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THIRD MEETING OF THE GREPECAS ATM/CNS SUBGROUP ATM COMMITTEE AIR TRAFFIC MANAGEMENT TASK FORCE – (ATFM/TF/3)

(San Andrés, Colombia, 18 to 22 June 2007)

Agenda Item 2: Necessary documentation on ATFM for the CAR/SAM Regions

CARIBBEAN/SOUTH AMERICAN ATFM CONCEPT OF OPERATIONS (CAR/SAM CONOPS ATFM)

(Presented by the Secretariat)

Summary

The Caribbean/South American ATFM Concept of Operations (CAR/SAM CONOPS ATFM), as approved by GREPECAS, is presented in this working paper.

References:

- GREPECAS/14 Meeting (GREPECAS/14, San José, Costa Rica, 16 – 20 April 2007)

1. Background

1.1 The Caribbean/South American ATFM Concept of Operations (CAR/SAM CONOPS ATFM) is a high-level document. Its main objective is to define and regulate ATFM implementation in a homogeneous manner in the CAR/SAM Regions. Taking into account that, while ATFM planning in both regions will be carried out jointly, the implementation of the system itself shall be carried out, according to the needs of each one of the regions involved.

1.2 In this connection, a unique ATFM operational concept for both regions shall enable a harmonized implementation in the regions and shall ensure an effective and equitable service. Operational concepts shall establish functions and minimum requirements in which the service implementation and ATFM Units required would be based.

2. **Discussion**

2.1 GREPECAS/14 analyzed the draft ATM Operational Concept presented by the ATM/CNS Subgroup ATM Committee, and considered that such document could be adopted by the CAR/SAM Regions, understanding that it is an evolutionary document and which could be amended as necessary, formulating Conclusion 14/49 which encourages CAR/SAM States/Territories that, based on their harmonized regional developments adopt the CAR/SAM ATFM Operational Concept (CONOPS) as shown in **Appendix A** to this working paper and establish a work programme to enable ATFM CONOPS implementation.

2.2 Also, and taking into consideration the main lessons learned during the ATFM development and implementation by the Federal Aviation Administration Air Traffic Control System Command Center (ATCSCC), the NAVCANADA Operations National Center (NOC) and the Mexico Flow Control Center (CCFMEX), it agreed that the ATM Committee take into account operational benefits reached in ATFM implementation in the NAM Region. During its forthcoming meeting, in evaluating the CAR/SAM CONOPS ATFM, consideration should be taken to the lessons learned in fields related to the objectives and functions of ATFM Centralized, the principles in which ATFM will be based, the team and personnel required for the Flow Management Unit/Flow Management Position (FMU/FMP), and for the ATFM centralized and operational procedures.

3. **Suggested action**

3.1 The Meeting is invited to:

- a) take note of the information presented in this working paper; and
- b) review the CAR/SAM CONOPS ATFM approved by GREPECAS and carry out the comments and/or propose actions deemed pertinent.

APPENDIX A



INTERNATIONAL CIVIL AVIATION ORGANIZATION

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

(CAR/SAM CONOPS ATFM)

Version	1.1
Date	April 2007

FOREWORD

The *Caribbean/South American ATFM Concept of Operations (CAR/SAM CONOPS ATFM)* is published by the ATM/CNS Subgroup of the Caribbean/South American Regional Planning and Implementation Group (GREPECAS). It describes air traffic flow management concept operational 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:

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The present edition (Version 1.1) includes all revisions and modifications until April 2007. Subsequent amendments and corrigenda will be indicated in the Record of Amendment and Corrigenda Table, according to the procedure established in page 3.

AMENDMENTS TO THE DOCUMENT

1. The Caribbean and South American (CAR/SAM) ATFM Concept of Operations is a regional document that includes aeronautical scientific and technological advances; as well as the operational experiences, both of the CAR/SAM Regions as of the other ICAO Regions that may affect ATFM concepts and procedures therein established in the same.
2. Due to this particularity, the ATFM CONOPS is also a dynamic document, in permanent progress and permeable in order to accept every modification originated by the constant improvement in the aeronautical disciplines and activities that enable its harmonious use in the CAR/SAM Regions, ensuring air operations 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, facilitating the review or the addition of new texts. Each Section is independent and includes an introduction giving 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:

<i>Italics</i>	<i>for new or revised text;</i>
<i>Italics</i>	<i>for editorial modification which does not alter the substance or meaning of the text; and</i>
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).

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GLOSARIO DE ACRÓNIMOS/ACRONYMS GLOSSARY

ACC	Centro de control de área Area control center Aeronautical fixed service
AFTN	Red de telecomunicaciones fijas aeronáuticas Aeronautical fixed telecommunication network
AIP	Publicación de Información aeronáutica Aeronautical Information Publication
AIS	Servicio de información aeronáutica Aeronautical information service
ANP	Plan navegación aérea Air navigation plan
ANS	Servicios de navegación aérea Air navigation services
ANSP	Proveedor de servicios de navegación aérea Air navigation service provider
AO	Operador de aeronave Aircraft operator
APP	Oficina de control de aproximación Approach control office
ATC	Control de tránsito aéreo Air traffic control
ATFM	Gestión de la afluencia del tránsito aéreo Air traffic flow management
ATM	Gestión del tránsito aéreo Air traffic management
ATS	Servicios de tránsito aéreo Air traffic services
CAA	Administración de aviación civil Civil aviation authority
CAR/SAM	Regiones Caribe y Sudamérica Caribbean and South American Regions
CATFM	Dependencia de Gestión de la afluencia del tránsito centralizada Centralized air traffic flow management unit
CBA	Análisis de costo/beneficios Cost/benefit analysis
CNS/ATM	Comunicaciones, navegación y vigilancia/gestión del tránsito aéreo Communications, navigation, and surveillance/air traffic management
FDPS	Sistema de procesamiento de datos de vuelo Flight data processing system
FIR	Región de información de vuelo Flight information region
FMU	Dependencia de organización de la afluencia Flow management unit
FMP	Puestos de gestión de afluencia Flow management position

FPL	Plan de vuelo Flight plan
GREPECAS	Grupo regional de planificación y ejecución CAR/SAM CAR/SAM regional planning and implementation group
MET	Servicios meteorológicos para la navegación aérea Meteorological services for air navigation
OACI/ICAO	Organización de aviación civil internacional International civil aviation organization
PANS ATM	Procedimientos para los servicios de navegación aérea –Gestión de tránsito aéreo Procedures for Air Navigation Services –Air traffic management
PIRG	Grupo regional de planificación y ejecución Planning and implementation regional group
TBD	A ser determinado To be determined
TMA	Area de control terminal Terminal management area
TWR	Torre de control Tower
WWW	Red mundial 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

Homogeneous ATM area. A homogeneous ATM area is an airspace with a common ATM 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 ATM systems.

Routing area. A routing area encompasses one or more major traffic flows, defined for the purpose of developing a detailed plan for the implementation of ATM systems and procedures.

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

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).

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.

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.

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.- Service which comprises airspace management, air traffic flow management and air traffic services.

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.

Main Traffic Flows.- It is a concentration of significant volumes of air traffic on the same or proximate flight trajectories.

Air Traffic Management System.- A system which provides ATM through the integration in cooperation with human beings, information, technology, facilities and services, with the support of communications, navigation and surveillance on board and spatial based.

Air Traffic Volume.- The number of aircraft within a defined airspace or aircraft movement 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 have been identified taking considering as ATFM community 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 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 an ATM Global Concept. A description of such homogeneous and routing areas is attached as 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 objective of the centralised ATFMs which has as main task to contribute so that the ATC may use to the maximum possible extent its capacity and, as required, issue flow management initiatives to maintain a safe, orderly and expeditious air traffic circulation, ensuring that air traffic volume is compatible with declared capacities making at the same time a description of principles and functions and establishing some requirements as regards units equipping or air traffic flow management units and the proper centralised ATFM units.

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 This document on CAR/SAM Air Traffic Flow Management Operations Concept (ATFM) is oriented towards the description of a high level on the service to be provided in the CAR/SAM Regions in a specific time horizon. It explains the current situation and which shall be the future situation to be progressively reached through a series of specific change stages.

2.2 The operational concept described herein 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.

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.***- which 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.***- referring in general terms to Contracting States in their owners 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.***- mainly referring to airlines and pilots.

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

3.6 ***Military aviation.***- referring to 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 in conditions to efficiently coordinate implementation activities of global ATM leading to become real a 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.

4.4 For a better illustration, the evaluation of the information submitted by CAR/SAM States is shown in **Appendix A**.

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 B** 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 of some of the CAR/SAM Regions FIRs. In view of this, it is necessary that CAR/SAM States maintain identified the saturation periods of their respective airports, terminal areas and traffic flows.

7. Objectives, principles and functions of a Centralized ATFM

Objective of the Centralized ATFM

7.1 As established in the PANS ATM (Doc 4444) air traffic flow management should be implemented within a region or within other defined area, as a centralized ATFM organization 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 ATFMs shall be to contribute so that the ATC use to the maximum possible extent its capacity and, as required, shall issue flow management initiatives to maintain a safe, orderly and expeditious air traffic circulation, assuring that the traffic volume is compatible with the declared capacities.

7.3 Consequently, and aware of their operational needs in agreement with its reality as regards ATC service, air traffic and airport problems, as well as air traffic volume, administrations should define whether a FMU is necessary, which in addition to communicating with the Centralized ATFM, may manage and coordinate the implemented Flow Management Position (FMP) implemented in ATC units which so require or adopt the direct communication process from these FMPs with the Centralized ATFM.

Principles in which ATFM will be based

7.4 Regional ATFM structure should be composed in such a manner that each State/Territory and International Organization of the CAR/SAM Regions may have access to a Centralised ATFM corresponding through an organization adequate to their needs and developed as per guidelines determined on this matter.

7.5 The Centralized ATFM, to comply with its objectives, should be based on the following principles:

- a) To be at disposal of all States/Territories and International Organizations in the region under their responsibility, considering the requirements of operators, airports, ATC units and other pertinent ATFM units.
- b) Use a common and permanently updated database.
- c) Take pertinent measures well in advance to prevent and/or minimise overloads.
- d) Keep close and continuous coordination with flow management units (FMUs) and/or flow management positions (FMPs), aircraft and airport operators, corresponding ATC units and other pertinent Centralized ATFM units.
- e) Take measures that ensure that existing delays are equitably distributed among operators.

- f) Apply quality management to the services provided.
- g) Base the implementation of ATFM measures in the collaborative decision making (CMD) process.
- h) Favour, to the maximum possible, the use of the existing capacity without compromising safety.
- i) Contribute in the achievement of the global ATM objectives.
- j) Have the necessary flexibility to enable operators to change their arrival or departure schedules.

Functions of a Centralized ATFM

7.6 To provide Air Traffic Flow Management (ATFM) service, the Centralized ATFM should comply with the following activities:

- a) Establish and maintain a data base in the region under its responsibility on:
 - the air navigation infrastructure, ATS units and registered aerodromes;
 - pertinent ATC and airport capacity; and
 - flight data foreseen.
- b) Establish a coherent chart of foreseen air traffic demand, a comparison with available capacity and determination of areas, and a time-frame of critical air traffic overloads foreseen;
- c) Make the necessary coordination to make every possible attempt to increase the capacity available, when necessary.
- d) When deficiencies in the capacity available matter may not be eliminated, determine and timely apply ATFM measures, as required, previously coordinated with aircraft operators and interested aerodromes.
- e) Carry out a follow-up on the result of measures adopted.
- f) Coordinate ATFM service with the other centralized ATFM units, when so required.

8. Equipment requirements for FMU/FMP and Centralized ATFM

8.1 The implementation of the ATFM shall require identifying and determining which would be the minimum requirements for the implementation of the service and the Centralized ATFM, FMU, or FMP in each CAR/SAM Regions ATC unit.

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

9. Personnel requirements for FMU/FMP and Centralized ATFM

9.1 Personnel performing in the Centralized ATFM as well as FMU/FMP functions shall require training and shall be qualified to provide an efficient flow management service. A detailed planning of ATFM training in advance shall ensure the optimisation of benefits in terms of capacity and operational efficiency and that personnel from FMU/FMPs be able to satisfactorily face the important change in their operational environments, ensuring high levels of continuous security.

10. Operational procedures

10.1 The operational procedures of the Centralized ATFM as well as those for the FMUs and FMPs should be developed in separate documents. These documents should describe the procedures applicable between the ATFM and all the FMUs/FMPs. Changes in these procedures shall be first agreed upon and shall be published as amendments to operational procedures prior to consultation to all parties involved.

10.2 The purpose of these documents shall be to assist personnel from the Centralized ATFM and FMUs/FMPs to establish a common understanding of the roles of each party interested in the effective provision of the flow management service and the capacity to air traffic services control and to aircraft operators.

10.3 ATFM measures should be addressed to traffic flows or flight series and to specific flights and days. To this end, planning, strategies development, and day-to-day monitoring, should be made. With regard to the above, ATFM activities could 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 ATFM phases, responsible units should maintain a close liaison with ATC and with aircraft operators to ensure an effective 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 Regional ATFM Centre. A Regional ATFM Centre shall demand ample studies to define operational concepts, requirements of systems and institutional aspects for ATFM implementation in the CAR/SAM Regions.

12. ATFM implementation stages

12.1 In order to enable maximum use of all resources available in the regions, either from personnel, equipment, facilities and/or automated systems, the implementation process of ATFM should be established, planned and developed in stages, according to the following sequence:

ATFM Airport Strategic

12.2 Normally the adoption of strategic flow management measures in airports located in airspaces of air traffic low density, avoids congestion and saturation of such airspace. Another aspect to be considered is that the adoption of ATFM strategic measures in airports are more simple to apply, keeping in mind that they demand a reduced data collection of flight intentions (RPL, Official Airline Guide - OAG, flight lists etc) and the use of automation and existing infrastructure tools.

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

12.4 ATFM strategic measures in airports should be limited to the use of Airport Slots and would have as objective to ensure a balance between the demand of regular flights and airport capacity. The application of slots would ensure the hour distribution of flights in airports.

12.5 Therefore, airports slots distribution procedures should be developed to operators which perform regular flights in function to the saturation/congestion of airports. The necessary capacity for other airspace users (non-regular flights) should also be kept in mind.

ATFM Airport tactical

12.6 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 programme for intention flights in order to include FPLs and it would be necessary in addition to the use of tools of automation and existing infrastructure tools, the use of an efficient communications means between aircraft operators which perform non-regular flights and FMUs or FMPs.

12.7 ATFM tactical measures in airports would continue to be limited to the use of airport slots. However, the balance between demand and airport capacity would also consider non-regular flights. At this phase, slots distribution procedures to operators should also consider non-regular flights.

12.8 It is expected that strategic measures in airports be sufficient to solve specific problems in airports where there is a significant demand of regular flights, while tactical measures would be applied only to airports in which a significant amount of non-regular flights are carried out.

ATFM Airspace strategic

12.9 From the experience acquired in the demand and airport capacity management, States/Territories and International Organizations should consider airspace analysis, mainly those in which ATFM measures in airports are not sufficient to solve congestion and airspace saturation problems.

These ATFM strategic measures should avoid congestion and airspace saturation. The adoption of these 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 which permit the analysis of air traffic movement in each airspace portion, in order to identify congestion or saturation in control sectors.

12.10 The balance between demand and capacity would consider regular flights that are carried out. At this phase airports slots distribution procedures should take into account airports and airspaces saturation/congestion provisions.

12.11 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 over-flights demand.

ATFM Airspace tactical

12.12 At this ATFM implementation phase, States/Territories and International Organizations should move to the most complex phase which involves ATFM tactical measures related to airspace, including dynamic procedures that are applied to flights carried out in few hours. The adoption of airspace tactical measures would be very complex since it would include the application of ATC slots, as per a continuous analysis of the relationship demand/capacity. This analysis would demand the use of more sophisticated automation and infrastructure tools than in the previous phase, which permit the assignment of ATC slots, addressed to avoid overloads of airspace sectors and airports.

12.13 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 shall have a high cost in automated systems, data bases, telecommunications system and human resources training.

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

13. Centralized ATFM implementation strategy in the CAR/SAM Regions

13.1 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.

13.2 In order to maximise its efficiency, it was considered that Centralized ATFM should have the responsibility of providing service on 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 ATFMs, one for each region.

13.3 It was also considered necessary that the procedures during all the implementation process be developed in a harmonious manner among the ATFM units 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 while for the implementation, two scenarios will be established depending on the operational needs and own features of each CAR and SAM Region. The activation of two ATFM Implementation Groups was considered, one for each Region.

13.4 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 capacities for an adequate implementation. Each phase should be implemented, based on operational configurations, descriptive documents of the operational models and systems, as per the established strategy.

13.5 In order to harmonize the National Plans with the Regional CAR/SAM ATFM Regional Plan, it is necessary that the civil aviation administrations take the required measures and make a closer follow-up of the regional development of the ATFM and prepare a ATFM implementation programme where implementation needs are determined, the impact that will have in the national ATC system, air traffic services as well as in operations and airport services be analysed, and pertinent coordinations are established, which make it possible an integral regional, timely and harmonious implementation.

14. Special flights exempt from application of ATFM measures

14.1 Aircraft complying ambulance flights, humanitarian flights, search and rescue operations to State aircraft in international flights would be exempt from the application of ATFM measures. States would continue having under their criteria measures to be adopted on this matter regarding domestic flights.

15. Contingency plan

15.1 In case of a partial or total interruption of the flow management service and/or support services, ATFM and FMUs/FMPs will have the corresponding contingency plans prepared as per GREPECAS guidelines, in order to help to ensure the safe and orderly movement of air traffic. These plans should be incorporated to the documents related with operational procedures of the Centralized ATFM and FMUs/FMPs.

APPENDIX A

Evaluation of operations in the main airports of the Regions

1. The methodology used to verify the percentage trend of operations of an airport, a State, a Region, or both CAR/SAM Regions, was as follows:

- a) The information was initially collected and processed in Excel.
- b) A comparative procedure of one year with respect to the other was applied and it was divided between the year required for comparison either in percentage or numerical (operations).
- c) A formula was applied to obtain global average of data collected in all years counted either by airport, State or Region.
- d) Finally, to obtain the global data a sum was made of data processed in all years counted.
- e) The data processed were designed in bar and linear graphics and numerical so that operational data appears in bars and lines by States. Even though this graphic may also be designed by airports.

2. Trends per regions as per aircraft movement in the period comprised between 2002 and 2005 were as follows:

- a) **CAR Region**
The total of operations reflected a positive trend of 1.92% between years 2002 to 2005.
- b) **SAM Region**
The total of operations reflected a negative trend of -0.56% between years 2002 to 2005.
- c) **CAR/SAM Regions**
The global trend in both CAR/SAM Regions reflects in a positive manner 0.66% between years 2002 to 2005.
- d) In the CAR Region, the following States reflect positive trends:

Cuba	6.41%
Dominican Republic	5.74%
Belize	4.77%
El Salvador	3.06%
México	2.57%
U. S. (P. R) (V. I)	2.51%
Guatemala	2.51%
Costa Rica	2.42%

- e) In the SAM Region the following States reflect positive trends:

Venezuela	4.79%
Panamá	3.73%
Chile	2.59%
Bolivia	2.49%
Perú	0.85%

3. Analysis of data

Based on the information sent by States, an analysis on flights concentration in the CAR/SAM Regions was made. The result of such analysis is contained as follows:

- a) Approximately 80% of flights reported is concentrated in the following 7 countries, as shown below:

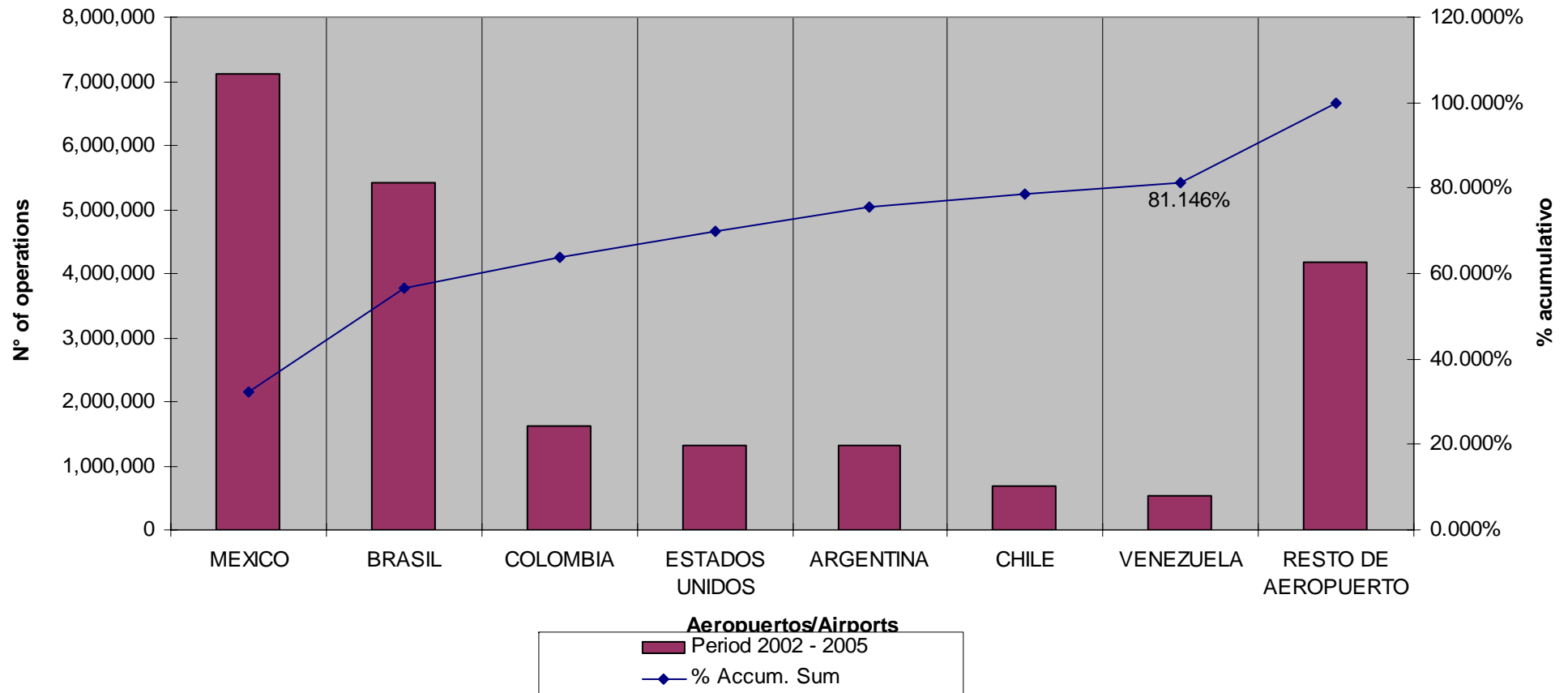
N°	AEROPUERTOS DE LAS REGIONES CAR/ SAM AIRPORTS IN THE CAR/SAM REGIONS	Periodo / Period 2002 - 2005	%
	1	MEXICO	7,116,319.00
2	BRASIL	5,412,758.00	24.408%
3	COLOMBIA	1,630,559.00	7.353%
4	ESTADOS UNIDOS/USA	1,328,879.00	5.992%
5	ARGENTINA	1,307,842.00	5.898%
6	CHILE	676,718.00	3.052%
7	VENEZUELA	522,090.00	2.354%
8	RESTO DE AEROPUERTOS/REST OF AIRPORTS	4,181,009.00	18.854%
TOTAL		22,176,174.00	100.000%

- b) From these seven (7) countries, 2 belong to the CAR Region: México with the greatest percentage in the CAR/SAM Regions (32.09%) and United States which occupies fourth place (5.99%). The rest of the places belong to SAM Region States. The flight volume generated in Brazil should be highlighted, representing a 24.408%, corresponding to the second place in both Regions.
- c) The rest of the States has been grouped in REST OF AIRPORTS, which individually contributes with non-significant margins (values of less than 5%) which jointly represent 18.854%.
- d) It is considered that percentages reflected in the table of numeral i) shall not vary, taking into consideration that States which did not submit information (50%) are mostly Caribbean States from which it is deemed that their flight volumes are below 5%, which would not affect the table shown above.

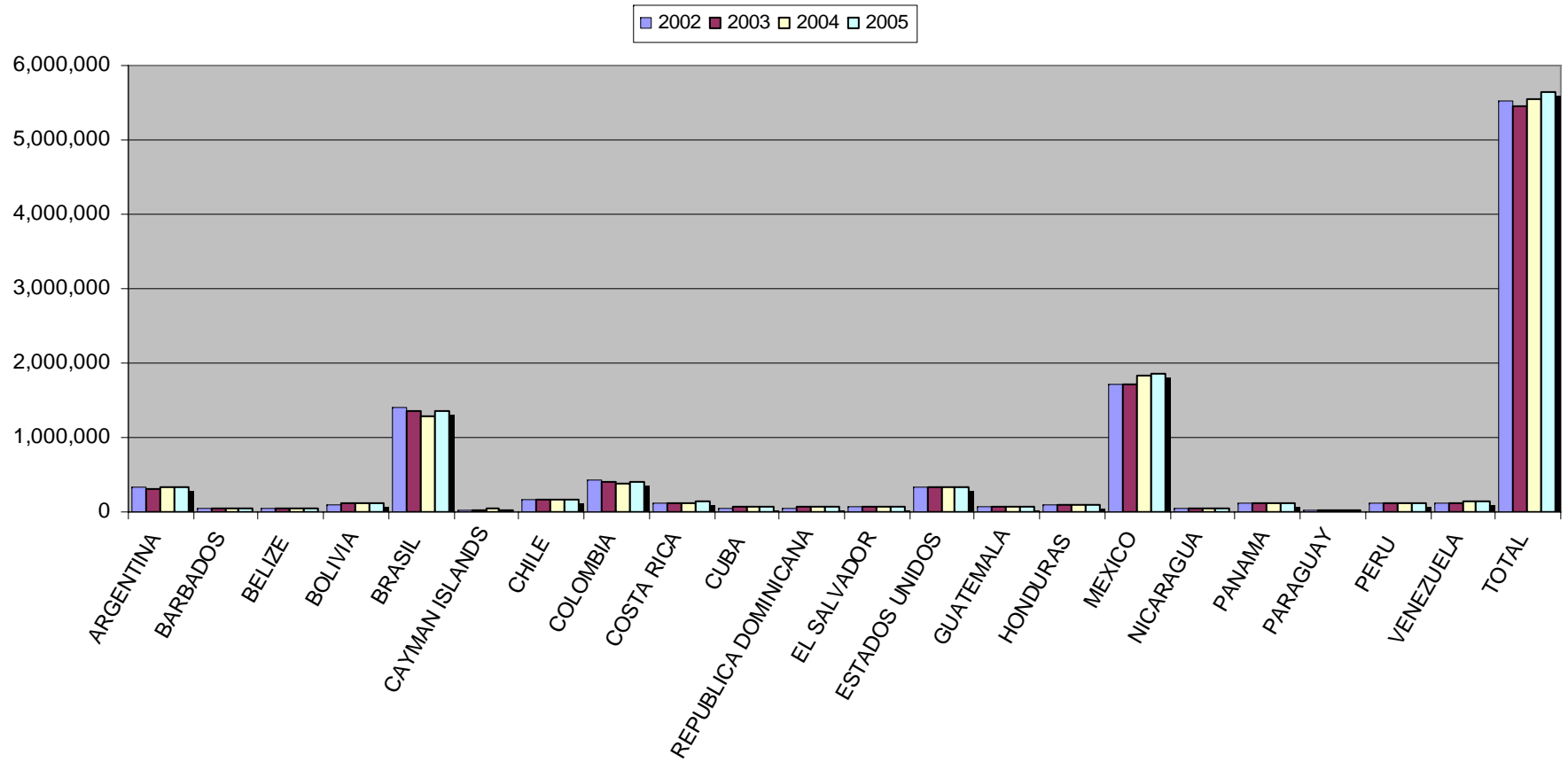
4. Resulting graphics

Pareto Chart

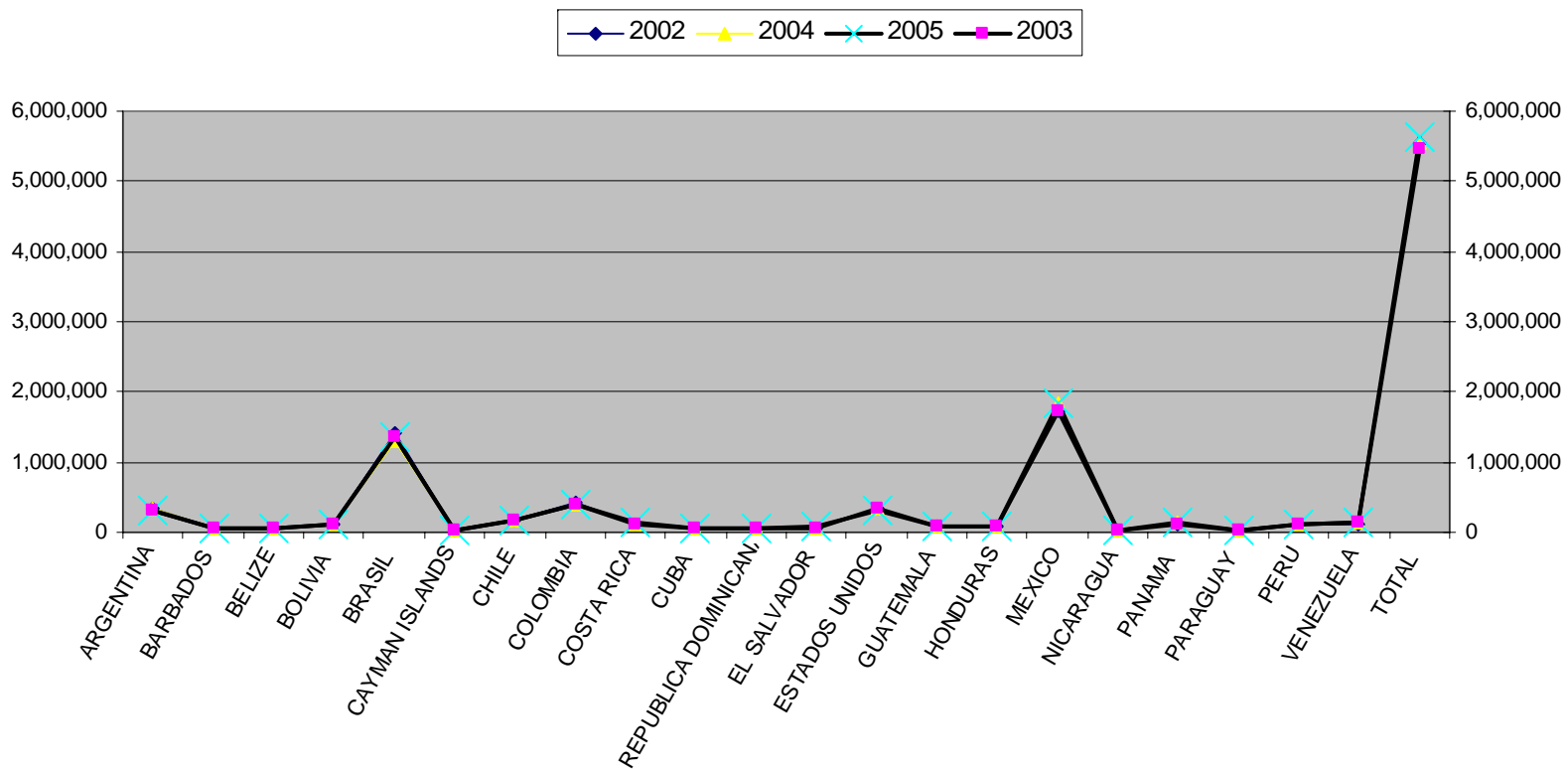
**Air Operations in the CAR/SAM Regions Airports
Period 2002-2005**



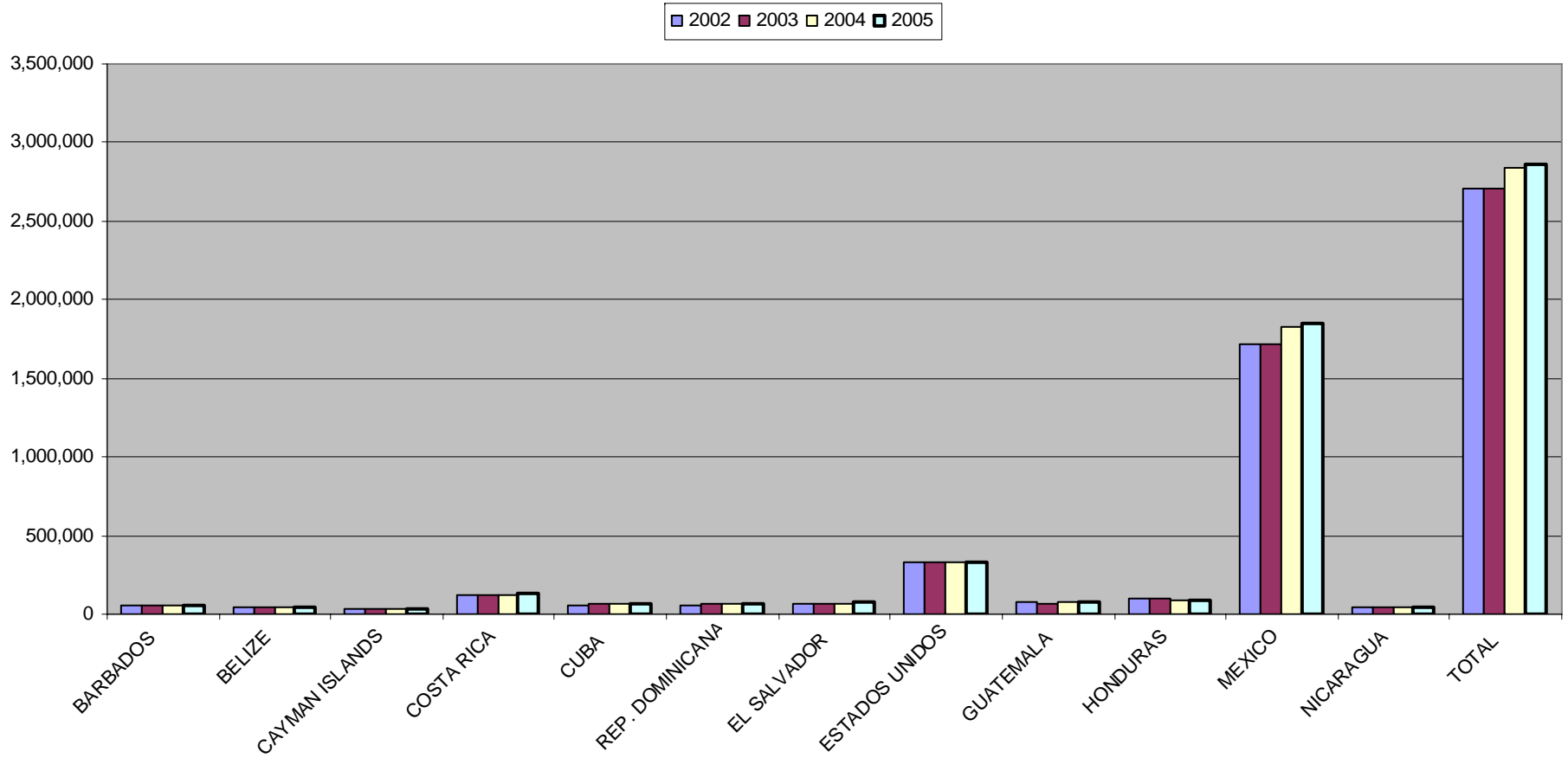
**AIRCRAFT MOVEMENT IN CAR/SAM REGIONS AIRPORTS
PERIOD 2002 - 2005**



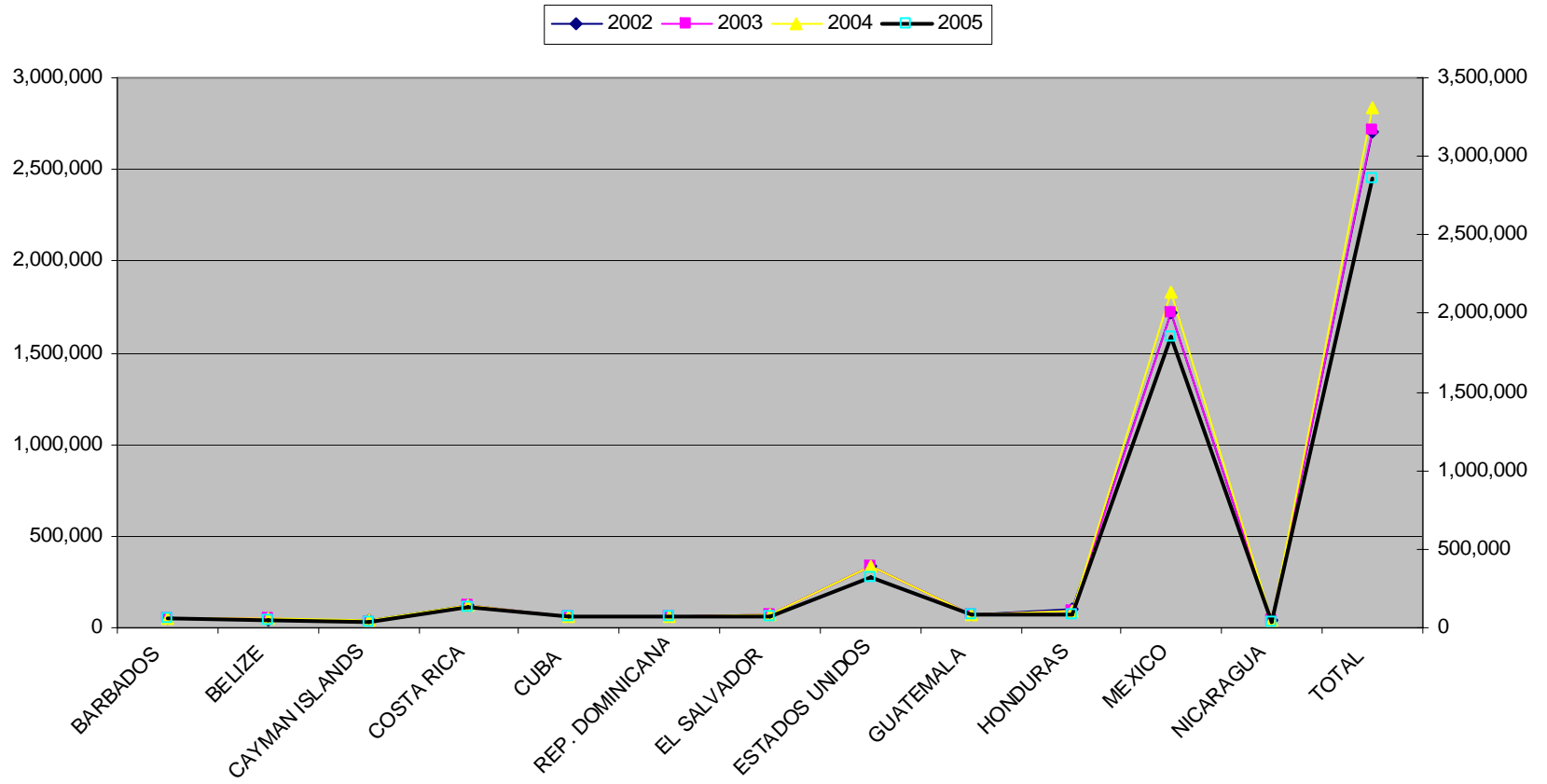
**AIRCRAFT MOVEMENTS IN THE CAR/SAM REGIONS AIRPORTS
PERIOD 2002 - 2005**



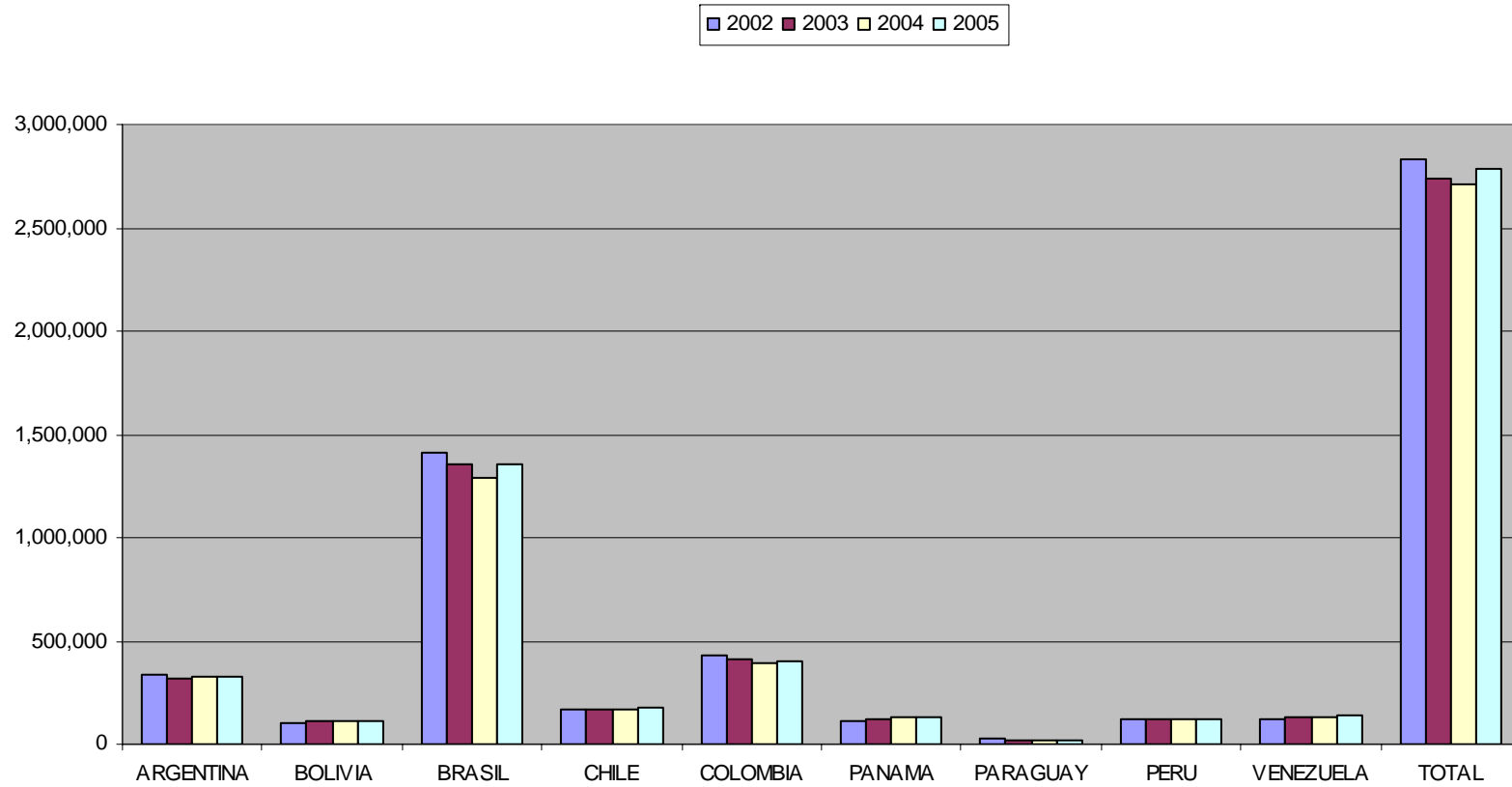
**AIRCRAFT MOVEMENT IN THE CAR REGION AIRPORTS
PERIOD 2002 - 2005**



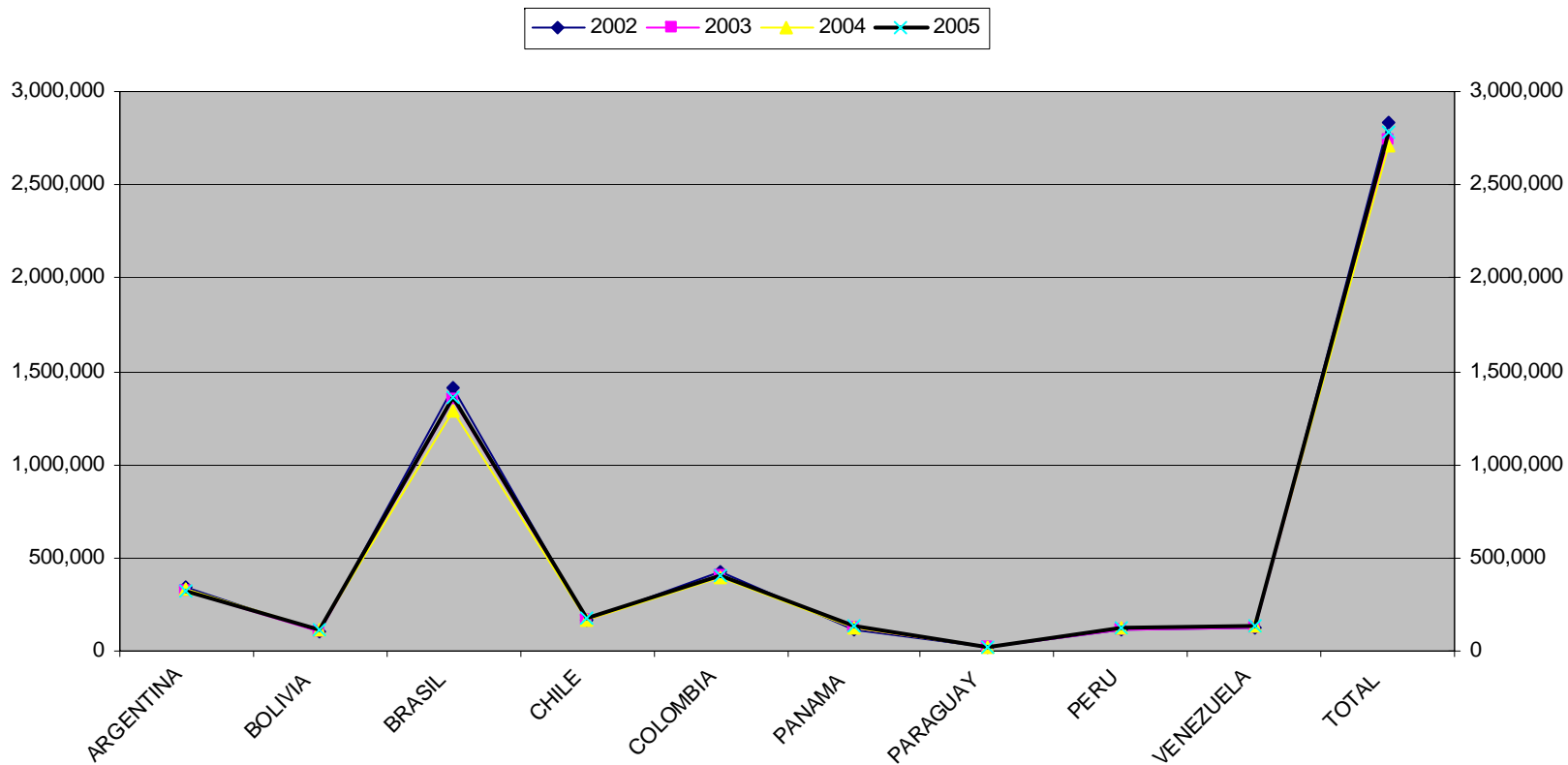
**AIRCRAFT MOVEMENT IN AIRPORTS OF THE CAR REGION
PERIOD 2002 - 2005**



**AIRCRAFT MOVMENT IN AIRPORTS OF THE SAM REGION
PERIOD 2002 - 2005**



**AIRCRAFT MOVEMENT IN AIRPORTS OF THE SAM REGION
PERIOD 2002 - 2005**



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APPENDIX B

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/Río de Janeiro	Santiago, Mendoza, Córdoba, Resistencia, Asunción, Curitiba, Brasilia	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

-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	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, 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

- A31 -

-1- Routing Area (AR)	-2- Traffic flows	-3- FIRs involved	-4- Type of area	-5- 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 C

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.