International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)

WORKING PAPER

GREPECAS/21 — WP/15 **Rev.**
16/11/23

Twenty-first Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/21)
Santo Domingo, Dominican Republic, 15 to 17 November 2023

Agenda Item 3: **Global and Regional Developments**
3.3 CAR/SAM Air Navigation Services (ANS) Implementation Level

AMENDMENT OF GREPECAS PROJECTS A1 ON THE IMPLEMENTATION OF THE PBN

(Presented by the Secretariat)

EXECUTIVE SUMMARY

This Working Paper presents a proposal to amend GREPECAS A1 projects related to the implementation of performance-based navigation (PBN), in accordance with Decision GREPECAS/20/01, to address the need to optimize Regional and Trans-regional airspace in terms of efficiency, capacity, safety and environmental protection, and include performance measurement in accordance with the *Global Air Navigation Plan* (GANP) Key Performance Indicators (KPIs) in the implementations.

Action:	Suggested Actions are included in Section 3.
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency • Environmental Protection
References:	• Convention on International Civil Aviation • Final Report of the Twentieth Meeting of the CAR/SAM Planning and Implementation Regional Group (GREPECAS/20), Salvador, Brazil, November 16-18, 2022 • Global Air Navigation Plan – GANP

1. Introduction

1.1 At the GREPECAS/20 meeting (Salvador, Brazil, November 16 to 18, 2022) it was reported that the SAM Region keeps the progress of the implementation of performance-based navigation (PBN) in the en-route, departures / arrivals, and approach segments, within the framework of Project A1. An average of 90.6% PBN implantation (APV-BARO VNAV) was achieved in 2022.

1.2 Horizontal cooperation between States and, at the same time, with industry, was emphasized to promote the implementation of PBN. In this regard, IATA explained that the Strategic Direct Routing (SDR) initiative was implemented in selected portions of airspace in 6 South American States, applying procedures published via the Aeronautical Information Publication (AIP) amendment or Aeronautical Information Circular (AIC). It was stressed that the SDR, as the basis of the concept of Direct Routing (DCT), is the most appropriate way to move towards the Free Route Airspace (FRA) in accordance with the provisions of the GANP, a document that develops the functional description, dependencies and relationships with other elements, detail of the enablers and the measurement of performance indicators.

1.3 In addition, the progress made by the Airspace Optimization Task Force (AO/TF) in the scope of the North American, Central America and Caribbean Working Group (NACC/WG) was presented. It was reported that the PBN Task Force (PBN/TF) changed to AO/TF in August 2021 to reflect the priority of optimizing the airspace of the regions and subsequently absorbed the Airspace Optimization Team in 2022. Within this framework, through the collaboration of CANSO, IATA and ICAO, a coordination process initiated by the CANSO Air Traffic Flow Management Data Exchange Network for the Americas (CADENA) is developed. This equipment is called CANSO IATA ICAO Free Route Airspace (CIIFRA).

2. Analysis

2.1 In the GREPECAS/20 meeting, IATA highlighted its participation in the CIIFRA joint group where the implementation of User Preferred Route (UPR) is promoted, which optimize the trajectory between a couple of cities without necessarily applying Air Traffic Services (ATS) routes published in the AIPs. CIIFRA allows early benefits to be obtained in States that are not in a position to implement SDR.

2.2 It was identified that activities in both regions are progressing and harmonization between them should begin as soon as possible, therefore, IATA proposed an implementation strategy based on the development of a common Technical Guidance Material for CAR/SAM Regions on the implementation of Enhanced Operations through Free Route Operations (FRTO), which would include UPR, SDR and Free-Route Airspace (FRA).

2.2 The Meeting agreed that the initiatives of the CAR and SAM Regions that have been advancing together with the industry, should be grouped under a single GREPECAS Programme, to develop in a harmonized and interoperable way the concepts for the optimization of the airspace that cover, in addition to the PBN implementation, several modules/operational elements of the GANP. In addition, it is proposed to include in the project the evaluation of CNS/ATM enablers and the optimization of longitudinal separation in continental space. In this regard, Decision GREPECAS/20/01 was approved, which is shown in **Appendix A**.

2.3 Consequently, in accordance with the mandate of GREPECAS, the Secretariat has prepared a proposal for amendment to Projects A1, which is included in **Appendix B** to this Note.

3. Suggested actions

3.1 The Meeting is invited to:

a) Take note of the information presented in this Working Paper;

b) evaluate the proposed amendment to Project A1 implementation of the PBN, in Appendix B. As necessary, provide input and comments for the proposal; and

c) If consensus is reached, adopt the proposal for amendment.

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APPENDIX A

<table>
<tr><td colspan="3">DECISION
GREPECAS/20/01</td><td colspan="2">AMENDMENT TO PROJECTS A1 OF THE CAR AND SAM REGIONS ON THE IMPLEMENTATION OF PBN, WITH THE PURPOSE OF DEVELOPING CONCEPTS FOR THE OPTIMIZATION OF THE AIRSPACE</td></tr>
<tr><td colspan="4">What:
That, the Secretariat,

a) review and amend the A1 Projects of the CAR and SAM Regions, originally defined in GREPECAS for PBN implementation, with the purpose of including in their scope the development of concepts for airspace optimization, based on the GANP operational modules for Enhanced Operations Arrival/Departure (APTA) and Enhanced Operations Through Optimized Route Trajectories (FRTO), as well as other Regional initiatives; and

b) include in these revised projects the participation and contribution of organizations, users and interested parties by GREPECAS/21.</td><td>Expected impact:
☐ Political / Global
☒ Inter-regional
☐ Economic
☒ Environmental
☒ Technical/Operational</td></tr>
<tr><td colspan="5">Why:
To address the need to optimize Regional and Trans-regional airspace in terms of efficiency, capacity, operational safety and environmental protection, and include performance measurement in implementations according to the GANP KPIs.</td></tr>
<tr><td colspan="2">When:</td><td>By GREPECAS/21</td><td>Status:</td><td>☒ Valid / ☐ Invalid / ☐ Concluded</td></tr>
<tr><td colspan="2">Who:</td><td>☐ States ☒ ICAO ☐ Others:</td><td colspan="2">NACC/SAM Secretariat</td></tr>
</table>

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APÉNDICE B / APPENDIX B

PROYECTO/PROJECT CAR/SAM

Región / *Region* CAR/SAM	**DESCRIPCION DEL PROYECTO /*PROJECT DESCRIPTION***	**N° NEOSPACE - 1**	
Programa/*Programme*	**Título /*Title***	**Inicio/ Start**	**Término/ End**
Optimización espacio Aéreo CAR/SAM ***CAR/SAM Airspace Optimization*** Coordinadores *Coordinators* RO NACC **TBD** xxx Fernando Hermoza	Implantación de módulos APTA y FRTO del GANP para incrementar la performance de la eficiencia, la capacidad y la seguridad operacional *Implementation of APTA and FRTO modules of the GANP to increase performance of efficiency, capacity, and safety* Coordinadores del proyecto/ *Project coordinators* ✓ Julio Cesar de Souza Pereira (IATA) ✓ XXX X X X X XXX (CAR TBD) ✓ Xxxx x x x x x xxxxxx (SAM TBD)	ENE 2024 *JAN 2024*	DIC 2027 *DEC 2027*
1. Objetivos **Objectives**	Reconociendo el actual progreso de actividades de implantación de ciertos elementos de los módulos APTA y FRTO del **GANP[1],** se requiere: a) Apoyar y reorientar la optimización de la estructura del espacio aéreo de Región CAR/SAM de una manera armonizada y coherente, fortaleciendo las implantaciones en curso. b) Impulsar las actividades de los Estados y organizaciones CAR/SAM para la implantación efectiva del Volumen III del ANP CAR/SAM. c) Generar beneficios medioambientales mediante ahorro de combustible y reducción de emisiones CO2. Recognizing the current progress of implementation activities for certain elements of the APTA and FRTO modules of the **GANP[2],** it is required: a) Support and reorient the optimization of the airspace structure of the CAR/SAM Region in a harmonized and coherent manner, strengthening ongoing implementations.		

[1] *Ver portal GANP: https://www4.icao.int/ganpportal/*

[2] *See GANP portal: https://www4.icao.int/ganpportal/*

	b) Promote the activities of the States and CAR/SAM organizations for the effective implementation of Volume III of the ANP CAR/SAM. c) Generate environmental benefits by saving fuel and reducing CO2 emissions.
2. Alcance **Scope**	✓ Iniciar y/o reforzar la implantación de elementos seleccionados del módulo FRTO del **GANP**[3]**:** a) para incrementar la performance en el área **Eficiencia**, en las áreas focales; tiempo de vuelo, distancia y vuelo vertical, incidiendo en ahorros de combustible y emisión de CO2; y b) para incrementar la performance en el área **Seguridad Operacional,** en objetivos específicos de evitar desviaciones en la navegación lateral/horizontal, y mejorar la detección temprana de autorizaciones del ATC conflictivas. ✓ Iniciar y/o reforzar la implantación de elementos seleccionados del módulo APTA del GANP (Aproximación, SID/STAR, CDO y CCO) para incrementar la performance en el área **Capacidad,** en las áreas focales; capacidad, rendimiento y utilización. ✓ Evaluar e implementar los habilitadores CNS/ATM necesarios a FRTO y APTA ✓ Optimizar la separación longitudinal en espacio continental, para incrementar la performance en el área **Eficiencia y Capacidad.** ✓ Initiate and/or reinforce the implementation of selected elements of the GANP FRTO module[4]**:** a) to increase performance in the area **Efficiency**, in the focal areas; flight time, distance and vertical flight, focusing on fuel savings and CO2 emissions; and b) to increase performance in the area **Safety**, in specific objectives of avoiding deviations in lateral/horizontal navigation and improving the early detection of conflicting ATC authorizations. ✓ Initiate and/or reinforce the implementation of selected elements of the GANP APTA module (Approach, SID/STAR, CDO and CCO) to increase performance in the area **Capacity,** in the focal areas; capacity, performance and utilization. ✓ Evaluate and implement the necessary CNS/ATM enablers to FRTO and APTA ✓ Optimize longitudinal separation in continental space, to increase performance in the **Efficiency and Capacity area.**
3. Métricas de soporte **Supporting metrics**	✓ Número de rutas SID/STAR PBN implantados, donde sea requerido para Aeropuertos Internacionales (Aplicación de técnicas CCO y CDO) ✓ Número de rutas RNAV/RNP implementadas (nuevas rutas/mejora de especificación de navegación/reemplazo de rutas convencionales). ✓ Número de Regiones de información de vuelo que han implementado enrutamiento directo estratégico (EDE). Volumen de espacio aéreo implementado. ✓ Número de Regiones de información de vuelo que han implementado Espacio Aéreo de Ruta Libre (FRA). Volumen de espacio aéreo implementado. ✓ Número de rutas preferidas por el usuario UPR implantadas.

[3] *El proyecto inicia con la planificación de módulos FRTO y APTA de Bloques 0 y 1. A partir de 2025, se incorpora el Bloque 2 de acuerdo con el GANP.*

[4] *The project starts with the planning of FRTO and APTA modules of Blocks 0 and 1. From 2025, Block 2 is incorporated according to the GANP.*

	✓ Porcentaje de umbrales con aproximaciones APV en Aeropuertos Internacionales. ✓ Reducción de consumo de combustible y emisiones CO2 ✓ Otras métricas que sean aplicables. ✓ Number of SID/STAR PBN routes implemented, where required for International Airports (Application of CCO and CDO techniques) ✓ Number of RNAV/RNP routes implemented (new routes/improved navigation specification/replacement of conventional routes). ✓ Number of Flight Information Regions that have implemented strategic direct routing (EDE). Volume of airspace implemented. ✓ Number of Flight Information Regions that have implemented Free Route Airspace (FRA). Volume of airspace implemented. ✓ Number of routes preferred by the UPR user implemented. ✓ Percentage of thresholds with APV approaches in International Airports. ✓ Reduction of fuel consumption and CO2 emissions ✓ Other metrics that are applicable.
4. Indicadores clave de performance del GANP (KPI) **GANP Key performance indicators (KPI)**	○ De acuerdo con la planificación del proyecto, serán seleccionados elementos de FRTO y APTA y respectivos indicadores KPI (proceso de planificación basada en performance del GANP y del Doc. 9883). Las metas (targets) de mejora en la performance requieren la definición de una línea base para los KPI. A partir de dicha línea base, es factible establecer las ambiciones de mejora de performance para un determinado KPI, en un lapso definido. ○ Se muestran debajo KPIs propuestos para proyecto (los Estados/Organizaciones, de acuerdo con sus necesidades, pueden calcular/monitorear otros KPIs del GANP o desarrollar sindicadores propios) ○ According to the project planning, FRTO and APTA elements and respective KPI indicators (GANP and Doc. 9883 performance-based planning process) will be selected. Performance improvement targets require the definition of a baseline for KPIs. From this baseline, it is feasible to establish performance improvement ambitions for a given KPI, within a defined period. ○ Proposed project KPIs are shown below (States/Organizations, according to their needs, can calculate/monitor other GANP KPIs or develop their own indicators)

	MODULO APTA **Indicador Básico - Capacidad** KPI 10 – Rendimiento máximo del aeropuerto **Indicadores Avanzados - Eficiencia** KPI 17 - Nivelación durante el ascenso KPI 19 - Nivelación durante el descenso **APTA MODULE** **Basic Indicator - Capacity** KPI 10 – Airport peak throughput **Advanced Indicators - Efficiency** KPI 17 – Level-off during climb KPI 19 - Level-off during descent	**MODULO FRTO** **Indicadores Básicos- Eficiencia** KPI 04 - Extensión en ruta del plan de vuelo presentado KPI 05 - Extensión en ruta **Indicadores Básicos – Seguridad Operacional** KPI20 – Número de accidentes de aeronaves KPI23 – Número de eventos airprox/alertas TCAS/pérdida de separación/cuasi colisión en el aire/ colisión en el aire (MAC) **Indicadores Avanzados - Eficiencia** KPI 17 - Nivelación durante el ascenso KPI 19 - Nivelación durante el descenso **Indicador Avanzado – Capacidad** KPI 06 – Capacidad de espacio aéreo en ruta **FRTO MODULE** **Basic Indicators - Efficiency** KPI 04 – Filed flight plan En-route extension. KPI 05 – Actual en-route Extension **Basic Indicators – Safety** KPI20 – Number of aircraft accidents KPI23 – Number of airprox events/TCAS alerts/separation loss/mid-air near collision/mid-air collision (MAC) **Advanced Indicators - Efficiency** KPI 17 – Level-off during climb KPI 19 - Level-off during descent **Advanced Indicator – Capacity** KPI 06 – En-route Airspace capacity

5. Estrategia **Strategy**	○ La ejecución de las actividades del Proyecto será coordinada a través de las comunicaciones entre miembros del Proyecto, los Coordinadores del Proyecto y el Coordinador del Programa a través de reuniones de los grupos de implantación en CAR y SAM. Se consideran otros eventos o entregables (estudios, material guía, Talleres, etc.). ○ Se deberá realizar reuniones de coordinación semestrales entre el SAMIG/GESEA y el NACC WG/AOTF. ○ El proyecto reconoce la necesidad de seguir apoyando la recuperación de la conectividad aérea en CAR y SAM, a través de optimización de la eficiencia y capacidad. Se prevé robustecer la armonización interregional e intrarregional para la implantación de FRTO y APTA. ○ A la vez, el proyecto fomenta el trabajo de los Estados/Organizaciones para fortalecer sus capacidades en materias de planificación basada en performance, impulsando la formulación, calculo y monitoreo de indicadores KPI del GANP, con lo cual se avanza en la gestión del **Volumen III**[5] del Plan Regional ANP CAR/SAM. Ver debajo en línea 6 los procesos para realizar esta transición. ○ Se prevé un trabajo colaborativo con todas las partes interesadas; ANSP, Estados, Usuarios, Aerolíneas, Organizaciones e Industria. ○ The execution of the Project activities will be coordinated through communications between Project members, the Project Coordinators, and the Program Coordinator through meetings of the implementation groups in CAR and SAM. Other events or deliverables (studies, guidance material, workshops, etc.) are considered. ○ Biannual coordination meetings should be held between SAMIG/GESEA and NACC WG/AOTF. ○ The project recognizes the need to continue supporting the recovery of air connectivity in CAR and SAM, through optimization of efficiency and capacity. It is expected to strengthen interregional and intraregional harmonization for the implementation of FRTO and APTA. ○ At the same time, the project promotes the work of States/Organizations to strengthen their capacities in performance-based planning, promoting the formulation, calculation and monitoring of GANP KPI indicators, which advances in the management of Volume III6 of the ANP CAR/SAM Regional Plan. See below on line 6 the processes to make this transition. ○ Collaborative work with all stakeholders is envisaged; ANSP, States, Users, Airlines, Organizations, and Industry.
6. Metas **Targets**	Se avanzará progresivamente desde el uso de métricas de soporte hacia la gestión de indicadores KPI seleccionados del GANP, en el contexto de ambiciones de mejora de performance. Se definen tres procesos: ○ Proceso 1 (no más allá de diciembre 2025): Se estipulan y monitorean las metas definidas en base a métricas de soporte. Simultáneamente, los Estados refuerzan y/o completan actividades de cálculo de líneas base para KPIs seleccionados. ○ Proceso 2 (no más allá de diciembre 2026): Se monitorean las metas definidas en base a métricas de soporte. Estados completan las líneas base de KPIs, y se inicia monitoreo de dichos indicadores. ○ Proceso 3 (no más allá de diciembre 2027): Establecimiento de monitoreo de metas en base KPIs. Las Métricas de soporte se utilizan sólo como referencia complementaria del progreso de implantación.

[5] *En el Volumen III, se estipulan los elementos del plan dinámicos/flexibles proporcionando guías de planificación de la implementación para sistemas de navegación aérea.*

[6] *Volume III stipulates the dynamic/flexible plan elements by providing implementation planning guidelines for air navigation systems.*

	Progress will be made progressively from the use of supporting metrics to the management of selected GANP KPIs, in the context of performance improvement ambitions. Three processes are defined: 1. Process 1 (no later than December 2025): Defined targets are stipulated and monitored based on supporting metrics. Simultaneously, States reinforce and/or complete baseline calculation activities for selected KPIs. 2. Process 2 (no later than December 2026): Defined targets are monitored based on supporting metrics. States complete the KPI baselines, and monitoring of these indicators begins. 3. Process 3 (no later than December 2027): Establishment of target monitoring based on KPIs. Support metrics are used only as a complementary reference for the implementation progress.
7. Justificación **Justification**	○ GREPECAS/20 identificó que las actividades en región CAR/SAM están avanzando en conjunto con la Industria, y la armonización entre ellas debería comenzar lo antes posible. Se concordó que dichas iniciativas deben ser agrupadas bajo un único Programa de GREPECAS, para desarrollar de manera armonizada e interoperable los conceptos para la optimización del espacio aéreo que abarcan, además de la implantación PBN, varios módulos/elementos operacionales del GANP. ○ El presente proyecto se enfoca en las áreas clave (KPA) de **Capacidad, Eficiencia** y **Seguridad Operacional** con el propósito de reducir la brecha entre la trayectoria de vuelo real y la trayectoria optima deseada por los usuarios. Asimismo, implementar rutas y procedimientos de vuelo por instrumentos que incrementen la ratio de llegadas del aeropuerto e incrementen la accesibilidad al aeropuerto, a la vez que se garantiza la seguridad operacional. ○ El proyecto apoya la optimización de la estructura del espacio aéreo de regiones CAR/SAM que se encuentra en progreso desde inicios de la implantación del módulo APTA en 2013, así como la implantación del módulo FRTO que se inició a través de varias iniciativas en CAR y SAM después del periodo de pandemia, con miras a respaldar la recuperación y sostenibilidad de la Industria, así como restablecer la conectividad aérea. ○ Simultáneamente, se impulsa la implantación efectiva del Volumen III del ANP CAR/SAM. ○ GREPECAS/20 identified that activities in the CAR/SAM region are advancing together with the industry, and harmonization between them should begin as soon as possible. It was agreed that these initiatives should be grouped under a single GREPECAS Program, to develop in a harmonized and interoperable manner the concepts for the optimization of airspace that cover, in addition to PBN implementation, several modules/operational elements of the GANP. ○ This project focuses on the key performance areas (KPA) **Capacity, Efficiency and Safety** in order to reduce the gap between the actual flight path and the optimal trajectory desired by users. Likewise, implement routes and instrument flight procedures that increase the airport's arrival ratio and increase accessibility to the airport, while ensuring operational safety. ○ The project supports the optimization of the airspace structure of CAR/SAM regions that is in progress since the beginning of the implementation of the APTA module in 2013, as well as the implementation of the FRTO module that was initiated through several initiatives in CAR and SAM after the pandemic period, with a view to supporting the recovery and sustainability of the Industry, as well as restoring air connectivity. ○ At the same time, the effective implementation of Volume III of the ANP CAR/SAM is promoted.

8. Proyectos relacionados **Related projects**	A2 - Sistemas de Navegación Aérea en apoyo de la PBN. B1 - Mejorar el equilibrio entre la demanda y la capacidad. A2 - Air Navigation Systems in support of PBN. B1 - Improving the balance between demand and capacity.

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Entregables *Deliverables*	Referencia al GANP *GANP references*	Responsable (s) Accountables	Estatus * Status *	Fecha entrega *Delivery date*	Comentarios *Comments*
Elaboración de material guía regional sobre implantación del módulo FRTO, y conceptos EDE y UPR Development of regional guidance material on implementation of the FRTO module, and EDE and UPR concepts	Elementos seleccionados del módulo FRTO Selected FRTO module elements	Oficinas Regionales Estados Industria *Regional Offices* *States* *Industry*			
Hoja de ruta implantación FRTO Región CAR/SAM. FRTO implementation roadmap CAR/SAM region.	Elementos seleccionados del módulo FRTO Selected FRTO module elements	Oficinas Regionales Estados Industria *Regional Offices* *States* *Industry*			
Revisión de la hoja de ruta implantación APTA Región CAR. Review of the APTA CAR Region implementation roadmap.	Elementos seleccionados del módulo APTA Selected elements of the APTA module	Oficinas Regionales Estados Industria *Regional Offices* *States* *Industry*			En el marco de la Resolución A-37-11 de la Asamblea. Within the framework of Assembly Resolution, A-37-11.
Revisión de la hoja de ruta implantación APTA Región SAM. Review of the APTA SAM Region implementation roadmap.	Elementos seleccionados del módulo APTA Selected elements of the APTA module	Oficinas Regionales Estados Industria *Regional Offices* *States* *Industry*			En el marco de la Resolución A-37-11 de la Asamblea. Within the framework of Assembly Resolution, A-37-11.

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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 estimado se requiere adoptar medidas mitigatorias.*

*

Grey	*Task not started.*
Green	*Activity in progress according to schedule.*
Yellow	*Activity started with some delay but would be arriving on time in its implementation.*
Red	*The implementation of the activity has not been achieved in the estimated period; it is necessary to adopt mitigating measures.*

— END/FIN —