



# INTERNATIONAL CIVIL AVIATION ORGANIZATION

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

### (CAR/SAM ATFM CONOPS)

|         |           |
|---------|-----------|
| Version | 1.2       |
| Date    | June 2007 |

## FOREWORD

The *Caribbean/South American ATFM Concept of Operations (CAR/SAM ATFM CONOPS)* is published by the ATM/CNS Subgroup 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.

The 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@mexico.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  
 E-mail : vhernandez@mexico.icao.int

**ICAO SOUTH AMERICAN OFFICE**

**LIMA, PERU**

E-mail : mail@lima.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  
 E-mail : jf@lima.icao.int  
 ao@lima.icao.int

The present edition (Version 1.2) includes all revisions and modifications until June 2007. Subsequent amendments and corrigenda will be indicated in the Record of Amendment and Corrigenda Table, according to the procedure established in page 3.





|   | <b>Page</b> |
|---|-------------|
| <b>Document content</b>   |             |
| Foreword.....   | 02          |
| Record of amendments and corrigenda.....  | 03          |
| Document amendments.....  | 04          |
| Document content.....   | 05          |
| Glossary of Acronyms.....   | 06          |
| Explanation of Terms and expressions.....   | 07          |
| Executive summary.....  | 09          |
| 1. History.....   | 10          |
| 2. Purpose of the document.....   | 11          |
| 3. Actors involved in ATFM.....   | 11          |
| 4. Trends and passenger traffic forecast in the main airports of the CAR/SAM Regions..... | 12          |
| 5. Main traffic flows.....  | 12          |
| 6. Identification of areas and/or routes where air traffic congestion is produced.....    | 13          |
| 7. Objectives, Principles and Functions of a Centralized ATFM.....                        | 13          |
| 8. Equipment requirements for FMU/FMP and centralized ATFM.....                           | 15          |
| 9. Personnel requirements for FMU/FMP and centralized ATFM.....                           | 15          |
| 10. Operational procedures.....   | 15          |
| 11. ATFM implementation strategy.....   | 16          |
| 12. Special flights exempt from the application of ATFM measures.....                     | 18          |
| 13. Contingency plan.....   | 18          |
| <b>Appendix A</b>   |             |
| Routing areas and main traffic flows identified in the CAR/SAM Regions.....               | 19          |
| <b>Appendix B</b>   |             |
| General considerations for the implementation process of a centralised ATFM.....          | 23          |

## GLOSARIO DE ACRÓNIMOS/ACRONYMS GLOSSARY

|         |   |
|---------|---|
| ACC     | Centro de control de área<br>Area control center  |
|         | Aeronautical fixed service  |
| 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 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      | Operador 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 la 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     | Administración de aviación civil<br>Civil aviation authority  |
| CAR/SAM | Regiones Caribe y Sudamérica<br>Caribbean and South American 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   |
| 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 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 management area   |
| TWR       | Torre de control<br>Control Tower  |
| WWW       | Red mundial<br>World Wide 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 smaller 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 aggregation of the airborne functions and ground-based functions (air traffic services, airspace management and air traffic flow management) required to ensure the safe and efficient movement of aircraft during all phases of operations.*

**Flight Management Position/Unit – FMP/FMU).** A position or working unit established in an appropriate air traffic control unit to ensure the necessary interphase between the local ATFM and a centralized ATFM units related to air traffic flow management – ATFM.

**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

GREPECAS considered that early ATFM implementation shall ensure optimum air traffic flow towards specific areas or through them during periods in which the demand exceeds or is foreseen to exceed available capacity of the ATC system. Therefore, an ATFM system should reduce aircraft delays both in flight and ground and avoid system overloading.

In this connection, GREPECAS approved the operational concept described herein, which reflects the expected order of events which might occur and should assist and guide the planners in the design and gradual development of ATFM system, in order to provide safety and effectiveness, and ensure an optimum air traffic flow towards certain areas or through them during periods in which the demand exceeds or is foreseen to exceed the available capacity of the ATC system.

The main actors involved in air traffic flow management *are* the organizations, bodies or entities which might participate, collaborate and cooperate in the planning, development, use, regulation, operation and maintenance of the ATFM System.

From the analysis of the statistics it may be noted that during the period 1994-2004, the passengers regular traffic (in PKP) of airlines in the Latin American and Caribbean Region grew at an average annual rate of 3.3% (in comparison to the 5.1% annual rate of global growth, foreseeing that air traffic growth continues to gradually improve at mid term, at the same time that the economical activity.

The total of operations of the main airports of the CAR Region in the period 2002 to 2005 reflected a positive trend of 1.92%. However, in the same period the trend in the SAM Region was negative -0.56% being the global trend positive 0.66% for both regions.

Also, several airspaces with common interests have been identified *with regard to* 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 Operational Concept. A description of such homogeneous and routing areas is attached *to the* CAR/SAM ATFM CONOPS.

As established in ICAO documents, air traffic flow management should be implemented within a region or within other defined areas as a centralised ATFM organization, with the support of flow management units (FMU) established in each ACC within the region or area of application.

In view of the above, this document describes the main objectives of the Centralized ATFM Facility 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 equipping flow management units and Centralized ATFM Facilities.

In the current operational concept, GREPECAS establishes a simple implementation strategy through the development in phases in order to ensure maximum utilisation of available capacity and permit all parties concerned to obtain sufficient experience. The implementation would be initiated with the application of basic ATFM procedures in airports and in an evolutionary manner to reach more complex phases, without

the immediate need for a regional ATFM centre, since its implementation would demand further studies to define operational concepts, systems requirements and institutional aspects for its implementation.

Finally, GREPECAS deemed 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 will also be available.

## **1. History**

1.1 ICAO CNS/ATM Systems received support from the Tenth Air Navigation Conference held in 1991 at ICAO Headquarters in Montreal, Canada. The same year, the CAR/SAM Regional Planning and Implementation Group (GREPECAS) started to work towards a regional application of this new air navigation services concept.

1.2 Further, at the Eleventh Air Navigation Conference (AN-Conf/11, Montreal September 2003), States supported and approved the new ICAO ATM Global Operational Concept, which encourages the implementation of a services management system which enables an operationally continuous regional airspace through the application of a series of ATM functions.

1.3 As per the guidance principles established by ICAO Council with regard to the facilitation of the inter-regional harmonization, the regional plans for CNS/ATM systems implementation in the regions should be prepared in accordance to the general profiles defined in the Global Air Navigation Plan for CNS/ATM Systems. After a careful analysis of the guidance principles of this Global Plan, GREPECAS adopted them and incorporated characteristics inherent to the CAR/SAM Regions, using as a basis the definitions of Homogeneous Areas and Main Traffic Flows. Homogeneous areas are those airspace portions with ATM requirements and similar complexity degrees, while main air traffic flows are airspaces where a significant amount of air traffic exists.

1.4 From the analysis carried out by ICAO/UNDP Project RLA/98/003, it may be inferred that while in general terms in the CAR/SAM Regions environment, currently no traffic congestions are registered requiring a complex flow management, they have been identified in some airports and airspace sectors, mainly in special periods and specific hours, where some congestions are already produced, which should be avoided.

1.5 In view of the above, GREPECAS considered that the early implementation of the ATFM shall ensure an optimum air traffic flow towards some areas or through them, during periods in which the demand exceeds or is foreseen to exceed the available capacity of the ATC system. Therefore, an ATFM system should reduce aircraft delays both in flight and ground and avoid system overloading. The ATFM system shall assist the ATC to comply with its objectives and achieve a more effective utilisation of the airspace and airports available capacity. ATFM should also ensure that air operations safety is not compromised in case unacceptable levels of air traffic congestion occur and at the same time ensure that air traffic is effectively administered without applying unnecessary restrictions to flow.

---

## 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 a specific time horizon. 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.

## 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, utilisation, 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 own capacity with legal authority to permit or deny access to their airspace sovereignty. 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 mainly to airlines and pilots.

3.5 ***ATM service providers.*** Constituted by all the organizations and personnel (i.e. controllers, engineers, technicians) implied in the provision of ATFM services to airspace users.

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

#### **4. Trends and traffic forecasts in the main airports of the CAR/SAM Regions**

4.1 During the period 1994-2004, the Latin American and Caribbean Region's airlines passengers' regular traffic (in PKP) grew at an annual average of 3.3% (in comparison to the global annual average growth rate of 5.1%). Until year 2000 privatisation of national carriers, fusions and inter-regional alliances, together with a wide rationalization of fleets and routes, counted among the measures that enabled airlines of the regions to capture a greater portion of traffic of United States – Latin America and Caribbean, one of the aviation markets with greater growth rate. After high traffic growth rates in 1997 and 1998 (9.5% and 7.8% respectively), the passengers traffic decreased in 1999 in a 0.3% but it was recovered in 2000 with a growth rate of 4.4%, decreasing again in 2001 in 5.1%. The traffic decreased in 1.6% in 2002 before recovering in 2003 (3.8%) and 2004 (8.4%). In some CAR/SAM areas the traffic growth in 2005 registered scopes of up to 13%.

4.2 Aircraft movement in the main airports in the period 2002-2005 would indicate that, in the CAR Region the total operations reflect a positive trend of 1.92% observing that in some States particularly, positive trends are reflected that vary from 2.42% to 6.41%. In the SAM Region, the total of operations reflected a negative trend of -0.56% between years 2002 to 2005 observing that some States particularly reflect positive trends which vary from 0.85% to 4.79%.

4.3 Making a balance of the previous information, it is observed that during years 2002 to 2005 the global trend in the CAR/SAM Regions is reflected in a positive 0.66%. It is foreseen that the traffic growth continues to gradually improve at mid term at the same time than economical activity.

#### **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 FIRs. In view of this, it is necessary that CAR/SAM States, Territories, and International Organizations maintain and disseminate to all interested parties *a list of* the saturation periods of their respective airports, terminal areas and traffic flows.

## **7. Objectives, principles and functions of a Centralized ATFM Facility**

### **Objective of the Centralized ATFM Facility**

7.1 As established in the PANS ATM (Doc 4444), air traffic flow management should be implemented within a region, *or other defined area*, as a Centralized ATFM Facility with the support of flow management positions (FMP) established in each ACC within the region or area of application.

7.2 The objective of the Centralized ATFM Facility is to enhance efficiency and safety of air traffic operations by demand and capacity balancing and traffic synchronization. This may be accomplished by the use of flow management initiatives to maintain a safe, orderly and expeditious air traffic circulation while ensuring that the traffic volume is compatible with the declared capacities.

7.3 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.

### **Principles in which ATFM will be based**

7.4 Regional ATFM structure should be developed according to agreed upon guidelines as stated herein and in such a manner that each State/Territory and International Organization of the CAR/SAM Regions has access to a Centralized ATFM Facility.

The implementation of the Centralized ATFM Facility should be based on the following principles:

- a) Be at the disposal of all States/Territories and International Organizations in the region under their responsibility, taking into consideration the requirements of ATFM community members.
- b) Use a common, comprehensive, and permanently updated database.
- c) Take appropriate measures well in advance to accomplish demand and capacity balancing.
- d) Maintain close and continuous coordination with FMUs and/or FMPs, aircraft and airport operators, and other pertinent Centralized ATFM Facilities.
- e) Take measures *to* ensure that restrictions and delays are equitably balanced among the airspace users.

- f) Apply quality management to the services provided.
- g) Use the collaborative decision making (CDM) process as the basis for developing and implementing ATFM measures.
- h) Favor, to the maximum possible, the use of the existing capacity without compromising safety.
- i) Contribute *to* the achievement of the global plan initiatives (GPIs).
- j) Provide the flexibility necessary to enable operators to change their arrival or departure schedules, even with short notice.

### **Functions of a Centralized ATFM Facility**

7.6 To provide ATFM service, the Centralized ATFM Facility should:

- a) Establish and maintain a *regional* database that includes:
  - the air navigation infrastructure, ATS units and registered aerodromes;
  - pertinent ATC sector and airport capacity;
  - 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 ATFM measures in a timely manner.
- e) Carry out a follow-up on the result of measures adopted.
- f) Coordinate ATFM measures with the other Centralized ATFM Facilities, when so required.

## **8. Equipment requirements for FMU/FMP and Centralized ATFM Facility**

8.1 The implementation of ATFM in the CAR/SAM Regions requires identifying and determining the minimum equipment requirements and communication links for implementing a Centralized ATFM Facility, FMU, and/or FMP.

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

## **9. Human resource planning and training requirements for FMU/FMP and Centralized ATFM Facility**

9.1 Establishment of a Centralized ATFM Facility, FMU, or FMP requires careful human resource planning and training. ATFM training shall be designed to include segments regarding techniques to balance demand and capacity, traffic synchronization, benefits of optimizing traffic flows and creating operational efficiency, techniques for managing change in the operational environment, and the process for ensuring high levels of service to the customers.

## **10. Operational procedures**

10.1 The operational procedures *for* the Centralized ATFM Facility, FMUs and FMPs should be developed in separate documents. After consultation with all applicable parties, changes, if necessary, shall be agreed upon and published as amendments to operational procedures.

10.2 The purpose of these documents shall be to:

- *establish the functions and responsibilities of personnel working in the Centralized ATFM Facility, FMUs and FMPs in regard to implementing flow management service.*
- *describe the procedures to be used between the Centralized ATFM Facility, FMUs, and FMPs.*
- *describe the air traffic flow management initiatives and messages that may be applied*

10.3 ATFM initiatives 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 - up to 48 hours before the day of the operation; pre-tactical - during 48 hours prior to the operation day; 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.

## **11. ATFM Implementation Strategy**

11.1 The operational concept establishes a simple implementation strategy. This strategy should be developed in phases, so as to ensure maximum utilisation of the available capacity and enable all concerned parties to obtain sufficient experience.

11.2 The experience acquired in other Regions and by some States in the CAR/SAM Regions permits States/Territories and International Organizations to apply basic ATFM procedures in airports, without the immediate need for a Centralized ATFM Facility. Such a facility will demand extensive studies to define operational concepts, requirements of systems and institutional aspects for ATFM implementation in the CAR/SAM Regions.

### **Airports**

11.3 Normally the adoption of ATFM strategic measures at airports located in airspaces of low traffic density, avoids congestion and saturation of such airspace. Another aspect to be considered is that the adoption of ATFM strategic measures at airports are simpler to apply, keeping in mind that they only demand a data collection of flight intentions (RPL, Official Airline Guide - OAG, flight lists etc) and reduce use of automation and existing infrastructure tools. In this stage, the airport slot allocation to operators should also consider non-regular flights.

11.4 The implementation process of ATFM in the CAR/SAM Regions should start with the establishment of a common methodology of calculating airport capacity which would enable identification of airports where periods exist in which demand is higher than capacity. With that identification, measures could be adopted with a view to optimise the utilisation of the existing capacity.

11.5 ATFM strategic measures at airports may be limited to the use of Airport Slots with the objective of achieving the balance between the demand of regular flights and airport capacity. The application of slots would ensure a smooth hourly distribution of these flights at airports.

11.6 The necessary capacity for other airspace users (non-regular flights) should also be kept in mind when developing airport slot allocation procedures.

11.7 The evolution of ATFM measures in airports should evolve towards the inclusion of non-regular flights in balancing procedures between demand and capacity. The adoption of ATFM tactical measures in airports would be still of low complexity. However, it would demand an increase in the data collection program for non-regular flights in order to include these FPLs. Also, in addition to the use of automation tools efficient communications means between with aircraft operators which perform non-regular flights must be established.

11.8 It is expected that ATFM strategic measures at airports will be sufficient to solve specific problems at airports where there is a significant demand of regular flights. ATFM tactical measures would be applied mainly to airports in which a significant amount of non-regular flights are carried out.

## **Airspace**

11.9 From the experience acquired in demand and airport capacity management, States/Territories and International Organizations should consider analysis of airspace capacity, especially in areas where ATFM measures at airports are not sufficient to solve congestion and airspace saturation problems. The ATFM strategic measures should avoid congestion and airspace saturation. The adoption of these ATFM measures would be of low complexity since it would only include their influence in the establishment of airports slots. However, it would demand the use of more sophisticated automation and infrastructure tools, in order to identify congestion or saturation in control sectors.

11.10 It is expected that strategic ATFM measures in the airspace are sufficient to prevent overload of control sectors, mainly in those airspaces in which there is a significant excess demand.

11.11 If demand and capacity balancing cannot be accomplished with the application of ATFM airspace strategic measures, States/Territories and International Organizations should move to more complex solutions. This involves ATFM tactical measures related to airspace, including dynamic procedures that are applied to flights scheduled in the near-term. The adoption of airspace tactical measures would be increasingly complex since it would include the application of slots, based on continuous analysis of the demand and capacity. This analysis would require the use of additional automation and infrastructure tools to those applied in the previous phase, which permit the assignment of slots, addressed to avoid overloads of airspace sectors and airports.

11.12 It is expected that airspace tactical ATFM be implemented only in States/Territories and International Organizations where there is a clear operational requirement, keeping in mind that the complexity of the application of tactical measures in airspace implies a significant investment in automated systems, data bases, telecommunications system and human resources training.

11.13 States/Territories and International Organizations who decide to implement airspace tactical ATFM measures should develop standards, procedures and operational manuals applicable to ATFM service.

### **Centralized ATFM Facility implementation strategy in the CAR/SAM Regions**

11.14 GREPECAS/13 was of the opinion that two CAR and SAM scenarios should be taken into account, but that they could be modified insofar as the operational concept development and the implementation plans progress. The strategy is to develop a harmonized planning of a CAR and SAM interregional ATFM system.

11.15 In order to maximise its efficiency, it was considered that the Centralized ATFM Facility should have the responsibility for providing service to the maximum extension of airspace possible, provided that this is homogeneous. In accordance with ATFM planning in the CAR and SAM Regions, it will have at least two Centralized ATFM Facilities one for each region.

11.16 It was also considered necessary that the procedures during all the implementation process be developed in a harmonious manner among the ATFM Facilities to avoid risking operational safety. This entails establishing a regional and interregional strategy to facilitate and harmonize all the implementation process. The ATFM Task Force will accomplish these planning and harmonization objectives. For implementation, two scenarios will be established depending on the individual operational needs and features of the CAR and SAM Region. The activation of two ATFM Implementation Groups was considered, one for each Region.

11.17 It was considered that operational implementation should be carried out in phases, according to ICAO Doc 9854 – Global Air Traffic Management Operational Concept, in order to permit a progressive implementation and acquire necessary expertise for an adequate implementation.

11.18 In order to harmonize the National Plans with the Regional CAR/SAM ATFM Regional Plan, it is highly recommended that the States, Territories and International Organizations take the following required measures: make a closer follow-up of the regional development of the ATFM, prepare an ATFM implementation program, assess the impact that ATFM will have in the national ATM system, and establish pertinent coordinations to accomplish a regionally harmonized implementation.

## **12 Special flights exempt from application of ATFM measures**

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

## **13 Contingency plan**

13.1 In case of a partial or total interruption of the flow management service and/or support services, ATFM and FMUs/FMPs will have corresponding contingency plans prepared in accordance with GREPECAS guidelines. These contingency plans will help ensure the safe and orderly movement of air traffic -- although not necessarily efficient -- and the plans will be incorporated into the operational procedures documents associated with the Centralized ATFM Facilities and FMUs/FMPs.

## APPENDIX A

**Table**

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

| -1-<br>Routing<br>Area<br>(AR)                    | -2-<br>Traffic flows                       | -3-<br>FIRs involved   | -4-<br>Type of area               | -5-<br>Remarks   |
|---|--|--|-----------------------------------|--|
| <b>Caribbean/South American Regions (CAR/SAM)</b> |  |  |                                   |  |
| 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, Brasília   | Low density Continental           | SAM intra regional traffic flow                        |
|   | Santiago de Chile-Sao Paulo/Río de Janeiro | Santiago, Mendoza, Córdoba, Resistencia, Asunción, Curitiba, Brasília  | Low density Continental           | SAM intra regional traffic flow                        |
|   | Sao Paulo/Río 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     |

| <b>-1-<br/>Routing<br/>Area<br/>(AR)</b> | <b>-2-<br/>Traffic flows</b>  | <b>-3-<br/>FIRs involved</b>  | <b>-4-<br/>Type of area</b>                         | <b>-5-<br/>Remarks</b>                                     |
|--|---|---|---|--|
|  | 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  | Ezeiza, 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 América, México  | Low density oceanic                                 | CAR/SAM /NAM intra- and inter-regional traffic flow        |
| AR 7                                     | South America – South Africa  | Ezeiza, Montevideo, Brasilia, Johannesburgo (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 Major traffic flow | CAR/NAM/NAT/ EUR inter-regional traffic flow               |
| GM-3                                     | Costa Rica, Panama, Honduras Kingston, Haiti, Santo Domingo San Juan,   | Central America, Panama, Kingston, Port-au-Prince, Curacao, Santo   | Oceanic high density                                | CAR/ NAT/EUR intra and interregional major traffic flow    |

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

**INTENCIONALMENTE DEJADA EN BLANCO**

**INTENTIONALLY LEFT IN BLANK**

## APPENDIX B

### General Considerations for the implementation process of a Centralized ATFM

The implementation of the Centralized ATFM 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 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 plans 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 centralized ATFMs
  - 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 FMUs and/or FMPs, as required.
  
- n) Redundancy of critical systems.

\*\*\*\*\*