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Transition to CNS/ATM Systems in the CAR and SAM Regions

SECOND MEETING OF THE GREPECAS ATM/CNS SUBGROUP ATM COMMITTEE AIR TRAFFIC MANAGEMENT TASK FORCE – (ATFM/TF/2)

(Bogotá, Colombia, 6 to 8 July 2006)

Agenda Item 2: Caribbean/South American ATFM Concept of Operations (ATFM CAR/SAM CONOPS)

ICAO PROVISIONS FOR AIR TRAFFIC FLOW MANAGEMENT (ATFM) IN THE CAR/SAM REGIONS

(Presented by the Secretariat)

SUMMARY

This Working paper presents information on the ICAO provisions for Air Traffic Flow Management (ATFM) service.

References:

- Annex 11
- Doc 4444
- Doc 9854
- Doc 9735
- Report of the Thirteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/13), Santiago, Chile, 14 to 18 November 2005).

1. Introduction

1.1 In several NAM/CAR Flight Information Regions in the past years, air operations saturation periods have occurred; in some airports there have been traffic increases up to 13%; it is foreseen that this problem will continue growing once have kept a continuous growth of operations. Some States have taken the initiative of implementing ATFM measures.

1.2 Operators have expressed GREPECAS their concern for the high cost of fuel and since this crisis affects airlines, as well as the fuel savings campaign initiated by IATA, through which service ATS providers have been requested to adopt actions addressed to the achievement of the greatest possible efficiency in the use of fuel, which would undoubtedly help users to overcome the cost problem. GREPECAS has expressed its commitment of taking into account this situation in all its activities aimed at studying and developing new strategies and ATM implementation.

1.3 The Thirteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/13), formulated, among other, the following conclusions concerning the development of Air traffic flow management (ATFM):

- **Decision 13/64 -** *Centralized ATFM Objectives, Principles and Functions and Requirements for its Implementation*
- **Decision 13/65 -** *Model Action Plan for ATFM Implementation in the CAR/SAM Regions*
- **Conclusion 13/67 -** *ATFM Events*
- **Decision 13/69 -** *Efficiency in the Use of Fuel*

2 Analysis

2.1 Annex 11, points out that ATFM shall be implemented for airspace where air traffic demand at time exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned. ATFM should be implemented on the basis of regional air navigation agreements or through multilateral agreements.

2.2 According to Doc 9854 – Global air traffic management operational concept the ATFM implementation should be done by phases so as aiming progressive evolution and achieve required system capacities; each phase should be implemented in basis to operational requirements, descriptive documents and operational models, according to the regional strategy agreed such as following sequence:

a) Strategic ATFM
b) Pre-tactical ATFM
c) Tactical ATFM.

2.3 Doc 4444, PANS- ATM, indicates basic procedures that should be observed for the implementing phases of ATFM service. Doc 9854 also depicts improvement guidelines for airspace organization and management (AOM), flexible use of airspace (FUA), airport operations and Traffic Synchronization (TS), such as Airspace User Operations (UO) related to ATFM system.

2.4 The Doc 9426 indicates that the ATFM service within a region or other defined area, should be developed and implemented as a centralized ATFM organization, supported by flow management positions (FMPs) established at each area control centre (ACC) within their area of applicability. The procedures governing the provision of the ATFM measures and services should be prescribed in a regional ATFM manual or handbook.

2.5 In the event that traffic demand regularly exceeds capacity or when it becomes apparent that forecast traffic demand will exceed the available capacity the appropriate ATFM units, in consultation with aircraft operators, initially should consider implementing measures aimed at improving the use of the existing system capacity, and developing plans to increase capacity so as to meet the forecast demand.

2.6 To meet this objective, the Air traffic flow management (ATFM) is a service addressed to ensure a balance between air traffic with the declared capacities and helps air traffic control (ATC) to use to the maximum extent its capacity to serve service demand. In order to attain its objectives, the ATFM unit (FMU) monitors air traffic and, if applicable, issues management initiatives to keep a safe, orderly and timely movement of the air traffic flow.

2.7 For the ATFM system, the totality of airspace should be considered as an available resource for users, establishing a dynamic and flexible management wherein any restriction be considered only on a temporary basis. In order to achieve this, one of the objectives of the ATM system is to encourage the flexible use of the global airspace through the optimization and equitable balance in the use of airspace between civil and military users, facilitated through strategic coordination and dynamic interaction of civil and military air traffic services including real-time civil/military controller-to-controller co-ordination.

2.8 The flexible use of airspace (FUA) should not be designated purely as civil or military, but rather as a continuum in which all user requirements are accommodated to the greatest possible extent; should result in the removal of large tracts of permanent or transient restricted airspace or special use airspace, to accommodate specific individual airspace uses, thereby blocking airspace of certain dimensions should be on a transient basis. Collaborative decision making is an extension of the principles of the flexible use of airspace to include airspace users in flight in decision making with respect to tactical assessment of the use of reserved airspace and requirements for transit times of special use airspace.

2.9 To the extent possible airspace should be structured free from operational discontinuities, inconsistencies and differing rules and procedures; alignment of airspace classifications can facilitate the implementation of ATFM service, introduction and better utilization of data link communications, an improved flight plan processing system, and advanced airspace management coordination tools and message exchange capabilities, leading to progressively more flexible and dynamic airspace management.

2.10 The user-preferred routes make pretend using of the capability of aircraft, based on a range of flight parameters. In accordance with this concept, States/Territories/International Organizations should encourage that ATS routes or tracks not be fixed to pre-determined routes or waypoints, except where required for control purposes; random routing permits defining areas within which routes are not designated and where aircraft may determine an appropriate track from an entry point to an exit point.

2.11 Also collaborative airspace design and management should be aimed to improve organizing airspace in a cooperative manner with all users so to accommodate the preferred trajectories of the users. States/Territories/International Organizations should take advantage of aircraft capabilities when designing and implementing airspace changes; collaboration with airspace users will permit identify procedures and/or solutions accordance with available aircraft capabilities.

2.12 States, Territories and International Organizations should carry out efforts to increase airspace management efficiency, optimizing air routes and transfer points with the aim of decreasing the workload of pilots and controllers and facilitating the safe, orderly and timely flow of air traffic, which in turn would mean savings for airspace users. When adopting these changes, the civil aviation administrations should also consider the impact of the new technology on their sovereignty and national security, and the military operations among other things.

2.13 The traffic growth in the NAM and CAR Regions represents new conquests and collaboration opportunities to achieve an interoperable regional ATM development. The States and Territories of should review the airports ATS organization and airspace management allowing a better efficiency, flexibility and optimization for the benefit of users and service providers. Other aspects to be resolved in the short-term are the following:

- Enhance civil/military coordination and co-operation aiming to achieve dynamic and flexible use of airspace
- the development of an ATFM operational procedures manual for its common application, including specifications to determine the airport capacity and ATS capacity;
- publish ATFM procedures in Doc 7030 and in the AIP, such corresponds;
- publish available service capacity according to ICAO guidelines;
- establish improvements regarding surveillance and automated systems for aircraft data processing as well as the development and co-ordination of ATFM messages;
- the effective planning of human resources and required training aspects;
- develop improvements of traffic forecast;
- encourage improvements of random routes, as well route network programmes; and
- encourage new operational agreements between ATS users and providers for ATFM implementations, especially in those areas where flow problems are already present caused by the traffic increase.

2.14 In order to improve the efficiency of air operations, the Meeting should foster the up-dating or establishment of operational agreements between ATS units in the short term and examine other agreements that might be necessary the mid-term. Therefore, the following Draft Conclusion is suggested for the Meeting's consideration:

DRAFT
CONCLUSION NAM/CAR ATM//X ATFM OPERATIONAL AGREEMENTS

That CAR/SAM States/Territories, that not done so, encourage ATS providers to establish operational agreements among ATS units for ATFM service provision in the CAR and SAM Regions by **30 November 2007**.

2.15 ATFM implementation will facilitate the path towards a seamless global harmonized and inter-operable air traffic management (ATM) system, merging efforts, data, knowledge, ideas, and concepts, and will contribute with great financial benefits, an enhanced safety, an increased ATM system capacity, and effectiveness of air operations. The **Appendix A** to this Working Paper depicts best practices for demand capacity balancing (DCB) management, basic criteria to assess ATC workload and planning requirements of ATM human resources.

2.16 The collaborative decision-making (CDM) process facilitates the planning, coordination and the dynamic application of ATFM initiatives for an efficient airspace and airports management, which results in an efficient use of resources and capacities in air operations, as well as in financial benefits for users and ATS providers. CDM also provides an equitable access to information, which in turn facilitates a better planning of air operations at the airports and accommodates the preferred routes of airspace users. CDM should be part of the planning, decision making, implementation and follow-up activities; **Appendix B** includes the basic characteristics of a CDM process.

2.17 The ATFM works should optimize human resources, savings, as well as dynamic use of communication means such as internet video conference, teleconferencing, e-mail, telephone and facsimile, which should be encouraged during the ATFM coordination period. The Meeting should ensure that the Strategic Objectives of ICAO are applicable to the work programmes and terms of reference of different intra-regional Working Groups and therefore must be reviewed taking into consideration the new Global Plan Initiatives (GPIs) and related ICAO on-line planning tools associated with future planning and implementation work.

3. Suggested action

3.1 Bearing in mind the foregoing background, the Meeting is invited to:

a) note the information presented in this Working paper;

b) adopt Draft Conclusion mentioned in paragraph 2.14;

c) recommend specific actions for the implementation of Air Traffic Flow Management (ATFM) in the CAR/SAM Regions;

d) recommend the appropriate actions to improve demand capacity balancing management in the airspace and international aerodromes of the CAR/SAM Regions; and

e) recommend other actions as appropriate.

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APPENDIX A

Demand capacity balancing (DCB) management

Capacity is maximum number of flights which can be handled from gate to gate can be measured by daily, monthly and/or annually to monitor performance system in effective, average and future manner in:

- Airport – acceptance arrival rate
- Terminal and enroute – maximum number of flights in sector/FIR

The purpose of DCB management is to establish sufficient capacity to provide service to normal and peak time traffic levels; to increase capacity.

When all the agreed requirements are adequately covered, the service capacity is 100%; the latter reduces when said requirements are restricted in their operation; the more restriction of resources corresponds less service capacity.

A record of all the aspects concerning the declared capacity should be carried out, in order to be able to determine when it is reduced or needs to be increased, the responsible ATS authority shall ensure that agreed safety levels are not jeopardized.

Among the most important DCB management aspects are the following:

ATS capacity - In order to attain its maximum efficiency, the following aspects should be analyzed

- Airspace and route structure - the operation of all the types of aircraft foreseen with the user's preferred profiles should be allowed; the final objective is to attain a dynamic and flexible use of airspace.
- High and low sector, TMAs, restrictions, etc.
- Available infrastructure and navigation accuracy of the aircraft using the airspace and routes in regard with agreed regional air navigation requirements
- ATC workload
- Weather aspects

Airport capacity - The development and establishment of a master plan aimed at optimizing the available airport capacity should be fostered; and the future service requirements should also be studied with regard to the following aspects:

- Runway and taxiway
- Airport capacity (timing use of runway, taxiways, and ramp) delays, restrictions, SLOTS, etc.
- Airport acceptance rate: considering additional services such as ramp, immigration, custom, and others related for:
  - VFR operations
  - IFR operations

Basic criteria to assess ATC workload

It should carry out an analysis of ATC workload under following considerations:

- Average operations volume
- Short and medium terms (2010/2015)
- Personnel increments and decrements, upon operational justification
- Average percentage of last 6 months
- Increase one ATCO when the total rate number is higher than 50%
- Determining required personnel to cover week days off, vacation periods and others
- Justify changes for other factors
- Adequately cover positions in accordance with ATS unit purposes
- Traffic volume, specially peak time periods during the shift
- Avoid affecting service
- Equitable distribution of workload
- ATCOS available during their journey
- Average operations that ATC personnel (ACC) may handle in one shift (e.g. 8 Hrs)

E.g. RADAR duties

Tc	=	COMMUNICATION TRANSFER	30”
COM	=	COMMUNICATION (INSTRUCTIONS)	75”
C	=	SEPARATION	45”
			150”

$$C = \frac{3600}{TC+COM+S} = \frac{3600}{150} = 24 \text{ OPS/h}$$

24 OPS X 8 = 192

Average of operations that ATC personnel (ACC) may handle in one shift (e.g. 8 Hrs)

NON RADAR duties

COR	=	COORDINATION
CO	=	COMMUNICATION
S	=	SEPARATION
TCO	=	COMMUNICATION TRANSFER

$$C = \frac{3600}{COR+CO+S+TCO} = \frac{3600}{240} = 15 \text{ OPS/h} : 105$$

ATC Capacity Sector

$$C = \frac{3600}{TFC}$$

C	-	Capacity
TPS	-	Flight sector average time
TFC	-	Average time performing ATC duties (Control Transferring, Communication Separation)

Planning requirements of ATM human resources

Upon specific operational requirements, when possible, the following requirements for ATM human resources planning should be analyzed:

- Air Traffic Controller - TWR
- Air Traffic Controller - APP
- Air Traffic Controller - Area
- Air Traffic Controller – Radar/APP
- Air Traffic Controller Radar/Area
- ATC Operational Supervisor
- ATFM coordinator
- ATC/OJT Instructor
- ATS airspace planning Officer
- ATS regulations Officer
- ATM Quality Assurance Officer and Safety Officer
- ATM internal auditor Officer

An appropriate ATM human resources planning also should seen:

a) Number of operations (VFR/IFR)

b) ATC service management required in airspace sectors

c) The impact of new implementation and technical communication improvements (CPDLC, ADS, etc.) in the ATC workload

d) the ATCO workload not be higher than 80% of individual capacity during the shift peak hour

e) Additional activities such as capture flight plan data, coordination, transfer or a combination of these

f) individual ATCO capacity may increase up to 100% with an assistant

g) the total of ATS personnel should be calculated annually considering vacation period and other foreseen absence variables

h) the operational capacity should foreseen as additional aspect the supporting personnel (planning, organization, supervision, administration)

i) the higher the unit more precise calculations should be done

j) Once the number of human resources has been assessed the non used capacity should be seen as reserve to cover emerging cases when capacity increases are required.

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APPENDIX B

COLLABORATIVE DECISION MAKING (CDM) PROCESS

The purpose of Collaborative decision-making is satisfy the convened levels of capacity and efficient use of resources, and allows that all members of the ATM community, especially airspace users, to participate in ATM decision-making that affects them. The level of participation reflects the level to which the decision will affect them.

Collaborative decision-making applies to all layers of decisions, from longer-term planning activities through to real-time operations. It applies across all concept components of the ATM system and is an essential element to achieving an acceptable solution, which takes into account the needs of those involved. ; the rules for determining priorities for access to an ATM resource will have been collaboratively agreed in advance, applied both actively and, through agreed procedures, passively.

Effective information management and sharing will enable members of the ATM community to each be aware, in a timely manner, of the needs, constraints and priorities of other members in relation to a decision-making issue. Collaborative decision making can occur between airspace users directly, without any involvement of an ATM service provider. Any member of the ATM community can propose a solution

Where a service provider is involved in collaborative decision making because of a requirement of the ATM system, it is often the ATM service provider who will propose a solution for consideration of the airspace user, as the service provider is aware of the requirements of other users and service providers and the collaboratively agreed rules for resolving competing requests for an ATM resource. However, because it is an information rich environment where the airspace user may have access to the same information as the service provider, the airspace user will understand why the particular solution is proposed.

A user can propose an alternative solution that addresses a user's preference that is not known to the service provider. In the same way the service provider can reject the user's proposed solution because of an ATM requirement that the user is not aware of.

Information management

Information management aims at integrating the ATM network in the information sense, not just in the system sense, forms the basis for the migration from past one-to-one message exchange concept to the future many-to-many information distribution , to geographically dispersed sources which collaboratively updating the information, with many geographically dispersed destinations.

Information managing the quality, integrity and accessibility of this complex, growing web of distributed will ensure that the information needs of ATM stakeholders, both within as well as outside the ATM network, will be satisfied in a much more flexible and cost-effective manner than previously.

Decision-making is a normal operational process, but decisions will be of a better quality and engender greater confidence because accurate and validated information in the right form, in the right place and at the right time. An open systems environment and better information management will allow information sharing on a much wider basis than hitherto, and will support a permanent dialogue between the various partners, throughout all phases of flight.

Automated systems are big support for CDM and ATM en-route services. The aim of these systems are conformance and safety monitoring.

Phases of flight

Trough CDM in the departure and landing phase of flight, ATM service delivery management might ensur that flights can get to the runway in time for their take-off slot and at the same time to integrate them with all the other departing and arriving flights in order to ensure safety and to optimize the use of the parking locations, ramps, taxiways and runways. The ATM service delivery management will ensure that service providers are given access to real-time data on projected arrivals and departures, runway loading, airport congestion, parking locations and environmental considerations, in order to reduce the inefficiencies in aircraft and vehicle movements. Within the en-route phase of flight, ATM service delivery management will be involved in matching ATM service capabilities with demand — e.g. traffic flow characteristics — by a range of means, including, inter alia, dynamic re-sectorization in ATM service centres, changes to route structures or airspace organization, or changes to conflict management modes.

During the course of a flight — from its inception at a scheduling or planning stage, through its actual operation, to its completion at an arrival parking location
a) planning — integration into the ATM environment to achieve a close match between user preferred trajectory and system delivered trajectory;

b) ramp —moving of the aircraft in and out of the parking locations;

c) surface-departures — moving aircraft from ramp to departure queue;

d) departure —the departure queue and the runway are managed to launch aircraft from the queue into the airspace;

e) dispersion — where aircraft get up and out of the terminal into the en-route structure;

f) cruise — in which the aircraft is at altitude and moving towards its destination, but it is not yet subject to actions related to its arrival phase;

g) collection — the state in which aircraft are sequenced and spaced to bring them into the terminal area for arrival;

h) approach — in which aircraft are assigned to runways and onto the surface;

i) surface-arrival — moving aircraft off runways and to the ramp; and, once again

j) ramp — working the aircraft into the parking location.