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

WORKING PAPER

PPRC/5 — WP/11
28/06/19

**Fifth Meeting of the Programmes and Projects Review Committee (PPRC/5)**
Mexico City, Mexico, 16 to 18 July 2019

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**Agenda Item 5:** **Review of GREPECAS Programmes and Projects and Subsidiary Groups**
**5.2 Projects under the ATFM Programme (B0-SEQ, B0-FRTO, B0-NOPS and B0 ACDM)**

# FOLLOW-UP ON THE ACTIVTIES OF THE ATFM PROGRAMME PROJECTS

(Presented by Secretariat)


**EXECUTIVE SUMMARY**

This Working Paper presents a report on the progress of the implementation activities related to the Air Traffic Flow Management (ATFM) Programme projects.


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| **Action:** | Suggested actions are included in Section 4. |
| *Strategic Objectives:* | • Safety<br>• Air Navigation Capacity and Efficiency<br>• Economic Development of Air Transport<br>• Environmental Protection |
| *References:* | • Doc 9971 — Manual on Collaborative Air Traffic Flow Management<br>• Concept of Operations of the Air Traffic Flow Management for the Caribbean and South American Regions (CONOPS ATFM CAR/SAM)<br>• Reports of the Programmes and Projects Review Committee (PPRC) Meetings<br>• Final Report of the Eighteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/18), Punta Cana, Dominican Republic, 9 – 14 April 2018 |

## 1. Introduction

1.1 Following GREPECAS Decisions 16/45 and 16/47, the ATFM Programme was structured with the following associated projects:

a) Improve the demand and capacity balancing in the CAR and SAM Regions
b) Implementation of the airspace flexible use in the CAR Region

## 2. Discussion

2.1 The progress in the activities of the projects that compose Programme B, linked to the ATFM implementation and Demand and Capacity Balancing (DCB), is described below:

2.2 CAR Region

2.2.1 The deliverables of this programme are being mainly addressed by the ATFM Task Force of the NAM/CAR Air Navigation Implementation Working Group (ANI/WG). This Task Force decided to review its work methodology and its activities in order to approach more precisely the Regional Performance Objectives (RPOs) related to the ATFM of the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (RPBANIP), extending its tasks until 2023. As a result, some changes in GREPECAS B1 and B2 Projects are presented (**Appendix A**), which is expected to conclude in 2019 and be revised to comply with the updated tasks in 2020.

2.2.2 Given that the composition of the ATFM TF and the CANSO Air Traffic Flow Management Data Exchange Network for the Americas (CADENA) is the same, for the CAR Region it was decided to work collaboratively and develop a common work agenda. Recognizing the different nature and approaches of each group, we seek to avoid duplication of activities and ensure that we can work towards achieving the objectives set by each Organization.

2.2.3 The ICAO NACC Regional Office organizes a Workshop on Airport Collaborative Decision Making (A-CDM) and Regional Air Traffic Flow Management (AFTM) Implementation Meeting, which will be held in Mexico City, Mexico, from 9 to 12September 2019. The Workshop will provide participants with guidance related to the concept of A-CDM, from the airport and Air Traffic Management (ATM) perspectives, and its use in ATFM, as well as in airport operations through A-CDM. The main purpose of this meeting is to exchange ideas about the regional initiatives required for the implementation of the ATFM in the CAR Region, taking as reference the CAR/SAM ATFM Concept of Operation (ATFM CONOPS). It is expected that these contributions will serve to endorse or reorient the regional plan for the implementation of the ATFM, identify the main obstacles and opportunities.

2.2.4 Improve the Demand and Capacity Balancing (DCB)

2.2.4.1 The ATFM Task Force held web conference meetings since August 2018. The meetings have included information on current Task Force participants and ATFM capabilities. The web conferences provided updates on the Federal Aviation Administration (FAA) data exchange and the experience of Trinidad and Tobago sharing the benefits of data exchange through the System wide information management (SWIM). The web conferences also provided an opportunity to analyse the routes used during high volume seasonal transit and contingency plans during hurricane operations.

2.2.4.2 Specifically, the following activities have been completed since 2018:

a) Traffic data from the Traffic Flow Management System (TFMS) of the Caribbean: Five Air Navigation Service Providers (ANSPs) now receive traffic data from the Federal Aviation Administration (FAA) (*Empresa Cubana de Navegación Aérea* (ECNA), *Instituto Dominicano de Aviación Civil* (IDAC), Jamaica Civil Aviation Authority (JCAA), *Servicios a la Navegación en el Espacio Aéreo Mexicano* (SENEAM), *Corporación Centroamericana de Servicios de Navegación Aérea* (COCESNA)).

b) The FAA Caribbean traffic data added 16 regional airports of the CADENA network to the Operational Information System (OIS) under the airport demand information.

c) The following States have received basic ATFM instruction: Antigua and Barbuda, Aruba, Costa Rica, Cuba, Curaçao, Cayman Islands, Dominican Republic, Jamaica, Mexico, Panama, Peru, Trinidad and Tobago and Turks and Caicos.

d) The 2018 FAA SNOWBIRD (Winter weather routes), Holiday Airspace Release Program (HARP) and Florida Metroplex Y and Q routes (PBN implementation) were coordinated and reported.

2.2.4.3 The ATFM Task Force made a proposal for amendment to the Concept of Operations of the Air Traffic Flow Management for the Caribbean and South American Regions (CONOPS ATFM CAR/SAM) with the objective of updating the regional implementation guidelines with the reality existing operational in the CAR and SAM Regions.

2.2.5 Implementation of Flexible Use of Airspace (FUA)

2.2.5.1 The ATFM Task Force has sent a survey to the States/Territories and International Organizations of the CAR Region, to assess their capabilities with respect to the ATFM and the processes for managing the use of airspace.

2.2.5.2 The results of this survey will be used to rethink the strategy related to the flexible use of airspace, through the update of the corresponding RPO of the RPBANIP.

**2.3 SAM Region**

2.3.1 Pursuant to GREPECAS Decisions 16/45 and 16/47 for the SAM Region, the ATFM Programme was structured based on Project B1: Improve demand-capacity balancing. Progress in this project is described below and the Programme is presented in the **Appendix B** (*available only in Spanish*) to this Working Paper.

2.3.2 No achievements had been made in ATFM in the Region, despite efforts by States and Project RLA/06/901, with the development of guidance material and the provision of ATFM training courses. Out of 14 SAM States/Territories, 4 had not yet implemented the FMP/FMU (Bolivia, French Guiana, Guyana and Suriname). Accordingly, the percentage of implementation in the Region was still 71%.

2.3.3 Misuse of “flow control” NOTAMs as pseudo-ATFM measures, which were not related to user impact assessments and were not designed for temporary application, had dropped in 2017 and 2018. During the first quarter of 2019, several FIRs of the Region had reinstated this practice mostly due to contingencies or CNS limitations, significantly degrading ATS capacity. These NOTAMs had created a domino effect on adjacent States and had had a significant impact on airlines.

2.3.4 Doc 9971, in paragraph 4.2.1, specifies that, in general, ATFM measures should only be applied for the period when expected demand exceeds the capacity and not on a routine basis. Frequent application of ATFM measures shows an imbalance between ATM capacity and traffic demand, which should be resolved in a more strategic manner.

2.3.5 During ANFS/6 Meeting (Lima, 24-26 June 2019) the participation of SAM States in CADENA – CANSO sessions was reviewed. It was noted that CADENA was a tool that had expedited communication in support of CDM and collaboration among the participating States/ANSPs. However, the operational use of ATFM in a single weekly session was limited.

2.3.6 Brazil informed that would no longer participate in CADENA sessions, however remains as member of CANSO. The Meeting considered the possibility of restoring ATFM teleconferences that had been held among SAM States until 2016, giving as an example the ATFM experience between Argentina and Brazil for the G-20 meeting in Buenos Aires.

2.3.7 ANFS/6 meeting analysed several technical options to facilitate ATFM teleconferences, including REDDIG, which allowed for conference calls, but required telephony points in the FMPs/FMUs. Another possible platform was go-to-meeting, which offered display advantages. The SAM/IG INTEROP group has included these ATFM connection tasks in its agenda.

2.3.8 The SAM Office completed the revision of the draft of CONOPS ATFM CAR/SAM, which was also presented at SAMIG/23, receiving contributions and opinions of States and IATA. In that sense, the draft of the CAR/SAM ATFM CONOPS for the 2019-2024 period, is shown in the **Appendix C** to this working paper for analysis.

## 3. Conclusions

3.1 A realistic ATFM implementation, well thought and in accordance with the operational requirements of each State/Territory is vital to guarantee the safe and sustainable growth of transit in the CAR Region.

3.2 The approach for the CAR Region continues to be the exchange of best practices, information on demand and capacity balance, and ATFM capabilities in the Region. The ANI/WG ATFM Task Force is encouraging all ANSPs and interested parties to participate and share information on airport-level operations through the upper airspace. With the information available for ANSPs, States can better identify their limitations, implement flow management programs, improve their arrival and departure rates, and increase the capacity of both airports and airspace.

3.3 SAM States continue driving efforts to optimize or, as applicable, activate flow units/posts in Area Control Centres (ACCs), which is a priority in the States that are affected by imbalances in demand/capacity at main Terminal Areas (TMAs).

3.4 Horizontal cooperation between Brazil and Paraguay is being developed to activate ATFM operation in the Flight Information Region (FIR) Asunción. Colombia together with Peru and Ecuador are also planning operating link ATFM initiatives.

4. Suggested Actions

4.1 The Meeting is invited to:

a) take note of the information provided in this Working Paper;

b) analyse and, if applicable, approve the reviewed CONOPS ATFM CAR/SAM included in the Appendix C to this note; and

c) recommend other actions deemed appropriate.

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**APPENDIX A / APÉNDICE A**

**IMPROVE DEMAND AND CAPACITY BALANCING (DCB) /**
**MEJORAR EL EQUILIBRIO ENTRE LA DEMANDA Y LA CAPACIDAD (DCB)**

| ***CAR Region / Región CAR*** | **PROJECT DESCRIPTION / DESCRIPCION DEL PROYECTO (DP)** | **DP N° B1** | |
|---|---|---|---|
| ***Programme / Programa*** | **Title of the Project / Título del Proyecto** | **Start / Fecha inicio** | **End / Fecha término** |
| *Improve demand and capacity balancing (DCB) / Mejorar el equilibrio entre demanda y capacidad (DCB)* (Programme Coordinator / Coordinador del Programa: Eddian Méndez) | *Improve demand and capacity balancing (DCB) / Mejorar el equilibrio entre demanda y capacidad (DCB)*<br><br>Project Coordinator / Coordinador del Proyecto:<br>Greg Byus (United States / Estados Unidos)<br>Jorge Centella / Ricardo Martínez (Cuba)<br>Deano Ledford (Jamaica)<br>Curtis Fraser (Trinidad and Tobago)<br>Kapri Kupper (CANSO)<br>Fernando Soto (COCESNA) | 2008 | ~~2018~~*2019* |
| **Objective / Objetivo** | Support the ATFM implementation based on the regional performance objectives of the Performance-based Air Navigation Implementation Plan for NAM/CAR Regions (RPBANIP NAM/CAR). /<br>Apoyar la implementación ATFM con base en 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 the ATFM service in CAR Region to ensure demand and capacity balancing (DCB). /<br>Implantación progresiva del servicio ATFM en la Región CAR para asegurar un equilibrio entre demanda y capacidad (DCB). | | |
| **Metrics / Métricas** | • % of States with coordination ATFM procedures implemented / % de Estados con procedimientos de coordinación ATFM implementados.<br>• % of States with Flow Management Unit (FMU) or Flow Management Position (FMP) implemented. /<br>% de Estados con dependencias de Organización de la afluencia (FMU) o puestos de gestión de la afluencia (FMP) implementadas. | | |

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| **Strategy / Estrategia** | The implementation 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. Experts nominated by States, Territories and International Organizations will be incorporated, as required. /<br>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. Se incorporarán expertos nominados por los Estados, Territorios y Organizaciones Internacional, según sea requerido. |
| **Targets / Metas** | • 60% of CAR States with ATFM units or Flow Management Position by December 2014. /on-going<br>60% de Estados de la Región CAR con unidades ATFM o puestos de gestión de afluencia implementados en Diciembre de 2014 /En progreso<br>• 90% of CAR States with ATFM procedures implemented by December 2016. / on-going<br>90% de Estados de la región CAR con procedimientos ATFM implementados en Diciembre de 2016 / En progreso |
| **Justification / Justificación** | GREPECAS supported the ATFM implementation to ensure an optimun traffic flow when demand exceeds or is expected to exceed the available capacity of the ATS system. /<br>El GREPECAS apoyó la implantación de la ATFM para garantizar una afluencia óptima de tránsito aéreo durante períodos en los cuales la demanda excede o se espera exceda la capacidad disponible del sistema ATS. |
| **Related Projects / Proyectos relacionados** | • PBN Implementation. /<br>Implementar la Navegación Basada en la Performance (PBN).<br>• Flexible use of airspace.<br>Uso flexible del espacio aéreo.<br>• Improve ATM Situacional Awareness. /<br>Mejorar la Conciencia Situacional ATM. |

| Project deliverables / Resultados 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 |
|---|---|---|---|---|---|
| Define common elements of ATM situational awareness between FMUs;<br>▪ common traffic displays,<br>▪ common weather displays (Internet),<br>▪ communications (teleconferences, web), and<br>▪ regular teleconference /messages methodology advisories<br><br>/Definir los elementos comunes de conciencia situacional ATM;<br>▪ visualización común de tránsito,<br>▪ visualización común de condiciones meteorológicas (Internet),<br>▪ comunicaciones (conferencias telefónicas, web), y<br>▪ metodología de asesorías regulares mediante conferencias telefónicas | RPOs 1, 2, 3, 9 | States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales | | ~~Dec 2016~~<br>Dec 2019<br>/<br>~~Proponer nueva fecha~~<br>Dic 2019 | Regional teleconferences are carried out on weekly basis through agreed methodology. Additional situational awareness requirements will be defined in the short term. /<br>Se llevan a cabo teleconferencias regionales semanalmente con la metodología acordada. Requisitos adicionales de conciencia situacional ATM serán definidos en el corto plazo. |

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| Project deliverables / Resultados 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 |
|---|---|---|---|---|---|
| Develop an ATFM proposal for amendment (PFA) to regional supplementary procedures (Doc 7030) . /<br>Desarrollar una propuesta de enmienda (PFA) a los procedimientos suplementarios regionales (Doc 7030) | RPOs 2, 3 | States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales | | Completed<br>/<br>~~Nueva fecha propuesta~~<br>Completada | ~~On-going~~ATFM CONOPS presented for approval / CONOPS ATFM presentado para aprobación |
| Develop operational agreements between ATFM units for interregional demand/capacity balancing. /<br>Desarrollar acuerdos operacionales entre unidades ATFM para equilibrar la demanda/capacidad interregional. | RPOs 3 | States, Territories, International Organizations / Estados, Territorios, Organizaciones Internacionales | | ~~Dec2018~~<br>Dec 2019<br>~~New date proposed~~<br>/<br>~~Nueva fecha propuesta~~<br>Dic 2019 | ~~Develop a model of ATFM LOAs based on~~ the ICAO Doc 9971 that includes a Model of ATFM LOA. /<br>Desarrollar un modelo de LOA basado en el Doc 9971 de la OACI que incluya un modelo de LOA ATFM. |
| **Required Resources / Recursos necesarios** | CAR Regional Project with the participation of States to support ATFM training aspects. /<br>Proyecto regional CAR con la participación de los Estados para apoyar los asuntos de instrucción ATFM. | | | | |

*Formatted:* Spanish (Mexico)

*Grey / Gris:* *Task not started / Tarea no iniciada;*
*Green / Verde:* *Activity underway as scheduled / Actividad en progreso de acuerdo con el cronograma;*
*Yellow / Amarillo:* *Activity started with some delay but expected to be complete~~d~~ ~~d~~on time / Actividad iniciada con cierto retardo pero estaría llegando a tiempo en su implantación;*
*Red / Rojo:* *It has not been posible to implement this activity as scheduled; mitigating measures are required / No se ha logrado la implantación de la actividad en el lapso de tiempo estimado se requiere adoptar medidas mitigatorias.*

**IMPLEMENTATION OF FLEXIBLE USE OF AIRSPACE (FUA)**
**/IMPLEMENTACIÓN DEL USO FLEXIBLE DEL ESPACIO AÉREO (FUA)**

| ***CAR Region / Región CAR*** | **PROJECT DESCRIPTION / DESCRIPCION DEL PROYECTO (DP)** | **DP N° B2** | |
|---|---|---|---|
| ***Programme Programa*** | **Title of the Project / Titulo del Proyecto** | **Start / Fecha inicio** | **End / Fecha término** |
| *Implementation of flexible use of airspace (FUA) / Implementación del uso flexible del espacio aéreo (FUA)* (Programme Coordinator Coordinador del Programa: Eddian Méndez) | *Implementation of flexible use of airspace (FUA) / Implementación del uso flexible del espacio aéreo (FUA)*<br><br>Project Coordinator / Coordinador del Proyecto:<br>Greg Byus (United States / Estados Unidos)<br>Jorge Centella / Ricardo Martínez (Cuba)<br>Deano Ledford (Jamaica)<br>Curtis Fraser (Trinidad and Tobago)<br>Kapri Kupper (CANSO)<br>Fernando Soto (COCESNA) | 2008 | ~~2016~~2019 |
| **Objective / Objetivo** | Support the implementation for the optimization, balance and equity in the use of airspace between different users and achieve a better civil/military coordination and cooperation, reinforcing air safety based on regional performance objectives of the Performance based Implementation Plan for NAM/CAR Regions (NAM/CAR RPBANIP) /<br>Apoyar la implementación para la optimización, el equilibrio y la equidad en el uso del espacio aéreo entre los diferentes usuarios y lograr una mejor coordinación y cooperación civil/militar reforzando la seguridad operacional, 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** | Development of guides for the implementation of flexible use of airspace (FUA) / Elaboración de guías para la implantación del Uso flexible del espacio aéreo (FUA) | | |
| **Metrics / Métricas** | • % of States with civil/military coordination Committees / % de Estados con Comités de Coordinación Civil/Militar<br>• % of reduction in number of permanent reserved airspace / % de reducción del número de espacios aéreos reservados de carácter permanente<br>• Reduction in number of permanent reserved airspace / Reducción del número de espacios aéreos reservados de carácter permanente | | |

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| **Strategy / Estrategia** | The implementation of activities will be coordinated between members of the Project, the Project Coordinator and the Programme Coordinator. The Programme Coordinator will coordinate with the project coordinator the requirements of other projects and NAM/CAR implementation working groups. Experts nominated by States, Territories and International Organizations will be incorporated to develop tasks as required /<br>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. Se incorporarán expertos nominados por los Estados, Territorios y Organizaciones Internacionales para desarrollar las tareas, según se requiera |
| **Goals / Metas** | • 80% of CAR Region States having implemented civil/military Coordination Committees for the flexible use of airspace (FUA) /Completed<br>• 80% de los Estados de la Región CAR con Comités de Coordinación Civil/Militar implantados para el Uso flexible del espacio aéreo (FUA) /Completado |
| **Justification / Justificación** | GREPECAS supported the implementation of flexible use of airspace (FUA) for the optimization of ATS airspace and air traffic flow management (ATFM) efficiency /<br>El GREPECAS apoyó la implantación del uso flexible del espacio aéreo (FUA) para optimizar la eficiencia del espacio aéreo ATS y la gestión de la afluencia del tránsito aéreo (ATFM). |
| **Related Projects / Proyectos relacionados** | • Implement PBN / Implementar la PBN<br>• Improve balance between demand and capacity / Mejorar el equilibrio entre la demanda y capacidad<br>• Improve ATM situational awarenes / Mejorar la Conciencia Situacional ATM |

| Project deliverables / Entregables del Proyecto | Relationship with RPB-ANIP / Relación con el RPB-ANIP NAM/CAR | Responsible / Responsable | Status of implementation / Estado de Implantación* | Delivery date / Fecha entrega | Remarks / Comentarios |
|---|---|---|---|---|---|
| Conduct a regional review of special use of airspace / Llevar a cabo una revisión regional del espacio aéreo de uso especial. | RPOs 1, 2, 3 | PBN TF | | ~~Dec 2018~~ Dec 2019 ~~New date proposed~~ / ~~Nueva fecha propuesta~~ Dec 2019 | Revision of the special use of airspace will be carried out in ~~2018~~ 2019 / La revisión del espacio aéreo de uso especial se llevara a cabo en ~~2018~~2019 |
| **Required Resources / Recursos necesarios** | CAR Regional Project with the participation of States to support civil-military coordination for the flexible use of airspace (FUA) / Proyecto regional CAR con la participación de los Estados para apoyar la coordinación civil-militar para el uso flexible del espacio aéreo (FUA) | | | | |

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*Grey / Gris:* *Task not started / Tarea no iniciada;*
*Green / Verde:* *Activity underway as scheduled / Actividad en progreso de acuerdo con el cronograma;*
*Yellow / Amarillo:* *Activity started with some delay but expected to be completed on time / Actividad iniciada con cierto retardo pero estaría llegando a tiempo en su implantación;*
*Red / Rojo:* *It has not been posible to implement this activity as scheduled; mitigating measures are required / No se ha logrado la implantación de la actividad en el lapso de tiempo estimado se requiere adoptar medidas mitigatorias.*

**APPENDIX B**

**PROYECTO B1 - MEJORAR EL EQUILIBRIO ENTRE LA DEMANDA Y LA CAPACIDAD**

| ***Región SAM*** | **DESCRIPCION DEL PROYECTO (DP)** | DP N° B1 | |
|---|---|---|---|
| ***Programa*** | **Título del Proyecto** | **Fecha inicio** | **Fecha término** |
| *Gestión de afluencia del tránsito aéreo (ATFM)*<br><br>*(Coordinador del Programa: ATM RO Fernando Hermoza Hubner)* | *Mejorar el equilibrio entre la demanda y la capacidad*<br><br>*Coordinador del proyecto: Nicolas Borovich (Argentina)* | 2012 | 2022 |
| **Objetivo** | Evitar la sobrecarga del sistema ATC y aeroportuario, reforzando la seguridad operacional, teniéndose en cuenta la reducción en esperas inducidas por condiciones meteorológicas y de tránsito que conducen a una reducción del consumo de combustible y de emisiones contaminantes. Además, buscar mejoras de la predicción y en la gestión de demanda en exceso de servicio en sectores ATC y en aeródromos. | | |
| **Alcance** | El alcance del proyecto de implantación define que la implantación del servicio ATFM se debería iniciar con el monitoreo de los aeropuertos y espacio aéreo con el fin de detectar incrementos significativos en las demoras en tierra y esperas en vuelo, así como los cuellos de botella (sector ATC, pista, plataforma e instalaciones aeroportuarias). Además, la determinación de la capacidad y el análisis de la demanda de tránsito aéreo son elementos importantes para la mejora del equilibrio entre la demanda y la capacidad. | | |
| **Métricas** | • % de Estados que han efectuado los cálculos de capacidad de pista y sectores ATC.<br>• % de Estados que tienen implantada la ATFM en Unidades de Gestión (FMU) o en Puestos de Gestión de Flujo (FMP). | | |

| | |
|---|---|
| **Estrategia** | La ejecución de las actividades del Proyecto define la implantación del ATFM en la Región SAM, a través del análisis de la demanda y capacidad del espacio aéreo, teniéndose en cuenta que los Estados en fase de implementación deberán coordinar con la comunidad ATM las acciones necesarias para el proceso de implantación de la ATFM. La infraestructura y base de datos, así como la política, normas y procedimientos son componentes importantes para la ejecución de este Proyecto. |
| **Metas** | • Estados de la Región SAM con expertos capacitados para el cálculo de capacidad de pista y la capacidad del espacio aéreo (SECTOR ATC) de las regiones del espacio aéreo de los Estados.<br>• Plan para la supervisión de la performance del sistema ATFM.<br>• Coordinación inter-regional CAR/SAM |
| **Justificación** | El GREPECAS consideró que la implantación temprana de la ATFM deberá garantizar una afluencia óptima de tránsito aéreo hacia ciertas áreas o a través de las mismas, durante períodos en los cuales la demanda excede o se espera exceda la capacidad disponible del sistema ATC. Por lo tanto, un sistema ATFM debería reducir las demoras de las aeronaves, tanto en vuelo como en tierra, y evitar la sobrecarga del sistema. |
| **Proyectos relacionados** | • Automatización. |

| Entregables del Proyecto | Relación con el Plan Regional basado en Rendimiento (PFF) | Responsable | Estado de Implantación* | Fecha entrega | Comentarios |
|---|---|---|---|---|---|
| Evaluar el progreso del programa de trabajo para implantación del ATFM | B0-NOPS | Coordinador de Programa | | 2016 | Tarea permanente |
| Cálculo de la Capacidad del Espacio Aéreo (SECTOR ATC). | B0-NOPS | Juarez Franklin Gouveia | | SAM/IG/9 | Brasil y Colombia presentaron sus estudios. |
| Lista de los sectores del espacio donde existan períodos cuando la demanda es mayor a la capacidad existente, incluyendo simulaciones, si fuera necesario, por parte de los Estados. | B0-NOPS | Juarez Franklin Gouveia | | SAM/IG/9<br>SAM/IG/10 | Brasil y Colombia presentaron sus estudios. |
| Lista de los factores operacionales que afectan la demanda y la capacidad del espacio aéreo para optimizar la utilización de la capacidad existente, incluyendo simulaciones, de ser necesario. | B0-NOPS | Juarez Franklin Gouveia | | SAM/IG/9 | Brasil y Colombia presentaron sus estudios. En la Reunión SAM/IG/11 Brasil, Paraguay y Perú presentaron datos. |
| Definición de los elementos comunes de conciencia situacional | B0-NOPS | Paulo Vila | | 2012 | Los Estados que mantienen intercambio de información son: Chile, Colombia, Paraguay y Venezuela. |

| Entregables del Proyecto | Relación con el Plan Regional basado en Rendimiento (PFF) | Responsable | Estado de Implantación* | Fecha entrega | Comentarios |
|---|---|---|---|---|---|
| Personal capacitado en las medidas estratégicas ATFM para el espacio aéreo | B0-NOPS | Proyecto RLA/06/901 | | 2019 | Se realizó en Brasil en 2010 un curso ATFM/CDM con la participación de varios Estados.<br>Se realizó en Brasil en marzo 2009 un curso de cálculo de capacidad de pista y sectores ATC.<br>Se realizó en el 2012 en Lima un curso de preparación de instructores para el cálculo de capacidad de pista y sectores ATC.<br><br>Se ha realizado un Seminario ATFM en junio 2018, donde se abordó la aplicación adecuada de medidas ATFM. |
| Lista de factores que afectan la decisión de implantación. | B0-NOPS | Coordinador de Programa | | 2010 | Durante la SAM/IG/11 se identificaron las siguientes causas:<br>- Estados que no tienen un requerimiento o necesidad de implantar ATFM;<br>- Razones presupuestales y organizacionales;<br>- Falta de personal dedicado específicamente a actividades ATFM;<br>- Personal que tiene la responsabilidad de gestionar la ATFM, pero que está involucrado con otras funciones. |
| Actualización cálculo de capacidad de pista. | B0-NOPS | Coordinador de Programa | | 2019 | 85% de los Estados han actualizado los cálculos de capacidad de pista. Guyana y Surinam, falta cálculo de capacidad |

| Entregables del Proyecto | Relación con el Plan Regional basado en Rendimiento (PFF) | Responsable | Estado de Implantación* | Fecha entrega | Comentarios |
|---|---|---|---|---|---|
| Actualización cálculo de la capacidad del espacio aéreo (SECTOR ATC) | B0-NOPS | Coordinador de Programa | | 2019 | 6 Estados de la Región han realizado los cálculos de capacidad de sectores ATC como tareas previas a la implantación, 5 de ellos no han realizado la actividad y está pendiente recibir información de 3 Estados. |
| Procesos de monitoreo de espacio aéreo.<br>Procesos de análisis de demanda de tránsito.<br>Normas para los procedimientos de una FMU/FMP.<br>Aplicación de medidas ATFM preliminares.<br>Aplicación de TMI.<br>Mensajería ATFM.<br>Coordinación eventos especiales.<br>Exención y coordinación civil/ militar | B0-NOPS | Curso CGNA Proyecto RLA/06/901 | | Noviembre 2014 FINALIZADO | Completada en fecha |
| Replicar a nivel nacional cursos ATFM. | B0-NOPS | Estados | | 15/05/2015 FINALIZADO | Los Estados replicaron los cursos ATFM a nivel nacional. |
| Medidas ATFM durante la realización de los Juegos Olímpicos y Para-Olímpicos Rio 2016 en Brasil | B0-NOPS | Brasil | | 13/05/2016 FINALIZADO | El detalle del AIC de Brasil se encuentra en el siguiente link de la Internet: http://publicacoes.decea.gov.br/?i=publicacao&id=4339 |

| Entregables del Proyecto | Relación con el Plan Regional basado en Rendimiento (PFF) | Responsable | Estado de Implantación* | Fecha entrega | Comentarios |
|---|---|---|---|---|---|
| Estado de implantación ATFM | B0-NOPS | Coordinador de Programa | | 31/10/2016 | A mayo 2017, 71% de los Estados han implantado ATFM. |
| CONOPS ATFM CAR SAM actualizada y aprobada por GREPECAS | B0-NOPS | Coordinador de Programa | | Julio 2019 | SAMIG/23 (junio 2019) revisó el draft. Presentada para aprobación de CRPP/5 |
| **Recursos necesarios** | Designación de expertos en la ejecución de algunos de los entregables. | | | | |

*

**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.**

# INTERNATIONAL CIVIL AVIATION ORGANIZATION

# Caribbean/South American Air Traffic Flow Management Concept of Operation

# (CAR/SAM ATFM CONOPS)

## 2019 - 2024

| | |
|---|---|
| Version | 2.**1** |
| Date | January 2019 |

## FOREWORD

The Caribbean/South American Air Traffic Management (ATFM) Concept of Operations (CAR/SAM ATFM CONOPS) is published by the B1 Project (IMPROVE DEMAND AND CAPACITY BALANCING (DCB)) of the Caribbean/South American Regional Planning and Implementation Group (GREPECAS). It describes an air traffic flow management operational concept to be applied in both regions.

GREPECAS and its contributory bodies will issue revised editions of the Document as required to reflect ongoing implementation activities.

Copies of the *CAR/SAM ATFM Concept of Operations* can be obtained by contacting:

**ICAO NORTH AMERICAN, CARIBBEAN, AND CENTRAL AMERICAN OFFICE**

**MEXICO CITY, MEXICO**

E-mail : icaonacc@icao.int
Web site : www.icao.int/nacc
Fax : +5255 5203-2757
Mail : P. O. Box 5377, México 5 D. F., México
Point of contact : Eddian Méndez
E-mail : emendez@icao.int

**ICAO SOUTH AMERICAN OFFICE**

**LIMA, PERU**

E-mail : icaosam@icao.int
Web site : www.lima.icao.int
Tel: : +511 611 8686
Fax : +511 611 8689
Mail : P. O. Box 4127, Lima 100, Peru
Point of contact: Fernando Hermoza
E-mail : fhermoza@licao.int

The present edition (Version 2.0) includes all revisions and modifications until 1 January 2019. Subsequent amendments and corrigenda will be indicated in the Record of Amendment and Corrigenda Table, according to the procedure established in page 3.

The publication of amendments and corrigenda is regularly announced through correspondence with States, and the ICAO web site, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

## RECORD OF AMENDMENTS AND CORRIGENDA

| AMENDMENTS | | | |
|---|---|---|---|
| No. | Date applicable | Date entered | Entered by |
| 1 | 20/06/07 | 20/06/07 | ATFM/TF/3 |
| 2 | 01/01/2019 | 01/01/2019 | ATFM/TF/z |
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## AMENDMENTS TO THE DOCUMENT

1. The CAR/SAM ATFM CONOPS is a regional document that includes aeronautical, scientific and technological advances related to ATFM. It also includes the operational experiences gained in the CAR/SAM Regions, as well as in other ICAO Regions, that may affect ATFM concepts and procedures.

2. Due to its unique and regional focus, the CAR/SAM ATFM CONOPS is also a dynamic document and is in continuous progress in order to accept every modification originated by the GREPECAS. This will allow for constant improvement based on experience gained from aeronautical disciplines and activities, enable its harmonious implementation in the CAR/SAM Regions, and ensure air operations efficiency and maintain agreed levels of safety.

3. In order to keep this ATFM CONOPS updated and make the required changes and/or modifications, the following amendment procedures have been established.

4. The ATFM CONOPS consists of a series of loose-leaf pages organized in sections and parts describing the concepts and procedures applicable to ATFM operations in the CAR/SAM Regions.

5. The framework of the sections and parts, as well as the page numbering, have been developed so as to provide flexibility, for review and revision of the various sections. Each section is independent and includes an introduction defining its purpose and status.

6. Pages bear the date of publication, as applicable. Replacement pages are issued as necessary and any portions of the pages that have been revised are identified by a vertical line in the margin. Additional material will be incorporated in the existing Sections or will be the subject of new Sections, as required.

7. Changes to text are identified by a vertical line in the margin in the following manner:

| | |
|---|---|
| *Italics* | *for new or revised text;* |
| *Italics* | *for editorial modification which does not alter the substance or meaning of the text; and* |
| Strikethrough | ~~for deleted text.~~ |

8. The absence of change bars, when data or page numbers have changed, will signify re-issue of the section concerned or re-arrangement of text (e.g. following an insertion or deletion with no other changes).

**Page**

**Document content**

## GLOSARIO DE ACRÓNIMOS/ACRONYMS GLOSSARY

| | |
|---|---|
| ACC | Centro de control de área<br>Area Control Centre |
| A-CDM | Airport Collaborative decision-making<br>Toma de decisiones en colaboración a nivel aeropuerto |
| AFTN | Red de telecomunicaciones fijas aeronáuticas<br>Aeronautical Fixed Telecommunication Network |
| AIP | Publicación de Información aeronáutica<br>Aeronautical Information Publication |
| AIS | Servicio de información aeronáutica<br>Aeronautical Information Service |
| ANP | Plan de navegación aérea<br>Air Navigation Plan |
| ANS | Servicios de navegación aérea<br>Air Navigation Services |
| ANSP | Proveedor de servicios de navegación aérea<br>Air Navigation Service Provider |
| AO | Explotador de aeronave<br>Aircraft Operator |
| APP | Oficina de control de aproximación<br>Approach Control Office |
| ATC | Control de tránsito aéreo<br>Air Traffic Control |
| ATFM | Gestión de afluencia del tránsito aéreo<br>Air Traffic Flow Management |
| ATM | Gestión del tránsito aéreo<br>Air Traffic Management |
| ATS | Servicios de tránsito aéreo<br>Air Traffic Services |
| CAA | Autoridad de aviación civil<br>Civil Aviation Authority |
| CAR/SAM | Regiones Caribe y Sudamérica<br>Caribbean and South America Regions |
| CATFM | Dependencia de Gestión de la afluencia del tránsito centralizada<br>Centralized Air Traffic Flow Management Unit |
| CBA | Análisis de costo-beneficios<br>Cost-Benefit Analysis |
| CDM | Toma de decisiones en colaboración<br>Collaborative decision-making |
| CNS/ATM | Comunicaciones, navegación y vigilancia/Gestión del tránsito aéreo<br>Communications, Navigation and Surveillance/Air Traffic Management |
| FDPS | Sistema de procesamiento de datos de vuelo<br>Flight Data Processing System |
| FIR | Región de información de vuelo<br>Flight Information Region |
| FMU | Dependencia de organización de la afluencia<br>Flow Management Unit |
| FMP | Puestos de gestión de la afluencia<br>Flow Management Position |

| | |
|---|---|
| FPL | Plan de vuelo<br>Flight Plan |
| GREPECAS | Grupo regional de planificación y ejecución CAR/SAM<br>CAR/SAM Regional Planning and Implementation Group |
| MET | Servicios meteorológicos para la navegación aérea<br>Meteorological Services for Air Navigation |
| OACI/ICAO | Organización de aviación civil internacional<br>International Civil Aviation Organization |
| PANS ATM | Procedimientos para los servicios de navegación aérea –Gestión de tránsito aéreo<br>Procedures for Air Navigation Services –Air Traffic Management |
| PIRG | Grupo regional de planificación y ejecución<br>Planning and Implementation Regional Group |
| TBD | A ser determinado<br>To be determined |
| TMA | Area de control terminal<br>Terminal Control Area |
| TWR | Torre de control<br>Control Tower |
| WWW | Red informática mundial<br>Worldwide Web |

**Explanation of terms and expressions**

The writing and explanation of some terms and particular expressions used in this document are defined for a better understanding.

***Air traffic management system.*** A system that provides ATM through the collaborative integration of humans, information, technology, facilities and services, supported by air and ground- and/or space-based communications, navigation and surveillance.

***Capacity (for ATFM purposes).*** The maximum number of aircraft that can be accommodated in a given time period by the system or one of its components (throughput).

***Demand.*** The number of aircraft requesting to use the ATM system in a given time period.

***Efficiency.*** The ratio of the cost of ideal flight to the cost of procedurally constrained flight.

***Homogeneous ATM area.*** An airspace with a common air traffic management interest, based on similar characteristics of traffic density, complexity, air navigation system infrastructure requirements or other specified considerations wherein a common detailed plan will foster the implementation of interoperable CNS/ATM systems.

*Note.— Homogeneous ATM areas may extend over States, specific portions of States, or groupings of States. They may also extend over large oceanic and continental en-route areas. They are considered as areas of shared interest and requirements.*

***Major traffic flow.*** A concentration of significant volumes of air traffic on the same or proximate flight trajectories.

*Note.— Major traffic flows may cross several homogeneous ATM areas with different characteristics.*

**Routing area.** A defined area encompassing one or more major traffic flows for the purpose of developing a detailed plan for the implementation of interoperable CNS/ATM systems.

*Note.— A routing area may cross several homogeneous ATM areas with different characteristics. A routing area specifies common interests and requirements among underlying homogeneous areas, for which a detailed plan for the implementation of CNS/ATM systems and procedures either for the airspace or for the aircraft will be specified.*

**Centralized ATFM.** A centralized unit responsible for the provision of air traffic flow management within a specific area.

**ATM Community**. All the organizations, bodies or entities which might participate, collaborate and cooperate in the planning, development, use, regulation, operation and maintenance of the ATM System.

**Air Traffic Flow Management (ATFM).** A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

**Air Traffic Management.** *The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.*

**Flow Management Unit (FMU).** A working unit established in an appropriate air traffic control facility to provide ATFM service for a specific set of ATS units, and to ensure the necessary interface between the local FMU and neighbouring FMUs with respect to air traffic flow management.

**Flow Management Position (FMP).** A position established at specific ATS units responsible for the day-to-day ATFM activities.

**Air Traffic Volume**. The number of aircraft within a defined airspace or aircraft movement area in an aerodrome, within a specific time frame.

**Executive summary**

***NOTE:***
***A NEW EXCUTIVE SUMMARY TO BE DEVELOPED, AFTER THE FINAL REVIEWED CONOPS IS ENDORSED BY CRPP/5.***

***LATEST UPDATES ARE MOVED TO A NEW "1. BACKGROUND" PARAGRAPH.***

## 1 Background

1.1 The purpose of ATFM is to balance demand and capacity, providing the framework to take collaborative decisions to make an efficient use of available resources for the provision of air traffic services. Air operators and other stakeholders expect the ANSPs take appropriate measures to ensure safety in air operations, while guaranteeing the best possible use of the airspace and movement areas.

1.2 ANSPs should be aware on the impact their traffic management initiatives have in the efficiency and safety of air transport. A number of options shall be analysed, Domestic ATFM, Cross Border ATFM, Multinodal Regional ATFM and Centralized ATFM.

1.3 The initial regional ATFM implementation principle for the CAR/SAM Regions was to establish two centralized ATFM Facilities, one for each Region, with the support of Flow Management Positions (FMPs) established in each ACC within the Region of application. Consequently, States, Territories and International Organizations may define whether a Flow Management Unit, and the associated Flow Management Positions, should be established in the interim phase before the implementation of the Centralized ATFM Facility can be accomplished. This should be considered as the ideal scenario for regional ATFM implementation, aligned with implementation of modules/elements of NOPS (B0, B1 and B2) of Global Air Navigation Plan (GANP) 6$^{th}$ edition.

1.4 However, the establishment of a single ATFM organization for each region was not feasible due to political and institutional considerations, which resulted in a considerable delay in the expected implementation of ATFM in the CAR and SAM Regions. In response to these circumstances, the CAR/SAM CONOPS makes emphasis on a multi-nodal cross border ATFM concept.

1.5 In view of the above, this document describes the main regional objectives of the ATFM which include: assist ATC in making the maximum use of its airspace and capacity; issue flow management initiatives, as required, in order to maintain a safe, orderly and expeditious flow of air traffic; ensure that air traffic volume is compatible with declared capacities; develop a description of the principles and functions of flow management units; and establish the requirements for FMUs including equipment and personnel.

1.6 In the current operational concept, GREPECAS establishes a simple implementation strategy in order to ensure maximum utilization of available capacity and to permit all parties concerned to obtain sufficient experience. The implementation will be initiated with the application of basic ATFM procedures in airports, terminal and en-route airspaces and in an evolutionary manner to reach more complex phases, without the immediate need for a regional ATFM centre.

1.7 The CAR/SAM ATFM CONOPS emphasizes a multimodal and decentralized implementation of the ATFM. However, experience in other regions proves that this approach is not totally free of challenges. Although, in principle, the multimodal approach may seem an appropriate option for the implementation and development of basic capacities by States and ANSPs, the reality is that at a certain point it is necessary to be able to make decisions from a regional perspective, and not individually. Therefore, in due time, measures should be taken to determine how these decisions would be made, whether through regional agreements or the implementation of a centralized decision-making system.

1.8 Finally, GREPECAS deemed it pertinent to establish exceptions for the application of ATFM measures for aircraft performing ambulance flights, humanitarian flights, search and rescue operations and State aircraft in international flights, leaving at the discretion of the States/Territories and International Organizations the measures to be adopted on this matter for domestic flights. It also set out

that for a partial or total interruption of flow management and/or support services the corresponding contingency plan will also be applicable.

## 2. Purpose of the document

2.1 The CAR/SAM ATFM CONOPS document is a high level description of service to be provided in the CAR/SAM Regions during the period 2019 - 2024. It explains the current situation, as well as the future situation, which will be reached through a series of specific stages.

2.2 The operational concept described herein reflects the expected order of events and should assist and guide the planners in the design and gradual development of the ATFM system. The concept is designed to promote safety, efficiency, and an optimum flow of traffic in areas where demands exceed, or is forecast to exceed, the available capacity of the ATM system or airport capacity.

## 3. Actors involved in ATFM

3.1 The ATFM community includes organizations, bodies or entities which could participate collaborate and cooperate in the planning, development, utilization, regulation, operation and maintenance of ATFM system. Among them, the following may be emphasized:

3.2 ***Aerodrome Community***. Includes aerodromes, aerodromes authorities and other parties involved in the provision and operation of the physical infrastructure needed to support the take-off, landing and ground handling of aircraft.

3.3 ***Airspace Providers***. Refers in general terms to Contracting States in their owner capacity with legal authority to permit or deny access to their sovereign airspace. The expression may also be applied to organizations of the State to which the responsibility has been assigned to establish standards and guidelines for the airspace use.

3.4 ***Airspace users***. Refers to airline, military, and general aviation aircraft operators and pilots.

3.5 ***ATM service providers.*** Refers to all the organizations and personnel (e.g., controllers, engineers, technicians) involved in the provision of ATM services to airspace users.

3.6 ***Military aviation.*** Refers to the personnel and material of military organizations in their vital role as wardens in States' security.

3.7 ***International Civil Aviation Organization (ICAO)***. Considered as the only international organization responsible for efficiently coordinating the implementation activities of global ATM which lead to a real, continuous global ATM.

3.8 The ATFM will be implemented, as required, through regional air navigation agreements or, if necessary, by means of multilateral agreements with other States. In these agreements, procedures and common methods on capacity calculation should be considered.

## 4. Trends and traffic forecasts for CAR/SAM Regions

4.1 According to the ICAO Circular 333-AT/190, Global Air Transport Outlook to 2030[1], CAR/SAM Regions[2] are enjoying increasing political stability and the emergence of Brazil as a major industrial and economic power with help boost traffic growth. Other nations are currently addressing political and economic concerns, but still have considerable potential for growth in the medium term.

4.2 Total passengers traffic grew annually by 6.2% between 1995 and 2010. Forecasts nevertheless call for a slightly lower but healthy annual growth rate of 5.9% up to 2030. By 2030 CAR/SAM Regions markets are expected to account for 74% of the total passenger traffic from-to-within the Regions.

4.3 All-cargo traffic will total 72 % of the intra-regional cargo traffic. The developing economy will grow 4.0 % a year in term of GDP, and the total cargo traffic related to these regions will grow 5.6%.

4.4 Air passengers traffic on domestic routes is expected to grow at an average rate of 6.5% annually between 2011-2030. Brazil and Mexico represent the most important domestic markets. Rising personal incomes and LCCs (low cost carriers) will drive future traffic increases.

4.5 Intra-regional passenger traffic is expected to grow at an average annual rate of 7.4% between 2011-2030. Between 1995 and 2010 a robust growth of 7.1 % per year was realized for the passenger market. Strong economic fundamentals and declining yields have contributed to the traffic growth. LCCs have been active in developing intra-regional routes.

## 5. Main traffic flows

5.1 The CAR/SAM air navigation plan has identified several airspaces with common interests as regards air traffic management, based on similar characteristics of traffic density, complexity and air navigation system infrastructure requirements within which a common plan shall foster the implementation of the ATM Global Concept. Within these routing areas, the main traffic flows have also been identified following the same or close flight trajectories between pairs of cities.

5.2 These routing areas and the respective traffic flows are described in the Table shown as **Appendix A** to this document.

## 6. Identification of areas and/or routes where traffic congestion is produced

6.1 Currently, saturation periods have been identified in several airports and traffic flows *in* some portions of the CAR/SAM Flight Information Regions (FIRs). In view of this, it is necessary that CAR/SAM States, Territories, and International Organizations determine the capacity of the airspace and/or airports for which they are responsible, and maintain and disseminate to all interested parties information concerning periods when demand exceeds the capacity of their respective airports, terminal areas and traffic flows.

[1] Published in 2013
[2] Circular 333-AT/190 considers “Latin America and the Caribbean Region”

## 7. Objectives, principles and functions of Air Traffic Flow Management.

7.1 According to ICAO *Manual on Collaborative Air Traffic Flow Management*, Doc 9971 3rd Edition 2018, the objectives of ATFM consist of:

a) enhancing the safety of the ATM system by ensuring the delivery of safe traffic densities and minimizing traffic surges;
b) ensuring an optimum flow of air traffic throughout all phases of the operation of a flight by balancing demand and capacity;
c) facilitating collaboration among system stakeholders to achieve an efficient flow of air traffic through multiple volumes of airspace in a timely and flexible manner that supports the achievement of the business or mission objectives of Airspace Users (AUs) and provides optimum operational choices;
d) balancing the legitimate, but sometimes conflicting, requirements of all AUs, thus promoting equitable treatment;
e) reconciling ATM system resource constraints with economic and environmental priorities;
f) facilitating, by collaborating with all stakeholders, the management of constraints, inefficiencies, and unforeseen events that affect system capacity in order to minimize negative impacts of disruptions and changing conditions; and
g) facilitating the achievement of a seamless and harmonized ATM system while ensuring compatibility with international developments.

### Objective of the Flow Management Unit

7.2 As established in the *Manual on Collaborative Air Traffic Flow Management* (Doc 9971), each State shall ensure that an air traffic flow management structure is developed that meets the needs of the aviation community.

7.3 The objective of the Flow Management Unit is to enhance efficiency and safety of air traffic operations by balancing demand and capacity. This may be accomplished by the use of Traffic Management Measures (TMMs) to maintain a safe, orderly and expeditious air traffic flow while ensuring that the traffic volume is compatible with the declared capacities. However, managing traffic flows means more than simply applying ATFM measures. Flow management entails implementing an ATFM solution, which is the combination of capacity optimization and ATFM measures. ATFM is therefore a process where, confronted with an imbalance between demand and capacity, consideration is first given to optimizing the capacity.

ATFM measures should generally only apply during periods when demand exceeds capacity and should not apply on a routine basis. The frequent application of ATFM measures suggests an imbalance between ATM capacity and traffic demand, which should be addressed in a more strategic fashion.

7.4 Consequently, States, Territories, and International Organizations shall establish a Flow Management Unit, and the associated Flow Management Positions, in their respective organizations. The implementation of a Flow Management Unit should be planned on a scalable basis, according to the emergence of imbalances indicators.

**Principles in which ATFM will be based**

7.5 An ATFM structure should be developed in accordance with Annex 11 and Doc 9971.

The implementation of the Flow Management Unit should be based on the following principles:

a) optimize available airport and airspace capacity without compromising safety;
b) maximize operational benefits and global efficiency while maintaining agreed safety levels;
c) promote timely and effective coordination with all affected parties;
d) foster international collaboration leading to an optimal, seamless ATM environment;
e) recognize that airspace is a common resource for all users and ensure equity and transparency, while taking into account security and defence needs;
f) support the introduction of new technologies and procedures that enhance system capacity and efficiency;
g) enhance system predictability, help to maximize aviation economic efficiencies and returns, and support other economic sectors such as business, tourism and cargo;
h) evolve constantly to support an ever-changing aviation environment; and
i) use the collaborative decision making (CDM) process as the basis for developing and implementing ATFM measures.

*Note.- Appendix B to this document contains "General consideration for CDM process".*

**Functions of a Flow Management Unit**

7.6 To provide ATFM service, the Flow Management Unit should*:*

a) Establish and maintain a database that includes:
- the air navigation infrastructure, ATS units and registered aerodromes;
- pertinent ATC sector and airport capacity; and
- forecast flight data.

b) Establish a method for displaying:
- a chart of forecast air traffic demand;
- a comparison of demand and available capacity for pre-determined areas; and
- the time-frame of forecast air traffic overloads.

c) Make the appropriate coordination to attempt to increase available capacity, when necessary.

d) When demand will exceed available capacity, coordinate, communicate, and apply traffic management measures in a timely manner.

e) Carry out a follow-up on the result of traffic management measures used.

f) Coordinate traffic management measures with neighbouring FMUs, when so required.
g) Provide Key Performance Indicator to ATM planning, in order to guide the increment of the ATC/airport capacity where necessary.

## 8. Equipment requirements for a Flow Management Unit

8.1 The implementation of ATFM in the CAR/SAM Regions requires identifying and determining the minimum equipment requirements and communication links for implementing an FMU and FMP. Equipment implementation should be planned in a scalable basis.

*Note: A proposed description of these requirements is shown in **Appendix C** to this document.*

## 9. Human resource planning requirements for a Flow Management Unit

*Note: The following model of a FMU has been given as a reference, taken from a FAA organization. States must define their own organization according to operational needs and suitable resources.*
*Some CAR/SAM States do not need this kind of structure, just a couple of people to monitor capacity and demand for ATM planning purpose and to identify the need to implement an FMU in the future.*

9.1 Establishment of a FMU, and associated FMP(s), requires careful human resource planning.

9.2 Proposed FMU Structure

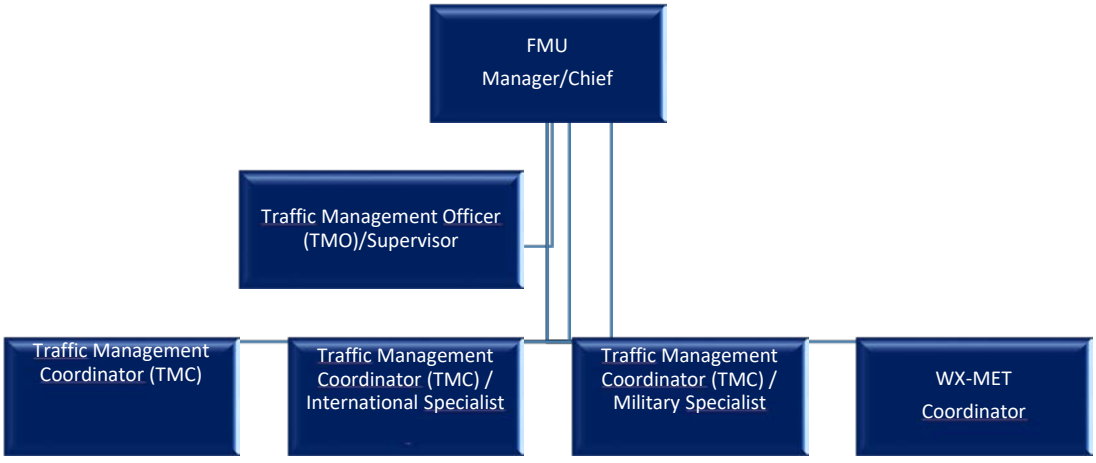



Figure 1: FMU Structure

## 9.3 DUTIES AND RESPONSIBILITIES: FMU MANAGER/CHIEF

### 9.3.1 TITLE OF THE POSITION

**FMU Manager/Chief**

### 9.3.2 JOB NATURE AND MISSION

Responsible for the planning, execution, and management of functions related to the operational activities in the FMU. Ensures that efficient and effective traffic management is applied within the geographic area of responsibility. Maintains an understanding of the technical aspects of the FMU and effectively manages human resources.

### 9.3.3 DIRECT REPORT

FMU Location: Area Control Centre (ACC)
FMU Manager/Chief reports directly to: Air Traffic Services Manager
Supervises directly: Traffic Management Officer (TMO)/Supervisor

### 9.3.4 COLLABORATIVE LIAISON

The FMU Manager/Chief ensures that the FMU staff maintains an effective and collaborative liaison with internal and external organizations.

Internal organizations can include, but are not limited to:

- ACC staff
- Underlying Terminal Management Areas (TMAs)
- Airport Traffic Control Towers (ATCTs)
- CNS/Technical Operations staff
- Search and Rescue (SAR) Office
- Aeronautical Reporting Office (ARO)
- Meteorological services (MET)
- NOTAM Office

External organizations can include, but are not limited to:

- Adjacent ACCs and FMUs
- A-CDM facilities/units concerned
- Stakeholders: airlines, general aviation, military
- Government agencies

### 9.3.5 RESPONSIBILITIES

FMU Manager/Chief responsibilities include:

- Collaborates and communicates with operational stakeholders
- Ensures the FMU monitors:
  - air traffic flows
  - air traffic demand and capacity
  - conditions that impact demand and capacity
- Ensures the FMU staff:

- delivers information regarding the status of the infrastructure of air navigation services. For example, NAVAIDS, airports, facilities, etc.
- prepares, delivers and briefs reports concerning the capacity and demand of ATC sectors, airport acceptance rates (AAR), and airport departure rates (ADR)
- plans, coordinates, briefs, implements, monitors, revises, and cancels traffic management measures (TMMs)
- maintains an awareness of activities in special use airspace
- coordinates and relays information related to NOTAMs

## 9.4 DUTIES AND RESPONSIBILITIES: TRAFFIC MANAGEMENT OFFICER (TMO)/SUPERVISOR

### 9.4.1 TITLE OF THE POSITION

FMU Traffic Management Officer (TMO)/Supervisor

### 9.4.2 JOB NATURE AND MISSION

Serves as supervisor on-duty for Traffic Management Coordinators (TMCs) in an FMU. Ensures that efficient and effective traffic management is applied by the TMCs within the geographic area of responsibility.

### 9.4.3 LOCATION AND DIRECT REPORT

FMU Location: Area Control Center (ACC)
FMU TMO/Supervisor reports directly to: FMU Manager/Chief
Supervises directly: Traffic Management Coordinators

### 9.4.4 RESPONSIBILITIES

- Provides supervision to a staff of TMCs
- Ensures that traffic instructions/restrictions are initiated in accordance with established procedures to maintain a safe and expeditious flow of traffic and minimize the impact of heavy traffic demand
- Provides training and guidance as appropriate throughout area(s) of responsibilities
- Assigns and reviews work
- Plans work and sets priorities and schedules
- Approves leave
- Prepares schedules for completion of work
- Assigns work to subordinates based on priorities
- Evaluates work performance of subordinates, ensuring equity of performance standards and ratings
- Adjusts staffing levels and work procedures to accommodate resource decisions made at higher management levels

## 9.5 DUTIES AND RESPONSIBILITIES: TRAFFIC MANAGEMENT COORDINATOR (TMC)

### 9.5.1 TITLE OF THE POSITION

FMU Traffic Management Coordinator (TMC)

### 9.5.2 JOB NATURE AND MISSION

Performs technical level of responsibilities of considerable difficulty. Responsible for distributing collecting and monitoring data and for overseeing the ATFM activities within the respective Flight Information Region (FIR). This ensures that all stakeholders have timely and efficient access to applicable ATFM. Utilizes equipment and aeronautical tools suitable for maintaining the balance of air traffic demand and capacity in Air Traffic Control (ATC) sectors and at airports. Coordinates directly with adjacent FIRs/ACCs and any other overseas/international organizations.

*Note. - As needed, the TMC should be assisted/supported by a TMC/international specialist, a TMC/military specialist and/or a WX MET coordinator.*

### 9.5.3 LOCATION AND DIRECT REPORT

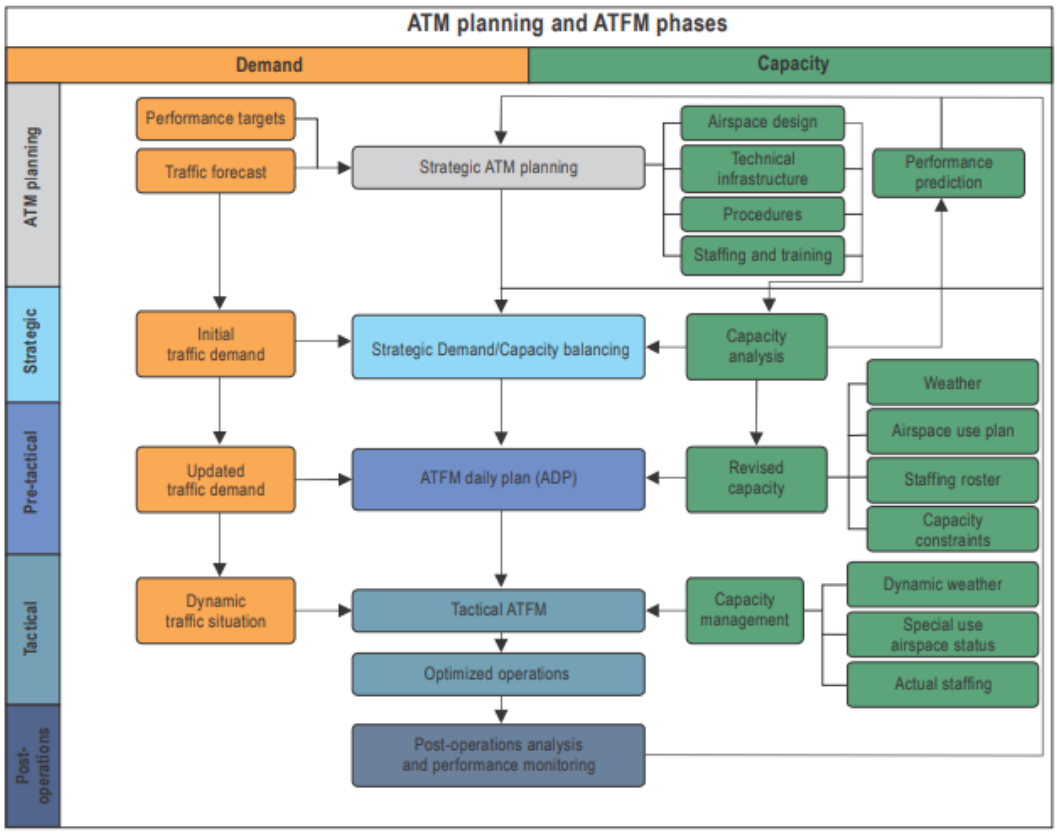
FMU Location: Area Control Center (ACC)
FMU TMO/Supervisor reports directly to: FMU TMO/Supervisor
Supervises directly: None.

### 9.5.4 RESPONSIBILITIES

- Constantly monitors the flow of air traffic, the state of the infrastructure of air navigation services, the conditions of different airports, the weather conditions and the projected air traffic demand to ensure acceptable levels of traffic are maintained
- Monitors weather conditions and collaborates with aviation stakeholders to avoid flight routes into undesirable weather conditions
- Ensures that all stakeholders have timely and efficient access to applicable ATFM information
- Utilizes equipment and aeronautical tools suitable for balancing air traffic demand and capacity in ATC sectors and at applicable airports
- Plans, coordinates, implements, revises, and cancels traffic management measures to balance demand and capacity in ATCS sectors and at applicable airports
- When air traffic delays are anticipated or known to exist, establishes plans to reduce delays
- Collects, distributes, and monitors aeronautical information pertinent to the ATFM activities within the FIR
- Ensures that the instructions and restrictions are applied in accordance with the established procedures to maintain a safely, orderly and expeditious flow of air traffic, in order to minimize the impact of high demand periods
- Coordinates directly with adjacent ACC FMUs and other overseas and international organization, as required
- Serves as a Military Liaison and coordinates all military exercises and activities within the designated FIR

## 10. Operational procedures

10.1 A methodology to balance demand and capacity should be developed in order to minimize the effects of ATM system constraints. This can be accomplished through the application of an "ATFM planning and management" process. In this initiative, interactive capacity and airspace planning process, airport operators, ANSPs, AUs, military authorities and other stakeholders work together to improve the performance of the ATM system (see Figure II-4-1 Doc. 9971).




10.2 The operational procedures for the FMUs and FMPs should be developed in a separate document. After consultation with all applicable parties, changes, if necessary, shall be agreed upon and published as amendments to operational procedures.

10.3 The purpose of this document shall be to:

- *establish the functions and responsibilities of personnel working in the FMUs and FMPs in regard to implementing the ATFM service.*

- *describe the procedures to be used between FMUs.*

- *describe the traffic management measures that may be applied.*

10.4 Traffic management measures should be designed to address specific daily traffic flows, flight series, or specific flights. To this end, traffic management planning, strategy development, and day-to-day monitoring, should be conducted. With regard to the above, ATFM activities should be developed in three phases: strategic - more than one day prior to the day of operation; pre-tactical - one day prior to

operations; and, tactical - during the day of the operation. During all three ATFM phases, responsible facilities should maintain a close liaison with system stakeholders to ensure efficient and equitable service.

**Post-operations analysis**

10.5 The final phase in the ATFM planning and management process is post-operations analysis. During this phase, an analytical process is carried out to measure, investigate and report on operational processes and activities. This process is the cornerstone in developing best practices and/or lessons learned that will further improve the operational processes and activities. It should cover all ATFM domains and all the external units relevant to an ATFM service.

*Note.- A best practice is a method, process, or activity that, upon evaluation, demonstrates success, has had a positive impact, and can be repeated. A "lesson learned" documents the experience gained during an event and provides valuable insight with respect to identifying a method, process, or activity that should be used or, to the contrary, avoided in specific situations.*

10.6 While most of the post-operations analysis process may be carried out within the ATFM unit, close coordination and collaboration with ATFM stakeholders will yield better and more reliable results.

10.7 The post-operations analysis should be accomplished by evaluating the ADP and its results. Reported issues and operational statistics should be evaluated and analysed in order to learn from experience and to make appropriate adjustments and improvements in the future.

10.8 The process should also include an analysis of items such as anticipated and unanticipated events, ATFM measures and delays, the use of predefined scenarios, flight planning and airspace data issues. The anticipated outcome (where assessed) should be measured against the actual outcome, generally in terms of delay and route extension, while taking into account performance targets.

10.9 All stakeholders within the ATFM service should provide feedback, preferably using a standardized electronic format, enabling the information to be used in an automated manner for the post-operations analysis.

10.10 In complex areas, and in order to support the post-operations analysis process, the use of an automated replay support tool, with graphical display, can be useful.

## 11. ATFM Implementation Strategy

11. 1 Three elements of ATM planning must feed the ATFM system: traffic forecast, performance targets, and the general output of ATM planning. The ATM planning phase is therefore a preparatory one. Measures taken in this step include:

a) reviewing airspace design (route structure and ATS sectors) and airspace utilization policies to look for potential capacity improvements;
b) reviewing the technical infrastructure to assess the possibility of improving capacity. This is typically accomplished by upgrading various ATM support tools or enabling navigation, communication or surveillance infrastructure;
c) reviewing and updating ATM procedures induced by changes to airspace design and technical infrastructure;
d) reviewing staffing practices to evaluate the potential for matching staffing resources with workload and the eventual need for adjustments in staffing levels; and

e) reviewing the training that has been developed and delivered to ATFM stakeholders.

11.2 Before moving forward with ATFM implementation, the following steps should be taken:

a) establish an accurate picture of the expected traffic demand through the collection, collation and analysis of air traffic data, bearing in mind that it is useful to:

1) monitor aerodromes and airspaces in order to quantify excessive demand and significant changes in:

i) forecast demand; and
ii) ATM system performance targets;

2) obtain varied demand data from different sources, for example:

i) a comparison of recent traffic history (e.g., compare the same day of the previous week or compare seasonal high-demand periods);
ii) traffic trends provided by national authorities, user organizations (e.g., IATA), etc.; and
iii) other related information (e.g., air shows, major sports events, large-scale military manoeuvres); and

b) consider the complexity and cost of these measures in order to ensure optimum performance, not only from a capacity point of view but also from an economic and cost-effective perspective.

11.3 The operational concept establishes a straight-forward implementation strategy. This strategy should be developed in phases and scalable basis, so as to ensure maximum utilization of the available capacity and enable all concerned parties to obtain sufficient experience.

**Airports**

11.4 The implementation process of ATFM in the CAR/SAM Regions related to airports starts with the establishment of the airport capacity which enables identification of periods in which demand is higher than capacity. With that identification, traffic management measures can be planned with a view to optimize the utilization of the existing capacity.

11.5 When developing airport slot allocation procedures, capacity allowance for other operations, such as non-regular flights should be kept in mind.

11.6 The evolution of traffic management measures for airports should evolve towards tactical applications and the use of automation tools and efficient and effective communications means with aircraft operators in order to tactically balance air flows, demand and capacity.

**Airspace**

11.7 Given that the fundamental purpose of ATFM is to be able to balance demand with capacity, it is understood that a realistic implementation is based on the determination of the capacity of the ATS system. The *Manual on Collaborative Air Traffic Flow Management* provides basic guidance for this determination.

11.8 It may be possible that strategic traffic management measures in the airspace will be sufficient to prevent overload of ATC sectors.

11.9 If demand and capacity balancing in the airspace cannot be accomplished with existing strategic traffic management measures, States/Territories and International Organizations should move to more effective solutions. This may involve tactical traffic management measures related to airspace, including dynamic procedures that are applied to flights scheduled in the near-term. This would require the utilization of automation and infrastructure tools in addition to those applied strategically.

11.10 States/Territories and International Organizations who decide to implement airspace tactical traffic management measures should develop standards and operational procedures applicable to this service.

## 12 ATFM performance and measurement

12.1 An ATFM service can provide significant business and operational benefits to the ATM community, by delivering flexible operations within defined and agreed sets of rules. Enhanced safety, reduced delays, improved flight efficiency and the associated cost benefits are some practical outcomes that can result from the delivery of a proactive ATFM service.

12.2 The key to fully realizing these benefits lies in the implementation and application of ATFM services at a system-wide level (e.g., regional, sub-regional and/or global). Furthermore, the adoption of a Performance-Based Approach (PBA) to implement ATFM would ensure that the deployment of ATFM-related capabilities and solutions have measurable benefits on ATM performance.

12.3 Measuring the performance of an ATFM system enables users to identify its contribution to the overall ATM operational environment and understand how performance improves as techniques and technology enable new capabilities. To measure and assess variations of ATFM performance, a baseline performance assessment is needed. It is then used to measure targeted improvements.

12.4 States must consider activities directed to assess the ATFM performance as of early stages of service implantation. Detailed information on ATFM measurement and indicators are shown in Doc 9971, Part II.

## 13 Special flights exempt from application of ATFM measures

13.1 Aircraft that file flight plans as air ambulance flights, humanitarian flights, search and rescue operations, and State aircraft will be exempt from the application of traffic management measures. States will continue to have jurisdiction on these aircraft when they file as domestic flights.

## 14 Contingency Plan

14.1 In case of a partial or total interruption of the flow management and/or support services, FMUs will have corresponding contingency plans prepared in accordance with ICAO guidelines. These contingency plans will help ensure the safe and orderly movement of air traffic and will be incorporated into the operational procedures documents associated with the FMU responsibilities.

# APPENDIX A

## Table

## Routing Areas and Main Traffic Flows Identified in the CAR/SAM Regions

| -1- Routing Area (AR) | -2- Traffic flows | -3- FIRs involved | -4- Type of area | -5- Remarks |
|---|---|---|---|---|
| **Caribbean/South American Regions (CAR/SAM)** | | | | |
| AR 1 | Buenos Aires-Santiago de Chile | Ezeiza, Mendoza, Santiago | Low density Continental | SAM intra-regional traffic flow |
| | Buenos Aires-Sao Paulo/Río de Janeiro | Ezeiza, Montevideo, Curitiba, Brasilia | Low density Continental | SAM intra regional traffic flow |
| | Santiago de Chile-Sao Paulo/Rio de Janeiro | Santiago, Mendoza, Córdoba, Resistencia, Asunción, Curitiba, Brasilia | Low density Continental | SAM intra regional traffic flow |
| | Sao Paulo/Rio de Janeiro-Europe | Brasilia, Recife | Continental / Low density Oceanic | SAM/AFI/EUR inter regional traffic flow |
| AR 2 | Sao Paulo/Río de Janeiro-Miami | Brasilia, Manaus, Maiquetía, Curacao, Kingston, Santo Domingo, Port au Prince, Habana, Miami | Continental / Low density Oceanic | CAR/SAM/NAM inter- and intra-regional traffic flow |
| | Sao Paulo/Río de Janeiro- New York | Brasilia, Belem, Paramaribo, Georgetown, Piarco, Rochambeau, San Juan (New York) | Continental / Low density Oceanic | CAR/SAM/NAM/ NAT inter- and intra-regional traffic flow |
| AR 3 | Sao Paulo/Río de Janeiro- Lima | Brasilia, Curitiba, La Paz, Lima | Low density Continental | SAM intra-regional traffic flow |
| | Sao Paulo/Río de Janeiro- Los Angeles | Brasilia, Porto Velho, Bogotá, Barranquilla, Panamá, Central América, Mérida, México, Mazatlán (Los Angeles) | Low density Continental | CAR/SAM/NAM inter- and intra-regional traffic flow |
| AR 4 | Santiago - Lima - Miami | Santiago, Antofagasta, Lima, Guayaquil, Bogotá, Barranquilla, Panamá, Kingston, Habana, Miami. | Continental / Low density Oceanic | CAR/SAM/NAM inter- and intra-regional traffic flow |

| -1- Routing Area (AR) | -2- Traffic flows | -3- FIRs involved | -4- Type of area | -5- Remarks |
|---|---|---|---|---|
| | Buenos Aires - New York | Ezeiza, Resistencia, Asunción, La Paz, Porto Velho, Manaus, Maiquetía, Curacao, Santo Domingo, Miami (New York) | Continental / Low density Oceanic | CAR/SAM/NAM/ NAT NAM inter- and intra-regional traffic flow |
| | Buenos Aires - Miami | Ezeza, Resistencia, Córdoba, La Paz, Porto Velho, Bogotá, Barranquilla, Kingston, Habana, Miami | Continental / Low density Oceanic | CAR/SAM/NAM NAM inter- and intra-regional traffic flow |
| AR 5 | North of South America - Europe | Guayaquil, Bogotá, Maiquetía, Piarco (NAT-EUR) | Continental / high density Oceanic | SAM/NAT/EUR inter-regional traffic flow |
| AR 6 | Santiago - Lima - Los Angeles | Santiago, Antofagasta Lima, Guayaquil, Central Amérca, México | Low density oceanic | CAR/SAM /NAM intra- and inter-regional traffic flow |
| AR 7 | South America – South Africa | Ezeiza, Montevideo, Brasilia, Johanesburgo (AFI) | Low density oceanic | SAM/AFI inter-regional traffic flow |
| | Santiago de Chile - Isla de Pascua - Papeete (PAC) | Santiago, Pascua, Tahiti | Low density oceanic | SAM/PAC inter-regional traffic flow |
| GM-1 | Mexico, Toluca, Guadalajara, Monterrey, Mazatlán, La Paz, Acapulco, Puerto Vallarta, Huatulco, Cancún Gulf of Mexico— North America | Mexico, Houston, Miami; Albuquerque; Los Angeles | Continental/oceanic high density | CAR/NAM inter-regional major traffic flow |
| | Cancún, Guatemala, El Salvador, Nicaragua, Honduras, Costa Rica – Miami | Mexico, Central America, Havana, Miami | Continental/oceanic high density | CAR/NAM interregional traffic flow |
| GM-2 | Mexico, Cancun, La Havana, Nassau — Europe | Mexico, Havana, Miami -NAT-EUR | Continental/oceanic high density<br>Major traffic flow | CAR/NAM/NAT/ EUR<br>inter-regional traffic flow |
| GM-3 | Costa Rica, Panama, Honduras Kingston, Haiti, Santo Domingo San Juan, The Caribbean — Europe | Central America, Panama, Kingston, Port-au-Prince, Curacao, Santo Domingo, San Juan – EUR | Oceanic high density | CAR/ NAT/EUR intra and interregional major traffic flow |

| -1-<br>Routing Area (AR) | -2-<br>Traffic flows | -3-<br>FIRs involved | -4-<br>Type of area | -5-<br>Remarks |
|---|---|---|---|---|
| | North America – East Caribbean | New York, Miami, Havana, San Juan, Santo Domingo Piarco | Oceanic high density | West Atlantic Route System CAR/NAM inter-regional traffic flow |

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## APPENDIX B

### General Considerations for Collaborative decision-making (CDM) process

*Note. - Doc. 9971 Part III expands the reach of collaboration and describes how the CDM concept applies to airport operations and aircraft turnaround. Building on the experiences of various States in different regions, and reflecting the scalability needed to ensure efficiency, the manual identifies the roles and responsibilities of actors and stakeholders, and details the methods and tools that can be used in airport collaborative decision-making (A-CDM).*

1) According to Doc. 9971 Part I, CDM is a process applied to support other activities such as demand/capacity balancing. CDM can be applied across the timeline of activities from strategic planning (e.g., infrastructure investments) to real-time operations. CDM is not an objective but a way to reach the performance objectives of the processes it supports. These performance objectives are expected to be agreed upon collaboratively. Since implementing CDM likely will require investments, these will need to be justified in accordance with the performance-based approach.

2) Although information sharing is an important enabler for CDM, the sharing of information is not sufficient to realize CDM and the objectives of CDM.

3) CDM also requires predefined and agreed upon procedures and rules to ensure that collaborative decisions are made expeditiously and equitably.

4) CDM ensures decisions are taken transparently based on the best information available as provided by the participants in a timely and accurate manner.

5) The development and operation of a CDM process follows these typical phases:

    1) identification of the need for CDM;

    2) CDM analysis;

    3) CDM specification and verification;

    4) CDM performance case;

    5) CDM validation and implementation; and

    6) CDM operation, maintenance and improvement (continuous).

    It is important that the results of all these phases be shared between the involved community members.

6) The first phase is the identification of the need to apply CDM to realize a performance improvement. This can relate to current processes/operations or to future processes. A “need statement” should refer to the process(es) to which CDM should be applied and specify the current situation, involved community members and current (or projected) performance shortfall(s).

7) In the second phase, CDM analysis, the process is further analysed from a decision-making perspective.

    The analysis should make clear what decisions are to be made, which community members are involved (or affected), which information is used in support of the decision(s), which process(es)

are followed, how and through which means the decision-making process can be improved and how such an improvement could contribute to better performance.

8) The third phase, which builds on the CDM analysis, results in a shared and verified specification of the CDM process. It will address:

    a) the decisions to be taken, how they are reached and finalized;

    b) the community members involved and their roles/responsibilities in the decision(s);

    c) agreement on objectives; there may be a shared objective with individual sub-objectives (e.g., resolve congestion while minimizing impact to one's own operation);

    d) decision-making rules, processes and principles including specification of timeline/milestones, interactions, roles and responsibilities;

    e) information requirements including data standards, quality, frequency and deadlines; and

    f) the CDM maintenance process: review, monitoring/verification, etc.

9) The objective of the performance case, developed through the fourth phase, is to justify the decision to implement the CDM process and to make the necessary investments. It should clearly specify the costs involved and describe the benefits that will result from the operation of CDM. It is important that the results of the performance case be shared between all relevant community members. In case the CDM process is an integral part of a new process, it should be integrated in the performance case.

10) The fifth phase, CDM validation and implementation, includes all steps to bring CDM into operation. It includes training and informing staff, implementation/adaptation of systems, information networks, etc.

11) Once the CDM process is operational it should be subject to a continuous and shared review, maintenance and improvement process. In this way, performance can be continually improved.

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## APPENDIX C

### General Considerations for the implementation process of a Flow Management Unit

The implementation of a Flow Management Unit should consider the following requirements:

a) Access to the operational status of the air navigation infrastructure.

b) Access to aeronautical information and cartography.

c) Access to meteorological information.

d) Database of:

- aerodromes;
- airport capacity;
- ATC sector capacity
- Air traffic demand
- Airspace structure
- Radio navigation aids
- Aircraft performance; and
- Utilization of airports and control sectors.

e) Access to flight planning data (FPL, RPL, etc.).

f) Flight plan processing.

g) Access to surveillance data (SSR, ADS, etc.)

h) Automated resources:

- Processing and data visualization system for flow management, having, among other thing, the following sub-systems:

  - Flight data processing
  - Airspace and airports structure data;
  - Situation analysis (capacity and demand);
  - Presentation of air traffic situation;
  - Monitoring of the operational status of the infrastructure;
  - Support to collaborative decision making (ATC slots, alternate routes, etc.).
  - Database maintenance.

i) Communication to coordinate with:

- Other FMUs
- Operators (airlines, general aviation, State, etc.);
- Airport management;
- FMUs and/or FMPs and/or ATS units;
- Aeronautical meteorological units;
- AIS units.

j) Human resources

- qualified personnel;
- support personnel;
- recurrent training.

k) Use of adequate tools for statistics

l) Infrastructure

- buildings
- equipment
- electrical power
- air conditioning
- supplies
- software

m) Implementation of FMPs, as required.

n) Redundancy of critical systems.

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