Organización de Aviación Civil Internacional
Oficina para Norteamérica, Centroamérica y Caribe

NOTA DE ESTUDIO

NACC/WG/8 — NE/20
24/08/23

Octava Reunión del Grupo de Trabajo de Norteamérica, Centroamérica y Caribe (NACC/WG/8)
Ciudad de México, México, 29 de agosto al 1 de septiembre 2023

Cuestión 3 del Orden del Día: **Seguimiento al plan de acción 2022-2023 del NACC/WG**

3.6 Avance del NACC/WG en operaciones: AO, Gestión del Tránsito aéreo (ATM), Búsqueda y Salvamento (SAR), ATFM y Aeródromos y ayudas terrestres (AGA)

INFORME DEL GRUPO DE TAREA SOBRE OPTIMIZACIÓN DEL ESPACIO AÉREO A LA REUNIÓN DEL NACC/WG

(Presentada por el Relator AO/TF)

RESUMEN EJECUTIVO

Esta nota de estudio presenta una actualización del trabajo y las actividades realizadas por el Grupo de tarea para la Optimización del Espacio Aéreo (AO/TF).

Acción:	Las acciones sugeridas se presentan en la Sección 4.
Objetivos Estratégicos:	• Seguridad Operacional • Capacidad y eficiencia de la navegación aérea • Desarrollo económico del transporte aéreo • Protección del medio ambiente
Referencias:	• Séptima Reunión del Grupo de Trabajo de Norteamérica, Centroamérica y Caribe (NACC/WG/7), 29 de agosto al 1 de septiembre de 2022 • Segunda Reunión del Grupo de Tarea Optimización del Espacio Aéreo (AO/TF/2) del Grupo de Trabajo de Norteamérica, Centroamérica y Caribe (NACC/WG), 13 l 17 de febrero de 2023

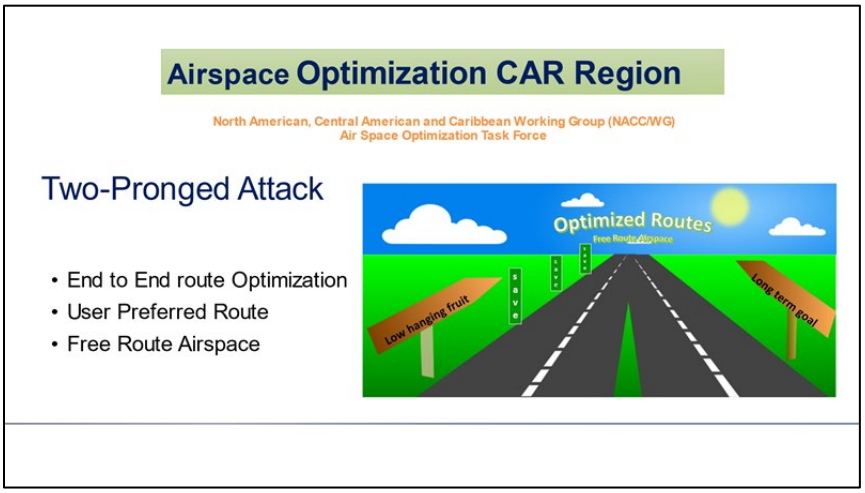
1. Introducción

1.1 Tras el análisis de la estructura actual del espacio aéreo de la Región CAR; y tomando en consideración el desarrollo de una hoja de ruta para lograr el hilo ASBU – Operaciones mejoradas a través de trayectorias en ruta mejoradas (FRTO); el Grupo de tarea para la optimización del espacio aéreo (AOTF) NACC de la OACI ha modificado su programa de trabajo para considerar las tareas necesarias para la transición al espacio aéreo de ruta libre (FRA).

1.2 El programa de trabajo modificado del AO/TF se presenta como **Apéndice A** (únicamente en español) de esta NE.

2. Discusión

2.1 Como se mencionó en reuniones anteriores del Grupo de trabajo, la labor del AO/TF se basa en un sistema de dos niveles: primero, busca los "frutos más fáciles"; es decir, rutas de pares de ciudades que se pueden optimizar sin costo ni inversión adicional; y el objetivo a largo plazo de la FRA. El AO/TF está formado por un equipo central de expertos en la materia (SME) en gestión del tránsito aéreo (ATM) y el equipo de espacio aéreo de ruta libre (CIIFRA) de CANSO, IATA y OACI. El equipo de CIIFRA coordina ensayos, realiza análisis y participa en actividades de colaboración y coordinación con las partes interesadas para lograr ventajas operativas (UPR, SDR, ensayos, etc.) basadas en los sistemas y procedimientos actuales. El equipo central se enfoca en las iniciativas de ASBU que respaldan a FRTO mediante la investigación, el análisis y el desarrollo de los procesos ATM necesarios. El Equipo Central también coordina con los Estados/Territorios/Organizaciones para garantizar que la información publicada en el Plan de Navegación Aérea (ANP) CAR/SAM Vol III sea válida. Ambos equipos colaboran en el desarrollo de la hoja de ruta para la transición de la región a FRA.



2.2 Luego de la Segunda Reunión del Grupo de Tarea Optimización del Espacio Aéreo (AO/TF/2) del Grupo de Trabajo de Norteamérica, Centroamérica y Caribe (AO/TF/2) del 13 al 17 de febrero de 2023, se reconoció que se requería una mayor colaboración entre los varios grupos de trabajo del NACC/WG para efectuar la Optimización Regional del Espacio Aéreo. Hay iniciativas CNS, AIM, ATFM AGA y ASBU relacionadas con MET que apoyan la implementación de FRTO. Durante la Segunda Reunión de Relatores del Grupo de Trabajo de Norteamérica, Centroamérica y el Caribe (NACC/WG/RAP/2) – (28 al 31 de marzo de 2023), se discutieron estos temas y se acordó que habrá un esfuerzo conjunto entre todos los grupos de trabajo para apoyar la implementación regional de FRA. El **Apéndice B** (únicamente en inglés) de esta nota de estudio proporciona una lista de áreas temáticas que requieren la atención de las PYME relevantes dentro de cada grupo de trabajo.

2.3 Durante la sexta Reunión del Grupo de Trabajo sobre la Implementación de la Gestión de Información Aeronáutica del Grupo de Trabajo de Norteamérica, Centroamérica y el Caribe (NACC/WG) (AIM/TF/6) – (21 al 24 de agosto de 2023), el AO/TF presentó una nota de estudio (NE/10) que destacó la necesidad de armonización en la sección de espacio aéreo/aerovías de las Publicaciones de Información Aeronáutica (AIP) en la región. Ambos grupos de trabajo trabajarán en el proceso para lograrlo.

3. Avances y resultados

3.1 El Grupo de tarea AO ha completado el Concepto de Espacio Aéreo Optimizado para la Región CAR que incluye un plan de transición a FRA. Cabe señalar que la implementación PBN se incorpora como parte de la transición a FRA y, por lo tanto, los objetivos PBN descritos en el programa de trabajo anterior se han incorporado al nuevo programa de trabajo. El borrador del documento se incluye como **Apéndice C** (únicamente en inglés) de esta nota de estudio.

3.2 Desde la última reunión del NACC/WG, se ha introducido un nuevo concepto en la optimización del espacio aéreo, el Enrutamiento Directo Estratégico (SDR). La siguiente es una definición de SDR:

"Enrutamiento directo estratégico (SDR): el SDR permite a los usuarios planificar una ruta utilizando cualquier punto de ruta con nombre dentro de un volumen específico de espacio aéreo, siempre que la ruta cumpla con los parámetros establecidos por el Estado. Los parámetros pueden incluir restricciones tales como horas en las que se aplican las reglas SDR, requisitos de altitud o superiores y distancia máxima entre puntos de referencia. Los usuarios deben presentar vuelos a través de rutas autorizadas (es decir, publicadas) hasta el punto de entrada y salida en los límites del volumen del espacio aéreo SDR; es decir, el sistema SDR sólo se aplica dentro del volumen definido de espacio aéreo. El SDR se considera una transición hacia la implementación del concepto de Espacio Aéreo de Ruta Libre (FRA)".

3.3 Los SDR comenzaron a fines de 2022 cuando México aprobó una prueba de aerolíneas limitadas para presentar cualquier ruta en FL290 o superior entre las 0000 y las 0600. Esta prueba se gestionó de cerca y, con base en resultados positivos de seguridad y eficiencia, los parámetros de la prueba se fueron ampliando con el tiempo. La República Dominicana ha publicado un AIC, que permite SDR sin restricciones en su FIR, y COCESNA le seguirá pronto con sus propios planes. Este es un momento emocionante ya que el avance hacia la FRA ha avanzado a pasos agigantados. La reunión del grupo de trabajo a finales de septiembre destacará estos movimientos y trabajará con todos los estados y ANSP para desarrollar sus propios planes para las pruebas/implementación de SDR.

3.4 El AO/TF encontró algunas dificultades en la ejecución de algunos elementos de su programa de trabajo. Con respecto a la Decisión NACC/WG/07/06 – Grupo Ad Hoc para Categorizar los Procedimientos del Espacio Aéreo Terminal, se formó el grupo ad hoc y hubo varias reuniones. El proyecto está completado aproximadamente en un 90% y se espera que la Guía de recursos esté disponible para su promulgación a finales de octubre. Además, hay un retraso en la tarea de verificar los límites de la FIR y los puntos de ruta (actualización/corrección de la base de datos ICARD) para ser incluidos en la actualización del ANP CARSAM. Se espera que este ejercicio se realice antes del 31 de diciembre de 2024.

3.5 Métricas actualizadas. Estas métricas representan información que el equipo de CIIFRA ha recibido y representan ahorros anuales mínimos de los datos más recientes.

	ete	fuel	CO2	cost
	min	kg	kg	$
UPR	26,199	2,604,033	8,228,744	4,514,401
SDR	8,380	506,500	1,592,429	1,222,724
SKBO-KJFK	1,071	106,469	336,442	193,949
FDX SDR	3,136	323,796	1,023,194	579,142
KIAH-MMSD	10,038	439,326	1,388,272	833,113
Total	48,823	3,980,124	12,569,080	7,343,329

4. Acciones sugeridas

4.1 Se invita a la Reunión a:

a) evaluar el progreso del AO/TF;

b) revisar y aprobar el programa de trabajo del AO/TF presentado en el Apéndice A;

c) considerar las áreas de colaboración del grupo de trabajo presentadas en el Apéndice B;

d) revisar y aprobar el documento Concepto de Espacio Aéreo Optimizado CAR presentado en el Apéndice C; y

e) proponer cualquier otra actividad que se considere necesaria.

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APÉNDICE A
Programa de trabajo 2023-2025 propuesto por el AO/TF
(únicamente en inglés)

Task Name/ Tarea	Start/ Inicio	Finish / Final	Deliverables/ Resultados	Follow-up/ Seguimiento	Responsible/ Responsables	Observations/ Comments- Observaciones/ Comentarios
a) Assist States/Territories with the Implementation of Airspace Optimisation concept for oceanic, continental and terminal areas in of NAM/CAR Regions in accordance with the ICAO PBN Manual Doc 9613 and Doc 9992	APR 2019	DEC 2025	i) 100% removal of **redundant** conventional ATS routes by December 2025 ii) 75% replacement of conventional routes by RNAV 5 routes by December 2025	ICAO Regional Office and NACC WG AO Task Force	AO Taskforce, ICAO, States, Territories, International Organizations	**Status: Valid - Ongoing** KPA: Capacity KPI06: En-route airspace Capacity Reference Sub-Project to Develop and Implement a Performance-Based Navigation (PBN) Airspace Concept Document for the CAR Region. **Requirements:** Commitment from executive decision makers, Funding for the project, Human Resources (Airspace Designers, ATCOs, Airline Operators, ANSP Decision makers).
	SEP 2022	June 2023	iii) Develop the CAR Airspace Optimization Concept which includes a roadmap for transition to FRA by June 2023	ICAO Regional Office and NACC WG AO Task Force	AO Taskforce, ICAO, States, Territories, International Organizations	**Status: Draft Vol.1 COMPLETED in August 2023. Approval required by NACC WG.** FRTO B0/1 and B1/1, Direct Routing and Free Route Airspace, respectively. KPA: Efficiency

Task Name/ Tarea	Start/ Inicio	Finish / Final	Deliverables/ Resultados	Follow-up/ Seguimiento	Responsible/ Responsables	Observations/ Comments- Observaciones/ Comentarios
						KPI04: Filed flight plan en-route extension
b) Assist States/Territories and International Organizations with PBN training	APR 2019	DEC 2024	Coordinate the development of an online PBN Training program to be delivered by two Regional CATCs (English/Spanish) by December 2024	ICAO Regional Office and NACC WG AO Task Force	States, Territories, Int. orgs, ANSPs and NAM/CAR Civil Aviation Training Centres Group (CATCG)	**Status: Valid - Ongoing** AO TF to engage with Civil Aviation Training Centers Group to promote the development of an online PBN training program for pilots and controllers. AO TF look into the possibility of supplementing PBN training for those states that require it.
c) Assist States/Territories and Int. Org. with the Implementation of CDOs based on RNAV 1 and RNP1 navigation specification	APR 2019	DEC 2025	Increase the amount of CDOs within the CAR region by 20% by December 2025	ICAO Regional Office and NACC WG AO Task Force	States, Territories, Int. Org. and ANSPs in conjunction with the NACC WG AO Task Force	**Status – Valid – Ongoing** APTA-B0/4 CDO (Basic) Operational KPA – Efficiency NACC WG AO Task Force will coordinate with states and airspace users to determine which aerodromes require CDOs

d) Assist States/Territories and Int. Org. with the Implementation of CCOs based on RNAV 1 and RNP1 navigation specification and RNP-AR departures/arrivals in terminal areas, as required	APR 2019	DEC 2025	Increase the amount of CCOs within the CAR region by 20% by December 2025	ICAO Regional Office and NACC WG AO Task Force	States, Territories, Int. Org. and ANSPs in conjunction with the NACC WG AO Task Force	**Status – Valid – Ongoing** APTA-B0/5 CCO (Basic) Operational KPA – Efficiency NACC WG AO Task Force will coordinate with states and airspace users to determine which aerodromes require CDOs/CCOs and RNP-AR departures/arrivals.
e) Identify the discrepancies between the ATS routes structure implemented in the CAR region and the CARSAM eANP VOLUME II (Table ATM II - ATS Routes) propose actions to attend the differences found	APR 2019	DEC 2024	Identify and correct 100% deficiencies by December 31, 2024	ICAO Regional Office and NACC WG AO Task Force	NACC WG AO Task Force, ICAO	**Status – Valid – Delayed Target date extended** NACC WG AO Task Force secretariat and rapporteur will coordinate with counterparts from SAM to resolve discrepancies.
f) Confirm the lateral limits of the FIRs within the CAR Region and update the CARSAM eANP VOLUME I)	JUN 2023	DEC 2024	Ensure 100% completion of updates by DEC 31, 2024	ICAO Regional Office and NACC WG AO Task Force	NACC WG AO Task Force, ICAO	**Status – Valid – Delayed Target date extended** NACC WG AO Task Force secretariat and rapporteur will coordinate with counterparts from SAM to resolve discrepancies.

g) Develop and implement a regional process to approve and implement routes optimization initiatives for the region	AUG 2023	JUN 2025	A clear process for regional approval and implementation of routes optimization initiatives for the region to be fully functional by JUN 2025	ICAO Regional Office and NACC WG AO Task Force	States, Territories, Int. Org and ANSPs in conjunction with the NACC WG AO Task Force	**Status – Valid – Delayed Target date extended** Part of the CIIFRA process. Develop ICAO NACC Web site to support the process. Coordinate with the SAM Region Route Optimization Process.
i) Update ICARD to reflect current and accurate 5LNC	AUG 2022	DEC 2023	Ensure ICARD reflects current and accurate 5LNC of the States AIPs. 75% completion by DEC 2023	ICAO Regional Office and NACC WG AO Task Force	ICAO, States, Territories, Int. Org.	**Status – Valid – Ongoing** NACC WG AO TF to support ANSPs to update ICARD to reflect current and accurate 5LNC

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APÉNDICE B
Áreas temáticas que requieren colaboración con todos los TF del NACC/WG
(únicamente en inglés)

ANS COMPONENT – TASK FORCE	GOAL	REMARKS	INITIATIVES
CNS – SURV, COMM, AIDC	Synchronize and Harmonize Communication, Navigation & Surveillance systems across the NAM/CAR/SAM to support the transition to FRA	The CNS System is the backbone of the ANS system. It is a critical enabler to Airspace Optimization. A gap analysis of the CNS across the regions should be conducted. Use the analysis to determine the expected baseline for the achievement of regional objectives. Some ANSPs may have more advanced CNS systems, but the region should agree upon the minimum equipment that all ANSPs need to have. A plan can then be developed to help those ANSPs that are currently below the minimum.	• Surveillance data sharing/ redundancy for surveillance • Air/ground and ground/ground Communication back-up/redundancy (e.g. agreement with adjacent States to house transceivers etc.) • Exploration of alternative technologies i.e., Space-based VHF • Harmonized ATM systems • MTCD capability • AIDC • CPDLC • Digital ATIS
AIM	Harmonize the methodology for electronic information sharing across the region to support the transition to FRA. Improvements to availability, reliability and integrity.	Information is the blood that flows through the veins of the ANS system. FRA relies on real-time, high integrity data for quick decision making. AIM is very important for predictability. Real time information allows for more efficient decisions. Accuracy affects safety. Availability ensures that the information	• Harmonization of AIP across the Region • Standardizing or eliminating the cost of access to AIP • Reduction of duplicate FPLs • Reduction in FPL errors • More digital information • Ensuring quality management of data • Sharing of digital data

ANS COMPONENT – TASK FORCE	GOAL	REMARKS	INITIATIVES
		reaches all the stakeholders that affect the ANS system.	
AGA	Guidelines for improved Airport infrastructure and design which facilitate en-route/terminal airspace optimization efforts	Airport operations sometimes negate the efficiency gains provided by improved en-route/ terminal airspace designs. Conduct an analysis of busy aerodromes in the region to determine choke spots and provide solutions aimed at improving efficiency.	• Greater collaboration between ANSP/Airlines and Airport operators re airport design, lighting, ground aids (approach) • Increased ACDM • Up to date Obstacle analysis
MET	Improved harmonization and availability of all MET related data to support the transition to FRA. MET data available in a digital form.	Accurate/real-time MET information is important for both strategic and tactical flight planning. An analysis should be conducted across the region to determine where improvements can be made. Research other regions to determine if there are things that this region can follow.	• Standardization of weather reports • Volcanic ash representations must be the same globally • Weather forecast and updates need to be given from an aviation perspective • Airline collaboration with ANSP on the acquisition of weather products • Special weather reports (SPECI) requirements. Should temperature change be included as a reason for SPECI issuance?

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APÉNDICE C
(únicamente en inglés)

INTERNATIONAL CIVIL AVIATION ORGANIZATION

SUB-PROJECT TO DEVELOP AND IMPLEMENT AN OPTIMIZED AIRSPACE CONCEPT DOCUMENT FOR THE CAR REGION

ICAO REGIONAL TECHNICAL COOPERATION PROJECT — "MULTI-REGIONAL CIVIL AVIATION ASSISTANCE PROGRAMME (MCAAP)" (RLA/09/801)

11 August 2023

Vol 1
11-8-2023

by

Ernest Snyder
Riaaz Mohammed
Luis Rosales
William Alsina

ICAO Representative:	Ernest Snyder ATM/SAR NACC Regional officer
Place of Mission:	ICAO NACC Regional Office Mexico City, Mexico
Dates of Mission:	26-29 July 2022
Objectives of the Mission:	● Develop an Optimized Airspace concept for the CAR region, which includes harmonized separation standards, airspace restructuring, Performance Based Navigation and Free Route Airspace. Goals where established for the optimization of airspace to allow continuous flow in the upper and lower airspace of contiguous Flight Information Regions (FIRs) and TMAs.
Summary of Activities:	● Concept began as project under PBN Taskforce in 2018 ● Concept was continued under the Airspace Optimization Taskforce in July 2022 ● Initial meeting with the SMEs to discuss the sub-project mission objectives. ● Identify requirements for the development of an optimized airspace concept for the CAR region. ● Consider a methodology to assess the readiness of each State to transition to FRA. ● Draft a report summarizing the sub-project mission outcomes.

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1. INTRODUCTION

1.1
Background- This document was started under the PBN Taskforce in 2018 and continued as the taskforce evolved into the Airspace Optimization Taskforce in 2022. This document aligns with and has been/will be coordinated with other regions.

1.1 The Sub-Project to develop and implement an optimized airspace concept document for the CAR Region involved Subject Matter Experts (SMEs) selected among Project Member States and led by the ICAO NACC Regional Office. This document includes recommendations for harmonized separation standards, airspace restructuring, continued implementation of Performance Based Navigation (PBN) and establishes a goal to transition to Free Route Airspace (FRA).

1.2 The GANP will be used as guidance to determine the generic requirements to optimize the airspace of the CAR Region including the transition to Free Route Airspace (FRA).

1.3 The Airspace Optimization (ASO) Taskforce will develop a methodology for future assessment of the readiness of each State to transition to FRA.

1.4 The SMEs collaborated with the CIIFRA team on the development of the optimized airspace concept and the transition roadmap for the CAR Region.

2. OBJECTIVES

2.1 The main objective of this document is to serve as a regional document on the process to move towards FRA as well as follow up with the ICAO program No Country Left Behind (NCLB). The Airspace Optimization (ASO) Taskforce will collaborate with the States to assist them with the individual airspace optimization plans.

2.2 Specific objectives:

The CAR Region Airspace Optimization has the next specific objectives aligning with the upcoming Air Navigation Plan (ANP) CAR/SAM Vol III
Safety: Reduce ATS incidents, Controlled Flights Into Terrain (CFIT), trough harmonization of airspace and improvement of STARs, SIDs and APPs designs.
Capacity: Allow a more flexible use of airspace to avoid saturation of traffic over determined areas.
Efficiency: Reduce work overload for crewmembers and Air Traffic Controllers.
Environment: Reduce CO2 emissions and noise over sensitive areas serving the states and linking to Vol III.

2.3 Benefits

Help States to comply with Aviation System Block Upgrade (ASBU) airspace optimization requirements.
Increase harmonization between adjacent States.
Reduce aircraft navigational equipment requirements.
Reduce distance travelled from point to point for each aircraft operation.
Improve aircrafts Fuel savings and reduction of CO2 emissions.
Increase continuous climb and descend operations for aircraft.
Reduce the use of holding patterns.
Provide greater access through mountainous areas.
Reduce noise in the vicinity of airports.
Reduce pilot and Air Traffic Control (ATC) workload.
Reduce radio congestion.

Reduce ANSP operational cost through the reduction of the requirement for ground navaids.
Reduce GPWS.
Increase flexible use of airspace.

3. SCOPE

3.1 This optimized airspace concept is intended for the following States/Organizations of the Caribbean (CAR) Region:

UPPER AIRSPACE	LOWER AIRSPACE
COCESNA (CENTRAL AMERICA)	BELIZE (BELIZE TMA)
	GUATEMALA (LA AURORA TMA)
	HONDURAS (LA MESA TMA; TONCONTIN TMA;ROATAN ATZ; LA CEIBA CTR; PALMEROLA)
	EL SALVADOR (EL SALVADOR TMA)
	NICARAGUA (MANAGUA TMA)
	COSTA RICA (EL COCO TMA; LIBERIA TMA)
MEXICO (MEXICO, MAZATLAN OCEANIC, MERIDA)	ACAPULCO; CANCÚN-COZUMEL; CIUDAD DEL CARMEN; CIUDAD JUAREZ;CIUDAD OBREGON; CIUDAD VICTORIA; CULIACÁN;CHIHUAHUA; DURANGO; GUADALAJARA; HERMOSILLO; IXTAPA-ZIHUATANEJO; LA PAZ; LOS MOCHIS; LEÓN - AGUASCALIENTES; MANZANILLO; MATAMOROS; MAZATLAN; MERIDA; MEXICO CITY; MONTERREY; MORELIA; NUEVO LAREDO; OAXACA; PUEBLA; PUERTO VALLARTA; QUERÉTARO; REYNOSA; SALTILLO; SAN JOSE DEL CABO; SAN LUIS POTOSÍ; TAMPICO; TIJUANA; TORREÓN; TUXTLA GUTIÉRREZ; VERACRUZ; VILLAHERMOSA;
JAMAICA (KINGSTON)	JAMAICA TMA;
HAITI (PORT AU PRINCE)	PORT AU PRINCE TMA
CUBA (HAVANA)	HAVANA TMA; SANTA CLARA TMA; SANTIAGO TMA
CURACAO (CURACAO)	CURACAO TMA; JULIANA TMA; BEATRIX CTR; FLAMENGO CTR;
DOMINICAN REPUBLIC (SANTO DOMINGO)	PUNTA CANA TMA; LAS AMERICAS TMA; CIBAO TMA
UNITED STATES (SAN JUAN)	SAN JUAN
TRINIDAD AND TOBAGO (PIARCO)	TRINIDAD AND TOBAGO (PIARCO CTR)
	ANTIGUA AND BARBUDA (VC BIRD TMA)
	BARBADOS (ADAMS TMA)
	MARTINIQUE (MARTINIQUE TMA)
	ST LUCIA (ST LUCIA CTR)

	ST VINCENT AND THE GRENADINES (ARGYLE TMA)
	GRENADA (MAURICE BISHOP TMA)
	GUADELOUPE (POINTE-A-PITRE-TMA)

Note: Due to the high flow of traffic and airspace complexity that exists between the CAR Region and the Miami Oceanic, Houston Oceanic and New York Oceanic FIRs, it is recommended that a point of contact from these FIRs be established to coordinate with the rest of the Region.

4. AIRSPACE OPTIMIZATION CONCEPT

4.1 GENERAL

4.1.1 The Airspace Optimization Concept is a plan to benefit all current and envisioned users of the airspace by improving safety, capacity and efficiency of operations in the CAR Region.

4.1.2 Airspace Optimization utilizes all available technologies, procedures and concepts, including **harmonized separation standards, airspace restructuring, PBN and FRA.**

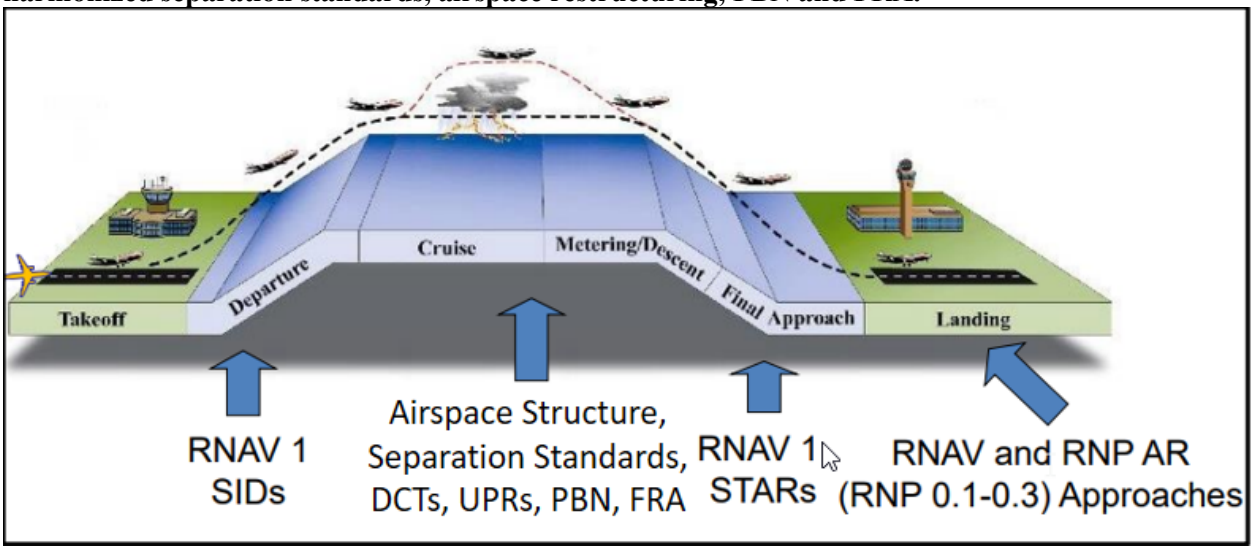

Image 1. Airspace Optimization throughout all phases of flight.

4.2. GOALS FOR THE AIRSPACE OPTIMIZATION

4.2.1 The following table reflects the goals established by the taskforce to meet the Specific Objectives of Airspace Optimization in the Region:

	Specific Objective				Goals
	Saf.	Cap.	Eff.	Env.	
Airspace Optimization		x	x	x	Implementation of RNAV 5 routes as agreed to in the Regional ANP.
		x	x	x	Continue the airspace optimization already begun in point to point trajectories, UPR trials and eventual transition to FRA.

		x	x	x	Conduct an analysis for the implementation of RNP 2 for continental airspace routes.
		x	x	x	Decide upon a date for the regional implementation of RNP 4 for oceanic airspace routes.
		x	x	x	For Oceanic airspace, use of 30 NM longitudinal and lateral separation (WHERE APPLICABLE) and 50 NM separation for all other oceanic areas.
	x				Removal of conventional routes made redundant by PBN route implementation.
	x	x	x	x	Harmonization of upper airspace routes with RNAV/RNP 1 STAR/SIDs (CCOs and CDOs) of TMAs within the FIR.
		x	x	x	For continental airspace, implementation of 20 NM longitudinal separation at FIR Boundaries (WHERE APPLICABLE).
	x	x	x	x	Implementation of RNAV/RNP 1 STAR/SIDs (CCOs and CDOs) to TMAs within the FIRs.
	x				Implementation of LNAV approaches for those International Airports so determined.
	x				Implementation of LNAV/VNAV (BARO VNAV) Approaches if analysis determines a benefit.
	x		x	x	Implementation of RNP AR Approaches/Departures if analysis determines a benefit.
	x		x	x	Implementation of APV (GLS/LPV) Approaches if analysis determines a benefit.

4.3 HARMONIZED SEPARATION STANDARDS

4.3.1 For continental airspace, implementation of 20NM longitudinal separation at FIR Boundaries (WHERE APPLICABLE).

4.3.1.1 This requirement is based on the Longitudinal Separation Minima based on distance using Distance Measuring Equipment (DME) and/or GNSS.

4.3.1.2 Separation shall be established by maintaining not less than specified distance(s) between aircraft positions as reported by reference to DME in conjunction with other appropriate navigation aids and/or GNSS. This type of separation shall be applied between two aircraft using DME, or two aircraft using GNSS, or one aircraft using DME and one aircraft using GNSS. Direct controller-pilot VHF voice communication shall be maintained while such separation is used.

4.3.1.3For oceanic airspace, use of 50 NM lateral separation.

4.3.1.4 RNAV 10 (designated and authorized as RNP 10) supports 50 NM lateral and 50 NM longitudinal distance based separation minima in oceanic or remote area airspace.

4.3.1.5For oceanic airspace, use of 30 NM longitudinal and lateral separation.

4.3.1.6 RNP 4 supports 30 NM lateral and the 30 NM longitudinal distance based separation minima in oceanic or remote area airspace.

4.3.1.7 The taskforce acknowledges there are varying separation standards utilized by ANSPs across the Region and this leads to inefficient operations. The taskforce will continue the work that has already begun to harmonize the separation standards across FIRs boundaries.
4.3.1.8 An analysis will be conducted to determine the timeline for the implementation of RNP 4 for oceanic airspace. This will required collaboration between the Taskforce, ANSPs and Airline Operators.

4.4 AIRSPACE STRUCTURE

4.4.1 The taskforce acknowledges that the current structure of regional airspace may be improved in order to achieve greater efficiencies.
4.4.2 The taskforce will analyze the regional airspace and seek to identify those portions of airspace that may be improved through redesign or gain benefit through functional use of airspace.

4.5 PBN AIRSPACE STANDARDS

4.5.1 Implementation of RNAV 5 routes as agreed to in the Regional ANP.

4.5.1.1 RNAV 5 operations are based on the use of RNAV equipment which automatically determines the aircraft position in the horizontal plane using input from one or a combination of the following types of position sensors, together with the means to establish and follow a desired path: a) VOR/DME; b) DME/DME; c) INS or IRS; and d) GNSS.

4.5.1.2 The ANSP must assess the navaid infrastructure in order to ensure that it is sufficient for the proposed operations, including reversionary modes. It is acceptable for gaps in navaid coverage to be present; when this occurs, route spacing and obstacle clearance surfaces need to take account of the expected increase in lateral track-keeping errors during the “dead reckoning” phase of flight.

4.5.1.3 Regarding separation, in an ATC surveillance environment, the route spacing will depend on acceptable ATC workload and availability of controller tools, separation is consider as follows:

18 NM for opposite direction routes,

16.5 NM for same direction routes, and

As low as 10 NM where ATC intervention capability permits.

4.5.2 Removal of conventional routes made redundant by PBN route implementation.

4.5.2.1 RNAV/RNP routes are more efficient than conventional routes providing “gate to gate” operations and also don't rely on radioaids installed on ground, improving safety and accuracy. Those are the main

reason why it is consider important to replace conventional routes to RNAV/RNP routes, mainly where they are superposed.

4.5.3 Implementation of RNAV/RNP 1 STAR/SIDs (CCOs and CDOs) to TMAs within the FIRs.

4.5.3.1 The main objective is to improve safety, predictability of flights and airspace capacity while reducing noise, fuel consumption, emissions and pilot-controller communications at the same time.

4.5.3.2 CDO is an aircraft operating technique aided by appropriate airspace and procedure design and appropriate ATC clearances enabling the execution of a flight profile optimized to the operating capability of the aircraft, with low engine thrust settings and, where possible, a low drag configuration, thereby reducing fuel burn and emissions during descent. The optimum vertical profile takes the form of a continuously descending path, with a minimum of level flight segments only as needed to decelerate and configure the aircraft or to establish on a landing guidance system (e.g. ILS).

4.5.3.3 Continuous climb operations (CCO) is an aircraft operating technique enabled by airspace design, instrument procedure design and facilitation by ATC, allowing for the execution of a flight profile optimized to the performance of the aircraft. CCO enables the aircraft to attain initial cruise flight level at optimum airspeed and engine thrust settings set throughout the climb, thereby reducing total fuel burn and emissions. Ideally, the departure design is such that arriving traffic is also able to descend based on an optimum descent profile. Where the departure and arrival flows cannot be designed independently, there will need to be a compromise between the needs of the departure and arrival flow optimization; this compromise should be reached collaboratively.

4.5.3.4 An aircraft's fuel efficiency in terms of fuel burned per kilometre flown in level flight increases with height. However, the fuel used in climbing to that altitude can be a significant part of the overall fuel used for the flight. Therefore, for any given route length, there is an optimum initial cruise flight level which will be dependent upon the aircraft type and mass, as well as on the meteorological conditions of the day. CCO is only one of the tools involved in a complete airspace design. Throughout the design process, CDO, CCO and other route modifications should all be considered.

4.5.4 Implementation of LNAV approaches for those International Airports so determined.

4.5.4.1 RNP APCH LNAV procedures provides lateral guidance and can be defined with fly-by and fly-over waypoints as "T" or "Y" type approach.

4.5.4.2 RNP APCH is defined as an RNP approach procedure that requires a lateral TSE of +/-1 NM in the initial, intermediate and missed approach segments (MAS) and a lateral TSE of ±0.3 NM in the Final Approach Segment (FAS).

4.5.4.3 RNP APCH LNAV procedure do not rely on ground radioaids and are more accuracy than conventional VOR/DME procedures. Also improve access being aligned in most cases with the runway centre line.

4.5.5 LNAV/VNAV (BARO VNAV) Approaches if analysis determines a benefit

4.5.5.1 Baro-VNAV approach procedures are classified as APV procedures in support of Type A 3D approach operations. They utilize a DA/H and not an MDA/H, and neither a FAF nor a missed approach point (MAPt) is identified. They use obstacle assessment surfaces similar to those for ILS, but based on the specific lateral guidance system.

4.5.5.2 Baro-VNAV procedures are used in association with LNAV-only procedures. The LNAV-only FAF and MAPt are needed to define the lateral areas and to support the lateral guidance but they are not used for the vertical navigation function.

4.5.5.3 Baro-VNAV procedures shall not be authorized with a remote altimeter setting.

4.5.5.4 Providing lateral and vertical guidance, BARO-VNAV approaches increase safety, access and accuracy compare with an RNP APCH LNAV procedure.

4.5.6 Implementation of RNP AR Approaches/Departures if analysis determines a benefit.

4.5.6.1 Implementation of RNP AR procedures extends beyond procedure design in that an authorization process for aircraft operators is necessary to ensure that other critical dependencies and associated airworthiness and operational procedure approvals are complete prior to implementation. Guidance on implementation and operational approval is provided in the PBN Manual.

4.5.6.2 RNP AR APCH is defined as an RNP approach procedure that requires a lateral TSE as low as ±0.1 NM on any segment of the approach procedure. RNP AR APCH procedures are only published where significant operational advantages can be achieved while preserving or improving safety of operation.

4.5.6.3 RNP AR APCH are very useful in mountainous and noise sensitive areas to improve access to the airport through radius to fix RF turns.

4.5.7 Implementation of APV (GLS/LPV) Approaches if analysis determines a benefit

4.5.7.1 GBAS is also refer as LAAS (local area augmentation system), It can be used to achieve accuracy required to CAT I-III and is done by locating 4 receivers on the ground at a precisely -surveyed (centimetre accuracy) positions.

4.5.7.2 The cost of one GBAS ground station is less that the cost of multiple ILSs for an airport. Another advantage of GBAS is that the accuracy enhancement is provided for the whole airport.

4.5.7.3 PBN is one of the tools that supports the airspace optimization concept and should continue to be implemented according to the timelines agreed to for the Region, in conjunction with other concepts in the transition to FRA.

4.5.7.4 PBN concept provide a safe and efficient airspace design for terminal areas. SIDs/STARs are the link to the upper airspace and utilizing CCOs/CDOs provide optimal efficiency.

4.6 MOVE TOWARD FRA

4.6.1 Given the diversity of the CAR Region airspace, the taskforce will develop a methodology to analyze the level of readiness of each FIR within the region and determine the steps required for Airspace Optimization, including the transition to Free Route Airspace, based on the following concepts:

- **Tactical Direct (TDR):** Tactical Directs (TDRs) are established at a national level and based upon a requested by the pilot and is operational advantageous. TDRs should be considered as **an early iteration of the FRA concept**.

- **User Preferred Routings (UPRs):** User Preferred Routings (UPRs) may allow users to **make a request and gain approval by ANSPs** to deviate from the basic requirements of published ATS route network in order to tailor individual flight's routes to achieve more favorable wind conditions and to meet other company objectives.

- **Strategic Direct Routing (SDR):** SDR allows users to plan a route using any named waypoints within a specified volume of airspace as long as the route complies with parameters set by the State. The parameters may include restrictions such as hours in which SDR rules apply, at or above altitude requirements and maximum distance between waypoints. Users must file flights via authorized (i.e., published) routes to the entry and exit point at the boundaries of the SDR airspace volume; that is, the SDR system only applies inside the defined volume of airspace. SDR is considered to be a transition to the implementation of the Free Route Airspace (FRA) concept.

- **Free Route Airspace (FRA):** Free Route Airspace is a specified volume of airspace within which **users may freely plan a route** between defined **entry and exit points**, with the possibility to route via intermediate waypoints, without reference to the ATS route network, subject to airspace availability.

  FRA enables airspace users to fly as close as possible to what they consider the optimal trajectory without the constraints of a fixed route network structure.

Note: These definitions are strictly for the purpose of this document.

4.6.2 In order to classify the capability of a particular portion of airspace to move forward with the Airspace Optimization process and the transition to FRA, the following levels will be utilized:

Level	Description
Level A	A portion of airspace which allows TDRs.
Level B	A portion of airspace which allows UPRs.
Level C	A portion of airspace which allows SDRs.
Level D	A portion of airspace which allows FRA.

Level	Requirements Requirements are a combination of Basic Building Blocks (BBBs) and ASBU Elements ASBU Elements - ICAO GANP Portal
Level A	Direct Controller-Pilot Communications (DCPC) **Currently available throughout CAR Region (Continental airspace)**
Level B	Level A requirements. ATS Surveillance. Collaborative Decision Making (CDM) process (such as CADENA) between airline operators and the ANSP. **Currently available throughout most of the CAR Region (Continental airspace)**
Level C	Level B requirements. ATM Automation System. FRTO-B0/4 -Basic conflict detection and performance monitoring. FRTO-B0/2- (Harmonized) Airspace Planning and Flexible Use of Airspace. **Currently available throughout some of the CAR Region (Continental airspace)**
Level D	Level C requirements. NOPS-B1/5 - Full integration of airspace management with air traffic flow management. FRTO-B1/4 - Dynamic sectorization. FRTO-B1/3 - Advanced Flexible Use of Airspace (FUA) and management of real time airspace data. FICE-B0/1 - Automated basic inter facility data exchange (AIDC). FRTO-B1/5 - Enhanced Conflict Detection Tools and Conformance Monitoring. DAIM-B2/2 - Daily Airspace Management information to support flight and flow Evolution. **In development, expected to be available 2028**

5. TIMELINE

Steps	Assigned to	Status	Due Date
Establish an Ad Hoc Team to collaborate, prepare and implement the first User Preferred Route (optimized wind route) trial **CIIFRA Team** **Delta Airlines** **ECNA, JCAA, CAA-PANAMA, DGAC-ECUADOR, CORPAC**	CIIFRA Team	**Completed**	02/15/2022
Conduct the first User Preferred Route (optimized wind route) trial: + City pair: **KATL..SPJC..KATL** + Airline volunteer: **DAL** • February 24 [DAL151] • February 25 [DAL150] + Aircraft capabilities (minimum) • RNAV 5 and VHF + ANSPs involved: **ECNA, JCAA, AAC-P, UAEAC, DGAC-E, CORPAC**	CIIFRA Team Ad Hoc Team	**Completed**	02/25/2022
Next Steps: Based on the results of the Feb 24 and 25 trial, coordinate and conduct longer timeframe (up to one-year) User Preferred Route (optimized wind route) trial: + City pair: **KATL..SPJC..KATL** + Airline volunteer: **DAL** • Date: TBD [DAL151] • Date: TBD [DAL150] + Aircraft capabilities (minimum) • RNAV 5 and VHF + ANSPs involved: **ECNA, JCAA, AAC-P, UAEAC, DGAC-E, CORPAC**	CIIFRA Team Ad Hoc Team	**Completed**	12/31/2022

Coordinate with the DGs of the various ANSPs to garner their support for FRA operations	Javier Vanegas Ernie Snyder	**Completed**	12/31/2022
Establish the meeting schedule and Work Plan (initial steps) for the Ad Hoc Team	Ernie Snyder Riaaz Mohammed	**Completed**	11/09/2022
Support SENEAM in conducting their Strategic Direct Routing (SDR) Trial	CIIFRA Team	**In progress**	12/31/2023
Work with the Ad Hoc Team to identify the key considerations for FRA flight plans: + Aircraft capabilities (minimum): • RNAV 5 and VHF + ANSP enroute automation: **Havana ACC, Kingston ACC, Panama ACC, Bogota ACC, Guayaquil ACC, Lima ACC** + SMS: Safety Assessment (**in draft**) + ANSP C/N/S: **Havana ACC, Kingston ACC, Panama ACC, Bogota ACC, Guayaquil ACC, Lima ACC** + ATCO training (enroute, TMA): **Havana ACC, Kingston ACC, Panama ACC, Bogota ACC, Guayaquil ACC, Lima ACC** + Airline training (pilot, dispatch): **Delta Airlines**	Ernie Snyder Riaaz Mohammed Ad Hoc Team CIIFRA Team	**In progress**	06/30/2024
Draft an AIP template for use by the impacted ANSPs to publish FRA in their AIP	CIIFRA Team	**Completed**	07/30/2022
Update the LAC Airspace Capability Table to include all of the FIRs in the SAM Region	CIIFRA Team	**Completed**	12/31/2022
Steps	**Assigned to**	**Status**	**Due Date**

Support SENEAM in conducting their Strategic Direct Routing (SDR) Trial	CIIFRA Team	**In progress**	12/31/2023
Coordinate with the ANSPs to conduct cross-border flight plan trials + COCESNA and SENEAM are coordinating a date for their flight plan trials + JCAA advised on 6/18/21 that they must complete a software upgrade before they can conduct AIDC testing with COCESNA. The date for the upgrade is still TBD + ECNA has advised that they are ready to conduct AIDC testing with JCAA when Kingston is ready	CIIFRA Team	**In progress**	12/31/2023
Prepare a regional FRA LOA for ANSP signature	CIIFRA Team	**In progress**	12/31/2023
Develop the procedures that will be included in the CADENA Procedures Manual regarding the application and support of flights that file FRA flight plans	CIIFRA Team	**In progress**	09/30/2023
Outline the training that needs to be presented to pilots and dispatchers to support the CIIFRA project	CIIFRA Team	**In progress**	12/31/2023

Steps	**Assigned to**	**Status**	**Date**
A. Categorization of ANSP's into status	Secretariat/Rapporteur/Ad Hoc Team	**Not begun**	06/30/2024
B. Provide ANS Taskforces update on AO plan and requirements/Assistance	Secretariat/Rapporteur	**In progress**	09/01/2023
C. Provide workshop to ANSP´s on SDR development	CIIFRA Team	**Not Begun**	10/01/2023

D. Begin SDR cross border tests	CIIFRA Team	**Not Begun**	01/31/2024
E. Establish needs from tests for FRA requirements	CIIFRA Team	**Not Begun**	06/30/2024
F. Begin FRA Tests in selected ANSP's	CIIFRA Team	**Not Begun**	01/01/2025

6. REFERENCE DOCUMENTS

ICAO Reference Documents

1. Performance Based Navigation (PBN) Manual (Doc 9613)
2. Continuous Climb Operations (CCO) Manual (Doc 9993)
3. Continuous Descent Operations (CDO) Manual (Doc 9931)
4. Required navigation Performance Authorization Required (RNP AR) Manual (Doc 9905)
5. Aircraft Operations volume 2- Construction of Visual and Instrument Flight Procedure (Doc 8168)
6. Procedures for Air Navigation Service-Air Traffic Management (Doc 4444)
7. Regional Performance-based Air Navigation Implementation Plan (RPB ANIP) for NAM/CAR Regions.

— FIN —