SAM/IG/4
WP/10
16/07/09

International Civil Aviation Organization
South American Regional Office

FOURTH WORKSHOP/MEETING OF THE SAM IMPLEMENTATION GROUP (SAM/IG/4)
REGIONAL PROJECT RLA/06/901

Lima, Peru, 19 to 23 October 2009

Agenda Item 5: Implementation of air traffic flow management (ATFM) in the SAM Region

(Presented by Ronald Fischer and Guilherme Freitas Lopes
Regional Project RLA/06/901 Experts)

Summary

This working paper presents information on the work carried out from 6 to 17 July 2009 under Regional Project RLA/06/901 Immediate Objective No. 1, on the development of the ATFM Manual for the SAM Region, in correspondence with the Air Traffic Flow Management (ATFM) Implementation Programme, at a regional level.

References:

- ICAO Annex 11
- Doc 4444 Air Traffic Management.
- Doc. 9426, Air Traffic Services Planning Manual.
- Doc. 9854, Global Air Traffic Management Operational Concept (which defines ATFM stages)
- GREPECAS/14 – CONOPS
- ATFM/TF/1 Meeting Report
- ATFM/TF/2 Meeting Report
- ATFM/TF/3 Meeting Report
- SAM/IG/3 Meeting Report

1 Background

1.1 Under the auspices of Regional Project RLA/06/901 – *"Assistance in the implementation of a ATM regional system according to the ATM operational concept and the corresponding technological support for communications, navigation, and surveillance (CNS)"* and within the framework of the ICAO Regular Programme, an expert was hired to develop the second part of the AFTM Manual, in order to present a draft to the SAM/IG/4 Meeting.

1.2 In parallel, Brazil supported this task, by sending an additional expert to the ICAO South American Office in Lima, Peru, to support in developing the second part of the ATFM Manual in a harmonized manner, taking into account the scope of both CAR/SAM Regions.

2 **Analysis**

2.1 During the ATFM/TF/5 Meeting, held in Armenia, Colombia, from 8 and 12 June 2009, the Task Force introduced significant modifications and suggestions for the preparation of this Manual, which have been taken into account after the necessary adjustment to the purpose and intention of this Manual. The list of amendments proposed are shown as follows:

a) Document reformatted, chapters 1-6 renamed and re-sequenced for continuity
b) History of document was included with background information
c) ATFM Stages updated and examples provided
d) Included was "Centralized ATFM strategy for CAR/SAM Regions
e) "Concepts to consider" incorporated
f) Chapter 1, Organization and Structure enhanced.
g) Chapter 2, Demand, Capacity and Impact Analysis: "Guidelines for application of a methodology for calculation of airport and ATC sector airspace capacity for the SAM region.". Also, added was a paragraph regarding pre/post event actions/analyses.
h) Chapter 3, Traffic Management Initiatives (TMIs); purpose, description of TMIs, explanation of approval authority, and processing added
i) Chapter 4, Collaborative Decision Making Process (CDM); reorganized and enhanced
j) Chapter 5, Coordination; enhanced to depict model and explanation
k) Chapter 6, Common ATFM Message Terminology; enhanced to include examples
l) The following appendices were included:
   - Trinidad and Tobago ATFM organizational structure
   - Flow Chart ATFM Analyses
   - Screen-shots of ATFM tools; i.e., SYNCHOMAX, PROSAT and TFMS
   - International Operations Planning Teleconference

2.2 The purpose of this Manual shall be to assist the States of the Region to establish a common understanding of the roles of each party interested in the effective provision of the flow management service, capacity to air traffic services, and to aircraft operators.

2.3 The intent of this document is to function as an introduction and not as an all inclusive body of knowledge. It is implied that this will be considered a living document that will be modified as needed to reflect the growth, future needs and harmonization of the region.

3 Suggested action

3.1 The meeting is invited to analyze the ATFM Manual developed within the framework of Regional Project RLA/06/901, as shown in **Appendix A** to this working paper, and to introduce the changes deemed pertinent, and if necessary, to recommend its adoption for its applications at a regional level.

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APPENDIX A

DRAFT

Caribbean/South American Air Traffic Flow Management Manual

(CAR/SAM ATFM Manual)

Draft Version	**1.0**
Date	**July 2009**

FOREWORD

The *South American (SAM) ATFM Manual* is published by the ATM/CNS Subgroup of the Caribbean/South American Regional Planning and Implementation Group, (GREPECAS). It describes air traffic flow management practices and procedures to be applied in the SAM region.

The GREPECAS and its contributory bodies will issue revised editions of the Document as required to reflect ongoing implementation activities. Copies of the *SAM ATFM Manual* can be obtained by contacting:

ICAO SOUTH AMERICAN OFFICE LIMA, PERU

Av. Víctor Andrés Belaúnde No.147
Centro Empresarial Real
Vía Principal No.102
Edificio Real 4, piso 4
San Isidro - Lima 27 – Perú
Apartado 4127 Lima 100, Perú
E-mail: mail@lima.icao.int
Tel: +511 611 8686
Fax.: +511 611 8689
Point of contact: jfernandez@lima.icao.int
aorero@lima.icao.int

North American, Central American and Caribbean Office

Av. Presidente Masaryk 29 – 3rd floor
Col. Chapultepec Morales
11570 México D.F., México
Postal Address: Apartado Postal 5-377
06500 México, D.F., MÉXICO
E-mail: icao_nacc@mexico.icao.int
Tel: (5255) 5250 3211
Fax: (5255) 5203 2757
Point of Contact: vhernandez@mexico.icao.int

The present edition (Draft Version 1.0) includes all revisions and modifications until October 2009. Subsequent amendments and corrigenda will be indicated in the Record of Amendment and Corrigenda Table, according to the procedure established in page X.

CAR/SAM ATFM MANUAL

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

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by

CORRIGENDA			
No.	Date applicable	Date entered	Entered by

AMENDMENTS TO THE DOCUMENT

1. The Caribbean and South American (CAR/SAM) ATFM Manual is a regional document that includes technological advances, best practices, 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 Manual 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, efficiency, and a secure air traffic system.

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

4. The ATFM Manual 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:

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

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

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Background

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.

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.

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.

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.

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 utilization 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.

The SAM/IG/3 Meeting examined the draft ATFM Manual to be applied by the SAM Region FMU/FMP, which contained guidelines related with ATFM implementation, such as demand and capacity, traffic management tools, traffic Management initiatives (TMI), Communications and coordination, organization and structure, system performance measurement, collaborative decision-making, common ATFM terminology whose aim was to provide orientation in ATFM management.

The document was in its initial stage, and the Meeting agreed that it would be convenient to continue with its development, task which should be included within the ATFM action plan. At the same time, the Secretariat was requested to carry out corresponding arrangements so that this task is carried out within RLA/06/901 Project Framework.

As a result of the analysis to the Manual, the Meeting deemed it necessary to request the assistance of experts to carry out the development of the chapters pertaining to said Manual.

During the Fifth Air Traffic Flow Management Task Force Meeting (ATFM/TF/5) held in Armenia, Colombia 8-12 June 2009, the meeting reviewed the draft ATFM Manual and proposed a series of amendments that were taken into account.

Purpose

Implementation of Air Traffic Flow Management (ATFM) in SAM Region

The purpose of this document shall be to assist the States of the Region to establish a common understanding of the roles of each party interested in the effective provision of the flow management service, capacity to air traffic services, and to aircraft operators.

The intent of this document is to function as an introduction and not as an all inclusive body of knowledge. It is implied that this will be considered a living document that will be modified as needed to reflect the growth, future needs and harmonization of the region.

ATFM Implementation Strategy

The operational concept establishes a simple implementation strategy. It is recommended that this strategy be developed in phases, so as to ensure maximum utilization of the available capacity and enable all concerned parties to obtain sufficient experience.

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 Center. A Regional ATFM Center shall demand ample studies to define operational concepts, requirements of systems and institutional aspects for ATFM implementation in the CAR/SAM Regions.

Note: For additional details, see Caribbean/South America Air Traffic Flow Management Operation (CAR/SAM ATFM CONOPS).

Centralized ATFM strategy for CAR/SAM Regions

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.

In the future, in order to maximize terminal and regional efficiency, consideration should be given to the establishment of a Centralized ATFM facility(s) that would have oversight responsibility for providing ATFM service.

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.

ATFM stages

Initially ATFM initiatives may only be required during certain periods when aerodromes and ATC sectors experience delays due to demand and capacity related issues. In order to maximize the use of all resources available in the regions, either from personnel, equipment, facilities and/or automated systems, the ATFM implementation process should be established, planned and developed in phases (airport and airspace), according to the following sequence.

Note: Doc 9854, Global Air Traffic Management Operation Concept defines the ATFM stages.

Strategic stage

At the strategic stage, demand and capacity balancing will respond to the fluctuations in schedules and demands, seasonal changes of weather and major weather phenomena, and special traffic management events such as Carnival. This takes place seven days or more prior to the day of operation and includes research, planning and coordination activities. This phase consists of analyzing the evolution of the forecast demand and the identification of potential new problems and in evaluating possible solutions. The outputs of this phase are the capacity plan for the following year, the Route Allocation Plans and sets of other plans that can be activated as necessary during the next phases. Through collaborative decision making, assets will be optimized in order to maximize throughput, thus providing a basis for predictable scheduling.

For example: The ATFM service provider in anticipation of an event would gather statistical data and discuss this with stakeholders for the development of an action plan. This plan should take into consideration both scheduled and non-scheduled FPLs.

This could include a special traffic management event such as a sporting event, or a planned outage that would impact airport/airspace capacities. The integral part of the strategic phase is to mitigate impact as much as possible through advance planning.

Pre-tactical stage

Applied six days prior to the day of operation and includes revisiting the strategic phase. It analyses and decides the best way to manage the available capacity resources and the need for the adjustment of TMIs. For example, this may include demand and capacity balancing, evaluation of the current capabilities of the ATC service provider, airspace user and aerodrome operator assets.

In the pre-tactical phase, it is required to revisit the strategic plan and make appropriate adjustments as needed based upon newly received/changed information.

Tactical stage

At the tactical stage, demand and capacity balancing will focus more closely on demand management to adjust imbalances. It will consider weather conditions, infrastructure status, resource allocations, and disruptions in schedules that would cause an imbalance. Through collaborative decision making, these actions will include dynamic adjustments to the organization of airspace to balance capacity, dynamic changes to the entry/exit times for aerodromes and airspace volumes, and adjustments to the schedules by users.

Tactical stage includes making appropriate real time adjustments based upon unanticipated factors and informing stakeholders of these changes.

Concepts for Consideration

ATFM shall be established with a view to optimizing the use of available airspace and airport capacity, and to enhance air traffic flow management processes. It shall be based on transparency and efficiency, ensuring that capacity is provided in a flexible and timely manner, consistent with the guidelines issued by ICAO.

Implementation shall support cooperation between air navigation service providers, airport operators and airspace users and shall cover the following areas:

a) flight planning
b) use of available airspace capacity during all flight phases
c) Issuing guideline initiatives for the optimization for the flow of air traffic

Implementation shall seek to balance the financial benefits for stakeholders with the expected operational safety improvements by the relevant parties and operational and technical benefits, taking into account the requirements for ATM global interoperability;

a) State aircraft (Special military missions)
b) Emergency/priority aircraft
c) ambulance flights
d) humanitarian flights (ambulance flights)
e) Search and rescue missions
f) Transport of human organs

Note: For additional details, see Caribbean/South America Air Traffic Flow Management Operation (CAR/SAM ATFM CONOPS).

It shall be recognized that airspace and airports are resources shared by all user categories with fairness and transparency, taking into account the operational safety needs of States and the commitments of international organizations.

Air traffic flow management should be based on principles of partnership to meet ATM expectations, by means of collaborative decision-making between:

a) Central units for air traffic flow management (ATFMC)
b) Flow Management Units (FMU/FMP)
c) Airspace users – general aviation, air carriers, the military
d) Aerodrome community

Air navigation service providers and air operators should share data when coordination agreement has been established.

Note: Such as SYNCHROMAX, PROSAT or TFMS (formerly ETMS)

ATFM shall apply within CAR/SAM States airspace and airports to:

a) all flights intended to operate or operating as general air traffic and in accordance with instrument flight rules (IFR) and visual flight rules (VFR) except as noted in paragraph XX
b) all phases of those flights.

ATFM shall apply to each of the following parties, or to anyone acting on their behalf who may be involved in air traffic flow management activities:

a) aircraft operators
b) air traffic service providers
c) units involved in airspace management
d) airport operators
e) the central unit entrusted by Member States with the provision of air
f) traffic flow management services.

Chapter 1: Organization and structure

1.1 It is understood that each State and/or service provider will develop an organizational structure that will meet the needs of the aviation system community. These needs at a minimum should address management and oversight of the following:

a) Air Traffic Flow Management System
b) Coordination/exchange of information both internal and external
c) Provide line authority as to how decisions are implemented
d) Ensure that mission requirements are met

1.2 Each organization may establish a Line of Authority that will support the mission of ATFM. This may include the following positions of responsibilities:

a) Manager of Traffic Flow Management System
b) Flow management unit that provides oversight for a specific geographic region and/or facilities
c) Flow management positions that are responsible for the day-to-day activities of traffic flow management

Note: Please see Attachment "A" for example of Trinidad and Tobago Civil Aviation Authority Flow Diagram of Piarco Flow Management Unit

Flow Management Unit (FMU)

1.3 FMUs monitor and balance traffic flows within their areas of responsibility in accordance with traffic management directives. The FMU is delegated the authority to direct traffic flows and implement approved TMIs in conjunction with, or as directed by the oversight authority.

Personnel training requirements for FMU/FMP ATFM

1.4 Personnel working in a Centralized ATFM function as well as regional FMU/FMP functions shall require standardized and recurrent training in order to keep pace with an ever changing and fluid environment. A detailed plan of ATFM training in advance shall ensure the optimization of personnel achieving operational efficiency in their respective FMUs/FMPs. This will allow them to successfully face the important changes in their operational environments, and allow them to provide the highest achievable level of customer service.

FMU/FMP Duties

1.5 FMP Duties may include:

a) Create and distribute plan of action after consultation with designated facilities and customers
b) Gather all relevant information such as weather, delays, NAVAID/radar shutdowns, runway closures, TELCO outages, computer malfunctions, and procedural changes affecting air traffic facilities. This may be accomplished through various means available, e.g. Teleconference, Email, Internet etc.
c) Analyze and distribute all data

d) A full description of all TMIs (e.g., ground delay programs, miles-in-trail (MIT)) is recorded in a designated log, which may include, but not limited to, start and stop times, facilities/operations affected, and justification.

e) Coordinate procedures with all stakeholders

f) Create a structure for dissemination of information e.g. Webpage

g) Conduct daily teleconferences as needed

h) Monitor/review the flow management system and make adjustments where necessary and cancel when no longer required.

Chapter 2: Demand, Capacity and Impact Analysis

2 Planning Process

2.1 In order to balance demand with capacity, it is necessary to determine the airport and airspace capacity. Once these capacities are established, steps can be taken to monitor and evaluate air traffic demand and implement measures (TMIs) for achieving equilibrium in the system.

2.2 The following example provides a general concept of the steps involved regarding pre and post event actions/analysis. Please see Attachment B, ATFM flow chart analysis.

a. Determining Capacities
Review/assess airport/ATC sector capacities for accuracy

Note: See Guidelines for the Calculation of Airport and ATC Sectors for the SAM Region.

b. Assess Demand
Determine what forecasted demand will be for a specified time frame, 15-minute period(s), hour(s), shift, etc.

c. Analysis and Comparison
Compare and analyze demand and capacity levels and time frames where demand exceeds declared capacity

d. Tool/technology for evaluation process
Manual computation or automated methodologies such as SYNCHROMAX, TFMS, PROSAT etc to facilitate process (please see Attachment C)

e. CDM model (see Chapter "x" regarding CDM)
Communicate situation to facilities/stakeholders via available means utilizing CDM methodology

f. Action required to mitigate demand imbalance
After gathering information and solicitation of input, determine appropriate TMI needed for situation

g. Disseminate information
Inform stakeholders of mitigation plan (TMI). This can be accomplished via telephony and/or automation

h. Monitor situation
Examine situation periodically as necessary in order to ensure applied TMI is mitigating situation. If necessary, re-evaluate and make appropriate adjustments

i. Conduct post analysis of event
After event, perform post analysis to determine effectiveness of TMI and to catalog best working practices

Chapter 3: Traffic Management Initiatives (TMI)

3 TMI

3.1 Traffic management initiatives are techniques used to manage air traffic demand according to system capacity. Some TMIs must be considered as control instructions or procedures. The determination is based on the size of the event, the coordination process, and the event duration.

Purpose

3.2 TMIs are important techniques for managing the air traffic system when they are coordinated and applied properly. TMIs are applicable when it is necessary to manage fluctuations in the air traffic demand, but they do cause an impact to the customers. It is important to consider this impact and implement only the initiatives that are necessary for maintaining the integrity of the system. Therefore, traffic management personnel should employ the least restrictive methods available in order to minimize delays.

Note: In certain instances it may be necessary to apply combinations of TMIs in order to maintain system integrity and still employ the least restrictive measures; i.e., miles-in-trail with holding in lieu of ground stopping aircraft.

Types of TMIs

Name	Description
Airborne holding	Holding of aircraft is a commonly utilized TMI especially when anticipated due to volume, weather, outages etc. When airborne holding is forecasted, AT facilities and customers can make appropriate adjustments and alert personnel as to the reasons and length of holding. Airborne holding is normally done when the operating environment supports holding and the conditions are expected to improve shortly; this ensures aircraft are available to fill the capacity at the airport.
Altitude	Utilized to segregate different flows of traffic, or to distribute the number of aircraft requesting access to a specified geographic region. **a. Capping**: Term to indicate aircraft will be cleared to an altitude lower than their requested altitude until they are clear of a particular airspace. Capping may apply to the initial segment of the flight or for the entire flight. **b. Tunneling**: Term to indicate traffic will be descended prior to the normal descent point at the arrival airport to remain clear of an airspace situation; e.g., holding. Capping and Tunneling are techniques commonly used to keep aircraft from entering busy and complex sectors and still permitting them to depart with minimal delays.
Fix balancing	Assigning an aircraft a fix other than that in the filed flight plan in the arrival or departure phase of flight to equitably distribute demand.
Ground delay programs (GDP)	A GDP is a TM process administered by the FMU; when aircraft are held on the ground in order to manage capacity and demand at a specific location, by assigning arrival slots. The purpose of the program is to support the TM mission and limit airborne holding. It is a flexible program and may be implemented in various forms depending upon the needs of the air traffic system.

Name	Description
Ground stops (GS)	GS is a process that requires aircraft that meet specific criteria to remain on the ground. Since this is one of the most restrictive methods of traffic management, alternative initiatives should be explored and implemented if appropriate. GSs should be used: **a.** In severely reduced capacity situations (below most user arrival minimums, airport/runway closed for snow removal, or aircraft accidents/incidents); **b**. To preclude extended periods of airborne holding; **c**. To preclude sector/center reaching near saturation levels or airport grid lock; **d**. In the event a facility is unable or partially unable to provide ATC services due to unforeseen circumstances; and **e**. When routings are unavailable due to severe weather or catastrophic events.
Miles-in-trail (MIT)	The number of miles required between aircraft that meet a specific criteria. The criteria may be separation, airport, fix, altitude, sector, or route specific. MIT are used to apportion traffic into manageable flows, as well as to provide space for additional traffic (merging or departing) to enter the flow of traffic.
Minutes-in-trail (MINIT)	The number of minutes required between successive aircraft. It is normally used in a non-radar environment, or when transitioning to a non-radar environment, or when additional spacing is required due to aircraft deviating around weather.
Reroutes	Reroutes are ATC routings other than the filed flight plan. They are issued to: **a.** Ensure aircraft operate with the "flow" of traffic. **b.** Remain clear of special use airspace. **c.** Avoid congested airspace. **d.** Avoid areas of known weather where aircraft are deviating or refusing to fly.
Sequencing programs	These programs are designed to achieve a specified interval between aircraft; they may be software generated or determined by ATFM personnel. Different types of programs accommodate different phases of flight. **1. Departure Sequencing Program (DSP)** - Assigns a departure time to achieve a constant flow of traffic over a common point. Normally, this involves departures from multiple airports. **2. En route Sequencing Program (ESP)** - Assigns a departure time that will facilitate integration in the en route stream. This is accomplished by instructing an air traffic control tower to call the traffic management unit for release -- "Call For Release." **3. Arrival Sequencing Program (ASP)** - Assigns fix crossing times to aircraft destined to the same airport.

TMI approval authority

3.3 The designated FMU/FMP for each Service provider and/or State is the approval authority for all TMIs that impact their airports, TMAs, and en route airspace system.

TMI processing

3.4 Prior to implementation, the FMU/FMP responsible for ATFM oversight must identify the need for a TMI, examine alternative options, and develop a justification for the TMI. The FMP must be prepared to discuss and coordinate the proposed TMI with the receiving facility prior to implementation. FMPs must continuously monitor and evaluate the TMI and make the necessary adjustments, including cancellation and notification in a timely and effective manner.

Chapter 4: COLLABORATIVE DECISION MAKING PROCESS (CDM)

4 CDM

4.1 CDM has evolved into a philosophy or a collaborative approach of how to conduct business. It brings together operators, government, private industry, military, and academia, for the purpose of improving ATFM decision making through enhanced information exchange, data sharing, and improved automated decision support tools.

4.2 As the aviation community continues to evolve, states and/or service providers will be required to keep pace with increasing demand levels, expanding capacities, and technological advances. As a result of these challenges, a new sense of partnership will be required by all stakeholders who either directly or indirectly contributes to the overall well being and success of the aviation industry.

4.3 This new partnership will combine the talents and experiences of all individuals which will facilitate the harmonization and globalization of the world's airspace system.

4.4 Collaborative decision making (CDM) is a methodology that brings service providers and system stakeholders together for the purpose of improving air traffic flow management decisions.

4.5 CDM is a key element to maximizing airport and air operations because it considers all coordination elements between air navigation service providers such as flow management units (FMUs) and recipients of these services such as aircraft and airport operators. CDM includes stakeholders participating in the planning process by sharing information such as aircraft position, predictions, weather forecast, traffic forecast, and in general anything that would contribute to the efficient operation of a regional air space system.

CDM Objectives

4.6 The CDM concept seeks to improve air traffic flow and airport capacity management by reducing delays and foreseeing events through improved resource management.

4.7 These objectives include but are not limited to:

a) Providing up-to-date information in real time to all stakeholders, thus ensuring a more accurate prediction of events and better capacity utilization, supported by a collaborative decision-making process.

b) Transferring information for decision-making between stakeholders.

c) Requiring that all system stakeholders function in an equitable manner for the betterment of the system.

d) Exchanging information among the relevant parties in charge of aircraft flight planning and operations to increase system capacity, and thus improving:

1. Operations quality and stability
2. Offering reliability and predictability
3. traffic synchronization amongst stakeholders

4. And air space organization which is critical for maximizing capacity and enhancing system safety.

4.8 CDM participants should consider utilizing all available electronic means and tools that allow the analysis of various traffic scenarios in order to more effectively achieve the balancing of demand and capacity.

Note Global experience has shown that teleconferences and electronic information exchanges are the recommended mechanisms for active participation throughout the System. However, each State/Service Provider may utilize whatever means are available to foster the sharing of information.

4.9 CDM implementation allows system participants to optimize their decisions in collaboration with others, by learning about their preferences, constraints, and the real and foreseen situation.

4.10 Decision-making within the CDM framework is facilitated by the exchange of accurate and timely information, aiming to adjust procedures, mechanisms and tools for better system performance.

4.11 The CDM concept consists of the following basic elements:

a) Information exchange.
b) Weather conditions.
c) Sequencing before departure.
d) Adverse conditions.
e) Up-to-date flight information.
f) Flight scheduling.
g) Airport Master Plan.
h) General Contingency Plans.
i) State aircraft operation planning (military, law enforcement and other).

CDM Structure

4.12 Developing a CDM organization within each State and/or Service Provider is essential in order to achieve the benefits that this model offers. The flexibility is that it takes into consideration any communication venues that already exist, and does not require expending valuable resources, and can be tailored to meet the local regional needs as determined.

4.13 For example, Service providers can begin with engaging the stakeholders as follows:

1. scheduling daily meetings
2. pre-establishing agenda items that are of mutual concern
3. discussing how tactical decisions will be managed, shared, disseminate
4. establishment of CDM participants and entering a memorandum of understanding (MOU) which stipulates guidelines in areas such as information distribution, rules and regulations, and how shared leadership is accomplished.
5. development of sub-work groups which fall under the direct leadership and guidance of the CDM organization and are specifically tasked with developing solutions.

Conclusions

4.14 As with any collaborative endeavor, each participant should realize that this will require a level of sacrifice, commitment and a sense of what is best for the greater whole and/or system.

4.15 Participant must be willing to share:

a) responsibility
b) resources
c) accountability
d) mutual goals
e) mutual trust

4.16 And as a direct result of these efforts, participants can generally expect to realize:

a) More effective communications
b) Increased information exchange
c) More effective decision making
d) Better solutions to ATFM problems

4.17 It is well accepted that regardless of the technological advances made in the aviation industry, CDM will require a culture change, team work approach, and be an integral part of how the future is shaped.

Chapter 5: Coordination

5 Coordination of traffic management information

5.1 It is understood that there exists different levels of traffic flow management oversight within the CAR/SAM regions. The concept is for each service provider to assign responsibility within their respective FIR for collecting, disseminating, monitoring, and providing oversight of TMIs. This methodology would ensure that applicable information is shared by all service providers and customers in a timely and efficient manner.

5.2 For example: Tactical level information such as capacities, demand, imbalances, airport conditions and anything that would impact their respective system. This list is not all inclusive and will depend on the good judgment of each facility.

5.3 A typical prototype model may consist of the following:

a) Control towers (TWR) coordinate with Approach Control Facilities (APP)
b) Approach Control Facilities (APP) coordinate with Air Control Center (ACC)
c) Air Control Center coordinate with ATFM authority
d) ATFM authority would be responsible for dissemination within their respective region

Note: The purpose of this coordination methodology is to establish a protocol for each level of the organization to be informed of timely and accurate information. It is fully realized that this as an organizational model and can be modified to meet the needs of each specific situation.

5.4 For example, a TWR coordinating directly with the ACC or APP with APP

Note: It would be desirable that the states could develop and/or modify letters of agreement (LOA) for standardization which describes this coordination.

Exchanging of ATFM Information

5.5 ATS and/or ATFM service providers in adjacent FIRs shall establish schedules and regular telephone conferences as required to meet their specific operational needs. The purpose of these conferences is to share and disseminate information to air traffic facilities and customers for making tactical adjustments as required.

5.6 It is recommended that the following three methodologies may be utilized:

a) Scheduled telephone conference: Consist of a pre-coordinated time when FMUs will establish a conference amongst themselves to exchange information.
b) Tactical telephone conference: This is a non-scheduled teleconference which is conducted on a real-time tactical level to make adjustments.

c) Automated Web Page

— Web pages

i ATFM service providers may create a web page with relevant ATFM information, as described in this paragraph. The purpose of the web page is to share applicable system information for everyone to access and to minimize workload. As a minimum, the web page may include:

ii TMI's such as ground stops, delay programs, etc.

iii Runway configuration

iv Runway/airport capacities

v Weather

vi Outages

vii Delay information

viii Airport closures

ix Miscellaneous

Operations plan

5.7 The operations plan may take into consideration the terms of balancing demand and capacity, ATFM initiatives, special operation requirements, special events such as Carnival, World Cup etc; and any other events that may arise. The purpose is to tactically and/or strategically develop an outlook for the applicable airspace system that the aviation community can use as a planning forecast. Specific items that may be used are similar to the web page and allow the aviation community to provide input into the development of this plan. For example, a FMU would canvass applicable AT facilities and customers on how best to resolve system impacts.

5.8 Special operations may be defined as air operations by State aircraft and for humanitarian activities. It is implied that each State and/or service provider may define special operations as needed.

5.9 Implementing, adjusting, coordinating, and canceling of TMIs It is recommended that States and/or service providers develop an internal operations manual for their respective facilities describing the above-mentioned actions.

5.10 For example:

a) Implementing TMIs will be accomplished through established means such as telephonically, web page, or any other methodology available.

b) Constant monitoring would be required for making the appropriate adjustments

c) Cancellation of TMI's are required when no longer needed and system balance is achieved regarding demand and capacity related issues. It is important for all system users to be informed of canceled initiatives so that adjustments can be accomplished.

Civil/military Coordination

5.11 It is recommended that States and/or service providers develop a letter of agreement (LOA) with their military customers that describes how military special use airspace can be utilized when not in use and/or during peak civilian periods in order to increase efficiency.

Chapter 6: Common ATFM Message Terminology

6 General

6.1 The primary goal of these guidelines is to develop standard terminology and phraseology for the exchange of ATFM telephone messages. The information contained herein is intended to reflect the current use of plain language and provide a basis for harmonization.

6.2 This includes the concept of modular and structured ATFM messages and define the components as who, what, where, when and why.

6.3 This is important because there is no module regarding how ATFM restrictions should be achieved by service providers. As with any communication model, it is the responsibility of both parties (sender and receiver) to ensure that the message is understood correctly and can be applied as requested.

6.4 It should be recognized that once information is exchanged regarding a restriction, it is considered MANDATORY unless otherwise coordinated.

ATFM Message Components

6.5 Each message should have five components that contain plain language elements and when combined provide a complete ATFM message.

6.6 This section breaks down the five message components.

a) **WHO**: This identifies the parties involved. Who is transmitting and receiving the message.
Example:

CGNA this is Colombia CFMU….

b) **WHAT**: This identifies the objective to be achieved.
Example: REQUEST 30 MILES [or MINUTES] IN TRAIL

c) **WHERE**: This identifies the location of the ATFM objective to be achieved. It is often preceded by a modifying clause, indicating what aircraft or traffic the restriction will apply to. The modifying clause and the location combination are used to construct the “where” component.

Example: for all aircraft destined El Dorado International Airport …

d) **WHEN**: This identifies the time and/or duration of the ATFM objective to be achieved.

Example: FROM NOW UNTIL 0900 UTC…

e) **WHY**: This identifies the reason for the ATFM objective:

Example: DUE TO (SEVERE) WEATHER over El Dorado International Airport

The following is an example of a complete message:

6.7 CGNA this is Colombia CFMU. Request 30-MILES IN TRAIL for all aircraft destined to El Dorado International Airport from now until 0900 UTC DUE TO SEVERE WEATHER over El Dorado International Airport

Amendment

6.8 **Amendment:** The amendment of an ATFM message should include similar elements but with additional modifiers. These modifiers may include: (Change for other State)

a) CHANGE
b) AMEND
c) REDUCE
d) INCREASE
e) DECREASE

Example: Guayaquil FMP this is Lima FMP, reduce your miles-in-trail to Jorge Chavez International Airport from 30 miles to 20 miles-in-trail from 1400 UTC to 1700 UTC due to improving weather conditions at Jorge Chavez International Airport

Cancellation (Change for other State)

6.9 The cancellation of an ATFM message should contain a canceling word or phrase. It is normally not necessary to state the reason for the cancellation. A canceling word or phrase may include:

a) CANCEL
b) RESUME
c) RESUME NORMAL
d) RELEASE

Example: Caracas FMP this is Georgetown FMP, cancel the ground stop for Timehri Cheddi Jagan International Airport due to the runway now open.

6.10 Cancellation messages should also identify which message is being cancelled, as several restrictions could be in place at one time.

EXPLANATION OF TERMS

When the following terms are used in the present manual they have the following meanings.

6.11 The development of this document is based on the understanding of important terms and expressions that7 are described below:

Stakeholders involved in ATFM - The ATFM stakeholder community includes the organizations, bodies or entities which could participate, collaborate and cooperate in the planning, development, utilization, regulation, operation, and maintenance of ATFM system.

Among them are:

Aerodrome Community - The air traffic control authorities, aerodrome authorities, commercial, military, and general aviation operators, 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.

Airspace Providers - Refers, in general terms, to Contracting States/Territories in their capacity as airspace owners with the legal authority to permit or deny access to their sovereign airspace. The term may also be applied to organizations of the State assigned responsibility for establishing the standards and guidelines for use of the airspace.

Airspace users - Refers to the commercial, military, and general aviation operators that utilize the sovereign airspace of States/Territories/Organizations.

ATM service providers - All of the organizations and personnel (e.g., controllers, engineers, technicians) involved in the provision of ATFM services to airspace users.

Military aviation - Refers to the personnel, aircraft, and equipment of military organizations that serve a vital role in the security of States/Territories.

International Civil Aviation Organization (ICAO) - Considered the only international organization in position to efficiently coordinate the implementation activities of global ATM.

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 ATC authority.

Air Traffic Management (ATM) - A service which comprises airspace management, air traffic flow management, and air traffic services.

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 Management System - A system which provides ATM through the integration and cooperation of personnel, information, technology, facilities and services. It also involves the support of on-board and space-based communications, navigation and surveillance.

Air Traffic Volume - The number of aircraft within a defined airspace or aerodrome movement area in a given period of time.

Capacity (for ATFM purposes) - The maximum number of aircraft that can be accommodated in a defined airspace or aerodrome (throughput) in given period of time.

Declared Capacity (for ATFM purposes) – A measure of the ability of the ATC system or any of its subsystems or operating position to provide service to aircraft during normal activities. It is expressed as the number of aircraft entering a specified portion of airspace in a given period of time taking into account weather, ATC unit configuration, staff and equipment available, and any other factors that may affect the workload of the controller responsible for the airspace.

Regional ATFM Center - A flow management unit responsible for the provision of air traffic flow management across multiple area control centers.

Collaborative Decision Making - an operating philosophy and the associated technologies that enable traffic managers and aviation industry representatives to respond in a timely manner to constraints in the airspace system.

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

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

Flow Management Unit (FMU) - FMUs monitor and balance traffic flows within their areas of responsibility in accordance with traffic management directives. The FMU is delegated the authority to direct traffic flows and implement approved TMIs in conjunction with, or as directed by the oversight authority.

Flow Management Position (FMP) - A position established in an appropriate air traffic control unit to ensure the necessary interface between the local ATFM functions and other FMUs and/or a centralized ATFM unit.

Homogeneous ATM area - An airspace with a common ATM interest, based on similar characteristics of traffic density, complexity, air navigation system infrastructure requirements and other specified considerations, wherein a common detailed plan will foster the implementation of ATFM.

Main Traffic Flow - The concentration of a significant volume of air traffic on the same, or similar, flight trajectories.

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

Traffic Management Initiatives - Techniques used by traffic managers to balance air traffic demand with available capacity.

ACRONYMS

LISTA DE ACRÓNIMOS/ LIST OF ACRONYMS

ACC	Centro de control de área	Area control centre
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 de 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	Explotador de aeronave	Aircraft operator
APP	Oficina de control de aproximación	Approach control facility

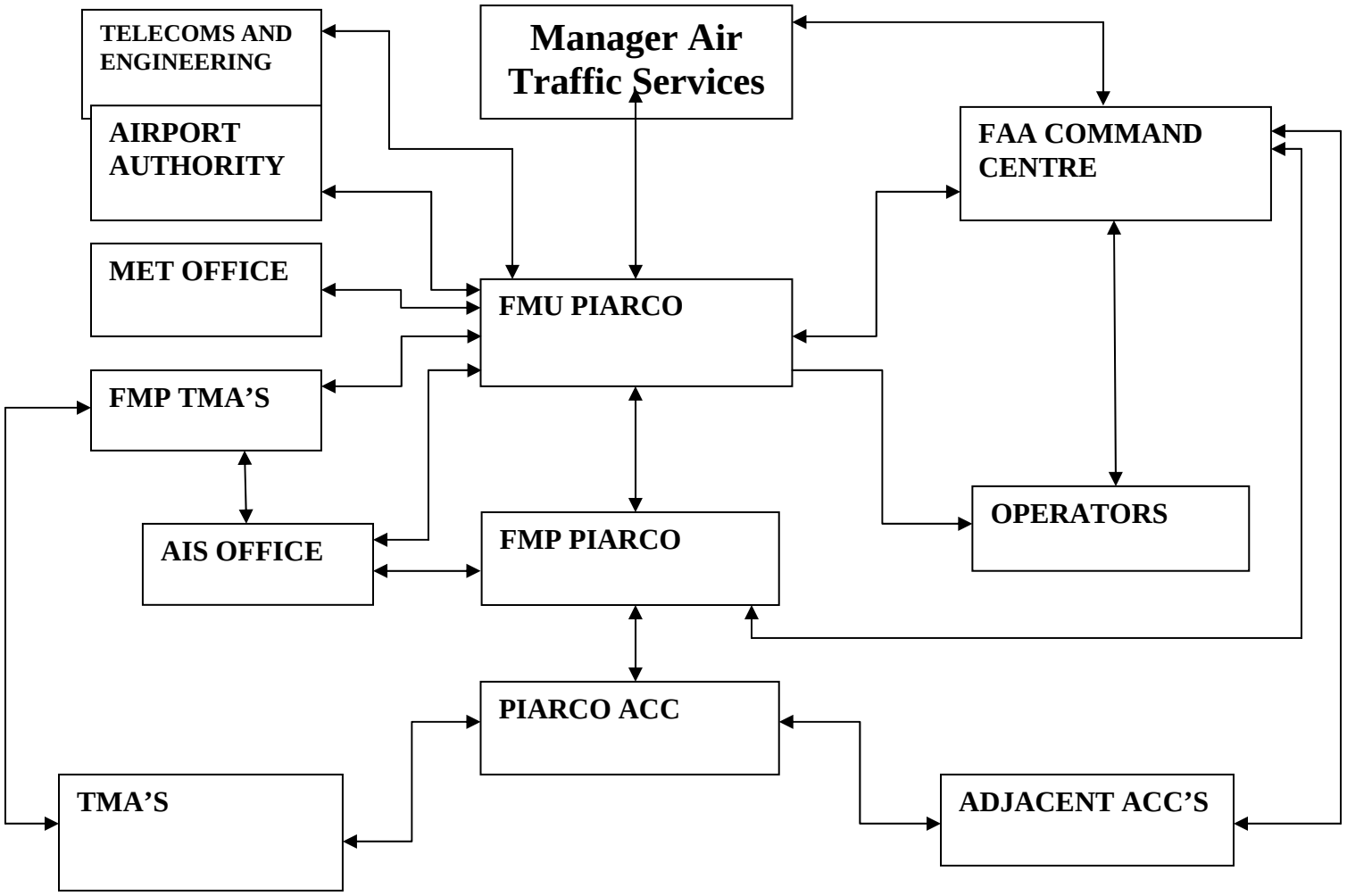
AAR	Régimen de aceptación del aeropuerto	Airport Acceptance Rate
ADR	Régimen de salida del aeropuerto	Airport Departure Rate
ATC	Control de tránsito aéreo	Air traffic control
ATFM	Gestión de afluencia del tránsito aéreo	Air traffic flow management
ATM	Gestión del tránsito aéreo	Air traffic management
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 central de gestión de afluencia del tránsito aéreo	Centralised air traffic flow management unit
C/BA	Análisis de costo-beneficio	Cost/benefit analysis
CDM	Toma de decisiones en colaboración	Collaborative Decision Making
CNS/ATM	Comunicaciones, navegación y vigilancia/gestión del tránsito aéreo	Communications, navigation, and surveillance/air traffic management
CTA	Area de control	Control area
FDPS	Sistema de procesamiento de datos de vuelo	Flight data processing system
FIR	Región de información de vuelo	Flight information Region
FMP	Puesto de gestión de afluencia	Flow management position
FMU	Dependencia de gestión de afluencia	Flow management unit
FPL	Plan de vuelo	Flight plan
GREPECAS	Grupo regional CAR/SAM de planificación y ejecución	CAR/SAM regional planning and implementation group
IATA	Asociación del Transporte Aéreo Internacional	International Air Transport Association
IFALPA	Federación Internacional de Asociaciones de Pilotos de Línea Aérea	International Federation of Air Line Pilots' Associations
IFATCA	Federación Internacional de Asociaciones de Controladores de Tránsito Aéreo	International Federation of Air Traffic Controllers' Associations
LOA	Carta de acuerdo	Letter of Agreement
MET	Servicios meteorológicos para la navegación aérea	Meteorological services for air navigation
NOTAM	Aviso a los aviadores	Notice to airmen
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	Regional planning and implementation group
PROSAT	Pronóstico de saturación	PROSAT
RNAV	Navegación de área/Area Navigation - RNAV Route: Ruta de navegación de área	Area navigation route

RNP	Performance de navegación requerida	Required navigation performance
SID	Salida normalizada por instrumentos	Standard instrument departure
STAR	Llegada normalizada por instrumentos	Standard instrument arrival
SYNCHROMAX	SYNCHROMAX	SYNCHROMAX
TBD	A ser determinado	To be determined
TELCON	Tele-conferencia	Telephone conference
TFMS	Sistema de gestión de la afluencia del tránsito (previamente, ETMS)	Traffic Flow Management System (previously called ETMS)
TMA	Área de control terminal	Terminal control area
TMC	Coordinador de la gestión del tránsito	Traffic Management Coordinator
TMI	Iniciativa de gestión del tránsito	Traffic management initiative
TWR	Torre de control	Control tower
WSO	Oficina del Servicio Meteorológico	Weather Service Office
WWW	Red mundial	World Wide Web

ATTACHMENT A

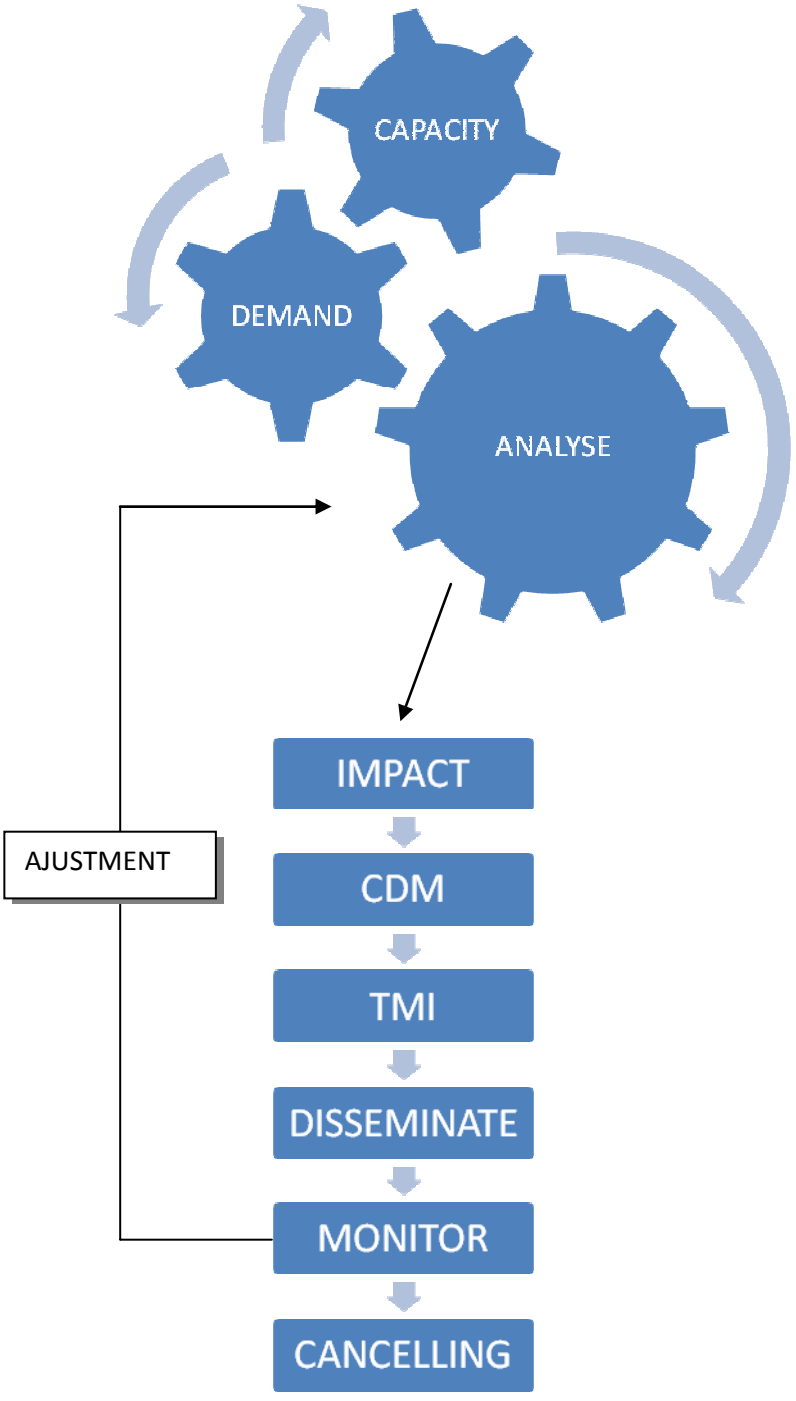
Trinidad and Tobago Civil Aviation Authority

Flow Diagram of Piarco Flow Management Unit



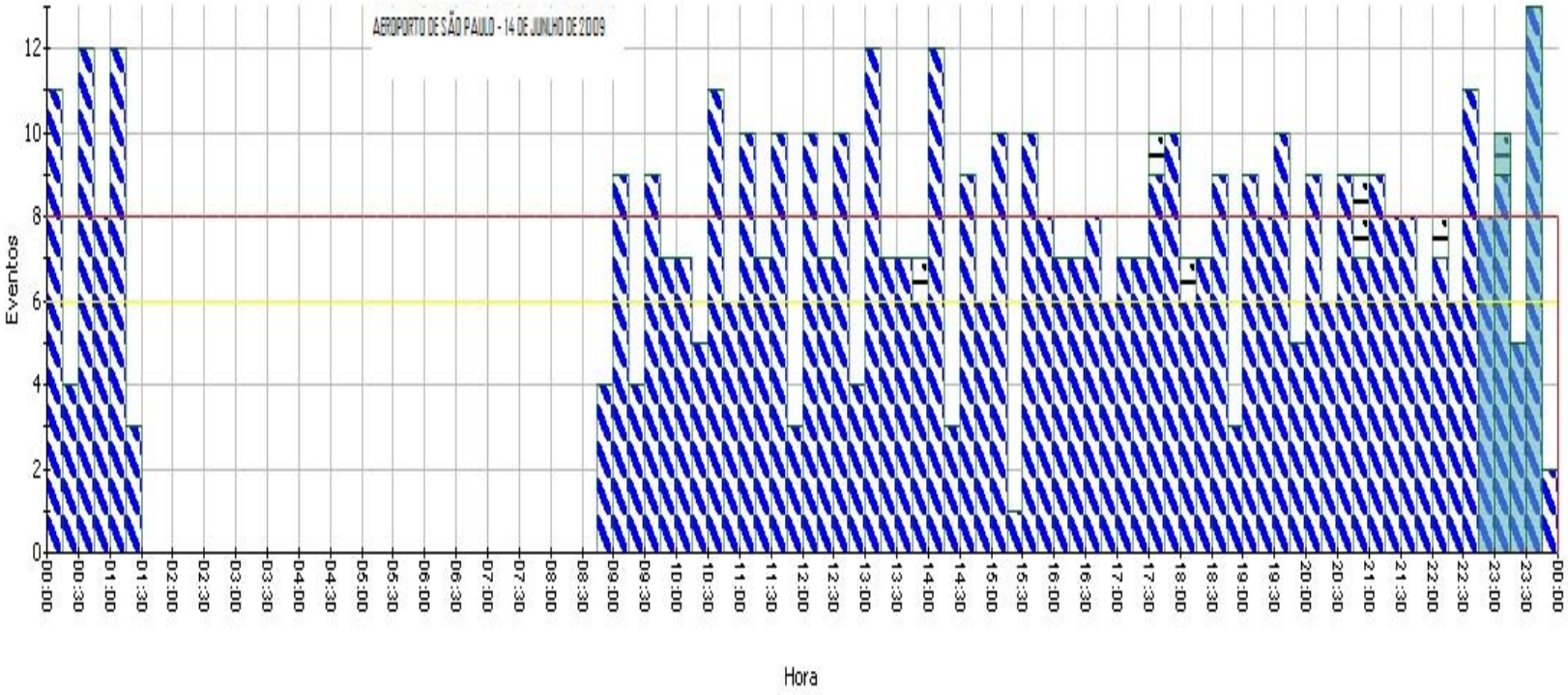
ATTACHMENT B

FLOW CHART ATFM ANALYSIS



ATTACHMENT C

SYNCROMAX DEMAND AND CAPACITY ANALYSE



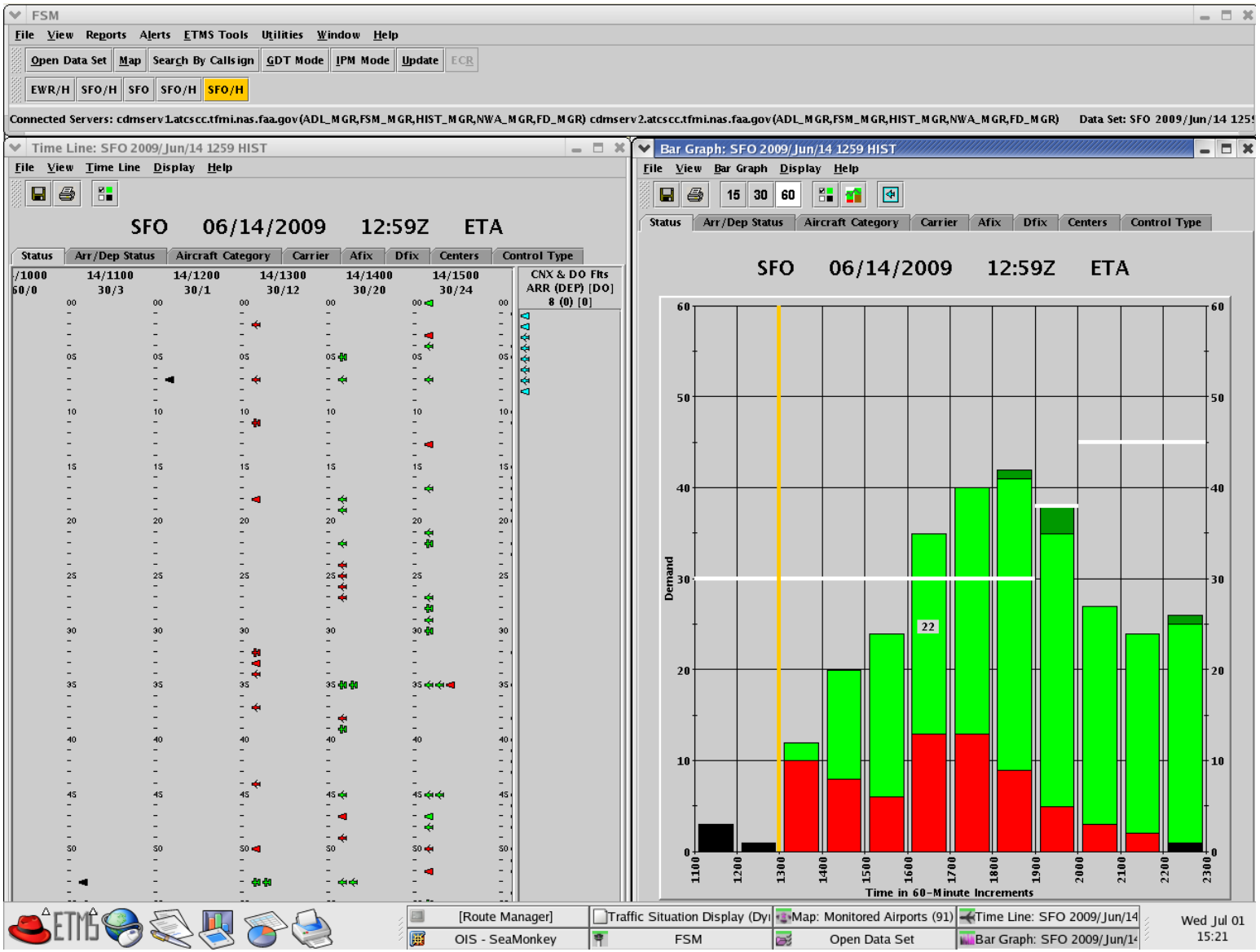
PROSAT

- **PRO**nóstico de **SAT**uración
  - Saturation Forecast

- Integral software in use at CCFMEX since February 2002. It provides a forecast up to four hours in advance of possible air traffic congestion at México City RTCU.

- It is capable to receive and process any ATS messages in addition to particular ones (FLU, SSL) in order to calculate ETA to the designated airport.

  - México City (MMMX)
  - Cancún (MMUN)
  - Guadalajara (MMGL)
  - San José del Cabo (MMSD)
  - Toluca (MMTO)
  - Monterrey (MMMY)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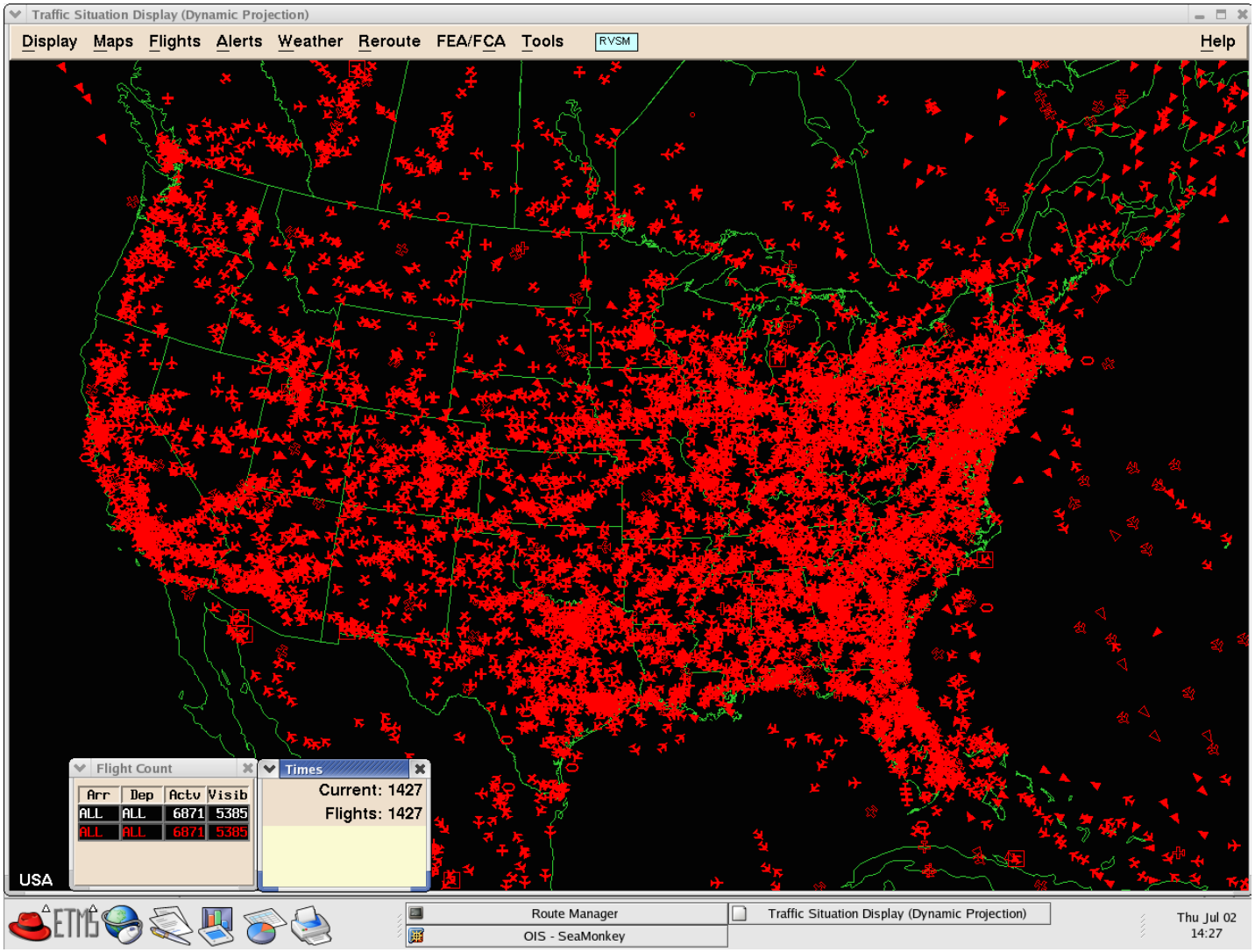
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USA
Route Manager
OIS - SeaMonkey
Traffic Situation Display (Dynamic Projection)
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14:27

ATTACHMENT D

INTERNATIONAL OPERATIONS PLANNING TELCON FORMAT

_____ Greeting and introduction

xxxxZ planning telcon, working from advisory xxx
Covering the timeframe from xxxx UTC to xxxx UTC

_____ Common Weather Products – working from

1) the ICAO Area "A" Prog Chart, valid xxxx UTC for (Date)
2) the ICAO Area "A" IR Satellite photo, xxxx UTC for (Date)

_____ Planning discussion -- Work from south to north then from the Caribbean to the Pacific (east to west)

Significant weather and atmospheric conditions

Thunderstorm activity
Turbulence
Volcanic ash clouds

Terminal discussion

For select aerodromes:

Airport/Sector Capacities
Projected terminal demand
Aerodrome constraints, such as construction projects or NAVAID outages

Anticipated traffic management initiatives (TMIs)

Expanded miles-in-trail
Potential airborne holding
Potential ground stops

Enroute discussion

Enroute constraints, such as frequency outages or NAVAID outages
Route discussion and issues
Anticipated TMIs

Expanded miles-in-trail
Potential airborne holding

_____ Additions to the plan, including any pertinent tactical updates.

_____ Stakeholder input, comments, and questions

_____ Next International Planning Telcon: xxxxZ