:

Percentage of SIDs/STARs, RNAV and/or RNP implemented at international airports
Percentage of continuous descent and climb operations implemented at international airports

State 2012	RNAV STAR	RNAV SID	RNP STAR	RNP SID	RNP LNAV	RNP BVNAV	RNP AR	Basic GNSS RNAV	CCO	CDO	No. International airports
ARG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
BOL	0%	0%	0%	0%	0%	0%	0%	**25%**	0%	0%	**9**
BRA	**85%**	**50%**	0%	0%	**11%**	**13%**	**6%**	0%	**15%**	**13%**	**27**
CHI	0%	0%	**33%**	**22%**	**32%**	**33%**	**22%**	0%	0%	0%	**9**
COL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**12**
ECU	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
FGY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
GUY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PAN	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PAR	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	

State 2012	RNAV STAR	RNAV SID	RNP STAR	RNP SID	RNP LNAV	RNP BVNAV	RNP AR	Basic GNSS RNAV	CCO	CDO	No. International airports
PER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
SUR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
URU	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**11**
VEN	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**10**

State 2013	RNAV STAR	RNAV SID	RNP STAR	RNP SID	RNP LNAV	RNP BVNAV	RNP AR	Basic GNSS RNAV	CCO	CDO	No. International airports
ARG	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
BOL	0%	0%	0%	0%	0%	0%	0%	**56%**	0%	0%	**9**
BRA	**90%**	**69%**	0%	0%	**33%**	**39%**	**17%**	0%	**39%**	**39%**	**27**
CHI	0%	0%	**44%**	**33%**	**44%**	**33%**	**22%**	0%	0%	0%	**9**
COL	**42%**	**25%**	0%	0%	0%	0%	0%	**42%**	0%	0%	**12**
ECU	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
FGY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
GUY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PAN	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PAR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
PER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
SUR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
URU	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**11**
VEN	0%	**100%**	0%	0%	**100%**	**100%**	0%	0%	0%	0%	**10**

2.20 With the exception of Brazil, regarding the implementation of instrument approaches based on PBN and the application of continuous descent (CDO) and continuous climb (CCO) operations, it should be noted that ICAO has recently approved the CDO Manual and has developed the CCO Manual (Doc 9993), which is still in the phase of consultation and receiving comments through the web.

2.21 Based on the information received, it is clear that, although the States are making efforts to comply with ICAO Assembly Resolution A37-11, some of them need more training assistance. Likewise, human and material resources are not sufficient in some States to comply with the Resolution.

2.22 At the SAM/IG/11 meeting, several States indicated that they did not have sufficient experts to design basic PANS-OPS procedures and PBN procedures, since the staff trained to perform such tasks in the Administrations had not been renewed. Furthermore, such specialised courses are expensive at the available academic institutions. The SAM Region, through its Project RLA/06/901, is working to provide training assistance to those States.

2.23 Due to the above, and based on that agreed by the SAM/IG Group, the proposal is to rename the programme as South American Airspace Optimisation and add the necessary tasks to Project A1 "PBN Operational Implementation" under that Programme, in order to continue implementing the subsequent route optimisation phases and extend its scope to include the assistance to the States in the redesign of their terminal areas through the implementation of SIDs and STARs, as well as CDO and CCO procedures that may have a direct and significant impact on the ATS route network structure. The name and metrics of the Project remain the same.

2.24 These new tasks will extend the horizon of Project A1 to the year 2018. **Appendix B1** describes Project A1, with its completed tasks and the new tasks being submitted to the consideration of the PPRC/2, with the new designation of the Programme and the redefinition of the scope of the Project to include assistance to the States for the optimisation of their terminal areas and associated procedures and operations.

Project A2 "Air navigation system in support of PBN"

2.25 As a follow-up to the activities under Project A2 "Air navigation systems in support of PBN", the SAM/IG/11 meeting considered that they had been completed, but Conclusion SAM/IG/7-6 had to be monitored. Accordingly, the States must inform the ICAO South American Regional Office of the corresponding changes that could affect the DME/DME coverage studies conducted in support of performance-based air navigation.

2.26 This DME/DME coverage study was presented to, and reviewed by, the SAM/IG/7 meeting (Lima, Peru, 23-27 May 2011). The coverage study was conducted using the EMACS tool, and the results were delivered in a KMZ file showing DME/DME coverage over a geographical map of the SAM Region, using Google Earth. The study only supports the RNAV/5 procedure.

2.27 The Practical guide for the implementation of GBAS systems was completed in October 2012, thus achieving the proposed goal. The guide is based on the experience of Brazil in the implementation of GBAS, and will serve as a reference for the States of the Region that are planning to implement a GBAS system.

2.28 Likewise, based on a preliminary study of the implementation of a RAM availability prediction service, the corresponding technical specifications were developed. It is expected that the bidding process will start in early July 2013, in order to have the application implemented by February 2014. The description of the Project appears in **Appendix B2** to this working paper.

Achievement of goals based on Project A-2 indicators/metrics

2.29 From the PPRC/1 meeting to date, the project has completed the guide for the implementation of a GBAS system and the technical specifications of the RAIM availability prediction service.

2.30 The RAIM prediction service, once implemented (February 2014) will initially benefit 11 SAM States. It is expected that by the end of 201, all the States and Territory will have this service.

2.31 Finally, it would be advisable to relocate Project A2 "Air navigation systems in support of PBN" under a new programme in the CNS area, since that project refers basically to the infrastructure and systems that support the application of performance-based navigation.

Conclusion

2.32 Although significant progress has been made in PBN implementation, it is necessary to increase the number of skilled human resources, improve training programmes, and improve PBN operational approval programmes. Therefore, States need to review and improve their own PBN implementation programmes with the assistance of ICAO CAR and SAM Regional Offices.

2.33 Based on the aforementioned developments, Appendices A and B to this working paper present the status of implementation of Projects A1 and A2 for the CAR and SAM Regions, respectively, based on the PBN programme (RNAV/RNP) approved by GREPECAS.

2.34 In the CAR Region, in accordance with the established objectives, scope and metrics, it is necessary to merge projects A1 and A2 for the CAR Region, as shown in Appendix A to this working paper. This would also expedite PBN implementation through better communication with a single Project Coordinator.

2.35 For the sake of project management efficiency, it is also necessary to support the proposal of the Secretariat to rename the PBN programme in the SAM Region as "SAM Airspace Optimisation", while extending Project A1 "PBN Operational Implementation" to include new tasks as necessary to assist States in the implementation of PBN at the level of routes, terminal areas, and the flexible use of airspace, as proposed in the description of Project B1 for the SAM Region contained in PPRC/2-WP/09.

3. **Suggested action:**

3.1 The Meeting is invited to:

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

b) approve the proposed merger of Projects A1 and A2 of the CAR Region, and the reformulation of Projects A1 and A2 of the SAM Region.

c) review project activities shown in Appendices A and B, and suggest other actions it may deem appropriate.

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APPENDIX A / APÉNDICE A

PROJECT IMPLEMENTATION OF PERFORMANCE BASED NAVIGATION (PBN) / PROYECTO IMPLANTACIÓN DE LA NAVEGACION BASADA EN LA PERFORMANCE (PBN)

CAR Region / Región CAR	**PROJECT DESCRIPTION / DESCRIPCIÓN DEL PROYECTO (DP)**	**DP N° A1/A2**	
Programme / Programa	**Project Title / Titulo del Proyecto**	**Start / Fecha inicio**	**End / Fecha término**
Performance Based Navigation / /Navegación basada en la performance (PBN) (Programme Coordinator / Coordinador del Programa: Victor Hernandez)	*Performance Based Navigation /Navegación Basada en la Performance (PBN)* Coordinator Project/Coordinador Projecto: Alfredo Mondragón (COCESNA) Experts / Expertos contribuyentes: Carl Gaynair (Jamaica); Jose Gil (México);Jose Perez (Dominican Republic); Randy Gómez (Trinidad and Tobago); Floyd Evans (IATA)	2008	2015
Objective /Objetivo	Support the implementation of the ATS route structure in terminal areas (SID/STAR RNAV) and en-route (RNAV) optimization project, as well as the implementation of RNP approach procedures according to regional performance objectives of the Performance-based Implementation Plan for NAM/CAR (RPBANIP NAM/CAR) Regions. / Apoyar la implementación del proyecto de optimización de la estructura de rutas ATS en el espacio aéreo terminal (SID/STAR RNAV) y en ruta (RNAV), así como la implantación de aproximaciones RNP en base a los Objetivos regionales de performance del Plan de Implementación Basada en la Performance para las Regiones NAM/CAR (RPBANIP NAM/CAR).		
Scope /Alcance	Progressive implementation of PBN and use of GNSS according to the goals of Assembly Resolution A37-11 and the PBN Airspace Concept for the CAR Region. / Implantación progresiva de la PBN y uso del GNSS acorde a las metas de la Resolución de la Asamblea A 37-11 y el Concepto de Espacio Aéreo PBN para la Región CAR.		

Metrics /Métricas	• Percentage of instrument runway ends with an approach procedure with vertical guidance (APV), (BARO-VNAV and/or augmented GNSS) either as the primary approach or as a back-up for precision approaches; • Percentage of international aerodromes with implanted SID/STAR RNAV, RNP and continuous descent and climb operations (CDO/CCO); • Estimated fuel saved with operational improvements. / • Porcentaje de final de pistas por instrumentos con un procedimiento de aproximación con guía vertical (APV), (BARO-VNAV y/o aumentación GNSS) sea como aproximación primaria o como apoyo para aproximaciones de precisión; • Porcentaje de aeropuertos internacionales con SID/STAR RNAV, RNP y operaciones de descenso y ascenso continuo (CDO/CCO) implantados; • Ahorros estimados de combustible por mejoras operacionales.
Strategy / Estrategia	The implementation of activities will.be coordinated between project members, the Project Coordinator and the Programme Coordinator. The Programme Coordinator will coordinate with the Project Coordinator requirements of other projects and NAM/CAR implementation working groups. States will develop their respective national programmes of implementation of routes and approach procedures according to PBN Airspace Concept in the CAR Region. Experts nominated by States, Territories and International Organizations will be incorporated to develop tasks as required. La ejecución de las actividades será coordinada entre miembros del proyecto, el Coordinador del Proyecto y el Coordinador del Programa. El Coordinador del Programa coordinará con el Coordinador del Proyecto los requerimientos de otros proyectos y Grupos de Trabajo de implementación NAM/CAR. Los Estados elaborarán sus respectivos programas nacionales de implantación de rutas y procedimientos de aproximación acorde al Concepto de Espacio Aéreo PBN de la Región CAR. Se incorporarán expertos nominados por los Estados, Territorios y Organizaciones Internacionales para desarrollar las tareas, según se requiera.
Goals / Metas	• Implement RNAV/RNP routes and RNP approach procedures according to Assembly Resolution A37-11 in 2016; • Implement a PBN airspace concept (CDOs, CCOs, SIDs, STARs, RNAV/RNP route and RNP approach procedures) in 8 FIR by end of 2014; • Analyze VOR, DME/DME infrastructure requirements for RNP approach procedures. / • Implementar rutas RNAV/RNP, y procedimientos de aproximación RNP de acuerdo a la Resolución de la Asamblea A37-11, en 2016; • Implementar un concepto de espacio aéreo PBN (CDOs, CCOs, SIDs, STARs, rutas RNAV/RNP, y RNP procedimientos de aproximación) en 8 FIR a fines de 2014; • Analizar los requisitos de infraestructura VOR, DME/DME para procedimientos de aproximación RNP.

Justification / Justificación	The Assembly Resolution A37-11, performance-based navigation (PBN) global goals, urged States to implement RNAV and RNP ATS routes and approach procedures in accordance with the ICAO Performance-based Navigation (PBN) Manual, Doc 9613, and requested the PIRGs to include in their work programme the review of status of implementation of PBN by States according to the defined implementation plans and report annually to ICAO any deficiencies that may occur. In addition, NAM/CAR States adopted a regional performance framework on the basis of the regional performance objectives (RPO) of the performance based air navigation implementation plan (RPB-ANIP) for NAM/CAR Regions and the Global ATM Operational Concept. The performance framework includes the implementation of a set of performance common metrics to facilitate comparative analysis of overall regional development, such as operational and economic cost-effectiveness of gate-to-gate flight operations, and the protection of the environment in the planning, implementation and operation processes of the global ATM system. / La Resolución A37-11 de la Asamblea, metas mundiales de navegación basada en performance (PBN), instó a los Estados a implantar rutas ATS RNAV y RNP, así como procedimientos de aproximación de acuerdo al Manual de la OACI sobre Navegación Basada en la Performance (PBN), Doc 9613, solicitando a los PIRGs incluir en sus programas de trabajo la revisión del estado de implantación de PBN por los Estados, de acuerdo a los planes de implantación definidos e informar anualmente a la OACI sobre cualquier deficiencia que pudiera ocurrir. Adicionalmente, los Estados NAM/CAR adoptaron un marco regional de performance en base a los objetivos regionales de performance (RPO) del plan de implantación de navegación basada en performance (RPB-ANIP) para las Regiones NAM/CAR y el Concepto Global de Operación ATM. El marco de performance incluye la implantación de un conjunto de métricas de performance comunes para facilitar el análisis comparativo del desarrollo regional en general, tales como el costo-efectividad operacional y económico de operaciones aéreas puerta a puerta y la protección del medio ambiente en los procesos de planificación, implantación y operación del sistema ATM global.
Related Projects / Proyectos relacionados	• Mejorar el equilibrio entre la demanda y capacidad; • Uso flexible del espacio aéreo; • Mejorar la Conciencia Situacional ATM; • Implementación del Nuevo Formato de Plan de Vuelo de la OACI. • Enhance demand and capacity balancing; • Flexible use of airspace; • Improve ATM Situational awareness; • Implement the New ICAO Flight Plan Form.

Project deriverables / Entregables del Proyecto	Relationship with RPB-ANIP NAM/CAR / Relación con el RPB-ANIP NAM/CAR	Responsible / Responsable	Status of implementation / Estado de Implantación*	Delivery date / Fecha entrega	Remarks / Comentarios
PBN Airspace Concept. / Concepto de Espacio Aéreo PBN.	RPOs 1, 2, 3	Alfredo Mondragón		Completed / Finalizada	Developed a comprehensive PBN Airspace Concept, in order to implement a trunk route network to/from city pairs in the upper and lower airspace. / Se elaboró un concepto del espacio aéreo PBN integral para implantar una red de rutas troncales desde-hacia pares de ciudades en el espacio aéreo superior e inferior
Optimize the ATS route structure based on RNAV-5 implementation in the upper continental airspace. / Optimizar la estructura de rutas ATS en base a la implementación de RNAV 5 en el espacio aéreo superior continental.	RPOs 1.1	States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales		Completed / Finalizada	RNAV 5 Routes implemented in the upper airspace. / Rutas RNAV 5 implantadas en el espacio aéreo superior.
Implement SIDs/STARS, CDO and CCO in terminal areas based on RNAV/1-2 and RNP1 navigation specifications. / Implementar SIDs/STARS, CDO y CCO en áreas terminales en base a especificaciones de navegación RNAV/1-2 y RNP1	RPOs 1.2	States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales		Completed / Finalizada	- 211 SIDs implemented / implementadas. - 145 STARs implemented / implementadas. - Implemented STARs /SIDs meet CDO/CCO criteria. / las STARs / SIDs implementadas cumplen con criterios CDO/CCO.

Design and implement PBN APV approach procedures in accordance with Assembly Resolution A37-11 (BARO-VNAV). / Diseñar e implementar procedimientos de aproximación PBN APV (BARO-VNAV) según la Resolución de la Asamblea A37-11.	RPOs 1.3	States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales		2014	140 RNP approach procedures implemented/ 140 procedimientos de aproximación RNP implementados.
Analysis to implement a comprehensive PBN airspace concept for the lower and upper airspace in the Central American FIR / Estudio para implementar un concepto de espacio aéreo PBN integral para el espacio aéreo inferior y superior en la FIR Centro América.	RPOs 1, 2, 3	Alfredo Mondragón		Completed / Finalizada	COCESNA coordinated the implementation of PBN airspace concept with 6 Central American States. / COCESNA coordinó la implementación de un concepto de espacio aéreo PBN con 6 Estados Centroamericanos.
PBN training programme for Pilots, ATCOs, operators and regulators. / Programa de Capacitación PBN para Pilotos, ATCOs, operadores y reguladores.	RPOs 1	States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales		Completed / Finalizada	States conduct their training programme according to the ICAO PBN Manual, Doc 9613. / Los Estados llevan a cabo su programa de capacitación acorde al Manual PBN, Doc 9613, de la OACI.
Evaluate and implement PBN requirements for ATC Automated Systems, according to the new ICAO Flight Plan Form requirements. / Evaluar e implementar los requisitos de los sistemas automatizados ATC acorde a los requisitos del nuevo formulario de plan de vuelo de la OACI	RPOs 1, 3, 4, 5	States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales		Completed / Finalizada	States have completed their action plan for the implementation of the New ICAO flight plan form. / Los Estados han completado su plan de acción para el procesamiento del nuevo formulario del plan de vuelo de la OACI.

Development of a proposal for amendment of the ATS routes network for the implementation of RNP 10 in the Gulf of Mexico oceanic area and RNAV 5 for the continental areas. / Elaboración de propuesta de enmienda a la red de rutas ATS para la implementación de RNP 10 en el área oceánica del Golfo de México y RNAV 5 para las áreas continentales	RPOs 1.1	Alfredo Mondragón, Roy Grimes		Completed / Finalizada	The proposal for amendment has been approved and implemented 11 new RNAV Routes. / La propuesta de enmienda ha sido aprobada e implementado 11 nuevas Rutas RNAV.
Develop PBN Safety Assessment Programme based on SMS methodology. / Desarrollar un Programa de Evaluación de Seguridad Operacional PBN en base a la metodología del SMS.	RPOs 1			Completed / Finalizada	States conduct safety assessment to implement changes in the airspace of their jurisdiction. / Los Estados efectúan una evaluación de la seguridad operacional para los cambios en el espacio aéreo de su jurisdicción.
Implementation of Random Routes in defined oceanic airspace. / Implantación de rutas aleatorias en espacio aéreo oceánico definido	RPOs 1.1, 3	Trinidad and Tobago / Trinidad y Tabago		Completed / Finalizada	RNP 10 and Random Routes implemented in the Oceanic area of the WATRS airspace, the Gulf of Mexico, Houston and Miami Oceanic and Piarco FIRs. / RNP 10 y Rutas RNAV aleatorias implementadas en el espacio aéreo oceánico WATRS, el Golfo de Mexico y las FIR Houston y Miami Oceanic y Piarco.
Analyse the DME/DME and GNSS infrastructure and coverage supporting PBN implementation. / Analizar la infraestructura y cobertura DME/DME y GNSS requerida para dar soporte a la implantación de la PBN.	RPOs 1	States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales		Completed / Finalizada	Current DME infrastructure supports the PBN approach procedures requirements. Regionally was not detected the necessity of more DME infrastructure. States will review their own DME radioaids requirements. / La infraestructura DME actual apoya los requisitos de los procedimientos de aproximación PBN. Regionalmente no se detectó la necesidad de más infraestructura DME. Los Estados analizarán sus propias necesidades de radioayudas DME.

Analysis of regional feasibility for SBAS (WAAS/SACSA) implementation. / Estudio de factibilidad regional de la implantación del SBAS (WAAS / SACCSA).	RPOs 1	Alfredo Mondragón assisted by SACCSA and WAAS / asistido por SACCSA y WAAS		2015	Mexico is testing 5 WAAS stations for domestic use. WAAS requirements will be regionally reviewed in the medium term. Feasibility of regional application, technical aspects, operational benefits, associated costs, for an SBAS (WAAS/SACSA) implementation. Implications for airborne equipment (factory delivered and retrofits) and other relevant aspects. / México tiene a prueba 5 estaciones WAAS para uso nacional. Los requisitos WAAS serán revisados regionalmente en el mediano plazo. Factibilidad de la aplicación regional, los aspectos técnicos, los beneficios operacionales, los costos asociados, de la implantación del SBAS (WAAS/SACCSA). Implicaciones para los equipos de a bordo (nuevas o actualización de aviónicas) y otros aspectos pertinentes.
Practical guidance for the implementation of GBAS Systems. / Guía práctica para implementación de sistemas GBAS.	RPOs 1	Alfredo Mondragón assisted by SACCSA and WAAS / asistido por SACCSA y WAAS		2015	
Develop a performance measurement programme / Desarrollar un programa de medidas de la performance.	RPOs 1, 3	ICAO		Completed / Finalizada	Implementation achievements are presented to the NACC/DCA Meetings. / Los resultados de implementación se presentan a las Reuniones NACC/DCA.
Monitor System Performance . / Monitorear la performance del sistema	RPOs 1	ICAO		2015	ICAO NACC Regional Office conducts this activity. / La Oficina Regional NACC de la OACI lleva a cabo esta actividad.

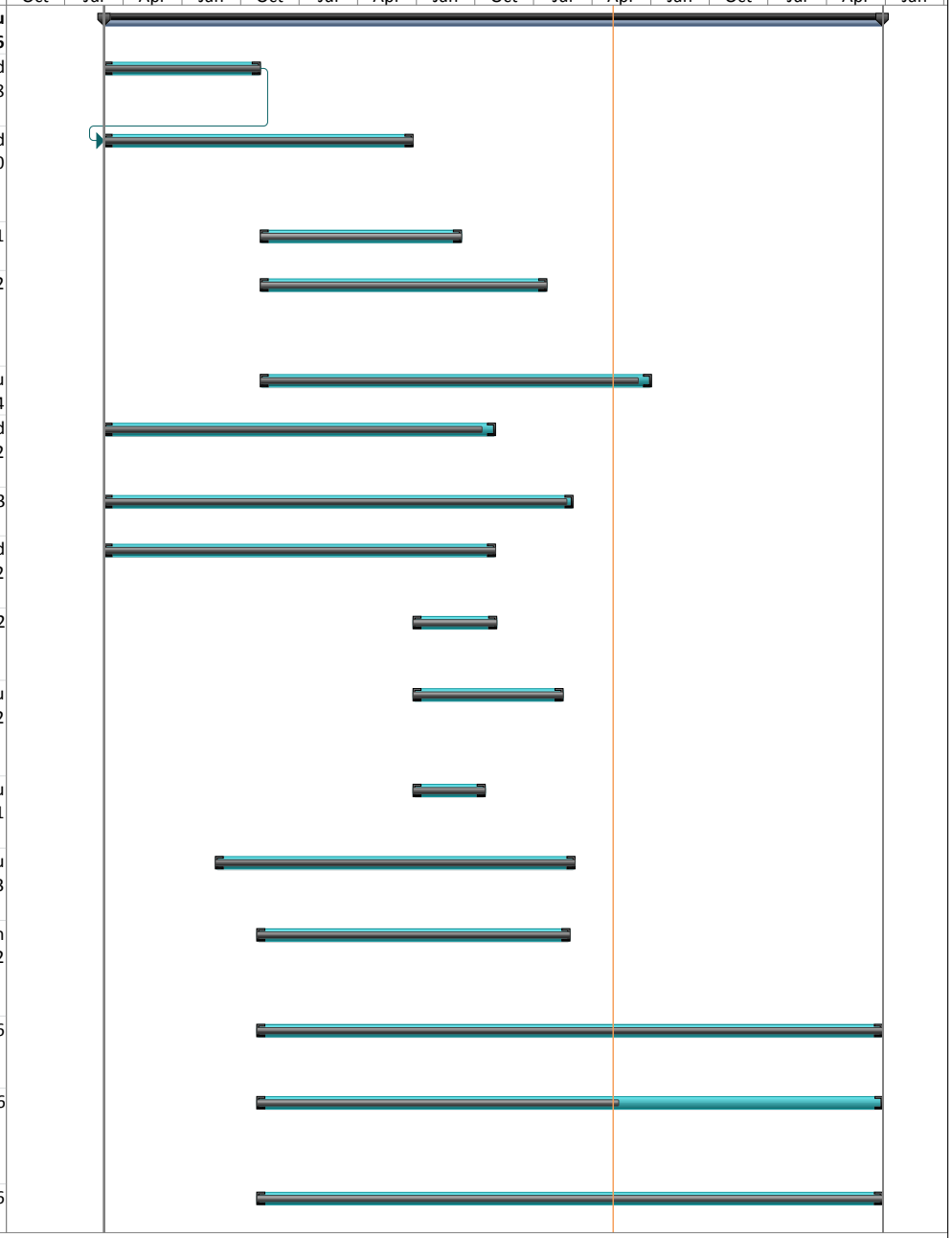
Required Resources / Recursos necesarios	CAR Regional Project with the participation of States to support PBN training programme. / Proyecto regional CAR con la participación de los Estados para apoyar el programa de capacitación PBN

Gris	Tarea no iniciada;
Verde	Actividad en progreso de acuerdo con el cronograma;
Amarillo	Actividad iniciada con cierto retardo pero estaría llegando a tiempo en su implantación;
Rojo	No se ha logrado la implantación de la actividad en el lapso de tiempo estimado se requiere adoptar medidas mitigatorias.

END - FIN

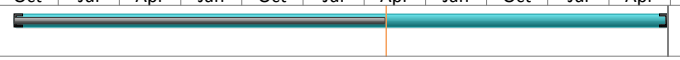
Implementation of Performance Based Navigation (PBN) / Implantación de la Navegación Basada en la Performance (PBN)

ID	Task Name	Start	Finish
1	**RPO 1, 2, 3- Implementation of performance based navigation (PBN) / Implantación de la navegación basada en la performance (PBN)**	**Mon 01/01/07**	**Thu 15/12/16**
2	Develop a regional strategy for the implementation of performance based navigation (PBN) / Desarrollar una estrategia regional para la implantación de la navegación basada en la performance (PBN)	Mon 01/01/07	Wed 31/12/08
3	Develop a national action plan for the implementation of performance based navigation (PBN) / Desarrollar un plan de accion nacional para la implantación de la navegación basada en la performance (PBN)	Mon 01/01/07	Wed 15/12/10
4	Develop a PBN airspace concept / Desarrollar un concepto de espacio aereo PBN	Wed 31/12/08	Fri 29/07/11
5	Analyze and enhance air communication, navigation and surveillance infrastructure in accordance with PBN requirements / Analizar y mejorar la infraestructura de comunicaciones, navegacion y vigilancia acorde a los requisitos PBN	Wed 31/12/08	Fri 31/08/12
6	Develop PBN Safety Assessment Programme / Desarrollar un Programa de Evaluación de Seguridad Operacional PBN	Wed 31/12/08	Thu 02/01/14
7	Publish regulations and procedures for aircraft and operators approval / Publicar reglamentaciones y procedimientos nacionales para aprobacion de aeronaves y operadores	Mon 01/01/07	Wed 04/01/12
8	Publish GNSS regulations / Publicar reglamentaciones GNSS	Mon 01/01/07	Tue 01/01/13
9	Publish AIP Supplement including applicable PBN standards and procedures / Publicar suplemento AIP incluyendo normas y procedimientos PBN aplicables	Mon 01/01/07	Wed 04/01/12
10	Develop PBN proposal for amendment to the applicable regional documentation / Desarrollar propuesta de enmienda PBN a la documentacion regional aplicable	Wed 15/12/10	Tue 10/01/12
11	Evaluate and implement PBN requirements for ATC Automated Systems, considering the new ICAO Flight Plan Format / Evaluar e implementar los requisitos de los sistemas automatizados ATC, considerando el nuevo formulario de plan de vuelo de la OACI	Wed 15/12/10	Thu 15/11/12
12	Develop Training programme for Pilots, ATCOs, operators and regulators / Desarrollar un programa de Capacitacion para Pilotos, ATCOs, operadores y reguladores	Wed 15/12/10	Thu 17/11/11
13	Implement RNP navigation specifications for oceanic areas / Implementar especificaciones de navegacion PBN para areas oceanicas	Wed 04/06/08	Thu 10/01/13
14	Optimize the airspace structure through implementation of RNAV Routes in the upper airspace based on RNAV-5 / Optimizar la estructura del espacio aereo superior mediante la implementacion de rutas RNAV en el espacio aereo superior en base a RNAV-5	Mon 15/12/08	Mon 17/12/12
15	Implement SIDs/STARS in terminal areas based on RNAV/1-2 and RNP1 specifications / Implementar SIDs/STARS en areas terminales en base a especificaciones RNAV/1-2 y RNP1	Mon 15/12/08	Sat 17/12/16
16	Design and implement PBN APV approach procedures in accordance with Assembly Resolution A37-11 (BARO-VNAV) / Diseñar e implementar procedimientos de aproximacion PBN APV (BARO-VNAV) segun la Resolucion de la Asamblea A37-11	Mon 15/12/08	Tue 20/12/16
17	Develop a performance measurement programme / Desarrollar un plan de medicion de la performance	Mon 15/12/08	Sat 17/12/16



Implementation of Performance Based Navigation (PBN) / Implantación de la Navegación Basada en la Performance (PBN)

ID	Task Name	Start	Finish
18	Monitor System Performance / Monitorear la performance del sistema	Mon 15/12/08	Tue 20/12/16



APPENDIX B1

PBN OPERATIONAL IMPLEMENTATION PROJECT

SAM Region	**PROJECT DESCRIPTION (DP)**	DP N° A1	
Programme	**Title of the Project**	**Start**	**End**
SAM Airspace Optimisation (Programme Coordinator: Roberto Arca Jaurena)	PBN Operational Implementation *Project coordinator: Alexandre Luiz Dutra Bastos (Brazil)*	2011	2018
Objective	Support the optimisation of the South American airspace structure through the optimisation of the ATS route structure in terminal (RNAV/RNP SIDs/STARs) and en-route (RNAV/RNP) airspace, as well as the implementation of PBN approaches pursuant to ICAO Assembly Resolution A37-11.		
Scope	The implementation project contemplates the optimisation of the South American airspace through the implementation of PBN and the application of the flexible use of airspace (FUA) concept, as well as the phased optimisation of the ATS route network of the region.		
Metrics	• Reduction of CO^2 emissions in tonnes for each route optimisation version. • Percentage of RNAV and/or RNP SIDs/STARs implemented at international airports. • Percentage of continuous descent and climb operations implemented at international airports. • Number of RNAV/RNP routes implemented, realigned and/or eliminated.		

Strategy	The conduction of project activities will be coordinated among project members, the project coordinator, and the programme coordinator, mainly at SAM/IG meetings. The project coordinator will coordinate with the programme coordinator the inclusion of additional experts, if warranted by the tasks and works to be executed. Furthermore, the States must check their respective national RNAV route implementation programme for consistency with the SAM RNAV implementation programme. Activities involving the review, implementation, modification, or elimination of routes in the SAM Reigon are foreseen in order to continue with the optimisation of the ATS route structure.
Goals	Implementation of version 02 of the ATS route network, based on RNAV, with the necessary PBN values to meet the current requirements of airspace users by the end of 2014. Strategy for the implementation of the FUA concept. Plan of action for route optimisation version 03 by 2015. 30% of terminal areas optimised at the main international airports by 2016, 50% by 2018.
Rationale	The 36th ICAO General Assembly requested the Council to encourage Contracting States to improve air traffic efficiency resulting in emission savings, to report the progress made in this field, and to expedite the development and implementation of routings and procedures that will permit efficient fuel burn to reduce aviation emissions.
Related projects	• Flexible use of airspace. • Automation. • Air navigation systems in support of PBN.

Project deliverables	Relationship with the performance-based regional plan	Responsible party	Status of Implemen-tation*	Delivery date	Comments
Implementation of version 01 of the ATS route network, based on RNAV, with the necessary PBN values to meet current requirements of airspace users.	PFF SAM ATM 01	Alexandre Luiz Dutra Bastos		October 2010	Finalised
Implementation of RNAV5 in the SAM Region.	PFF SAM ATM 01	Alexandre Luiz Dutra Bastos		October 2011	Finalised
Action plan for the implementation of version 02 of ATS route network optimisation.	PFF SAM ATM 01	Alexandre Luiz Dutra Bastos		ATS/RO/3	Finalised

Traffic data to understand airspace traffic flows.	PFF SAM ATM 01	ICAO coordinator		SAM/IG/6	Finalised
Fleet navigation capacity.	PFF SAM ATM 01	Alexandre Luiz Dutra Bastos		SAM/IG/9	Finalised
Listing of gateways of the main TMAs in the SAM Region.	PFF SAM ATM 02	Alexandre Luiz Dutra Bastos		SAM/IG/9	Few States have provided the data requested. The SAM/IG/11 meeting agreed to support States in the design of their TMAs so as to expedite PBN implementation.
Letters of Agreement and Contingency with adjacent States	PFF SAM ATM 01	Alexandre Luiz Dutra Bastos		SAM/IG/10	Finalised
Detailed study of the SAM ATS route network, route network version 02	PFF SAM ATM 01	Alexandre Luiz Dutra Bastos		April 2012	Finalised
Risk analysis for the implementation of Version 02 of the ATSRO Programme	PFF SAM ATM 01	External consultants		SAM/IG/10	Finalised
"*Airspace Modelling*" studies and Fast-Time Simulation to assess the scenarios developed in the detailed study of the SAM ATS route network.	PFF SAM ATM 01	Alexandre Luiz Dutra Bastos		December 2014	This task is subject to the availability of Brazilian technical support and facilities in Jose dos Campos

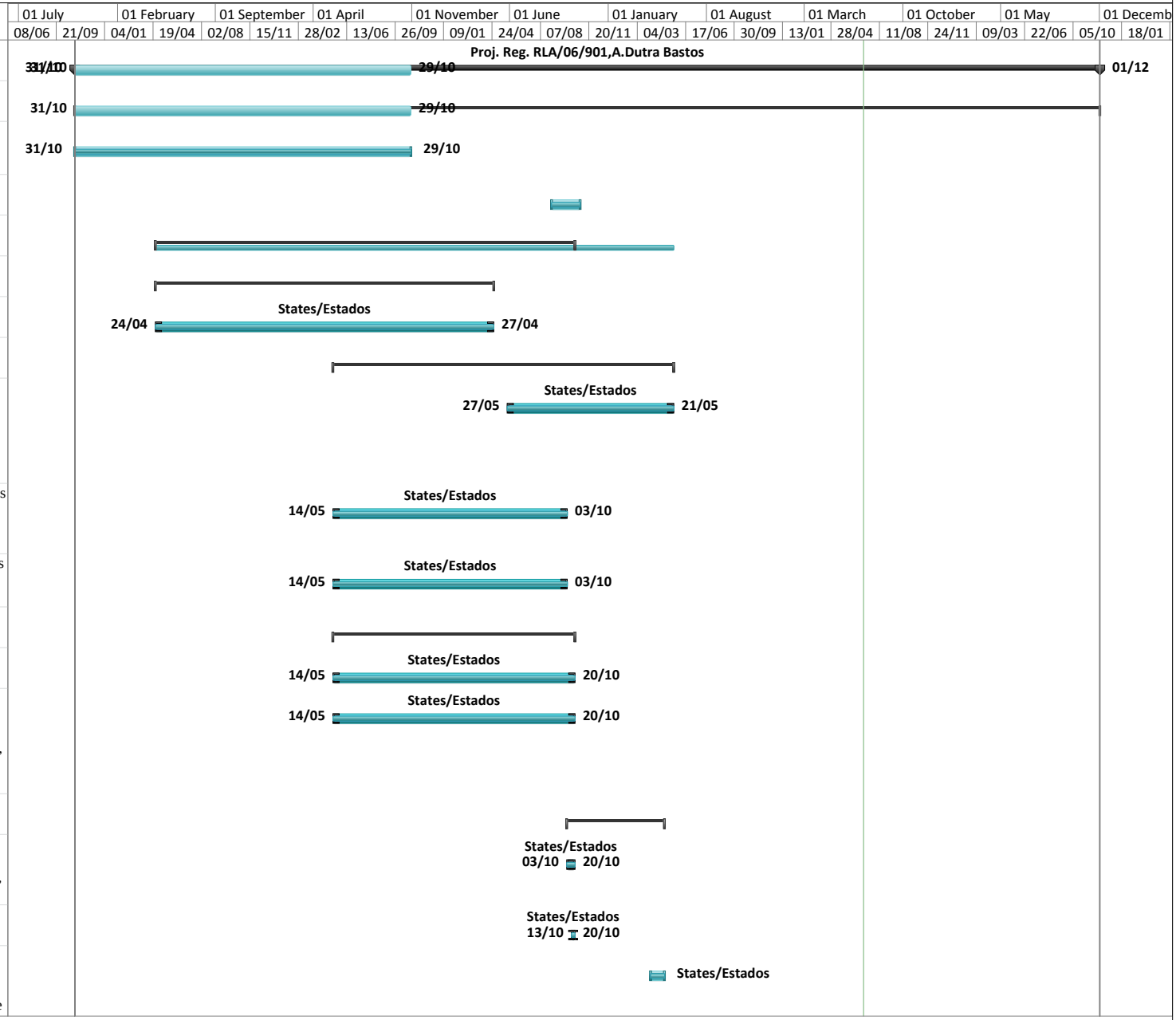
Prepare and conduct a course/workshop on the design of terminal areas applying PBN		TBD		December 2013	New task to be approved
Prepare and organise a support team (ST) to support States that require direct assistance for airspace optimisation		TBD		2014	New task to be approved
Develop the terminal area optimisation planning strategy		TBD		2014	New task to be approved
Develop guides for the design, assessment, and selection of the navigation specification to be applied in TMAs where required		TBD		2014-2016	New task to be approved
Develop concept verification and validation and risk analysis procedures		TBD		2014-2016	New task to be approved
Identify implementation restrictions and develop guides for pre-implementation training		TBD		2014-2016	New task to be approved

Plan of action for Version 03 of the SAM ATS route optimisation programme		TBD		October 2015	New task to be approved
Design the necessary tasks for the implementation of version 03 of the SAM ATS route optimisation programme		TBD		2016-2018	New task to be approved
Regional strategy and work programme for the implementation of the flexible use of airspace, applying a phased approach, starting with a more dynamic sharing of reserved airspace		TBD		2013-2018	This task is currently under Project B2 of the SAM Region, and the proposal is that it be transferred to this Project.
Resources required	Designation of experts in the execution of some of the deliverables.				

*

Grey	Task not started
Green	Activity underway as scheduled
Yellow	Activity started with some delay but expected to be completed on time
Red	It has not been possible to implement this activity as scheduled; mitigating measures are required

ID	Task Name
1	**Implantación operacional PBN/PBN operational implementation**
2	**Optimización de Rutas ATS/ATS Route Optimization**
3	Implantación de la versión 1 de la red de rutas ATS, basadas en RNAV/ ATS Route Optimization RNAV based Version 1
4	Análisis de Riesgo Post Implantación/Risk analisis Post Implementation
5	**RNAV-5 a corto plazo/ RNAV-5 Short term**
6	**Aprobación de aeronaves y operadores / Aircraft and operator approval**
7	Aprobación de aeronaves y operadores / Approval of aircraft and operators
8	**Normas y procedimientos**
9	Publicar Suplemento AIP que contenga normas y procedimientos aplicables, incluyendo las contingencias en vuelo. / Publish the AIP Supplement containing applicable standards and procedures, including in-flight contingencies
10	Revisar el Manual de Procedimientos de las unidades ATS involucradas / Review the Procedural Handbook of the ATS units involved
11	Actualizar cartas de acuerdo entre unidades ATS/ Update the letters of agreement between ATS units
12	**Capacitación / Training**
13	Conducir programas de capacitación
14	Realizar seminarios orientados a los operadores, indicando los planes y los beneficios operacionales y económicos esperados/ Conduct seminars for operators, explaining plans and expected operational and economic benefits
15	**Decisión de implantación/ Implementation decision**
16	Evaluar la documentación operacional disponible (ATS, OPS/AIR) / Assess the available operational documentation (ATS, OPS/AIR)
17	Publicar trigger NOTAM / Publish trigger NOTAM
18	Ejecutar un programa de monitoreo post-implementación de operaciones en Ruta/ Implement a post-implementation en-route operations monitoring programme



ID	Task Name
19	**Plan de acción Versión 02 optimización de la red de rutas ATS/ ATS Route Optimization Version 2**
20	Datos de tráfico para entender los flujos de tráfico del espacio aéreo/Data traffic to understand trafffic flows
21	Analisis de rutas ATS seleccionadas de la versión 2/Selected ATS Routes Vs.2
22	Análisis de riesgo para la implantación de la Versión 2 del Programa ATSRO
23	Simulación acelerada y Modelado de espacio aéreo/Fast simulation and airspace modeling
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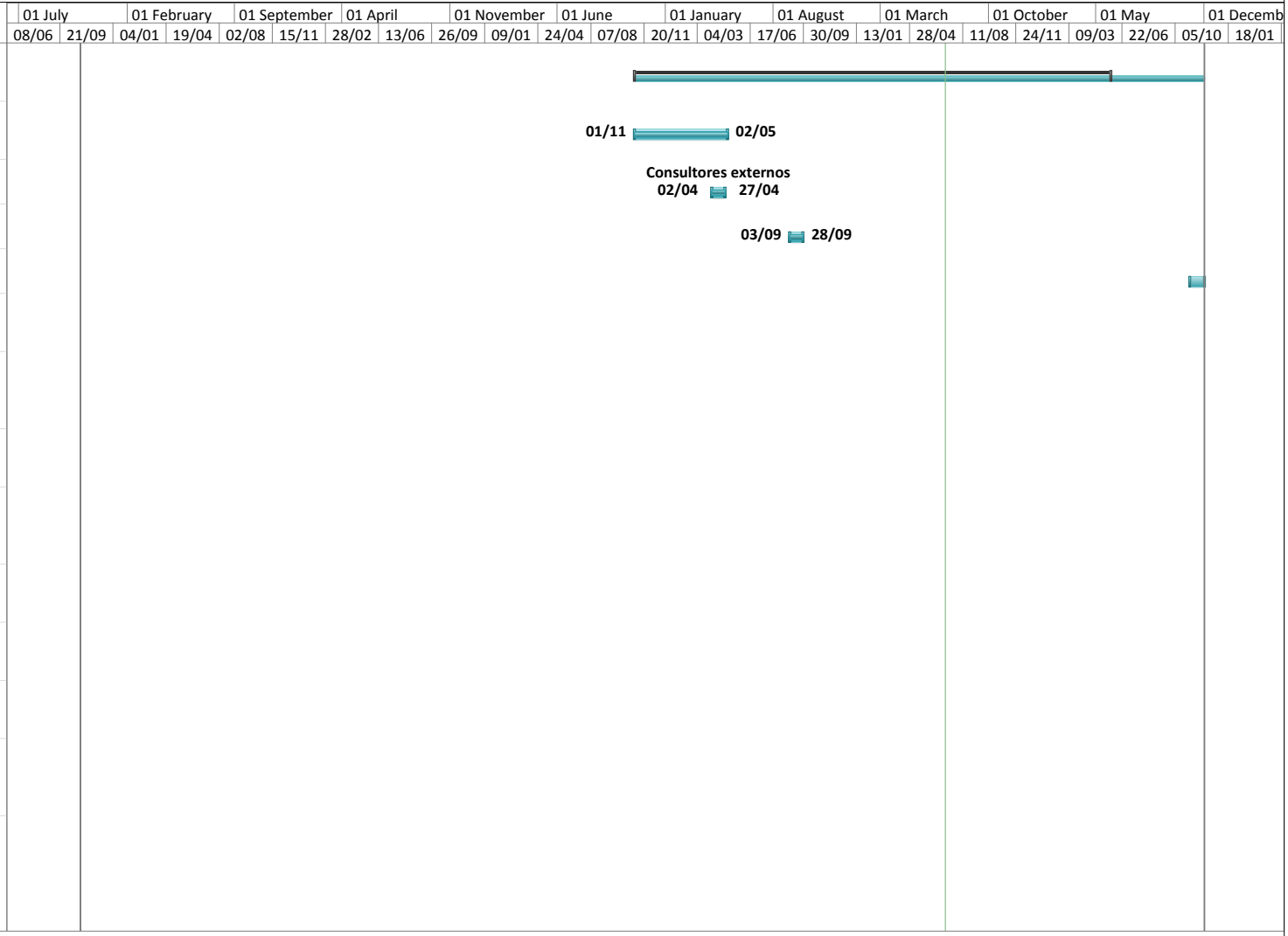

APPENDIX B2

SAM Region	**PROJECT DESCRIPTION (DP)**	**DP N° A2**	
Programme	**Title of the Project**	**Start**	**End**
PBN (*Programme Coordinator: TBD)*	Air navigation systems in support of PBN *Project Coordinator: Alexandre Luiz Dutra Bastos (Brazil)* *Experts contributing to the project: Alessander Santoro, Andre Jansen, Fabio Augusto Andrade (Brazil), Paulo Vila and Tomas Macedo (Peru), and the SAM/IG SAM PBN Group*	January 2011	February 2014
Objective	Develop guides, conduct analyses and implement services in support of PBN implementation in the SAM Region.		
Scope	Support to PBN implementation in the SAM Region, initially consisting of: • Practical guide for the implementation of GBAS systems. • Analysis of DME/DME coverage to support PBN procedures. • Implementation of a RAIM availability prediction service.		
Metrics	• Drafting of a practical guide for the implementation of a GBAS system. • Analysis of DME/DME coverage in the SAM Region completed. • Availability of a RAM availability prediction service. • % of States providing the RAIM availability service.		
Strategy	• All activities will be conducted by experts designated by SAM States and organisations participating in the project entitled "*Air navigation systems in support of PBN",* under the management of the project coordinator and the supervision of the programme coordinator. Communications among project members, and between the project coordinator and the programme coordinator shall be done through teleconferences and the Internet. Likewise, the programme coordinator may meet with the project coordinator and the contributing experts at the SAM/IG implementation meetings. • Once the studies have been completed, the results will be sent to the ICAO programme coordinator as a final consolidated document, and to the GREPECAS PPRC for analysis, review and approval.		
Goals	• Guide for the implementation of a GBAS system, by October 2012. • Assessment of DME/DME coverage to support PBN procedures, by May 2011. • RAIM availability prediction service in the SAM Region implemented by February 2014. • 11 SAM States with RAIM availability prediction service available by February 2014. • 3 SAM States and one territory with the service available by the end of 2014.		

Rationale	• The implementation of PBN procedures for approach, terminal and en-route operations requires the implementation of air navigation systems, services and infrastructure studies, such as the proper installation of DME to support the DME/DME navigation required in the event of failure of the GNSS system, the RAIM availability prediction service to enable the user to know what is RAIM availability for en-route, terminal and approach operations, and the implementation of GBAS systems to support precision landing procedures. • This project contributes to the implementation of SAM PFF CNS 03, ATM 01, ATM 02, and ATM 03 of the *SAM Performance-based navigation system implementation plan (SAM PBIP).*
Related projects	• Implementation of PBN operational aspects.

Project deliverables	**Relationship with the performance-based regional plan (PFF) and ASBU modules**	**Responsible party**	**Status of implemen-tation**	**Delivery date**	**Comments**
Develop a practical guide for the implementation of the GBAS system					
Practical guide for the implementation of GBAS systems	SAM PFF CNS 03 B0-65	Alessander Santoro (Brazil)		October 2012	The practical guide for the implementation of GBAS systems was presented at the SAM/IG/8 meeting.
Analyse DME/DME and GNSS infrastructure and coverage needed to support PBN implementation					
Analysis of the DME/DME and GNSS infrastructure required to support PBN implementation in the SAM Region	SAM PFF CNS/03 SAM PFF ATM/01 ATM/02 ATM/03 B0-65, B0-10, B0-05, and B0-20	Fabio Augusto Andrade and Andre Jansen (Brazil) Paulo Vilas and Tomas Macedo (Peru)		The coverage study to support RNAV5 was completed (SAM/IG/8 October 2011)	A *DME/DME coverage study* was presented and reviewed at the SAM/IG/7 meeting (Lima, Peru, 23-27 May 2011). The coverage study was conducted using the EMACS tool and the results were delivered in a KMZ file clearly showing DME/DME coverage over the geographical map of the SAM Region, using Google Earth. The study only supports the RNAV/5 procedure.

Project deliverables	Relationship with the performance-based regional plan (PFF) and ASBU modules	Responsible party	Status of implemen-tation	Delivery date	Comments
Development of guidance on the use and availability of GNSS performance forecast/validation tools.					
Implementation of a RAIM availability prediction service	SAM PFF CNS/03 SAM PFF ATM/01 ATM/02 ATM/03 B0-65, B0-10, B0-05 and B0-20	Project coordinator PBN Group SAM/IG		February 2014	Based on an initial study of the implementation of a RAIM availability prediction service (SAM/IG/8 (Lima, Peru, 10-14 October 2011), the corresponding technical specifications were developed. It is expected that the bidding process will start in early July 2013 in order to have the application implemented by February 2014.
Monitor activities for the implementation of air navigation systems in support of PBN		ICAO		January 2011 – February 2014	
Resources required	Implementation of the RAIM availability prediction service.				

Grey *- Task not started*
Green *- Activity underway as scheduled*
Yellow *- Activity started with some delay but expected to be completed on time*
Red *- It has not been possible to implement this activity as scheduled; mitigating measures are required*

GRUPO REGIONAL CAR/SAM DE PLANIFICACION Y EJECUCION / CAR/SAM REGIONAL PLANNING AND IMPLEMENTATION GROUP (GREPECAS)

A2 - PBN supporting air navigation systems / Sistemas de navegación aérea en apoyo a la PBN

ID	Nombre de tarea	Start	Finish
1	**PBN SUPPORTING AIR NAVIGATION SYSTEMS/SISTEMAS DE NAVEGACION AEREA EN APOYO A LA PBN**	**Mon 03/01/11**	**Fri 28/02/14**
2	**Guide on the practical guidance for the implementation of GBAS Systems / Guía práctica para implementación de sistemas GBAS**	**Mon 30/05/11**	**Fri 05/10/12**
3	Collection of information/Recolección de información	Mon 30/05/11	Fri 07/10/11
4	Delivery of a guide draft proposoal/Entrega de propuesta de borrador de guía	Tue 11/10/11	Fri 14/10/11
5	Review of draft proposal/Revisión del borrador de propuesta	Mon 17/10/11	Tue 15/05/12
6	Guide final adjustments/Ajustes finales en la guía	Tue 15/05/12	Fri 28/09/12
7	Guide final delivery/Entrega guía final	Fri 28/09/12	Fri 05/10/12
8	**Analysis of the DME/ DME and GNSS infrastructure supporting PBN implementation in the SAM Region / Análisis de la infraestructura DME / DME y GNSS requerida para apoyar la implementación de la PBN en la Región SAM**	**Mon 03/01/11**	**Fri 21/10/11**
9	Collection of DME installation information/ Recolección de información sobre DME	Mon 03/01/11	Fri 11/02/11
10	Analysis for DME/DME using EMAC software tool/ Análisis de DME /DME usando sofware EMAC preliminar	Mon 14/02/11	Fri 20/05/11
11	Delivery of a preliminary analysis/Entrega análisis inicial	Mon 23/05/11	Fri 27/05/11
12	Review of preliminary analysis/Revisión del borrador inicial	Tue 31/05/11	Fri 07/10/11
13	Adjustments in the Analysis/Ajuste en el análisis	Mon 10/10/11	Fri 14/10/11
14	Delivery of final analysis/Entrega análisis final	Mon 17/10/11	Fri 21/10/11
15	**Implementation of a RAIM availability prediction service/Implantación de un servicio predicción de la disponibilidad RAIM**	**Mon 21/02/11**	**Fri 28/02/14**
16	Collection of information/Recolección de información	Mon 21/02/11	Mon 23/05/11
17	Development of requirements/Desarrollo de requerimientos	Tue 24/05/11	Fri 07/10/11
18	Service provider consult/Consulta proveedor de servicio	Tue 24/05/11	Fri 07/10/11
19	State consult for implementation/Consulta a los Estados para la implantación	Mon 10/10/11	Mon 30/04/12
20	Drafted technical specification/Elaboración especificaiones técnicas	Fri 01/06/12	Fri 09/11/12
21	Revision of technical specification/Revision de las especificaciones tecnicas	Mon 12/11/12	Fri 29/03/13
22	Bid process/Proceso de licitación	Mon 22/07/13	Mon 23/09/13
23	Implementation/Implantación	Tue 07/01/14	Fri 28/02/14
24	**Monitor PBN supporting air navigation systems activities in the SAM Region / Monitorear las actividades de implantación de los sistemas de navegación aérea de apoyo a la PBN en la Región SAM**	**Mon 03/01/11**	**Fri 28/02/14**

ID	Nombre de tarea	Start	Finish	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
25	Monitor PBN supporting air navigation systems activities in the SAM Region/Monitorear las actividades de implantación de los sistemas de navegación aérea de apoyo a la PBN en la Región SAM	Mon 03/01/11	Fri 28/02/14								**OACI/ICAO**					