FINAL VERSION
ATM/COMM/5 REPORT

INTERNATIONAL CIVIL AVIATION ORGANIZATION

CAR/SAM REGIONAL PLANNING AND IMPLEMENTATION GROUP

(GREPECAS)

ATTACHMENT 1

TO THE REPORT OF THE FIFTH MEETING OF THE ATM/CNS SUBGROUP OF GREPECAS

"REPORT OF THE FIFTH MEETING OF THE ATM COMMITTEE OF THE ATM/CNS SUBGROUP OF GREPECAS (ATM/COMM/5)"

(Lima, Perú 13 to 17 November 2006)

Prepared by the Secretariat

November 2006

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE FIFTH MEETING OF THE ATM COMMITTEE OF THE GREPECAS ATM/CNS SUBGROUP

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Prepared by the GREPECAS
ATM/CNS Subgroup Secretariat

November 2006

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HISTORY OF THE MEETING

History of the Meeting

ii.1 Place and Duration of the Meeting

The Fifth Meeting of the ATM Committee of the GREPECAS ATM/CNS Subgroup (ATM/CNS/SG/5) was held at Lima, Peru. The Meeting commenced on 13 November 2006 and ended on 17 November 2006.

ii.2 Organization, Officers and Secretariat

The Meeting was chaired by Mr. Roberto Arca (Uruguay), and Mr. Fidel Ara (Cuba) was Vice-chairman of the Committee. Mr. Jorge Fernández, Regional Officer ATM/SAR of the ICAO SAM Regional Office, and Secretary of the Subgroup was assisted by Messrs. Víctor Hernández and Alberto Orero, Regional Officers ATM/SAR of ICAO NACC and SAM Offices, respectively. The Meeting met in plenary sessions, and in Ad hoc Groups when necessary.

ii.3 Working Languages

The working languages of the Meeting were English and Spanish. The documentation and the Report of the Meeting were issued in both languages.

ii.4 Agenda

The following Agenda was adopted:

Agenda Item 1: RVSM Operational use in the CAR/SAM Regions

Agenda Item 2: Report of the ATM Task Forces
- 2.1 Performance based navigation (PBN)
- 2.2 Air Traffic Flow Management (Task ATM-ATFM/400)
- 2.3 ATM automation (Task ATM/ATS/305)

Agenda Item 3: Contingency plans

Agenda Item 4: Review of Deficiencies and pending GREPECAS Conclusions/Decisions in the ATM and SAR fields (Task ATM-GRAL/100)

Agenda Item 5: Draft amendment to the CAR/SAM Regional Plan for the Implementation of CNS/ATM Systems

Agenda Item 6: Matters related to the organization of the ATM Committee

6.1 Review of the ATM Committee Terms of Reference and Work Programme and its Task Forces
6.2 ATM Committee Future Work Programme

Agenda Item 7: Other matters

ii.5 **Schedule and Working Methods**

The Meeting held its sessions as a Whole since Monday 13 November 2006 from 1130 to 1600 to 16 November 2006, from 0900 to 1530 hours, with appropriate breaks. Two Ad-hoc groups were formed, ATM Automation and Analysis of the CAR/SAM Transition Plan towards the ATM System.

ii.6 **Conclusions and Decisions**

The ATM/CNS Subgroup records its activities in the form of Draft Conclusions, Draft Decisions, and Decisions, as follows:

Draft Conclusions: *Conclusions that require approval by GREPECAS prior to their implementation.*

Draft Decisions: *Decisions that require approval by GREPECAS prior to their implementation*

Decisions: *Decisions that deal with matters of concern to the ATM/CNS Subgroup and its Committees.*

The first two ones are submitted to the ATM/CNS Subgroup for further submission to GREPECAS and the last ones are for the information of the Subgroup with respect to the internal activities of the Subgroup.

List of Draft Conclusions

NUMBER	TITLE	PAGE
DRAFT CONCLUSION ATM/5/1	COLLECTION OF AIR TRAFFIC SAMPLES	1-7
DRAFT CONCLUSION ATM/5/2	TRAINING ON THE ANALYSIS OF LARGE HEIGHT DEVIATIONS (LHD)	1-8

List of Decisions

List of Documentation

Working Papers

Number	Agenda Item	Title	Date	Presented by
WP/01	1	Agenda Items, Working Methods, Schedule and Work Plan	14/09/06	Secretariat
WP/02	1	Review of CAR/SAM RVSM matters	04/10/06	Rapporteur GT/SAM
WP/03	1	Assessment of the actions to be taken to reduce LHD	16/10/06	Rapporteur GT/GTE
WP/04	2	CAR/SAM Regions Roadmap on Performance-Based Navigation (PBN)	24/10/06	Rapporteur GT/PBN
WP/05	2	CAR/SAM Regions Air Traffic Flow Management (ATFM) Operational Concept	16/10/06	Rapporteur GT/ATFM
WP/06	2	Interphase Control Document (ICD) for the integration of CAR/SAM Regions ATM automated systems	10/10/06	Rapporteur GT/AUTO/TF/2
WP/07	3	Situation of ATM contingency plans in the CAR/SAM Regions and form for the regional contingency plans catalogue	17/10/06	Secretariat
WP/08	4	Deficiencies identified in the ATM and SAR fields	10/10/06	Secretariat
WP/09	4	GREPECAS Pending Conclusions and Decisions related with ATM and SAR	30/10/06	Secretariat
WP/10	5	Draft amendment to the CAR/SAM Regional Plan for the implementation of CNS/ATM Systems –ATM Evolution tables	12/10/06	Secretariat
WP/11	6	ICAO Strategic Objectives and Global Plan Initiatives (GPIs)	29/09/06	Secretariat
WP/12	6	Review of the Terms of reference, Work Programme and New Work Programme of the ATM Committee	24/10/06	Secretariat
WP/13	7	West Atlantic Route System (WATRS) plus airspace redesign and separation reduction initiative	16/10/06	United States
WP/14	7	International Cricket Council Cricket World Cup 2007 ATFM Tasks	31/10/06	Trinidad y Tobago
WP/15	2	Traffic Flow Management	27/10/06	Mexico

Information Papers

Number	Agenda Item	Title	Date	Presented by
IP/01	--	List of working papers and information papers	09/11/06	Secretariat
IP/02	2.2	Gestión de Afluencia de Tránsito (Tarea ATM-ATFM/400)	27/10/06	Cuba
IP/03	7	Operational Approval For Required Navigation Performance 10 (RNP 10) West Atlantic Route System (WATRS) Plus Airspace Redesign and Separation Reduction Initiative	27/10/06	USA
IP/04	2.2	Action plan for ATFM implementation in Central America	31/10/06	Cocesna

Agenda Item 1: RVSM Operational use in the CAR/SAM Regions

CAR/SAM Regions RVSM Post-implementation safety assessment

1.1 The Meeting took note that during the AP/ATM/10 Meeting (May 2005), the CAR/SAM Regions' RVSM Task Force analysed the safety assessment associated with RVSM which was implemented in January 2005.

Technical risk

1.2 The meeting recalled that the goal of the RVSM post-implementation safety assessment is to demonstrate that the TLS of 2.5×10^{-9} fatal accidents per aircraft flying hours is being satisfied with a high level of confidence**.** The technical risk was evaluated considering aircraft movements in three adjacent FIRs of the CAR Region and four from the SAM Region as was done in the pre-implementation safety analysis. The selection of FIRs was based on those that presented the larger rate of passing frequencies according to the traffic sample collected from 1 to 15 December 2005. At that time, Havana, Central America and Kingston FIRs and Curitiba, Brasilia, Recife and the Manaus sector from Amazónica FIR were analysed.

1.3 The collision risk was evaluated individually for the CAR and SAM Regions and for the total CAR/SAM airspace, as shown in the table below, where IOP represents the phase immediately after implementation and FM-I represents operations a year after implementation.

Technical Collision Risk

Caribbean		**South America**		**CAR/SAM**	
FM-I	**IOP**	**FM-I**	**IOP**	**FM-I**	**IOP**
0.140×10^{-9}	0.112×10^{-9}	0.036×10^{-9}	0.081×10^{-9}	0.076×10^{-9}	0.098×10^{-9}

Effect of traffic growth

1.4 The evolution of collision risk in the period 2004 to 2015 was estimated using an annual traffic growth rate of 8% which directly affects the passing frequency value. It should be noted that the estimated technical risk through 2015 will remain below the limit of 2.5×10^{-9}.

Operational Risk

1.5 The Collision Risk Model (CRM) for operational risk was developed in connection with CAR/SAM RVSM implementation. As such, it reflects certain operational characteristics of the CAR/SAM Regions that are not common to other airspaces. The study was based on reported large height deviations (LHD).

1.6 The LHDs identified in reports received by CARSAMMA are caused by operational procedures, adverse meteorological conditions or emergency procedures due to equipment failures or pressurization and can be divided into four main groups:

a) ATC-pilot loop errors and incorrect clearances;
b) aircraft contingency events;
c) deviations due to meteorological effects; and
d) deviations due to ACAS.

Classification of errors and risk evaluation

1.7 The causes of the group errors were classified and contribute to two different events:

- *Aircraft leveling at a wrong flight level*;

  According to information analysed, 43 aircraft levelled at a wrong flight level, reaching 4215 seconds with the average time spent at the wrong flight level 0.02723 hours. Two aircraft levelled in the opposite direction of the flow.

- *Aircraft climbing/descending through one or more flight levels*.

  According to information analysed, 20 crossings of flight levels have occurred without ATC clearance and thirteen of them in the opposite direction of the flow.

1.8 All deviations due to non-severe meteorological effects (more than or equal to 300ft and less than 1000ft) were considered in the AAD distribution.

1.9 The deviations due to *ACAS (TCAS)* were classified and analysed according to a specific model. For this, a composite distribution of typical and atypical performance was developed considering the *ACAS* deviations using the same model composed of a double-double exponential as used to the AAD distribution.

Risk Assessment for RVSM operations in the CAR/SAM Regions

1.10 An estimate of risk associated with all causes in connection to RVSM use was presented. The technical and operational risk values were combined to estimate the total risk attributable to all causes for the system.

1.11 The vertical collision risk was calculated with the Reich Collision Risk Model associated with each group of LHDs. In the following table, the values of risk for the resulting models are presented:

- N_{az}^{tec} is the technical vertical risk;
- N_{az}^{ne} is the vertical risk due to aircraft leveling at a wrong flight level;
- N_{az}^{nc} is the vertical risk due to an aircraft crossing a flight level without ATC clearance;
- N_{az}^{ACAS} is the vertical risk due to ACAS advisories; and
- N_{az} is the vertical collision risk due to all causes or the total risk.

Collision Risks to the CAR/SAM Region

Risk	CAR		SAM		CAR/SAM		*TLS*
	FM-I	IOP	FM-I	IOP	FM-I	IOP	
N_{az}^{Tec}	1.4×10^{-10}	1.1×10^{-10}	3.6×10^{-11}	8.1×10^{-11}	7.6×10^{-11}	9.8×10^{-11}	5.0×10^{-9}
N_{az}^{ACAS}	1.3×10^{-10}	2.4×10^{-11}	3.4×10^{-11}	1.6×10^{-11}	7.1×10^{-11}	2.0×10^{-11}	
N_{az}^{ne}	2.6×10^{-9}	0.0	8.2×10^{-9}	3.0×10^{-9}	6.1×10^{-9}	1.8×10^{-9}	
N_{az}^{nc}	3.9×10^{-10}	0.0	8.8×10^{-10}	1.2×10^{-10}	6.7×10^{-10}	7.6×10^{-11}	
N_{az}^{Total}	3.3×10^{-9}	1.4×10^{-10}	9.0×10^{-9}	3.2×10^{-9}	6.9×10^{-9}	2.0×10^{-9}	

1.12 The result of the assessment carried out, considering technical risk and the risk due to all other causes, indicates that the total risk for the CAR/SAM Regions is greater than the agreed TLS.

1.13 It is necessary to remark that this total risk was strongly influenced by LHDs, most of which were due to errors in ATC-unit-to-ATC-unit coordination messages. Those errors are not caused by RVSM operations, but are due to failures in common procedures in transferring aircraft from one ATC Unit to another.

1.14 Based on the traffic in the CAR/SAM Regions, roughly 1253 seconds per year of aircraft leveling at wrong flight levels can be tolerated without exceeding the agreed TLS if no aircraft crosses a flight level without ATC clearance. Alternatively, 97 flight level crossings without ATC clearance can be tolerated as long as no aircraft levels at a wrong flight level and the rate of climb/descent of 10 kts is not exceeded.

1.15 Consequently, to reduce the risk it is necessary to implement effective remedial actions to reduce the time spent at wrong flight levels and the number of flight levels crossed without ATC clearance.

1.16 Considering the above, the Meeting considered it necessary to continue to monitor LHDs and to take actions to reduce them to within acceptable limits.

1.17 The analysis of the causes in LHD reports revealed that errors in the ATS coordination loop had a direct impact on safety. In order to drastically and significantly reduce the occurrence of this type of error, the CAR/SAM States/Territories/International Organizations should commit to the urgent adoption of the measures referred to in GREPECAS/13 Conclusion 13/61 *"Measures to reduce operational errors in the ATC coordination loop between adjacent ACCs"*, and particularly the Error Prevention Programme in the ATC coordination cycle between adjacent ATS units, associated with the referred conclusion.

1.18 In addition to the aforementioned conclusion, the Grupo de Trabajo de Escrutinio (GTE) proposed the following recommendations:

> That States/Territories/International Organizations do their utmost to send to CARSAMMA the LHD reports by the 10th of each month, even if no deviations have occurred.

That States/Territories/International Organizations, when completing the LHD form, fill in all the fields in order to permit an adequate analysis and the determination of the time spent by the aircraft at a wrong flight level or altitude.

That all large height deviation reports submitted to CARSAMMA are confidential, containing only de-identified data.

1.19 During its last meeting, the GTE reviewed Large Height Deviation Reports submitted to CARSAMMA and noted that the primary cause of reported LHDs in the CAR/SAM Regions is still category "M", that is, error in ATC-unit-to-ATC-unit coordination messages, and proposed the following actions as short and mid-term solutions:

<u>Short-term actions</u>

a) That States, Territories and International Organizations continue their excellent compliance with the LHD requirements to report to CARSAMMA on a monthly basis.

b) States, Territories and International Organizations distribute a copy of category "M" error messages (ATC-unit-to-ATC-unit in coordination messages) and category "N" messages (No ATC unit coordination message was received) (see **Appendix A** to this part of the report) to the adjacent ACC involved in addition to CARSAMMA.

c) When a trend is identified from the reports, the States, Territories, and International Organizations shall share information and shall meet on a bilateral basis to develop a solution to the cause of the identified LHD.

d) Because some ACCs adjoin international oceanic airspace, ICAO NACC and SAM Regional Offices are requested to advise the corresponding adjacent ICAO Regional Offices (EUR/NAT, WACAF) of the LHD reports from the adjacent ACC and urge positive interaction with the reporting CAR/SAM unit.

<u>Medium-term actions</u>:

a) Implement a safety management system as stated in Annex 11.

b) Progressively implement ATS interfacility data communications (AIDC), which will enhance the safety of the airspace and shall reduce category "M" errors.

Note: It is recognised that implementing AIDC can be expensive and that the CAR/SAM States which consider it appropriate, begin arrangements to submit to the World Bank an application for sufficient monies to enhance their automation systems. The Meeting recalled that AIDC is addressed within the Automation Task Force Program and therefore no additional action is required at this point.

1.20 In view of the above, the Meeting considered it appropriate to request that GREPECAS approve these new corrective actions, additional to those reflected in Conclusion 13/61, and to include them in the Error Prevention Programme in the ATC coordination loop between adjacent ACCs.

Total risk after the remedial actions

1.21 The identified remedial actions should result in a reduction of time spent at wrong flight levels so that the collision risk will no longer exceed the TLS. If the type M LHD is excluded from the analysis, the estimated result of total risk attributable to all causes related to the use of RVSM in the CAR/SAM Regions is below the TLS.

1.22 Summarizing, the technical risk estimated for the combined RVSM implementations is 7.6×10^{-11}. This estimate satisfies the agreed TLS value of no more than 2.5×10^{-9} fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 1000 ft.

1.23 The total risk estimated for the combined CAR/SAM RVSM airspace following successful remedial action would be 2×10^{-9}. The estimated total risk associated to combined technical and operational risk after adopting corrective actions, would satisfy the agreed TLS value of no more than 5.0×10^{-9} fatal accidents per flight hour due to all causes**.**

Reports of severe turbulence

1.24 The Meeting recalled that when a non-RVSM approved aircraft conducting an international flight or a domestic flight above/below exclusionary airspace is experiencing severe turbulence and requests entry into RVSM airspace, the clearance should be denied according to the regions' Concept of Operations (CONOPS) manual. This could be a safety issue and guidance for this scenario should be considered.

1.25 The Meeting advised that when a non-RVSM approved aircraft enters RVSM airspace, 2000 ft separation must be applied; this can be an increase in workload for the controller.

1.26 As stated in RVSM CONOPS documents, non-RVSM approved international flights are not permitted to enter RVSM airspace in the regions. The meeting was of the opinion that guidance could be provided to air traffic controllers on a State by State basis, as needed. The following are suggested topics to include in recommended guidance:

a. Offer lower altitude
b. Provide a vector
c. Reroute
d. If the non-approved aircraft is permitted to enter RVSM airspace
   i. Provide 2000ft separation
   ii. Provide a maximum duration

1.27 The Group recommended for these situations the following methods for validating reports of severe turbulence:

a) Ask nearby aircraft at the same FL

b) Request that the pilot submit a Pilot report concerning the severe turbulence.

Loss of in-flight RVSM capability in remote and oceanic areas

1.28 With reference to the necessity of establishing a specific procedure for allowing an RVSM-approved aircraft to remain in remote or oceanic RVSM airspace following an in-flight loss of RVSM capability, the meeting considered two separate scenarios:

a. *When direct controller pilot communications exist*:

In this situation, the pilot will report to air traffic control the loss of RVSM capability of an otherwise approved aircraft and will follow controller clearances that will be delivered based on traffic complexity, work load and the effort to maintain the highest level of safety in the airspace. 2000 feet vertical separation will be applied.

b. *When direct controller pilot communications do NOT exist*:

This situation is more difficult as the controller will NOT know that the aircraft is not mechanically capable of RVSM compliance, hence the pilot should execute the in-flight contingency procedures that already exist for use in oceanic and remote airspace. These procedures are published in ICAO PANS-ATM (Doc 4444).

RVSM approved aircraft database

1.29 The Meeting noted that CARSAMMA has developed and maintains a database on RVSM approved aircraft, which will be placed on its website (http://www.cgna.gov.br/CARSAMMA/siteESP/inicial.htm for Spanish language, and http://www.cgna.gov.br/CARSAMMA/siteUSA/inicial.htm for English language).

Renewal of RVSM operational approval and aircraft monitoring programmes

1.30 The Meeting took note of the existence of operators who prove to be misinformed with regard to requirements and renewal of RVSM operational approval as well as of monitoring programmes. Recognizing the above, the meeting encouraged States/Territories/International Organizations to reiterate these procedures among their operators.

Operational safety monitoring in RVSM airspace

1.31 Considering the need for a new safety assessment of RVSM operations in the CAR/SAM Regions through the utilisation of a Collision Risk Model, the Meeting deemed it appropriate to carry out a new data collection of air traffic movements and approved the following:

DRAFT
CONCLUSION ATM/5/1 COLLECTION OF AIR TRAFFIC SAMPLES

The States/Territories/International Organizations collect air traffic movement data in the period 15 to 19 January 2007 and provide the information to CARSAMMA not later than 15 February 2007. The data collection form to be used is shown in **Appendix B** to this part of the report.

1.32 With regard to the traffic movement data collection form, it was considered of utmost importance for CARSAMMA to have in their data base if the referred flight has inserted the letter W for RVSM approval in box 10 of the flight plan.

1.33 For this reason, the incorporation of a new column in the traffic movement data form was requested to indicate such information.

Training for GTE Members

1.34 The States/Territories/International Organizations have provided support and dedication for the continuation of the GTE activities. However, past scheduled GTE meetings revealed conflicts with concurrent meetings, thus limiting their members' participation. Additionally, a significant portion of each GTE meeting is allotted to a review of the methodology utilized by the Group, therefore reducing the amount of available time to conduct a thorough analysis.

1.35 In view of the above, and in order to ensure that the work of the GTE continues to be of excellent quality, the Meeting considered the need for developing a group of subject matter experts who are experienced in air traffic management or flight operations to be permanent participants in GTE. To accomplish this, training sessions should be conducted separate from the GTE meetings. In this regard, the Meeting adopted the following:

DRAFT
CONCLUSION ATM/5/2 TRAINING ON THE ANALYSIS OF LARGE HEIGHT DEVIATIONS (LHDs)

That, taking into account the need to have qualified experts available to assist in the activities of the GTE, the CAR and SAM States/Territories/International Organizations:

a) support training on analysis of Large Height Deviations as part of regional activities;

b) send technical experts to the training sessions envisaging those experts becoming regular participants of the GTE; and

c) that ICAO take the necessary actions to coordinate GTE training sessions in each Region.

APPENDIX A

Description of Criteria

Note: *The following terms, expressions and definitions are not approved by the ICAO's Council and should be used for analysis of Large Height Deviation purpose only.*

Cleared Flight Level – the flight level at which the pilot was cleared or currently operating (eg, Aircrew accepts a clearance intended for another aircraft and ATC fails to capture the read back error or aircrew conforms to a flawed clearance delivered by ATC)

Reference Flight Level – The altitude that would have provided at least the minimum separation (vertical or horizontal) required

That flight level from which the Height Deviation is calculated; this level may be different from the Cleared Flight Level and must often be determined by the Scrutiny Group operational experts from the data in the Large Height Deviation report

Event Flight Level – the flight level of error, the incorrect altitude of operation for an identifiable period of time without having received an ATC clearance

Height Deviation – any altitude variation of 300ft or greater from the assigned altitude, these variations can be the result of turbulence, equipment malfunction, ATC loop errors, etc.

ATC Loop Errors – any incident where there is a misunderstanding between the pilot and the controller, failure to properly coordinate altitude information or unable to maintain situational awareness

Total Deviation – the total amount of feet between the altitudes of current operation prior to the deviation and the point at which the aircraft is once again under ATC supervision, a deviation that resulted in an increase of altitude will be recorded as a positive number, a deviation that resulted in a decrease of altitude will be recorded as a negative number

Hazard Zone – 300ft buffer zone above and below each flight level (Diagram B-1)

Duration - length of time that an aircraft was level at an altitude that was not cleared by air traffic control, duration will be recorded in one second increments (Diagram B-1)

Levels Crossed – the total number of flight levels between the point that the aircraft exits the cleared flight level and is once again under ATC supervision (Diagram B-1)

Levels Final – the cleared flight level after the error/deviation

Code – a category and a subcategory assigned to each event (Diagram B-2)

Rate of Descent		Rate of Climb	
Drift	1000 ft per minute	Minimum	500
Normal	1500+ ft per minute	Normal	750
Rapid	2500+ ft per minute	Expedite	1250

Diagram B-1

RVSM Flight Levels

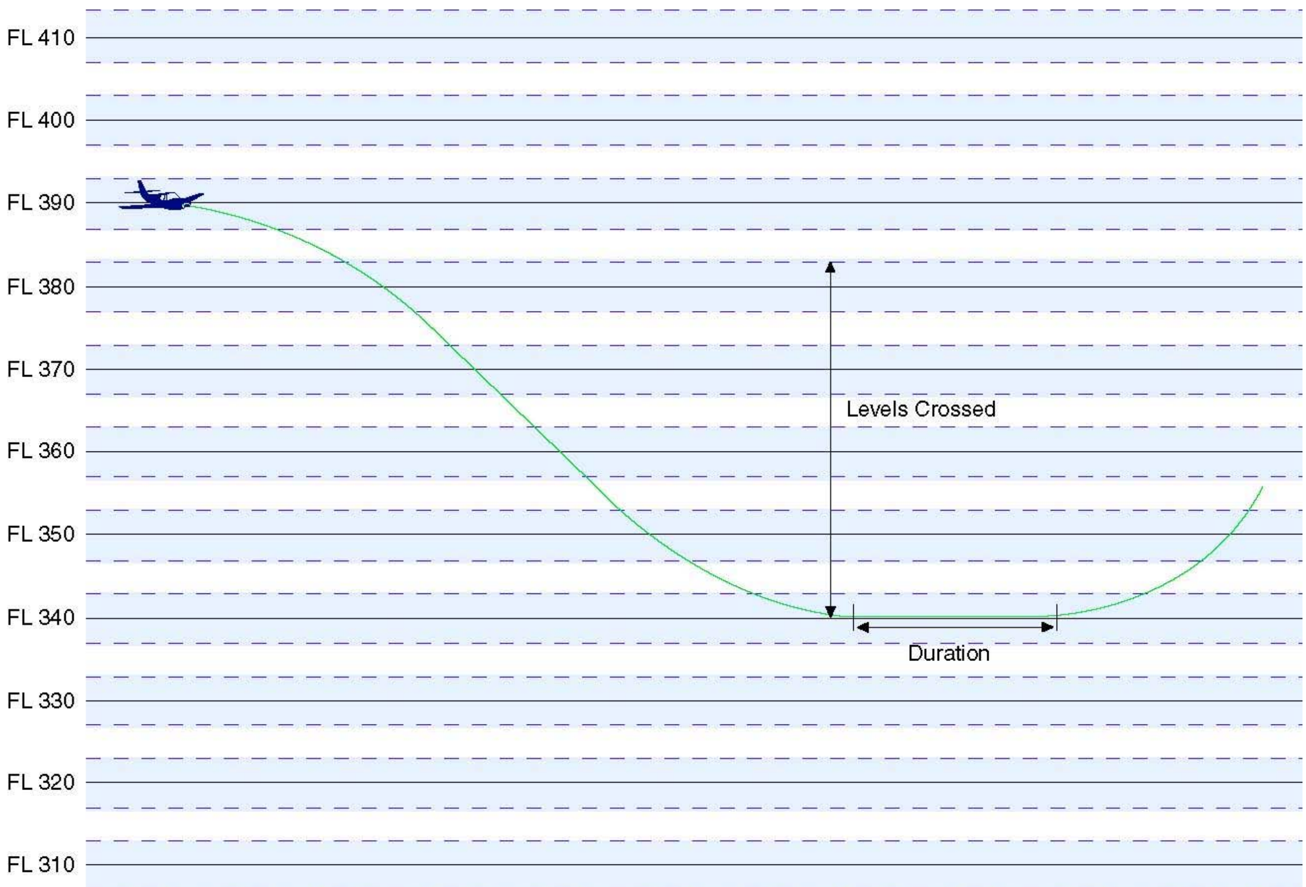


Diagram B-2

Codes for Vertical Errors Used by the CARSAM GTE

Code	**Cause of Large Height Deviation**
A	Failure to climb/descend as cleared
B	Climb/descend without ATC clearance
C	Entry into airspace at an incorrect flight level
D	Deviation due to turbulence or other weather related cause
E	Deviation due to equipment failure
F	Deviation due to collision avoidance system (TCAS) advisory
G	Deviation due to contingency event
H	Aircraft not approved for operation in RVSM restricted airspace
I	ATC system loop error ; (e.g. pilot misunderstands clearance message or ATC issues incorrect clearance)
J	Equipment control error encompassing incorrect operations of fully functional FMS or navigation system (e.g. by mistake the pilot incorrectly operates INS equipment)
K	Incorrect transcription of ATC clearance or re-clearance into the FMS
L	Wrong information faithfully transcribed into the FMS (e.g. flight plan followed rather than ATC clearance or original clearance followed instead of re-clearance)
M	Error in ATC-unit-to-ATC-unit transition message
N	Negative transfer received from transitioning ATC-unit
O	Other
P	Unknown

CARSAMMA
Caribbean and South American Monitoring Agency

The information contained in this form is confidential and will be used for safety analysis purposes only.

ALTITUDE DEVIATION FORM

Report to the CARSAMMA of an altitude deviation of 300ft or more, including those due to TCAS, Turbulence and Contingency Events

TO BE USED FOR SAFETY ANALYSIS ONLY

Today's date:	Reporting Unit:		
INCIDENT DETAILS			
Operator Name:	Call Sign:	Aircraft Type:	Mode C Displayed:
Date of Occurrence:	Time UTC:	Occurrence Position (lat/long or Fix):	
Cleared Route of Flight:			
Cleared Flight Level:	Estimated Duration at Incorrect Flight Level (seconds):		Observed Deviation (+/- ft):
Other Traffic Involved:			
Cause of Deviation (*brief title*): (Examples: ATC Loop Error, Turbulence, Weather, Equipment Failure)			

AFTER SEPARATION RESTORED:		
Observed/Reported Final Flight Level*: *Please indicate the source of information – ModeC/Pilot	Mark the appropriate box Is the FL above the cleared level: ❑ Is the FL below the cleared level: ❑	Did this FL comply with the ICAO Annex 2 Tables of Cruising Levels? ❑ Yes ❑ No

NARRATIVE
Detailed Description of Incident (*Please give your assessment of the actual track flown by the aircraft and the cause of the deviation.*)

CREW COMMENTS (IF ANY)

When complete please forward the report(s) to:

Management Center Of Air Navigation Caribbean and South American Monitoring Agency (CARSAMMA)
Av. Brig. Faria Lima, 1941
São José dos Campos, SP
Cep: 12227-000 Brazil
Telephone: (55-12) 3904-5004 or 3904-5010
Fax: (55-12) 3941-7055
E-Mail: carsamma@cgna.gov.br

													)						
Date (DD/MM/YY) / Fecha (DD/MM/AÑO)	**Aircraft Call Sign/Distintivo de llamada ACFT**	**Aircraft Type/tipo de Acft**	**Aircraft Registration Number/Número de Registro de Aeronave**	**Does Item 10 of Flight Plan Indicate that the Operator and Aircraft are RVSM approved? (Does a "W" appear in Item 10 of Flight Plan?)/El item 10 del Plan indica que el Operador y la Aeronave tienen aprobación RVSM? (Una "W" aparece en el item 10 del Plan de Vuelo?)**	**Origin Aerodrome / Aeródromo de Origen**	**Destination Aerodrome/ Aeródromo de Destino**	**Entry Fix into RVSM Airspace/Punto de entrada en el espacio aéreo RVSM**	**Time at Entry Fix (HH:MM)/Hora en el punto de entrada fijo (HH:MM)**	**Flight Level at Entry Fix/Nivel de Vuelo en el punto de entrada**	**Exit Fix from RVSM Airspace/Punto de salida desde el espacio aéreo RVSM**	**Time at Exit Fix (HH:MM)/ Hora en el punto de salida (HH:MM)**	**Flight Level at Exit Fix/Nivel de Vuelo en el Punto de Salida**	**First Airway within RVSM Airspace/Primera ruta dentro del espacio aéreo RVSM)**	**Time at first Fix (HH:MM)/Hora en primer punto (HH:MM)**	**Flight Level at First Fix/Nivel de vuelo en primer punto**	**Second Fix Within RVSM Airspace or Second Airway Within RVSM Airspace/Segundo punto dentro del espacio aéreo RVSM o segunda ruta dentro del espacio aéreo RVSM.**	**Time at Second Fix (HH:MM) /Hora en el segundo punto (HH:MM)**	**Flight Level at Second Fix/Nivel de vuelo en el segundo punto**	**(Continue with as many Fix/Time/Flight-Level entries as are required to describe the flight's movement within RVSM airspace)/Continuar con tantos puntos de entradas/hora/Nivel de vuelo como se requieren para describir el movimiento de vuelo dentro del espacio aéreo RVSM)**
(Necessary) (Necesario)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Optional) (Opcional)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Necessary) (Necesario)	(Optional) (Opcional)	(Optional) (Opcional)	(Optional) (Opcional)	(Optional) (Opcional)	(Optional) (Opcional)	(Optional) (Opcional)	(Optional) (Opcional)

Agenda Item 2: Report of the ATM Task Forces

2.1 Performance-based navigation (PBN)

2.1.1 The Meeting took note that in order to plan and implement performance-based navigation it is necessary to obtain detailed information on several aspects related to CNS infrastructure as well as navigation capability of the fleet operating in the CAR/SAM Regions, and therefore a questionnaire on RNAV and RNP was developed, which was used for the development of a Road Map which is considered a fundamental document for the harmonization of PBN implementation in the CAR/SAM Regions.

CNS Infrastructure

2.1.2 **Appendices A, B** and **C** to this part of the Report present graphics of the theoretical coverage of the current communications, navigation and surveillance systems in the CAR/SAM Regions, obtained from the survey and from available information in the ICAO Regional Offices.

Fleet navigation capability

2.1.3 Derived from the analysis of RNAV navigation capabilities of the aircraft fleet operating in the CAR/SAM Regions and based on the information collected for this purpose, it was concluded that a great part of the same is equipped to carry out RNAV 5 operations. Also, it has been verified that older aircraft could reach RNAV 5 capability with a STC application or Service Bulletin, at reasonable costs.

2.1.4 In view of the above, the Meeting agreed that the VHF communications, navigation and surveillance infrastructures, as well as the fleet navigation capability in the CAR/SAM Regions would be adequate for the application of RNAV 5 values in selected airspaces.

Navigation specifications

2.1.5 Besides the CNS infrastructure and the fleet capability, the existing Navigation Specifications that will be part of Volume 2 of the PBN Manual should be taken into consideration. These specifications are the following:

Navigation Specification	Airspace/Operation	Applicable Sensors	Operational Limitations
RNP 10	En-Route - Oceanic/Remote	GNSS	No limitations
		INS/IRS	6.2 h until the first update, after 5.7 h
RNAV 5	En-Route - Continental	GNSS	No limitations
		VOR/DME	Within the radio aid coverage
		DME/DME	Within 60 NM coverage of conventional VOR or 75NM of Doppler VOR
		LORAN	Within the Loran coverage
		INS/IRS	Up to 2 hours after the take-off
RNAV 1/2	En-Route – Continental TMA	GNSS	No limitations
		DME/DME	Routes and Procedures where there be proper coverage
		DME/DME/IRU	Routes and Procedures where the faults in the DME/DME coverage are short (approximately 15 minutes)
RNP 4	En-Route - Oceanic/Remote	GNSS *	No limitations
RNP 1/2	En-Route – Continental TMA	GNSS	No limitations
		DME/DME	Routes and Procedures where there be proper coverage
		DME/DME/IRU	Routes and Procedures where the faults in the DME/DME coverage are short (approximately 15 minutes)
RNP 0.3	Approach	GNSS	No limitations
RNP AR (RNP 0.3 – 0.1)	Approach	GNSS RF MASRNP	No limitations
* Additional navigation requirements under study.			

Road Map for Performance-Based Navigation Implementation in the CAR/SAM Regions

2.1.6 As result of the analysis of the above, the Meeting established the following short- and medium-term implementation strategies which are included in the PBN Road Map.

Short Term

2.1.7 The meeting agreed that in short term, until 2010, the existing onboard capability of the aircraft will be used, as well as the existing CNS infrastructure. The chart below, contains a summary of the short term implementation proposals.

Short Term (until 2010)	
Airspace	**RNAV or RNP Value**
En-Route (Oceanic and Remote)	RNP 10 Corridor EUR/SAM and Santiago/Lima/AORRA/WATRS
En-Route (Continental)*	RNAV 5 in selected airspaces
TMA (SID – STAR)	RNAV 1 Radar environment with adequate ground navigation infrastructure
	RNP 1 Non-radar environment with or without appropriate DME coverage
Approach	RNP 0.3 at most domestic airports and in all international airports RNP AR at airports where there are obvious operational benefits
• Non-compulsory installation of RNAV equipment onboard non equipped aircraft in TMA and APP • Mixed Operations (equipped and non equipped aircraft) in TMA and APP * RNAV 2 required at or above FL350 for flights to/from United States.	

Medium Term

2.1.8 In the medium term, between 2011 and 2015, RNAV and/or RNP equipment will be compulsory in some airspaces. The following chart contains a summary of medium term implementation proposals.

Medium Term (2011-2015)	
Airspace	**RNAV or RNP Value**
En-Route (Oceanic or Remote)	RNP 4 in EUR/SAM Corridor and Santiago/Lima
En-Route (Continental)*	RNP 2 in selected airspaces
TMA (SID/STAR)	Expansion of RNAV 1 or RNP 1 application. Compulsory RNAV 1 or RNP 1 approval for aircraft operating in greater air traffic density TMAs (exclusionary airspace)
Approach	Expansion of RNP 0.3 and RNP AR applications. Application of GLS procedures
*RNP 2 required at or above FL290 for flights to/from United States.	

2.1.9 As a consequence of the above, the Meeting approved the following:

DRAFT
CONCLUSION ATM/5/3 CAR/SAM ROADMAP FOR PBN

That States, Territories and International Organizations adopt and apply the CAR/SAM Roadmap for PBN as shown in **Appendix D** to this part of the Report.

WGS-84 implementation

2.1.10 The Meeting considered of utmost importance the completion of WGS-84 implementation before implementing performance-based navigation and particularly to support implementation of RNP 0.3 approaches and more restrictive RNP.

RNAV and RNP training requirements

2.1.11 The Meeting recalled the importance of RNAV and RNP training for safety oversight. In several events, the need for States, Territories and International Organizations in the CAR and SAM Regions to develop a methodology for the training of experts who would be directly involved in the development, planning and design of airspace and RNAV and RNP operations was raised. It was considered convenient that those States and International Organizations having courses in matters such as airspace planning, PANS/OPS procedures design and safety assessment offer them to other States and International Organizations, and that all available consultation material be incorporated into the ICAO Regional Offices websites.

2.1.12 The Meeting deemed it necessary to carry out courses, workshops and seminars on airspace planning, air navigation procedures construction, aircraft and operator approval, safety evaluation and airspace monitoring, with the aim of carrying out a harmonized implementation in the Regions.

Status of ICAO documentation related to instrument approach procedures

2.1.13 Updated information was received concerning ICAO documentation related to instrument approaches. In this respect, the revised version of the *Procedures for Air Navigation Services – Aircraft Operations* (PANS-OPS, Doc 8168) was noted.

2.1.14 It was also recognized that several States were implementing RNAV and RNP approaches; however, there was no available guidance material on how to conduct flight inspection and validation of the associated procedures. In this context, the meeting was informed that unlike conventional approach procedures based on navigation aids, RNP approaches did not require checking of signals. In this respect, the meeting was informed that ICAO Doc 8071 would be updated and would contain guidance material on flight inspection and validation of RNP approaches. Additionally, it observed that the Obstacle Clearance Panel (OCP) was developing a Quality Assurance Manual which would provide more guidance on this subject.

2.1.15 The meeting was reminded that the ground-based augmentation systems (GBAS) category I flight procedures criteria were already contained in Doc 8168.

Development of RNAV/GNSS applications and procedures promoted by IATA

2.1.16 IATA informed on the development of RNAV/GNSS applications promoted as part of the transition towards the new ICAO ATM/CNS concept, which allows the usage of current avionics already onboard a large number of aircraft. These procedures have proven to provide benefits to the States, airports and operators by greatly enhancing safety, improving operational efficiency and reliability while also providing a positive environmental impact. Some States have supported this IATA initiative to create an industry partnership for the implementation of these procedures at international airports.

Aircraft Operation and Airworthiness

2.1.17 The Meeting took note of the RNAV/RNP process of approval and the training programmes for flight crews, flight dispatchers and those in charge of flight operations and maintenance personnel.

2.1.18 In this connection, the information concerning PBN was reviewed with regards to its two categories, RNAV and RNP, and also the guidelines and directions for inspectors of the AAC on the approval process of the different types of operations: RNP 10, RNP 4, RNAV 5, RNAV 2 and RNAV 1. These documents are shown in **Appendix E** to this part of the Report. Also, **Appendix F** includes guidelines related to the user training programme.

Safety assessment seminars

2.1.19 The Meeting felt that, to implement the PBN concept in a harmonized way, it will be necessary to provide safety assessments for many different portions of airspace, using different methodologies. The meeting considered that today there is a small number of professionals involved in the safety assessment subject. Also, it considered that there was no common methodology for safety assessments, understanding that possibly the Separation and Airspace Safety Panel could deal with this initiative. In view of the above, the following was concluded:

DRAFT CONCLUSION ATM/5/4 SAFETY ASSESSMENT SEMINARS AND METHODOLOGY

That ICAO:

a) promote seminars related to safety assessments, aiming at the preparation of personnel to work in the future PBN implementation;

b) encourage the Separation and Airspace Safety Panel (SASP) to develop a common methodology for safety assessments in terminal areas.

Operational errors in a PBN environment

2.1.20 The Meeting considered the industry activities in developing minimum aviation system performance standards (MASPS) for RNP that address aspects of implementation including system performance criteria, operational considerations, system qualification, navigation data, and navigation databases. These discussions resulted in new standards that represent fundamental changes in a number of areas:

a) system requirements that reflect the distribution of safety responsibility across the stakeholders (i.e. pilot, system, operational procedure, procedure and airspace design, airworthiness approval and operational approval),

b) setting specific conditions and criteria for the system and procedure design,

c) performance standards intended to support obstacle clearance or separation,

d) specification of changes necessary to assure the reliability, repeatability and predictability of the navigation system for flight guidance and flight management,

e) specification of data management and control processes necessary for navigation databases containing the RNP procedures,

f) specification of data requirements along with the rigor and processes to assure correct, accurate and usable navigation source data.

2.1.21 It was remarked that RNAV/RNP approach procedures, whether AR or basic procedures (regardless of RNP), have not suffered jet transport accidents due to crew error or other causes. In large part, this is due to the greater assurance of the aircraft capability, crew training and procedures and the procedure design.

2.1.22 Operational safety has also been significantly enhanced through:

a) Simplicity of flying the approaches relative to the traditional VOR/ADF. Fix-to-fix navigation using LNAV in conjunction with a MAP display is vastly simpler for crews than monitoring primitive VOR course or ADF bearing information while trying to combine this with DME information, crossing radials/bearings, etc.

b) Constant angle barometric path definition and the ability to fly this path automatically means that multiple crew errors must be made to result in a CFIT accident, as opposed to traditional "dive and drive" methods which only require one crew error to cause a fatal accident. The potential for multiple errors is removed by the capabilities and improvements in the flight systems.

c) The constant angle path also easily provides the crew a low-workload stabilized approach method to avoid landing accidents.

2.1.23 Considering the information provided, it is evident that with RNP there is tight coupling between the procedure and airspace design criteria for en-route and terminal operations and the assurance that only performance qualified aircraft, systems and operators are allowed to conduct the operations. Together, all requirements of the aircraft qualification and operator approval constitute specific aspects of the safety of the operation that must be addressed and approved. Consequently, the Meeting deemed pertinent that, when developing requirements for the risk analysis of the operations, as well as when developing national regulations for the aircraft and operators' approval for the operations with the use of the PBN concept, guidelines and operational criteria provided in **Appendix G** to this part of the Report be taken into account and consequently, the following was approved:

DRAFT
CONCLUSION ATM/5/5 **IMPORTANCE OF OPERATIONAL ERRORS IN A PBN ENVIRONMENT**

States, Territories and International Organizations analyze the importance of operational errors in an environment with PBN and invest all possible resources in the training of air traffic controllers and pilots aiming at the reduction of these errors considering the future implementation of this concept in the CAR/SAM Regions.

2.2 Air Traffic Flow Management (Task ATM-ATFM/400)

Documentation on air traffic flow management and GREPECAS policies

2.2.1 The Meeting noted a summary of the discussions carried out during the Second Meeting of the Air Traffic Flow Management Task Force (ATFM/TF2) Meeting (Bogota, Colombia, 6 to 8 July, 2006).

Documentation on air traffic flow management and GREPECAS

2.2.2 The Meeting observed that in several CAR and SAM Flight Information Regions air traffic saturation periods have occurred in recent years. Some airports have experienced up to 13% traffic increase and based on the projected growth of traffic this problem is expected to continue. The Meeting was informed that some States have already coordinated and implemented ATFM measures to solve the problem.

2.2.3 In addition, the Meeting agreed that ATFM implementation should be conducted in phases in order to permit a progressive evolution and achieve the desired system capacities applying pre-tactical and tactical strategic phases. The performance objective to improve the Balance between Demand and Capacity for the CAR and SAM ATFM implementation is presented in the Agenda Item 6 to this Report.

2.2.4 The Meeting identified other aspects related to ATFM that should be addressed:

a) enhance civil/military coordination and co-operation with the goal of achieving dynamic and flexible use of airspace;

b) develop an ATFM operational procedures manual for common application in the CAR and SAM regions, including methods to determine the airport capacity and sector capacity;

c) publish corresponding national regulations in the AIP and regional ATFM procedures in Doc 7030;

d) publish available service capacity according to ICAO guidelines;

e) establish improvements regarding surveillance and automated systems for flight data processing and the development and coordination of ATFM messages;

f) develop human resource requirements and required training aspects;

g) develop improvements for traffic forecasting;

h) encourage improvements for random routes, as well ATS route networks, and;

i) encourage new operational agreements between ATS users and providers for ATFM implementations, especially in those areas where flow problems already exist.

2.2.5 To the extent possible, airspace should also be structured free from operational discontinuities, inconsistencies and differing rules and procedures. Alignment of airspace classifications should be encouraged, data link communications should be further developed and utilized, flight plan processes should be improved, and ATFM message exchange capabilities should be developed.

2.2.6 With regard to the status of the CAR and SAM States/Territories/International Organizations' ATFM activities, existing ATFM documentation will be collected and posted on the ICAO Regional Offices websites. In addition, ICAO will take pertinent actions to establish a forum whereby States can share their experiences and information related to the development, methodology, and implementation of ATFM procedures.

2.2.7 In order to improve the efficiency of air operations and to promote the updating or establishment of operational agreements between ATS units in the short term, the Meeting adopted the following Draft Conclusion:

DRAFT
CONCLUSION ATM/5/6 ATFM OPERATIONAL AGREEMENTS

That CAR and SAM States/Territories/International Organizations, which so require and that have not done so, when reviewing operational bilateral agreements among ATS units, include demand and capacity balancing measures not later than **30 November 2007**.

CAR and SAM ATFM Concept of Operations

2.2.8 The Meeting analyzed the necessary documentation on ATFM for the CAR and SAM Regions. Pertinent documents for homogeneous implementation to be prepared include an ATFM Concept of Operations and an ATFM regional manual wherein the procedures covering the provisions of ATFM service will be prescribed as established by the PANS-ATM.

2.2.9 The CAR and SAM ATFM Concept of Operations (CAR/SAM ATFM CONOPS) is a high-level document whose main objective is to define and specify ATFM implementation in a homogeneous manner in the CAR and SAM Regions. While ATFM planning in both regions will be carried out together, ATFM system implementation will be carried out separately, according to the needs of each Region.

2.2.10 In this regard, a single ATFM Concept of Operations for both regions will enable harmonized implementation across the Regions and ensure effective and equitable service. The harmonized ATFM Concept of Operations will establish the basic functions of the ATFM units, minimum service requirements, and implementation process.

2.2.11 The Meeting analysed a draft ATFM Concept of Operations and considered that the document could be adopted for the CAR/SAM Regions, approving the following conclusion:

DRAFT
CONCLUSION ATM/5/7 **ADOPTION OF THE CAR AND SAM ATFM CONCEPT OF OPERATIONS (CAR/SAM ATFM CONOPS)**

That the CAR and SAM States, Territories and International Organizations:

a) adopt the CAR and SAM ATFM Concept of Operations (CAR/SAM ATFM CONOPS) shown in **Appendix H** to this part of the Report; and

b) establish a work program to enable the implementation of the CAR/SAM ATFM CONOPS.

ATFM databases

2.2.12 The Meeting noted that electronic databases, combined with surveillance and communication systems, are valuable tools for analyzing airspace and flight operations and for effectively balancing demand and capacity. It will be important to achieve real-time electronic exchange of data, with sufficient integrity and accuracy to accomplish effective traffic management, between ATFM units. In addition, it will be essential to automate the data collection and update processes in order to provide for data consistency.

2.2.13 The Meeting recognized that database preparation and definition should be carried out by a group of experts who will analyze the data available in the CAR and SAM Regions and determine how to integrate this data into ATFM. In the CAR and SAM Concept of Operations, the Meeting envisioned that all ATFM information should be integrated in a database designed to present:

a) flight intentions as reflected in flight plans and OAG flight schedules;

b) mapping information data such as airport location and layout, airspace configuration, standard instrument departures (SID), standard terminal arrivals (STAR), airways, navigation aids, and airspace fixes; and

c) aircraft performance data

2.2.14 Given the importance of developing homogeneous databases, the Meeting considered it appropriate for the ATFM Task Force to incorporate into its Work Program the possible creation of a group of experts, who could analyze data available in the CAR/SAM Regions and its integration into ATFM.

2.2.15 The Meeting recognized that providing ATFM service requires the use of verbal communication and automated methods to ensure complete exchange of information. Enhancement of communication capabilities improves information exchange, coordination activities, and collaboration between airspace users and air traffic service providers. Telephone conferences (TELCON) involving key system stakeholders should be initiated periodically and hosted by the Central ATFM Units to discuss, evaluate and resolve traffic management issues.

Cost-benefit analysis

2.2.16 The Meeting recalled that, among the tasks which pertain to the action plan for ATFM implementation approved by GREPECAS, is Task 1.13, "Provide data to the Cost Benefit Analysis".

2.2.17 The cost-benefit analysis is used to calculate the economic viability of an investment project to obtain the point at which the total benefit of the investment exceeds its total cost. From the standpoint of a service provider or operator, the evaluation of the net financial impact, in terms of updated value, should include not only the cost of the implementation and operation, but also positive changes produced as regards profitability, environment and/or social benefits.

2.2.18 Therefore, the Meeting considered it necessary to encourage the air navigation service providers in the CAR and SAM Regions, in coordination with the ATFM implementation groups, to collect all the information required for the cost-benefit analysis and formulated the following conclusion:

DRAFT CONCLUSION ATM/5/8 COLLECTION OF INFORMATION FOR THE COST-BENEFIT ANALYSIS

That CAR/SAM States/Territories/International Organizations which have not yet done so, initiate the data collection to develop its financial cost-benefit analysis of the ATFM implementation project, using as guidance material the information shown in **Appendix I** to this part of the Report.

ATFM Tasks of the Cricket World Cup 2007 of the International Cricket Council

2.2.19 Trinidad and Tobago informed that they have begun the coordination of plans and requirements for the implementation of Air Traffic Flow Management (ATFM) Measures within the Piarco Flight Information Region (FIR) inclusive of the Terminal Areas (TMAs) and Control Zones (CTRs) from 01 March 2007 to 05 May 2007, arising from the International Cricket Council (ICC) Cricket World Cup 2007 (CWC 2007) which will be played in the Caribbean.

2.2.20 In anticipation that there will be a significant increase in aircraft movements within the FIR to/from match venue countries, ATFM measures will be established to permit airspace users to conduct their flight operations with efficiency and reduce delays. This initiative is expected to provide demand/capacity balancing in the airspace concerned and make available more fuel-efficient flight profiles. It will also afford greater operational flexibility to the air traffic control units that are responsible for the provision of ATC services in the Piarco FIR through demand/capacity balancing (DCB) concepts while at the same time fostering safety, orderliness and expedition. General information provided to the Meeting is included as **Appendix J** to this part of the Report.

ATFM Initiatives in the CAR Region

Initiatives of Cuba

2.2.21 The Meeting was informed on the initiatives of Cuba, through the Civil Aviation Institute (IACC), to develop a harmonized and timely ATFM implementation, initiating the execution of a National Plan for ATFM Implementation. Additional information is presented in **Appendix K** to this part of the Report.

Initiatives of Mexico

2.2.22 The Meeting was informed that Mexico proposes to establish a Regional Coordination Unit for Air Traffic Flow Management in the CAR-W Region in order to carry out appropriate coordination for the traffic flows between the NAM and SAM Regions operating through the CAR-W Region, based on the fact that Mexico has gained the necessary experience from the amount of operations taking place in Mexican airspace, besides already having the required infrastructure, systems, equipment and specialized personnel with the experience to perform such an important task.

2.2.23 The Meeting thanked Mexico for the information and considered that this matter should be reviewed among States and International Organization in due course and agreed to include this valuable information in **Appendix L** to this part of the Report.

Initiatives of COCESNA

2.2.24 According to the guidelines resulting from different air navigation meetings coordinated by ICAO, among them GREPECAS, RAN CAR/SAM, AN-CONF/11, ATM/CNS Subgroup Meetings, ATM Committee ATFM Task Force, AP/ATM, as well as the concepts contained in the ATM Task – ATFM/400 of the ATM Committee: “Development of an ATFM system for future implementation in CAR/SAM Regions”, and GREPECAS/13 Conclusion 13/66: “National Plans for the ATFM Implementation in CAR/SAM Regions”, COCESNA has done a series of actions for the implementation of ATFM in Central America. These actions are reflected in **Appendix M** to this part of the Report.

2.3 ATM automation (Task ATM/ATS/305)

2.3.1 The Ad-hoc Group reviewed the *Interface Control Document for ATS Inter-Facility Data Communications in the Caribbean and South American Regions* and recalled that the purpose of this document is to provide guidance material for exchanging specific messages (FPL, CPL, CNL, etc) between ATM automated systems in the near term, in accordance with Annex 10 – Vol. II, Annex 11, Doc 4444, and other ICAO and State documents, as applicable; and, in some cases containing supplementary information to meet additional needs of modern automation systems.

2.3.2 The meeting took note that the Interface Control Document (ICD) describes a common message set by which States/Territories/International Organizations can exchange flight data and control information. The document also includes telecommunication requirements, interface protocols and describes a phased functionality of the core messages, as follows:

- Passing/receiving active flight plan and logical acceptance or rejection messages.
- Passing/receiving change, modify and cancellation messages needed for full automated exchange of flight plans.
- Messages needed to support automated radar data handover and point-out and other applications.

2.3.3 The Group recognized that several States/Territories/International Organizations have initiated bilateral conversations to carry out studies and agreements for flight data exchange between current automation systems, taking into consideration the ICD. The Group reiterated the great importance to continue cooperation between States/Territories/International Organizations looking for regional and global interoperable ATM systems, and strongly supported continuation of works for data exchanging in the CAR and SAM Regions, specifically between those facilities that have identified that their systems are ready for and capable of interfacing.

2.3.4 The Group proposed to rename the ICD *"Interface Control Document (ICD) for Data Communications between ATS units in the Caribbean and South American Regions"* including a change in part III Communications and Support Mechanisms, as pointed out in **Appendix N** *(available in English only)*, and agreed that it could be submitted for GREPECAS approval, and will be maintained as an living document, updated and expanded as needed as new requirements are identified and new technologies implemented.

2.3.5 It was noted that where automated exchanges have been implemented using ATS inter-facility data communication or comparable methods, States have experienced reductions in controller workload, improved safety, increased efficiency and increased accuracy of the data being exchanged. In order to enjoy these same benefits, States/Territories/International Organisations of the CAR and SAM Regions should take a harmonized approach in the short term to implement automated flight data exchanges.

2.3.6 The Meeting considered that the best way to achieve a seamless and interoperable ATS system between the States/Territories/International Organizations begins with establishment of bilateral or multilateral agreements among the concerned adjacent ATS units where the capability and necessity exists. As experience is gained with successful implementation, the knowledge, advantages and benefits will be shared among all interested parties. Therefore, the Group agreed on the following Draft Conclusion:

DRAFT CONCLUSION ATM/5/9 AGREEMENTS FOR ATM AUTOMATED SYSTEMS INTERFACE

That CAR/SAM States/Territories/International Organizations:

a) take into account technical feasibility studies and operational benefits, and coordinate the establishment of bilateral and multilateral agreements for the interface of automated systems between adjacent units; and

b) use guidance material specified as "*Interface Control Document (ICD) for Data Communications Between ATS Units in the CAR and SAM Regions*", included in **Appendix N** to this part of the Report, keeping in mind that:

   i) ICAO guidance material contained in said document is applicable at the regional level; and

   ii) material that does not comply with ICAO guidelines, should be used only as reference and must be agreed on a bilateral or multilateral basis, as required.

2.3.7 Considering the above, the Group concurred that States/Territories/International Organizations should formulate an action plan based on the performance objective for the interface of ATM automated systems, presented in the Agenda Item 6 to this Report, therefore, the following Draft Conclusion was agreed:

DRAFT CONCLUSION ATM/5/10 ESTABLISHMENT OF AN ACTION PLAN FOR THE INTERFACE OF ATM AUTOMATED SYSTEMS

That CAR/SAM States/Territories/International Organizations, formulate an Action Plan for the interface of ATM automated systems, which includes:

a) the assignment of an expert as point of contact to carry out the regional coordination work for the interface of ATM automated systems;

b) the analysis of the current service level provided by ATS automated systems, as well as requirements to satisfy future operational applications of the ATM community using the Table of ATS Operational Requirements for Automated Systems, included in **Appendix O** to this part of the Report; and

c) document the action plan and share best practices and experiences with other States/Territories/International Organization, which so require.

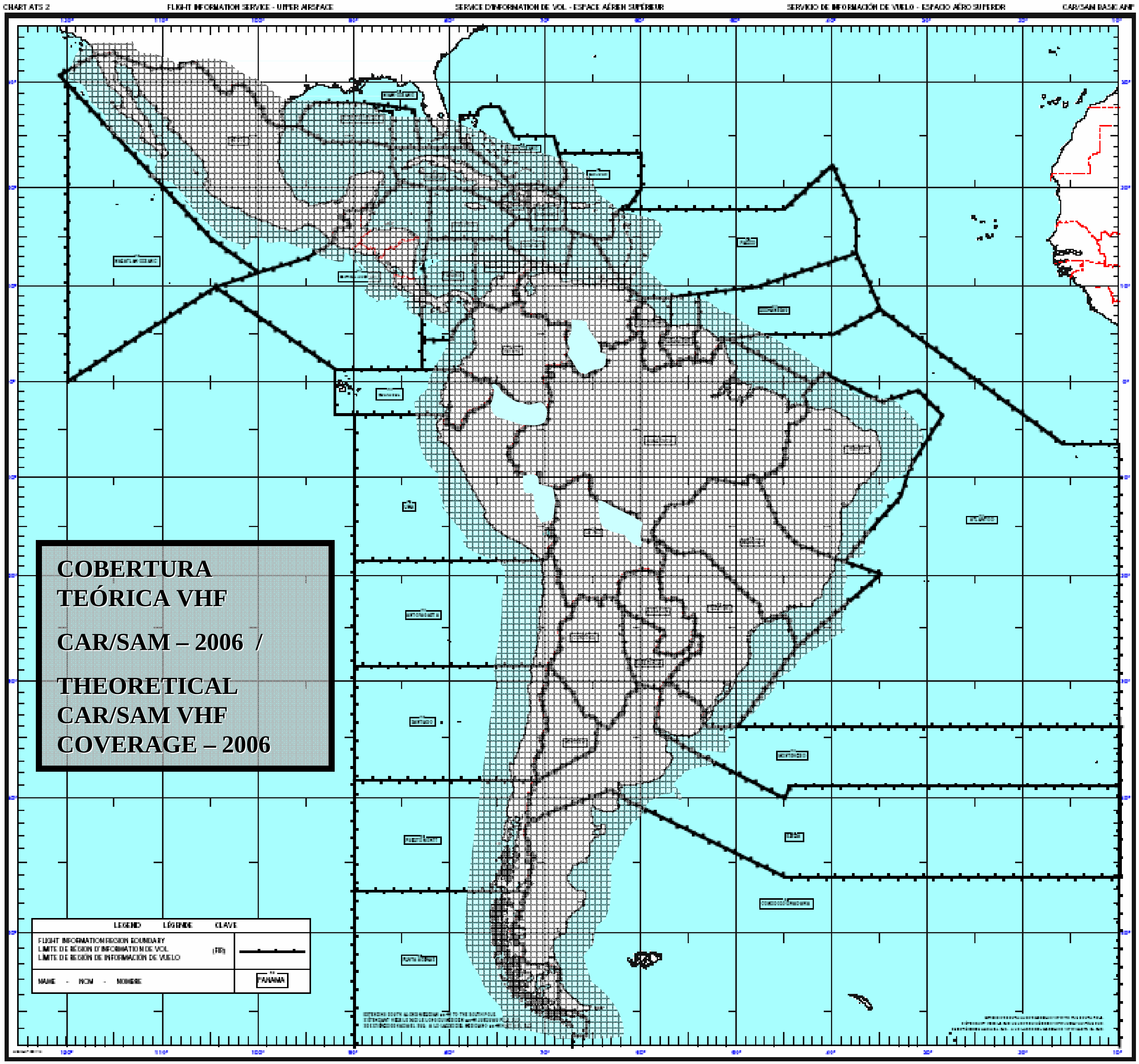
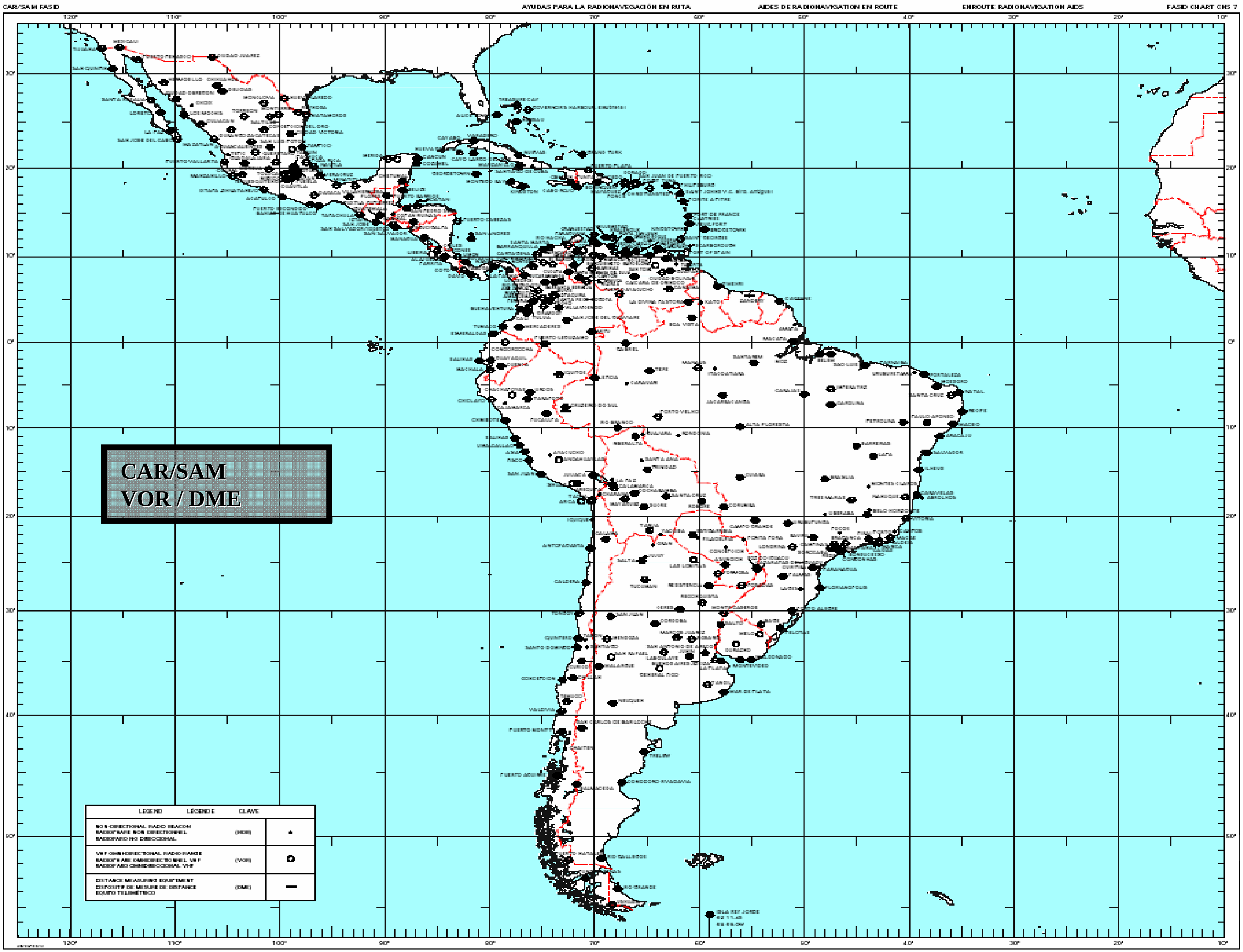
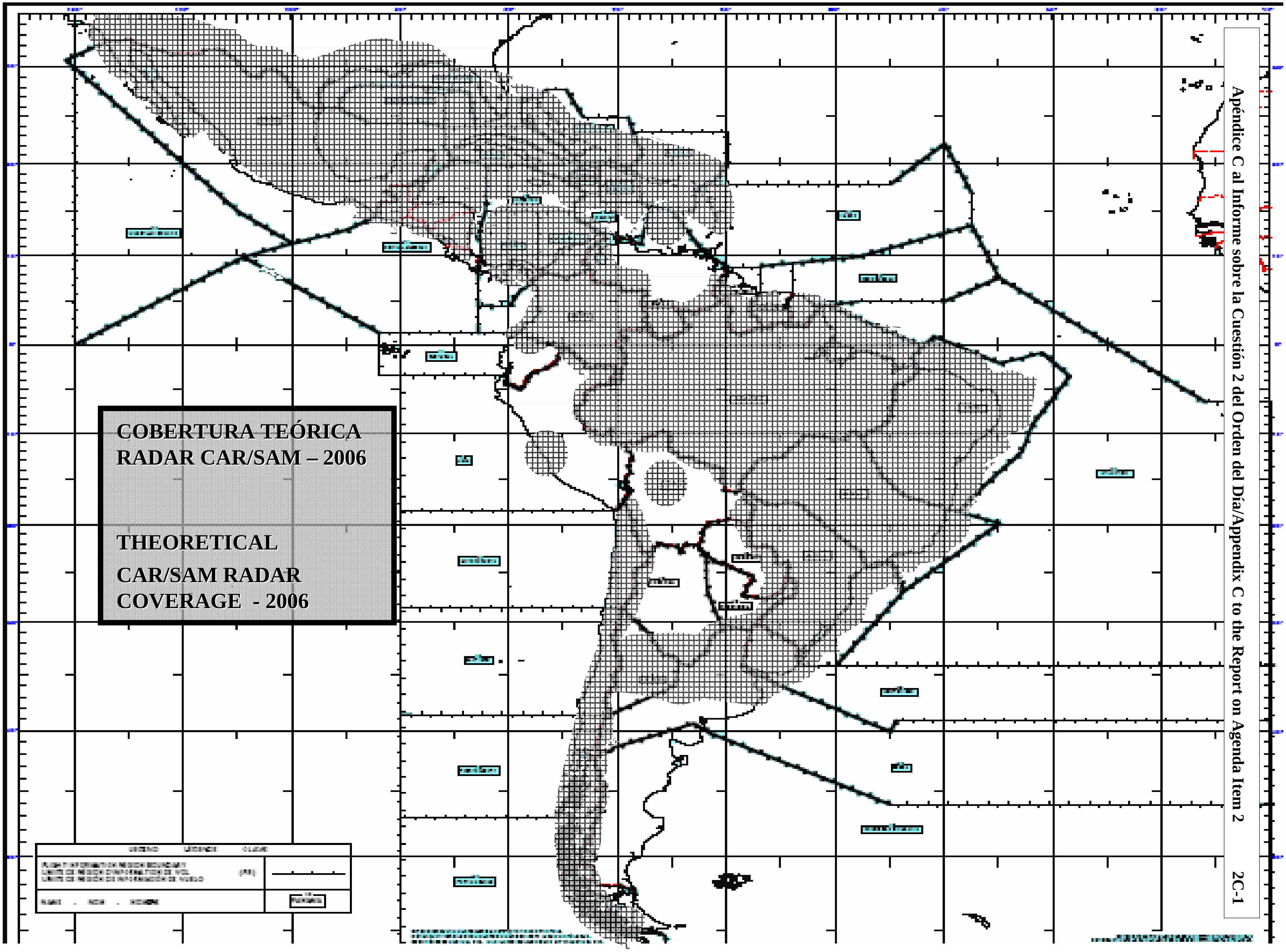


CHART ATS 2
FLIGHT INFORMATION SERVICE - UPPER AIRSPACE
SERVICE D'INFORMATION DE VOL - ESPACE AÉRIEN SUPÉRIEUR
SERVICIO DE INFORMACIÓN DE VUELO - ESPACIO AÉREO SUPERIOR
CAR/SAM BASIC ANP
COBERTURA
TEÓRICA VHF
CAR/SAM – 2006 /
THEORETICAL
CAR/SAM VHF
COVERAGE – 2006
LEGEND LÉGENDE CLAVE
FLIGHT INFORMATION REGION BOUNDARY
LIMITE DE RÉGION D'INFORMATION DE VOL
LIMITE DE REGIÓN DE INFORMACIÓN DE VUELO
(FIR)
NAME - NOM - NOMBRE
PANAMA


CAR/SAM FASID
AYUDAS PARA LA RADIONAVEGACION EN RUTA
AIDES DE RADIONAVIGATION EN ROUTE
ENROUTE RADIONAVIGATION AIDS
FASID CHART CNS 7
CAR/SAM
VOR / DME
LEGEND
LÉGENDE
CLAVE
NON-DIRECTIONAL RADIO BEACON
RADIOPHARE NON DIRECTIONNEL
RADIOFARO NO DIRECCIONAL
(NDB)
VHF OMNIDIRECTIONAL RADIO RANGE
RADIOPHARE OMNIDIRECTIONNEL VHF
RADIOFARO OMNIDIRECCIONAL VHF
(VOR)
DISTANCE MEASURING EQUIPMENT
DISPOSITIF DE MESURE DE DISTANCE
EQUIPO TELEMÉTRICO
(DME)


COBERTURA TEÓRICA
RADAR CAR/SAM – 2006
THEORETICAL
CAR/SAM RADAR
COVERAGE - 2006

APPENDIX D

PBNRM

INTERNATIONAL CIVIL AVIATION ORGANIZATION

North American, Central American and Caribbean (NACC) Regional Office

South American (SAM) Regional Office

CAR/SAM ROADMAP FOR PERFORMANCE-BASED NAVIGATION

(Lima, November 2006)

Table of Contents

1. EXECUTIVE SUMMARY

1.1. Following RVSM implementation on 20 January 2005, the main tool for optimising the airspace structure is the implementation of performance-based navigation (PBN), which will foster the necessary conditions for the utilisation of RNAV and RNP capabilities by a significant portion of airspace users in the CAR/SAM Regions.

1.2. In view of the need for detailed navigation planning, it was deemed advisable to prepare a PBN Roadmap to provide proper guidance to air navigation service providers, airspace operators and users, regulating agencies, and international organisations, on the evolution of navigation, as one of the key systems supporting air traffic management, which describes the RNAV and RNP navigation applications that should be implemented in the short, medium and long term in the CAR/SAM Regions.

1.3. The CAR/SAM PBN Roadmap was developed by the CAR/SAM States and International Organizations, together with the international organizations concerned (IATA, IFALPA, IFATCA), and is intended to assist the main stakeholders of the aviation community plan the future transition and their investment strategies.

1.4. The CAR/SAM PBN Roadmap will be the basic material for the development of a broader CAR/SAM navigation strategy, which will serve as guidance for regional projects for the implementation of air navigation infrastructure, such as SBAS, GBAS, etc., as well as for the development of national implementation plans.

1.5. This document begins with a brief description of the need for a roadmap, the strategic objectives of the document, and the principles on which the implementation will be based. It should be noted that, during the transition period, conventional air navigation procedures would continue to be applied in order to safeguard the operations of users that are not RNAV- and/or RNP-equipped.

1.6. It then explains the PBN implementation strategy for both en-route and terminal area operations. It also analyses briefly the PBN concept, and lists the benefits of implementing this concept.

1.7. A review is made of data concerning the regular traffic of passengers on CAR/SAM airlines during the 1994-2004 period, CAR/SAM traffic forecasts, and traffic trends up to the year 2015.

1.8. It furthermore defines the implementation of performance-based navigation in the short, medium, and long term with respect to en-route operations, TMA operations (SIDs and STARs), and IFR approaches, broadly establishing the requirements and specifications for each stage.

1.9. A description is made of RNAV/RNP approval, which will encompass two types of approvals: airworthiness, exclusively relating to the approval of aircraft; and operational, dealing with the operational aspects of the operator. RNAV/RNP approval will be granted to operators that comply with these two types of approvals.

1.10. The implementation of the performance based navigation forecast significant safety-related changes in the airspace structure as well as to the ATC system. The ICAO requirement for new operations introduced post 2000 is that the risk of collision has to be less than 5 than $5x10^{-9}$ per dimension.

1.11. After the implementation of PBN applications and the airspace concept, the total system needs to be monitored to ensure that the safety of the system is maintained. A System Safety Assessment is conducted after implementation and evidence collected to ensure that the safety of the system is assured.

2. EXPLANATION OF TERMS

2.1 The drafting and explanation of this document is based on the understanding of some particular terms and expressions that are described below:

CAR/SAM PBN Roadmap. Document offering appropriate guidance for air navigation service providers, airspace operators and users, regulating agencies, and international organizations, on the evolution of navigation, as one of the key systems supporting air traffic management, which describes the RNAV and RNP navigation applications that should be implemented in the short, medium and long term in the CAR/SAM Regions.

Performance Based Navigation. Performance based navigation specifies RNAV system performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in an airspace.

Performance requirements. Performance requirements are defined in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept. Performance requirements are identified in navigation specifications which also identify which navigation sensors and equipment may be used to meet the performance requirement.

3. ACRONYMS

3.1 Lista de Acrónimos/ List of Acronyms

ADS/B	Vigilancia dependiente automatica-radiodifusión Automatic dependent surveillance-broadcasting
ADS/C	Vigilancia dependiente automática-contrato Automatic dependent surveillance-contract
ANS	Servicios de navegación aérea Air navigation services
ANSP	Proveedores de Servicios de Navegación Aérea/Air Navigation Service Providers
ASM	Gestión del espacio aéreo/ Airspace Management
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
ATN	Red de telecomunicaciones aeronáuticas/ Aeronautical Telecommunication Network
ATS	Servicio de tránsito aéreo/ Air Traffic Services
CAR/SAM	Regiones Caribe y Sudamérica/Caribbean/South American Regions
CNS/ATM	Comunicaciones, navegación y vigilancia/Gestión del tránsito aéreo/ Communications, Navigation and Surveillance/Air Traffic Management
CPDLC	Comunicaciones por enlace de datos controlador-piloto /Controller-Pilot Data Link Communications
CTA	Area de control /Control Area
DME	Equipo Radiotelemetrico/Distance-Measuring Equipment
FAR	Regulación federal de aviación/Federal Aviation Regulation
FANS-1/A	Sistemas de navegación aérea del futuro – Aviónica/ Future Air Navigation Systems - Avionics
FDE	Detección y eliminación de fallas / Fault Detection and Exclusion
FIR	Región de información de vuelo /Flight Information Region
FMS	Sistema de gestión de vuelo /Flight Management System
GBAS	Sistema de Aumentación con Base en Tierra/Ground-Based Augmentation System
GLS	Sistema de aterrizaje GBAS / GBAS Landing System
GNE	Error de navegación grave / Gross Navigation Error
GNSS	Sistema mundial de navegación por satélite / Global Navigation Satellite System
GPMS	Sistema de monitoreo de la performance del GPS / GPS Performance Monitoring System
GREPECAS	Grupo Regional de Planificación y Ejecución CAR/SAM/ CAR/SAM Regional Planning and Implementation Group
GRAS	Sistema de Aumentación Terrestre Regional / Ground Regional Augmentation System
HF	Alta frecuencia/ High Frequency
IATA	Asociación del Transporte Aéreo Internacional/ Internacional Air Transport Association
ICD	Documento de control de interfaz / Interface Control Document
IFALPA	Federación Internacional de Asociaciones de Pilotos de Líneas Aéreas/International Federation of Air Line Pilots' Associations
IFATCA	Federación Internacional de Asociaciones de Controladores de Tránsito Aéreo/International Federation of Air Traffic Controllers' Associations
IRU/INS	Unidad de referencia inercial/Sistema de navegación inercial/ Inertial Reference Unit/Inertial Navigation System
JAA	Autoridades Conjuntas de Aviación Civil/Joint Aviation Authorities

JAR	Regulaciones Conjuntas de Aviación Civil/Joint Aviation Regulations
NAT	Atlántico septentrional /North Atlantic
NDB	Radiofaro no direccional /Non-Directional Beacon
NOTAM	Aviso al Personal Encargado de las Operaciones de Vuelo/Notice to Airmen
PBN	Navegación Basada en la Performance /Performance-Based Navigation
RNAV	Navegación de área/Area Navigation - RNAV Route: Ruta de navegación de área/Area navigation route
RNP	Performance de navegación requerida /Required Navigation Performance
RNP AR	Requerimiento de aprobación para la performance de navegación requerida/ Required Navigation Performance Aproval Required
RNPC	Capacidad de la performance requerida de navegación/Required navigation performance capacity
RNPSORSG	Grupo de Estudio sobre RNP y Requerimientos Operacionales Especiales/RNP and Special Operational Requirements Study Group
SARPS	Normas y métodos recomendados (ICAO)/ Standards and Recommended Practices (ICAO)
SATCOM	Comunicaciones por satélite/Satellite Communications
SBAS	Sistema de Aumentación de Base Satelital/Satellite-based Augmentation System
SID	Salida Normalizada por Instrumentos/Standard Instrument Departure
SSR	Radar secundario de vigilancia/Secondary Surveillance Radar
STAR	Llegada Normalizada por Instrumentos/Standard Instrument Arrival
TLS	Nivel de seguridad deseado/Target Level of Safety
TMA	Area Terminal/Terminal Area
VHF	Muy alta frecuencia /Very High Frequency
VDL	Enlace de datos en VHF/ VHF Data Link
VOR/DME	Radiofaro omnidireccional VHF/Equipo radiotelemétrico/Very High Frequency Omnidirectional Radio Range/Distance-Measuring Equipment

4. INTRODUCTION

Need for a roadmap

4.1 Following RVSM implementation on 20 January 2005, the main tool for optimising the airspace structure is the implementation of performance-based navigation (PBN), which will foster the necessary conditions for the utilisation of RNAV and RNP capabilities by a significant portion of airspace users in the CAR/SAM Regions.

4.2 Current planning by the Regional Planning and Implementation Groups is based on the Air Navigation Plans and the Regional CNS/ATM Plans. Currently, these plans are mostly made up by tables that do not contain the necessary details for the implementation of each of the CNS and ATM elements.

4.3 In view of the need for detailed navigation planning, it was deemed advisable to prepare a PBN Roadmap to provide proper guidance to air navigation service providers, airspace operators and users, regulating agencies, and international organisations, on the evolution of navigation, as one of the key systems supporting air traffic management, which describes the RNAV and RNP navigation applications that should be implemented in the short and medium term in the CAR/SAM Regions.

4.4 Furthermore, the CAR/SAM PBN Roadmap will be the basic material for the development of a broader CAR/SAM navigation strategy, which will serve as guidance for regional projects for the implementation of air navigation infrastructure, such as SBAS, GBAS, etc., as well as for the development of national implementation plans.

Objectives

4.5 The CAR/SAM PBN roadmap has the following strategic objectives:

a) To ensure that the implementation of the navigation item of the CNS/ATM system is based on clearly established operational requirements.
b) To avoid unnecessarily imposing the mandate for multiple equipment on board or multiple systems on ground.
c) To avoid the need for multiple airworthiness and operational approvals for intra- and inter-regional operations.
d) To prevent commercial interests from outdoing ATM operational requirements, generating unnecessary costs for CAR/SAM States and International Organizations, as well as for airspace users.
e) To explain in detail the contents of the CAR/SAM Air Navigation Plan and of the CAR/SAM CNS/ATM Plan, describing potential navigation applications.

4.6 Furthermore, the CAR/SAM PBN Roadmap will provide a high-level strategy for the evolution of the navigation applications to be implemented in the CAR/SAM Regions in the short term (2006-2010), medium term (2011-2015). This strategy is based on the concepts of Area Navigation (RNAV) and Required Navigation Performance (RNP), which will be applied to aircraft operations involving instrument approaches, standard departure (SID) routes, standard arrival (STAR) routes, and ATS routes in oceanic and continental areas.

4.7 The CAR/SAM PBN Roadmap was developed by the CAR/SAM States and International Organizations together with the international organizations concerned (IATA, IFALPA, IFATCA), and is intended to assist the main stakeholders of the aviation community plan a gradual transition to the RNAV and RNP concepts. The main stakeholders of the aviation community that benefit from this roadmap are:

- Airspace operators and users.
- Air navigation service providers.
- Regulating agencies.
- International organizations.

4.8 This roadmap is intended to assist the main stakeholders of the aviation community plan the future transition and their investment strategies. For example, airlines and operators can use this roadmap to plan future equipage and additional navigation capability investments; air navigation service providers can plan a gradual transition for the evolving ground infrastructure. Regulating agencies will be able to anticipate and plan for the criteria that will be needed the future.

Principles

4.9 The implementation of PBN in the CAR/SAM Regions shall be based on the following principles:

a) Conduction of cost-benefit analyses to justify the implementation of the RNAV and/or RNP concepts in each particular airspace;
b) Conduction of pre- and post-implementation safety assessments to ensure the application and maintenance of the established target levels of safety;
c) Development of airspace concepts, applying airspace modelling tools as well as real-time and accelerated simulations, which identify the navigation applications that are compatible with the aforementioned concept.
d) Continued application of conventional air navigation procedures during the transition period, to guarantee the operations by users that are not RNAV- and/or RNP-equipped.

PBN implementation strategy

En-route operations

4.10 It is impossible to include the whole CAR/SAM airspace in a single Implementation Plan for En-Route Operations, since the restructuring of the CAR/SAM airspace for PBN application would become an extremely complicated task.

4.11 Likewise, the establishment of a single RNAV or RNP value for the CAR/SAM Regions is unlikely, bearing in mind the differences in air traffic complexity and movement, as well as the differences in CNS infrastructure, which will probably lead to the application of different airspace concepts in the CAR/SAM Regions.

4.12 Thus, the most appropriate strategy is the implementation of PBN by routing areas in CAR and SAM scenarios, according to their own airspace concepts and infrastructure characteristics, which may involve a group of States/Territories and International Organizations. This implementation strategy will be applied by the States/Territories/International Organizations themselves and will permit the establishment of the RNAV or RNP values for the various areas that will be harmonised within the scope of GREPECAS.

TMA operations

4.13 TMA operations have their own characteristics, taking into account the applicable separation minima between aircraft and between aircraft and obstacles. It also involves the diversity of aircraft, including low-performance aircraft flying in the lower airspace and conducting arrival and departure procedures on the same path or close to the paths of high-performance aircraft.

4.14 In this sense, the States/Territories and International Organizations shall develop their own national plans for the implementation of PBN in TMAs, based on the CAR/SAM PBN Roadmap, seeking the harmonisation of the applicable RNAV and/or RNP criteria to avoid the need for multiple operational approvals for intra- and inter-regional operations, and the applicable aircraft separation criteria that will be soon published by ICAO Headquarters.

5. PBN CONCEPTS

5.1 Performance based navigation specifies RNAV system performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in an airspace.

5.2 Performance requirements are defined in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept. Performance requirements are identified in navigation specifications which also identify which navigation sensors and equipment may be used to meet the performance requirement.

5.3 There are both RNP specifications and RNAV specifications. A RNP specification includes a requirement for onboard performance monitoring and alerting and is designated as a RNP X. A RNAV specification does not have such requirements and is designated as RNAV X.

5.4 Performance based navigation therefore depends on:

- the RNAV system and installation on the aircraft being approved to meet the performance and functional requirements of the navigation specification prescribed for RNAV operations in an airspace; and
- Air crew satisfying the operating requirements set out by the regulator for RNAV operations; and
- A defined airspace concept which includes RNAV operations; and
- an available Navaid infrastructure;

Note: Additional information may be obtained in the Manual XXXX – Performance based navigation.

6. BENEFITS OF PERFORMANCE-BASED NAVIGATION

Performance Based Navigation

6.1 Air traffic growth in the CAR/SAM Regions is foreseen at mid term, at the same time that the economical activity. A growth of 6.2, 5.5 y 5.6, % of regular passenger air traffic of CAR/SAM Regions airlines is foreseen in 2005/2006/2007, respectively, as compared to global growth forecast of 7.6, 6.5 and 6.2%, respectively. At long term, airlines passengers air traffic in the Region is expected to grow at an average of 4.0% until year 2015. This growth may lead to air traffic congestion periods which may guide to ATM lack of efficiency.

6.2 In order to ensure ATM efficiency and avoid unnecessary restrictions to airspace users, specifications should be avoided as to who to satisfy navigation requirements indicating only which is the performance and navigation functionality required from the RNAV system. Under the PBN concept, the generic navigation requirements are defined based on operational requirements. Thus, users may evaluate the available options as regards technology and air navigation services which could permit to satisfy these requirements. The solution elected should be the most cost-effective

6.3 The development of the Performance Based Navigation Concept recognizes that advanced aircraft RNAV systems are achieving a predictable level of navigation performance accuracy which, together with an appropriate level of functionality, allows a more efficient use of available airspace to be realized. It also takes account of the fact that RNAV systems have developed over a 40 year period and as a result there are a large variety of implementations. Identifying navigation requirements rather than on the means of meeting the requirements will allow use of all RNAV systems meeting these requirements irrespective of the means by which these are met.

6.4 The main benefits derived from the implementation of PBN are:

a) Increased airspace safety through the implementation of continuous and stabilised descent procedures that avoid controlled flight into terrain (CFIT);
b) Reduced aircraft flight time due to the implementation of optimal flight paths, with the resulting savings in fuel and environmental protection.
c) Use of the RNAV and/or RNP capabilities that already exist in a significant percentage of the aircraft fleet flying in CAR/SAM airspace.
d) Improved airport and airspace arrival paths in all weather conditions, and the possibility of meeting critical obstacle clearance and environmental requirements through the application of optimised RNAV or RNP paths.
e) Implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows.
f) Reduced delays in high-density airspaces and airports through the implementation of new parallel routes and new arrival and departure points in TMAs.
g) Possible reduction of spacing between parallel routes to accommodate more traffic in the same flow.
h) Reduced workload for air traffic controllers and pilots due to reduced communications time.

7. IMPLEMENTATION OF PERFORMANCE-BASED NAVIGATION

7.1 ATM operational requirements

7.1.1 The ATM World Plan makes necessary to adopt an airspace concept able to provide and operational scenery that includes Routes Network, Minimum separation, Assessment of obstacles clearance, and CNS infrastructure that satisfies safety specific strategic objectives, capacity, efficiency, environment and technology addressed to the implementation of performance/based navigation.

7.1.2 In this regard, the following programmes will be developed in different areas:

a) traffic and cost benefit studies
b) automation necessary update
c) operations simulation in different sceneries
d) ATC personnel training
e) FPL processing
f) AIS support
g) WGS 84 implementation when necessary
h) uniform classification of adjacent and regional airspaces
i) RNAV/RNP application in SIDs and STARs
j) RNAV routes implementation and coordination

7.2 RNAV/RNP approval will cover to types of approvals: airworthiness, which will exclusively deal with aircrafts approval, and operations, which will take care of the operational aspects of air transport operators. The fulfilment of these types of approvals will permit operators to obtain RNAV/RNP approval.

7.3 **Short term (up to 2010)**

7.3.1 En-route operations

7.3.1.1 Taking into account air traffic low density in oceanic airspaces, no significant changes are expected in the present airspace structure that will demand changes in applied RNAV values. The only exception will be RNP-10 application in the WATRS Region, which will demand a significant change in the CAR Region airspace structure. In airspaces where RNP-10 is applied (EUR/SAM Corridor, Lima-Santiago de Chile Routes and South Atlantic Random Routes System), no short-term changes are expected.

7.3.1.2 In the continental airspace, RNAV-5 implementation in selected airspaces is expected, where possible to obtain operational benefits and available CNS infrastructure is able to support it.

7.3.2 TMA operations (SIDs and STARs)

7.3.2.1 The application of RNAV-1 in State-selected TMAs, in radar environments, with ground navigation infrastructure is expected, which permits DME/DME and DME/DME/INS operations. In this phase mixed operations (equipped and non-equipped) will be admitted, and RNAV-1 operations shall be initiated when an adequate percentage of air operations are approved.

7.3.2.2 In non-radar environments and/or in environments that do not count with adequate ground navigation infrastructure, the application of RNP-1 is expected in State-selected TMAs with exclusive application of GNSS, whenever an adequate percentage of air operations are approved. In this TMA will also be admitted approved and non-approved aircrafts. The application of overlay procedures or exclusive RNP procedures will depend on air traffic complexity and density.

7.3.3 IFR approaches

7.3.3.1 The application of RNP 0,3 approach procedures (basic GNSS) is expected in the maximum possible of State-selected airports, principally in international airports, maintaining conventional approach procedures for non-equipped aircraft.

7.3.3.2 The application of RNP AR approach procedures is expected in State-selected airports, where obvious operational benefits can be obtained, based on the existence of significant obstacles.

Short Term (until 2010)	
Airspace	**RNAV or RNP Value**
Route (Oceanic o Remote)	RNP 10 Corridor EUR/SAM and Santiago/Lima/AORRA/WATRS
Route (Continental)	RNAV 5 in selected airspaces
TMA	RNAV-1 in radar environment and with adequate ground navigation infrastructure.
	RNP 1 – No radar environment and/or without appropriate DME coverage.
Approach	RNP 0,3 in most possible airports and in all international airports. RNP AR in airport where there are obvious operational benefits.
• Non compulsory installation of RNAV equipment on board of non equipped aircraft in TMA and APP • Mixed Operations (equipped and non equipped aircraft) in TMA and APP • Required RNAV 2 equipment above FL350 for flights to/from United States.	

7.4 **Medium term**

7.4.1 En-route operations

7.4.1.1 The application of RNP 4 in the oceanic airspace in EUR/SAM corridor is expected, with utilization of ADS/CPDLC, in order to permit the use of lateral and longitudinal separation of 30 NM. This application will depend on the evolution of the aircraft fleet flying in the airspace.

7.4.1.2 In this phase, the application of RNP-2 is expected in selected areas of the continental airspace, with high air traffic density and exclusive application of GNSS, depending on the analysis of ground infrastructure, which will indicate whether it is possible to use RNAV applications. The establishment of a backup system will be necessary as well as the development of contingency procedures in the event of GNSS failure. The application of RNP-2 will facilitate the PBN application is non surveillance airspace. With the exclusive application of GNSS more control of the GNSS signal is needed, through GPS Monitoring Systems that include NOTAM, FDE, etc.

7.4.2 TMA operations

7.4.2.1 In this phase, it is expected to extend the application of RNAV (RNP) 2/1 in State-selected TMAs, depending of ground infrastructure and of aircrafts navigation capacity. In TMAs of high air traffic complexity and movement (excluding airspaces), the use of RNAV or RNP 1 equipments will be mandatory. In TMAs of less air traffic complexity, mixed operations will be admitted (equipped or non-equipped).

7.4.3 IFR approaches

7.4.3.1 In this phase the extended application of procedures RNP 0.3 and RNP AR in selected airports is expected. Also, the initiation of application of GLS procedure is expected to guarantee a smooth transition between TMA phase and the approximation ´has, basically using GNSS for the two phases.

Medium Term (2011-2015)	
Airspace	**RNAV or RNP Value**
Route (Oceanic or Remote)	RNP 4 in EUR/SAM Corridor and Santiago/Lima
Route (Continental)	RNP 2 in selected airspaces
TMA (SID/STAR)	Expansion of RNAV-1 or RNP-1 application Compulsory RNAV 1 or RNP 1 approval for aircraft operating in greater air traffic density TMAs (exclusionary airspace)
Approach	Expansion of RNP 0,3 and RNP AR application Application of GLS procedures
• RNP2 required equipment over FL290 for flights to/from United States.	

8. SAFETY ASSESSMENT

8.1 The implementation of the performance based navigation forecast significant safety-related changes in the airspace structure as well as to the ATC system, including the implementation of reduced separation minima or new procedures that only shall be applied after a safety assessment has demonstrated that an acceptable level of safety will be met.

8.2 To demonstrate that the system is safe it will b necessary to execute a safety assessment of the proposed operation. This will take two forms:

1) A collision risk assessment for the proposed RNAV system specification;
2) A safety case for the operation.

8.3 After the PBN applications implementation, all the system should be monitored in order to ensure to maintain operational safety. In case of unforeseen events, dependency in charge of monitoring should propose and coordinate with all interested parts the implementation of mitigating measures as soon as possible.

A-1
APPENDIX X1

Reference documentation for developing operational and airworthiness approvals

Organisation	Code	Title
ICAO	Doc (under development by the RNPSORSG)	Performance-based navigation (PBN)
ICAO	Doc 8168 – OPS/611	Aircraft operations
ICAO	Doc 4444	Procedures for air navigation services – Air traffic management
ICAO	Doc 8733	CAR/SAM air navigation plan
ICAO	Doc 7030/4	SAM Regional supplementary procedures (SUPPS)
FAA	Order 8400.10	Required navigation performance 10 (RNP 10) operational approval
FAA	AC 90-96	Approval of US operators and aircraft to operate under instrument flight rules (IFR) in European airspace designated for basic area navigation (BRNAV/RNP 5)
FAA	AC 90-100	US Terminal and en route area navigation
FAA	AC 90-101	Approval guidance for RNP procedures with SAAAR
FAA	Order 8260.52	United States standards for required navigation performance (RNP) approach procedures with special aircraft and aircrew authorization required (SAAAR)
JAA	Leaflet No. 2 (TGL 2) Rev 1	Guidance material on airworthiness approval an operational criteria for the use of navigation systems in European airspace designated for basic RNAV operations
JAA	Leaflet No. 3 (TGL 3) Rev 1	Interim guidance material on airworthiness approval and operational criteria for the use of the NAVSTAR Global Positioning System (GPS)
JAA	Leaflet No. 10 (TGL 10)	Airworthiness an operational approval for precision RNAV operations in designated European airspace
EUROCONTROL	Doc 003-93	Area navigation equipment: operational requirements and functional requirements
RTCA	Do-236B	Minimum aviation system performance standards: Required navigation performance for area navigation
RTCA	Do-238A	Minimum operational performance standards for required navigation performance for area navigation

Documentation availability

The documentation described in paragraph 1 of this document may be obtained at the following websites:

a) Copies of EUROCONTROL documents may be requested from EUROCONTROL, Documentation Centre, GS4, Rue de la Fusee, 96, B-1130 Brussels, Belgium; (Fax: 32 2729 9109). Website: http://www.ecacnav,com.

b) Copies of EUROCAE documents may be purchased from EUROCAE, 17 rue Hamelin, 75783 Paris Cedex 16, France (Fax: 33 1 4505 7230). Web site: http://www.eurocae.org.

c) Copies of FAA documents may be obtained from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325, USA. Website: http://www.faa.gov/certification/aircraft/ (Regulation and guidance library).

d) Copies of RTCA documents may be obtained from RTCA Inc., 1140 Connecticut Avenue, N.W., Suite 1020, Washington, DC 20036-4001, USA, (Tel: 1 202 833 9339). Website: www.rtca.org.

e) Copies of ARINC documents may be obtained from Aeronautical Radio Inc., 2551 Riva Road, Annapolis, Maryland 24101-7465, U.S.A. Website: http://www.arinc.com.

f) Copies of JAA documents are available from the JAA´s Publisher Information Handling Services (IHS). Information on prices, where and how to order is available in the JAA website: http://www.jaa.nl and in the IHS websites: http://www.global.his.com and http://www.avdataworks.com.

g) Copies of EASA documents may be obtained from EASA (European Aviation Safety Agency), 101253, D-50452 Koln, Germany.

h) Copies of ICAO documents may be purchased from the Document Sales Unit, International Civil Aviation Organization, 999 University Street, Montreal, Québec, Canada H3C 5H7, Fax: 1 514 954 6769, or at: sales_unit@icao.org, or through national agencies.

APPENDIX E

RNAV/RNP APPROVAL GUIDELINES

1. General

1.1 As the implementation of the PBN concept grows throughout the world, it is expected than an aircraft will pass through different airspaces and routes with different types of RNAV and/or RNP between the time it takes off and lands, which will require multiple authorisations for a single aircraft and operator, thus increasing the workloads for both operators and the CAA. In order to reduce this workload, it is necessary to design a generic approval process that will allow RNAV/RNP authorisations to be issued under a single criterion.

1.2 These guidelines contain information about the new performance-based navigation (PBN) concept and its two application categories defined as: area navigation (RNAV) operations and required navigation performance (RNP) operations. It also gives CAA inspectors directions and guidance about the approval process for the following types of operations: RNP 10, RNP 4, RNAV 5, RNAV 2 and RNAV 1.

2. RNAV/RNP approval

2.1 RNAV/RNP approval will cover two types of approvals: airworthiness approval that will deal exclusively with aircraft approval, and operational approval, which will deal with the operational aspects of the operator. Compliance with these two types of approvals will permit operators to obtain RNAV/RNP approval.

2.1.1 Airworthiness approval.-

a) Any aircraft an operator intends to use in RNAV/RNP airspace must obtain an airworthiness approval from its CAA before an operating approval can be issued to it;
b) Approval will be granted to an aircraft that meets the requirements of the airworthiness approval documents of each State, which must be based on the requirements of the PBN manual (being prepared at this time by the RNPSORSG working group).

2.1.2 Operational approval.-

a) The State of the Operator will be the authority responsible for approval of flight operations in the airspace in which a type of RNAV/RNP is prescribed. The approval authority will make sure that the aircraft is equipped with the necessary systems for conducting operations of the RNAV/RNP type for which operational approval is required.

3. RNAV/RNP approval process

3.1 The RNAV/RNP approval process consists of five phases as described below:

a) Phase one: Pre-application;
b) Phase two: Formal application;
c) Phase three: Analysis of the documentation;
d) Phase four: Inspection and demonstration;
e) Phase five: Approval.

4. Phase one – Pre-application

4.1 Phase one may be started by the operator, when it determines and expresses its intention to the CAA to operate in RNAV/RNP airspace, or by the CAA, when it requires that operators obtain an RNAV/RNP approval.

4.2 On learning the intention of the operator or of the CAA, the Head of the inspection and certification body will appoint the certification team, one of whose members will be the designated HCT. In that case, the POI may be appointed as such.

4.3 The CAA team appointed to carry out the applicant's approval process must become familiar with all aspects of the proposed or required operation, in order to give the operator guidance and advice during the pre-application meeting and throughout the entire process. The inspectors must accordingly:

a) become familiar with the existing CAA policy and with the requirements established for RNAV/RNP approval;
b) become familiar with the appropriate RNAV/RNP technical material;
c) become familiar with aircraft requirements for each type of RNAV/RNP;
d) become familiar with the methods used to determine aircraft admissibility;
e) make a precise evaluation of the nature and scope of the proposal;
f) determine whether validation tests or flights are required;
g) determine the need for coordination requirements;
h) make sure that the operator or applicant clearly understands the minimum requirements for an acceptable application; and
i) determine the date on which the operator intends to start RNAV/RNP operations.

4.4 The newly appointed head of the certification team (HCT) will call the operator to a pre-application meeting.

4.5 The CAA team will take up the following issues in the course of the pre-application meeting:

a) Phases of the approval process, pointing out the responsibilities of each party during those phases;
b) existing RNAV/RNP regulatory requirements and approval documents;

c) reference documents (for example, the ICAO performance-based navigation manual and this document);
d) elements of the airworthiness data package;
e) airworthiness and operations documents, manuals and programmes that the operator must present, together with the application for RNAV/RNP approval in Phase two;
f) operating and maintenance procedures to be carried out by the operator;
g) aircraft requirements for each type of RNAV/RNP;
h) methods for determining aircraft admissibility;
i) coordination procedures between the CAA and the operator;
j) the need for the applicant to form a working team for the approval operation;
k) timetable of events;
l) grounds for rejecting the documentation;
m) validation flight or test requirements;
n) validation test or flight plan (if required);
o) acceptable standards or rules for the submission of documents;
p) training programmes for flight crews, FOO/AD and maintenance personnel;
q) paragraph or paragraphs of the OpSpecs to be implemented;
r) grounds for suspension or revocation of RNAV/RNP approval.

4.6 During this phase, the CAA and the operator will reach a common understanding about the RNAV/RNP approval.

4.7 This phase concludes when the CAA is satisfied that the operator has a gained a thorough knowledge of all the aspects involved in the RNAV/RNP approval process.

5. Phase two – Formal application

5.1 Phase two starts when the operator sends the formal application, together with the following documentation. Figure 2-1 – *Example of a formal application,* describes an example of its contents.

a) Airworthiness documents, that make it possible to determine aircraft admissibility, such as:
   1) For aircraft under production (or new aircraft): AFM, AFM supplement, and/or TCDS;
   2) For aircraft that have achieved their service capacity: as applicable, SB; Aircraft service change; Service letter; STC, including certification data package, and document confirming fulfilment of the modification and/or inspection (e.g. FAA/JAA Form 337).

b) Maintenance documents, as applicable:
   1) For aircrafts that have demonstrated their capacity in its manufacturing process; all maintenance documents and manual presently in force and applicable to operation (for example: MM, SRM, IPC, WDM, etc); Maintenance manuals;
   2) For aircrafts that have achieved their capacity in service: all updated maintenance documents and manual (all supplements to affected manual, for example: supplement to AFM, MM, etc.);
   3) Revised operator maintenance control manual , which should contain description of aircraft equipment, giving a detail of its relevant components to carry out the requested RNAV/RNP operation.
   4) Revised maintenance programme
c) Description of navigation equipment integration;
d) In the case of RNP 10 and/or RNP 4 operations, the time limits for requested operation with INS or with IRU in oceanic or remote areas. The time limit proposed by the applicant for RNP 10 and/or RNP 4 operations should be stated in relation to the specified INS or IRU. The applicant should keep in mind the effect of headwinds in the area where RNP 10 and/or RNP 4 operations are to be carried out.
e) Description of updating procedures, if used;
f) RNAV/RNP training programmes (initial and periodic):
   1) Flight crew;
   2) FOO/AD; and
   3) Maintenance personnel.
g) Revised operations manual: policies, operational practices, and procedures.
   1) Flight planning;
   2) Pre-flight procedures;
   3) En-route procedures;
   4) Updating procedures and repercussions of the update on the navigation solution (if the update is planned and whether it is only for aircraft with inertial systems);
   5) Flight crew knowledge; and
   6) In-flight contingency procedures according to ICAO Doc 7030 *Regional supplementary procedures*.
h) MEL
i) Procedure for validation of navigation database and authorization letters of suppliers of said data.
j) Aircraft operating manual (AOM) and checklists;
k) Performance history (previous performance);
l) Validation test or flight plan.

5.2 This phase does not include a thorough evaluation, nor the analysis of the documentation presented; however, the documentation must be examined in enough detail to determine its completeness.

5.3 If the proposal is unsatisfactory, it should be returned to the operator with a written explanation of the reasons for its rejection.

5.4 If the proposal is satisfactory, the CAA HCT will decide to continue with the following phase of the process.

6. Phase three – Analysis of the documentation

6.1 In phase three, the CAA team must make a detailed analysis of all the documentation presented with the formal application.

6.2 The CAA team will determine the admissibility of the aircraft or group of aircraft by using one of the following three methods:

a) Aircraft that have an RNAV/RNP airworthiness statement in the AFM;
b) Aircraft that do not have an RNAV/RNP airworthiness statement in the AFM, to which approval is granted by virtue of other rules or previous rules (*e.g.* Appendix 30 to the OPS LARs, Part I, or Appendix G to 14 CFR, Part 121); and
c) Collection of data, using the following methods:
   - sequential; or
   - periodic.

6.3 There are two possibilities as a result of phase three:

a) When the results of the detailed analysis of the documentation are satisfactory, the process proceeds to phase four. Otherwise, the application will be returned to the operator, together with the documentation and a written explanation of the reasons for its rejection.

7. Phase four – Inspection and demonstration

7.1 Once the documentation has been approved, the following activities will be carried out in phase four:

a) RNAV/RNP training for flight crews, FOO/AD and maintenance personnel, which will be verified by the CAA; and
b) Validation tests or flights, which will follow the guidelines of Chapter 13 – *Validation tests,* of Volume II, Part II of the MIO and the corresponding chapter of the MIA.

7.2 The regulations of the States do not prohibit the commercial transportation of passengers during validation tests. The CAA team may authorise the applicant to transport passengers on board a validation flight when the proposed operation is similar to those included in the applicant's previous experience.

7.3 This phase ends when the training and validation test requirements have been successfully completed. If the applicant fails the validation tests or flights, the operator must take corrective measures and then reschedule those tests or flights, and send in a new validation test or flight plan.

8. Phase five – Approval

8.1 Once the operator has completed the airworthiness, continued airworthiness, and operational requirements, the CAA will issue the RNAV/RNP approval through paragraphs B034, B035 or B036 of the OpSpecs, as applicable.

9. Work aid

9.1 Figure 2-2 – *Work aid for RNAV/RNP approval* describes the specific steps to be followed during the RNAV/RNP approval process.

10. Documentation availability

10.1 The documentation described in paragraph 1 of this document may be obtained at the following electronic addresses:

a) Copies of EUROCONTROL documents may be requested from EUROCONTROL, Documentation Centre, GS4, Rue de la Fusee, 96, B-1130 Brussels, Belgium; (Fax: 32 2729 9109). Web site: **http://www.ecacnav,com**.
b) Copies of EUROCAE documents may be purchased from EUROCAE, 17 rue Hamelin, 75783 Paris Cedex 16, France (Fax: 33 1 4505 7230). Web site: **http://www.eurocae.org**.
c) Copies of FAA documents may be obtained from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325, USA. Web site: **http://www.faa.gov/certification/aircraft/** (Regulation and guidance library).
d) Copies of RTCA documents may be obtained from RTCA Inc., 1140 Connecticut Avenue, N.W., Suite 1020, Washington, DC 20036-4001, USA, (Tel: 1 202 833 9339). Web site: **www.rtca.org**.
e) Copies of ARINC documents may be obtained from Aeronautical Radio Inc., 2551 Riva Road, Annapolis, Maryland 24101-7465, USA. Web site: **http://www.arinc.com**.
f) Copies of JAA documents are available from the JAA´s Publisher Information Handling Services (IHS). Information about prices and where and how to order is available at the JAA website: **http://www.jaa.nl** and IHS websites: **http://www.global.his.com** and **http://www.avdataworks.com**.
g) Copies of EASA documents may be obtained from EASA (European Aviation Safety Agency), 101253, D-50452 Koln, Germany.
h) Copies of ICAO documents may be purchased from the Document sales unit, International Civil Aviation Organization, 999 University Street, Montreal, Québec, Canada H3C 5H7, (Fax: 1 514 954 6769, or by e-mail: **sales_unit@icao.org**) or through national agencies.

Figure 2-1 – Example of a formal application

Mr. Jorge Medrano
Head of the certification and inspection body
Chiclayo 857
Miraflores

Dear sir:

I am writing you, in your capacity as Head of the CAA certification and inspection body, to ask you to issue an approval of the ORION Company's OpSpecs to carry out RNP 10 (4) and/ RNAV 1 (2, 5) operations, *for 6.2 hours between updates on the designated routes (for RNP 10 and RNP 4 operations only*).
The following aircraft meet the requirements and capabilities specified in (*specify the order or AC according to which the aircraft will be approved, e.g. AC 90-100/TGL 2, etc.*).

Type of RNAV/RNP	Aircraft type and series	Navigating equipment	Communication equipment	Time limit
RNP 10 and 4 RNAV 1, 2 and 5	B 747-400	List the navigation equipment, by name, type, model and manufacturer	List the navigation equipment, by name, type, model and manufacturer	Number of hours or unlimited for RNP 10 or RNP 4
RNP 10 and 4 RNAV 1, 2 and 5	B 737-500	List the navigation equipment by name, type, model and manufacturer	List the navigation equipment by name, type, model and manufacturer	Number of hours or unlimited for RNP 10 or RNP 4

Sincerely yours,

César Martínez Zerpa
Executive President of ORION

Figure 2-2 – Work aid for RNAV/RNP approval

Applicant:		
RNAV Type: **RNP Type:**		
Activities	**Inspectors**	**Date**
1. Phase one - Pre-application		
a) Statement of the intention of the applicant		
b) Appointment of the CAA team that will conduct the RNAV/RNP approval of the applicant		
c) Familiarisation of the CAA team with: 1) The existing policy of the CAA and the requirements established for RNAV/RNP approval; 2) The appropriate RNAV/RNP technical material; 3) The aircraft requirements for each type of RNAV/RNP; 4) The methods for determining aircraft admissibility; 5) A precise evaluation of the nature and scope of the proposal; 6) Determining whether validation tests or flights are required; 7) Determining the need for coordination requirements; 8) Making sure the operator or applicant clearly understands the minimum requirements for an acceptable application; and 9) Determining the date on which the applicant intends to start RNAV/RNP operations.		
d) Convening of the applicant to a pre-application meeting		
e) Pre-application meeting (subjects to be covered) 1) Phases of the approval process 2) Regulatory requirements and approval documents		

3) Reference documents 4) Airworthiness data package 5) Airworthiness and operational documents to be submitted with the formal application 6) Operating and maintenance procedures to be carried out by the applicant 7) Aircraft requirements 8) Methods for determining aircraft admissibility 9) Coordination procedures 10) Creation of a work team by the applicant 11) Timetable of events 12) Grounds for rejection of the documentation 13) Validation test or flight requirements 14) Validation test or flight plan (if required) 15) Acceptable standards for the submission of the documentation 16) Training programmes for flight crews, FOO/AD and maintenance personnel. 17) Paragraph or paragraphs of the OpSpecs to be developed 18) Grounds for suspension or revocation of RNAV/RNP approval		
f) Opening of the approval record		
2. Phase two – Formal application		
a) Formal application letter, attaching the following documentation:		
1) Airworthiness documents - For aircraft under production: AFM, AFM supplement and/or TC data sheet - For aircraft that have achieved their service capacity: as applicable, SB; Aircraft service change; Service letter; STC, including certification data package, and document confirming fulfilment of the modification and/or inspection (*e.g.* FAA/JAA Form 337)		

2) Maintenance documents - For aircrafts that have demonstrated their capacity in its manufacturing process; all maintenance documents and manual presently in force and applicable to operation (for example: MM, SRM, IPC, WDM, etc); Maintenance manuals; - For aircrafts that have achieved their capacity in service: all updated maintenance documents and manual (all supplements to affected manual, for example: supplement to AFM, MM, etc.); - Revised operator maintenance control manual , which should contain description of aircraft equipment, giving a detail of its relevant components to carry out the requested RNAV/RNP operation. - Revised maintenance programme		
3) Description of aircraft equipment		
4) For RNP 10 and/or RNP 4 operations, the INS/IRU time limits		
5) Description of the update procedures, if used		
6) Training programmes for flight crews, FOO/AD, and maintenance personnel		

7) Revised operations manual: policies, operational practices and procedures: - Flight planning - Pre-flight procedures - En-route procedures - Update procedures and repercussions of updates on the navigation solution - Flight crew knowledge - Contingency procedures		
8) MEL		
9) Procedure for validation of navigation database and authorization charts of suppliers of said data		
10) Aircraft operating manual (AOM) and checklists		
11) Performance history		
11) Validation test or flight plan		
3. Phase three – Documentation analysis		
a) Analysis of the documentation submitted with the formal application		
1) Airworthiness documents - For aircraft under production: AFM, AFM supplement and/or TC data sheet - For aircraft that have achieved their service capacity: as applicable, SB; Aircraft service change; Service letter; STC, including certification data package, and document confirming fulfilment of the modification and/or inspection (*e.g.* FAA/JAA Form 337)		
2) Maintenance documents - For aircrafts that have demonstrated their capacity in its manufacturing process; all maintenance documents and manual presently in force and applicable to operation (for example: MM, SRM, IPC, WDM, etc); Maintenance manuals;		

- For aircrafts that have achieved their capacity in service: all updated maintenance documents and manual (all supplements to affected manual, for example: supplement to AFM, MM, etc.); - Revised operator maintenance control manual, which should contain description of aircraft equipment, giving a detail of its relevant components to carry out the requested RNAV/RNP operation. - Revised maintenance programme		
3) Description of navigation equipment integration		
4) For RNP 10 and/or RNP 4 operations, INS/IRU time limits		
5) Description of update procedures, if used		
6) Training programmes for flight crews, FOO/AD, and maintenance personnel		
7) Revised operations manual: policies, operational practices and procedures: - Flight planning - Pre-flight procedures - En-route procedures - Update procedures and repercussions of updates on the navigation solution - Flight crew knowledge - Contingency procedures		
8) MEL		
9) Procedure for validation of navigation database and authorization letters of suppliers of said data;		
10) Aircraft operating manual (AOM) and		

checklists		
11) Performance history		
12) Validation test or flight plan		
b) Evaluation of the navigation system to determine its admissibility: 1) Aircraft with RNAV/RNP airworthiness statement in the AFM; 2) Aircraft without RNAV/RNP airworthiness statement in the AFM, to which approval is granted by virtue of other standards or previous standards 3) Data collection (RNP 10) by the following methods: - sequential or periodic		
4. Phase four – Inspection and demonstration		
a) Evaluation of the training given to: 1) Flight crews 2) FOO/AD 3) Maintenance personnel		
b) Evaluation of validation tests or flights according to the guidelines of Chapter 13 –*Validation tests*, of Volume II, Part II of this manual		
c) Aircraft inspection		
5. Phase five – Approval		
a) Approval of the paragraph or paragraphs of the OpSpecs b) Presentation of the paragraph or paragraphs of the OpSpecs to the applicant c) Completion and closing of records d) Completion and closing of the general approval registry		

APPENDIX F

1. Training, operational practices and procedures programmes

1.1 In order to guide operators through the RNAV/RNP approval process, a model will be developed of the contents of the training programmes, operational practices and procedures for flight crews, flight operations officers/flight dispatchers (EOV/DV), and maintenance personnel. In general, the training programmes, operational practices and procedures should cover the following areas:

a) General operational topics
b) flight planning;
c) pre-flight procedures;
d) procedures prior to entering RNAV/RNP airspace or route;
e) procedures within RNAV/RNP airspace and/or route;
f) flight crew knowledge; and
g) in-flight contingency procedures according to ICAO Doc. 7030 *Regional supplementary procedures*.

2. General operational topics

2.1 General operational topics will include at least the following elements:

a) Performance-based navigation (PBN) and RNAV/RNP operations concepts and definitions;
b) RNP 10, RNAV 5, RNAV 1/2, RNP 4, RNP 1/2, RNP 0,3 and RNP navigation specifications with required authorization (RA) (RNP 0,3 – 0,1), indicating operation airspaces, applicable sensors and operational limitations;
c) changes in aeronautical charts and documents reflecting entrance in force of RNAV/RNP operations;
d) effects of updating navigation systems;
e) MEL utilization;
f) requirements for flight planning;
g) contingency procedures for RNAV/RNP airspaces (e.i. failure of RNAV equipment);
h) procedures for each type of applicable RNAV/RNP;
i) procedures and personnel in charge of verifying integrity and validity of navigation database (e.i. ARINC 424);
j) procedures for degradation and restitution of a RNAV/RNP operation; and
k) information of Advisory circulars (AC) and ICAO PBN Manual.

3. RNP 10 and RNP 4 training programmes and operational practices and procedures

3.1 The training programme for flight crews and flight operations officers/flight dispatchers (EOV/DV), shall be reviewed and approved. At least the following areas will be included:

3.2 Flight planning.- During flight planning, the flight crew must pay particular attention to conditions that could influence operations in RNP 10/RNP 4 airspace or routes. These conditions could include the following:

a) check to see whether the aircraft is approved for RNP 10/RNP 4 operations;
b) check to see whether the RNP 10/RNP 4 time limit has been considered (only for aircraft equipped with INS or IRU);
c) check to see whether the letter "R" has been entered in box 10 of the ICAO flight plan;
d) verify GRS requirements, such as FDE, if applicable to the operation;
e) if required for a given navigation system, take into account any operational restriction related to RNP 10/RNP 4 approval; and
f) check the planned flight route, including diversion to any alternate aerodrome, in order to identify the types of RNAV/RNP required.

3.3 Pre-flight procedures.- The following activities must be carried out during the pre-flight stage:

a) review the technical maintenance records (maintenance logbooks) to make sure that the equipment meets the conditions for flight in RNP 10/RNP 4 airspace or routes. Make sure that maintenance measures have been taken to correct any defects in the equipment required;
b) during the external inspection of the aircraft, check the condition of navigation antennas and of the airframe coating near each of the antennas (a competent and authorised person other than the pilot may do this, *e.g.* a flight mechanic or a maintenance worker); and
c) review the emergency procedures for operations in RNP 10/RNP 4 airspace or routes. These are no different from normal oceanic emergency procedures with one exception: flight crews should be capable of recognising, and the ATC should be notified, when the aircraft is no longer fit to navigate at its capacity level, according to the RNP 10/RNP 4 approval.

3.4 En-route procedures.- The following shall be observed:

a) before the oceanic point of entry, two LRNS must be in operating condition. If that is not the case, the pilot shall consider diverting to an alternate aerodrome where that equipment is not required or diverting for repairs;
b) before entering oceanic airspace, the position of the aircraft must be determined as accurately as possible through external navigation aids. This may require DME/DME or VOR checks to determine errors in the navigation system by comparing displayed and actual positions. If the system needs an update, appropriate procedures must be followed with the assistance of a prepared checklist;
c) the in-flight operational exercises conducted by the operator must include mandatory cross-check procedures, in order to identify navigation errors in time to keep the aircraft from inadvertently deviating from the routes authorised by the ATC.

3.5 Contingency procedures.- Flight crews must become familiar with the following general provisions:

a) an aircraft must not enter or continue to operate in RNP 10 designated airspace, according to the authorisation in force issued by the ATC, if its navigation system, due to failure or degradation, falls below RNP 10/RNP 4 requirements. In that case, the pilot will obtain an amended authorisation as soon as possible;
b) according to the instructions of the ATC, operations can continue according to the authorisation in force issued by the ATC or, if that proves impossible, a revised authorisation may be requested;
c) in any case, the flight crew shall follow the contingency procedures established for each region in which it operates and obtain ATC authorisation as soon as possible.

4. RNAV 5 training programmes

4.1 RNAV 5 training programme.- The training programme for flight crews shall be reviewed and approved by the CAA. The operator will include at least the following areas:

a) definition of RNAV in terms of RNAV 5 requirements in CAR/SAM airspace;
b) knowledge of the airspace where RNAV 5 is required;
c) changes in aeronautical charts and documents that reflect the entry into effect of RNAV 5 operations;
d) equipment required and its operation in order to be able to operate in RNAV 5 airspace, together with the limitations of such equipment;
e) flight planning requirements;
f) contingency procedures in RNAV 5 airspace (*e.g.* RNAV system failure);
g) RNAV 5 en-route and terminal area procedures, when applicable;
h) methods to reduce navigation errors through dead-reckoning navigation techniques;
i) information cited in the ACs of each State and in this document.

5. RNAV 1 and RNAV 2 training programme

5.1 The training programme shall provide sufficient training (*e.g.* through flight training devices, flight simulators, and the aircraft) concerning the on board RNAV system. The training programme will include the following topics:

a) information concerning this section;
b) meaning and proper use of the suffixes of aircraft navigation equipment;
c) characteristics of procedures as defined in chart and textual descriptions:
    1) description of WPT types (fly over and fly through) and of route finalizers, and of any other types used by the operator, as well as those associated with the flight routes of the aircraft; and

2) navigation equipment required for operation in RNAV routes, SIDs, and STARs (for example: DME/DME, DME/DME/IRU, GNSS).

d) specific information about the RNAV system:
   1) levels of automation, announcement modes, changes, alerts, interactions, reversions and degradations;
   2) functional integration with other aircraft systems;
   3) meaning of en-route disconformities, as well as related flight crew procedures;
   4) monitoring procedures for each flight phase (*e.g.* monitoring of PROG or LEGS pages);
   5) types of navigation sensors (*e.g.* DME, IRU, GNSS) used by the RNAV and associated systems;
   6) anticipation of turns, taking into account the effects of speed and altitude;
   7) interpretation of electronic displays (indicators) and symbols;

e) RNAV operating procedures, as applicable, including how to perform the following actions:
   1) checking the validity of the aircraft navigation data;
   2) checking the successful conclusion of the RNAV self-testing system;
   3) initialising the position of the RNAV system;
   4) obtaining the flight and database of a SID or STAR with the appropriate transition;
   5) tracking of speed and altitude restrictions associated with a SID or STAR;
   6) changing a runway associated with a SID or STAR;
   7) checking the WPT and the flight plan programming;
   8) conducting a manual or automatic runway update (with a change in the take-off site, if applicable);
   9) direct flight to a WPT;
   10) one-course/path flight to a WPT;
   11) intercepting a course/path;
   12) vectoring outside, and then again following, the procedure;
   13) determining errors perpendicular to the path and diversions;
   14) inserting and eliminating en-route disconformities;
   15) removing and reselecting navigation sensor entries;
   16) when so required, confirming the exclusion of a specific navigation aid or type of navigation aid;
   17) when so required by the CAA, executing major navigation error checks, using conventional NAVAIDs; and
   18) changing arrival and alternate aerodromes.

f) automation levels recommended by the operator for each flight phase and workload, including methods for minimising error perpendicular to the path, in order to keep to the centre line of the procedure;

g) phraseology for RNAV applications;

6. GNSS training module for operators that request to operate this system

6.1 Training programme on the GPS as primary means of navigation.**-** In addition, training programmes for flight crews**,** flight operations officers/flight dispatchers (EOV/DV), and maintenance personnel that use GPS, will include the following training curriculum:

6.1.1 GPS system components and operating principles.- Understanding of the GPS system and its operating principles:

a) GPS system components: control segment, user segment, and space segment;
b) on-board equipment requirements;
c) GPS satellite signals and pseudo-random code;
d) positioning principle;
e) receiver clock error;
f) masking function;
g) performance limitations of the different types of equipment;
h) WGS84 coordinate system;

6.1.2 Navigation system performance requirements.- Define the following terms in relation to the navigation system and evaluate the degree of compliance by the GPS system of the requirements associated with the following terms:

a) precision;
b) integrity;
    1) means to improve GPS integrity: RAIM.
c) availability;
d) service continuity

6.1.3 Authorisations and documentation.- Requirements applicable to pilots and navigation equipment for GPS operation:

a) pilot training requirements;
b) aircraft equipment requirements;
c) AFM system certification criteria and limitations;
d) GPS-related NOTAMs.

6.1.4 GPS system errors and limitations.- Cause and magnitude of typical GPS errors:

a) ephemerides;
b) clock;
c) receiver;
d) atmospheric/ionospheric;
e) multi-reflection;
f) selective availability (SA);
g) total typical error associated to the C/A code;
h) effect of the dilution of precision (DOP) on the position;
i) susceptibility to interference;

j) comparison of vertical and horizontal errors; and
k) path-tracking precision. Collision avoidance.

6.1.5 Human factors and GPS.- Limitations on the use of GPS equipment due to human factors. Operating procedures that offer protection against navigation errors and loss of awareness of the real situation due to the following causes:

a) mode errors;
b) data entry errors;
c) data checks and validation, including independent cross-checking procedures;
d) automation-induced relaxation;
e) lack of standardisation of GPS equipment;
f) information processing by humans and situational awareness.

6.1.6 GPS equipment – Specific navigation procedures.- Knowledge of the appropriate operating procedures for GPS in the typical navigation tasks for each specific type of equipment in each type of aircraft that includes:

a) selection of the appropriate operating mode;
b) review of the different types of information contained in the navigation database;
c) forecast of the availability of the RAIM function;
d) procedure for entering and checking the WPT defined by the user;
e) procedure for entering, retrieving and checking flight plan data;
f) interpretation of the typical information shown on the GPS navigation display: LAT/LONG, distance and heading to the WPT, CDI;
g) interception and maintenance of the GPS-defined routes;
h) in-flight determination of ground speed (GS), estimated time of arrival (ETA), time and distance to the WPT;
i) indication of WPT overflight;
j) use of the “DIRECT TO” function;
k) use of the “NEAREST AIRPORT” function;
l) use of the GPS in GPS or DME/GPS arrival procedures.

6.1.7 Verification of GPS equipment.- For each type of equipment in each aircraft, the following operational and start-up checks must be conducted at the appropriate time:

a) constellation status;
b) RAIM functional status;
c) dilution of precision (DOP) status;
d) effectiveness of the instrument flight rules (IFR) database;
e) receiver operating condition;
f) CDI sensitivity;
g) position indication.

6.1.8 GPS messages and warnings.- For each type of equipment in each aircraft, timely action must be recognised and taken in face of GPS messages and warnings, including the following:

a) loss of RAIM function;
b) 2D/3D navigation;
c) dead-reckoning navigation mode;
d) database not updated;
e) loss of the database;
f) GPS equipment failure;
g) barometric data entry failure;
h) power failure;
i) prolonged parallel displacement; and satellite failure.

7. Training programme for maintenance personnel

a) PBN concepts and definitions.
b) Maintenance dispatch ensuring equipment requirements compliance for RNAV/RNP operations.
c) Preflight inspection: condition of the navigation antennas and coverage of fuselage near the antennas.
d) MEL use – dispatch restrictions
e) Instructions about the installation of new equipment
1) Approved data and TSOs compliance
f) Changes in the maintenance programme – ICA
g) FMS – DB, registries and personnel in charge of the update, etc.
h) Precision of sensors – certified equipment for precision assessment
i) Training necessary to carry out approval process of RNAV/RNP airworthiness..

APPENDIX G

PERFORMANCE-BASED NAVIGATION INFORMATION

1 Purpose

1.1 The main purpose of this document is to provide information to aid understanding of the paradigm change with Performance-based Navigation operations. To do so requires a brief review and discussion on a number of background items including the shared safety role of the airborne system, procedure and airspace design, and operator.

2 Introduction

2.1 The initial industry activities in developing minimum aviation system performance standards (MASPS) for RNP addressed aspects of implementation including system performance criteria, operational considerations, system qualification, navigation data, and navigation databases. These discussions resulted in new standards that represented fundamental change in a number of areas:

a) system requirements that reflected the distribution of safety responsibility across the stakeholders (i.e. pilot, system, operational procedure, procedure and airspace design, airworthiness approval and operational approval)
b) setting specific conditions and criteria for the system and procedure design,
c) performance standards intended to support obstacle clearance or separation,
d) specification of changes necessary to assure the reliability, repeatability and predictability of the navigation system for flight guidance and flight management,
e) specification of data management and control processes necessary for navigation databases containing the RNP procedures,
f) specification of data requirements along with the rigor and processes to assure correct, accurate and usable navigation source data.

3 Safety Assurance Process

3.1 From the system functional safety and airworthiness standpoint, processes were identified and defined to formalize the level and types of assessments and analyses necessary to assure intended functionality, and performance. The functional hazard analyses identify effects of functional failures and conditions in the system, along with required or recommended actions and limitations where necessary. The system safety analysis formalizes a comprehensive analyses of all aspects of the system hardware, architecture, configurations, modes and functionality to show how safety requirements are satisfied.

3.2 An associated step in the airworthiness process is system validation. Using a combination of analyses and tests on the ground, lab and aircraft, the system and its functionality are assessed for varying conditions and environments. A key aspect of this for performance-based operations is the extension of conditions and situations to address rare-normal events. The addition of rare-normal in the systems demonstration provides a fundamental alleviation for procedure design consideration of such conditions.

4 System Design Assurance

4.1 Besides the process assurance steps, key system requirements were needed and specified based upon assessment and analysis of critical aspects of the systems functions, usage, failures and errors. Specifying system and operational requirements for these has the effect of being able to exclude or minimize the risk of many failures and conditions that would result in potential deviations and increasing operational risk.

4.2 However, the opportunities for operational errors go beyond just the functions, features and performance of the airborne system. This led to additional assessment of RNP error components and the potential effects of the errors, erroneous information, etc with the equipment, infrastructure, navigation data, flight planning and human in the loop. This resulted in added guidance for operations and usage.

4.3 Altogether, the standard for navigation system performance was raised significantly to meet the needs of RNP operations, facilitate implementation, and enhance operational safety. Areas where this takes place include:

a) Lateral performance assurance limits (containment integrity) were specified at 2xRNP, with an associated probability of 10^{-5} of undetected excursion.
b) Lateral performance continuity (containment continuity) was specified at 10^{-4} probability of annunciated loss of a required RNP capability.
c) definition of reliable, predictable and repeatable lateral and vertical flight paths, using leg types with such characteristics, as well as altitude/speed constraints for geometric point to point paths and paths with vertical angles.
d) definition of flight path data contained in the system navigation database.
e) specification of unique factors affecting the path i.e. earth reference, magnetic variation, etc.
f) crew situational awareness with lateral and vertical deviation information and displays and operating procedures as integral to lateral and vertical operations.
g) operational considerations associated with RNAV e.g. RNP applicability, transitions in paths, etc.
h) monitoring and alerting.
i) Vertical path performance limits that bound vertical total system error and is based upon modern aircraft performance.
j) specification of unique factors affecting the vertical path i.e. temperature effects.

k) operational considerations associated with vertical navigation i.e. system calculated deceleration path segments

4.4 With all this attention to system functions, features and performance, a known area with significant impact required attention. This was the source navigation data, derived charts, and electronic versions contained in airborne navigation databases. The letter of authorization for navigation database suppliers and processes, based upon the industry standard DO-200A/ED-76 is a critical part in minimizing the potential for errors in procedures contained in databases. Just as important is source data quality and the need for service providers and States to meet the industry standards outlined in DO-201A/ED-77.

4.5 Collectively, all of the parts result in much more robust systems, performance and functionality than has existed previously.

5 System Safety versus Operational Safety

5.1 To start, there is no direct statistical connection between the system safety processes for the aircraft and system, and the target level of safety objective typical to the operational safety rationale.

5.2 However, the airworthiness process includes safety assurances steps described previously, which are tied to the regulations for safety from the equipment, systems and installation standpoint. Included is the determination of the system hazard classification that is one element of the safety in an operation. Other elements are the performance and design assurance in the RNP system stemming from the containment integrity and containment continuity provided.

5.3 The level for the hazard classification for the RNP system is designated “major”, which corresponds to a 10^{-5} probability of misleading navigation information per flight hour. And for RNP system performance, there is a requirement that the probability of exceeding the airspace performance requirement undetected and unannunciated should be less than 10^{-5}per flight hour.

5.4 The general concern is that this aspect of system performance appears insufficient for the target level of safety, i.e. risk of accident that is 10^{-7} per operation.

5.5 One consideration is the historical accident rate for approach which is 2.6 x 10^{-7} per approach, for all causes. None have been associated with the undetected misleading or erroneous navigation system performance. And this is just for systems whose design assurance basis “major”, 10^{-5} as well as those meeting the MASPS performance requirements. So it is clear that while the 10^{-7} safety objective is matched to the accident rate, there is no connection between the accident rate and the system assurance level.

5.6 One set of explanations is that current airspace allocations provide a large operational safety margin, that dependence on the navigation system functions is low, that other safety nets such as surveillance and collision avoidance systems have been effective, and that operations have been largely dictated by ATC instruction.

5.7 Another explanation contains several parts.

5.7.1 One part is that with modern aircraft the manner in which flight and status information is presented to the crews have not only significantly improved safety in the conduct of flight operations, but aided the crew in the identification of anomalies that could have created some sort of operational problem. With the modern systems architectures and flight planning capabilities in the aircraft, the crew has continuous awareness of the desired flight path, the aircraft location, flight progress, and navigation performance. So when considering operational risk, the airplane navigation system has not been a causal factor in accidents or incidents.

5.7.2 Another part is that a focus solely on performance requirements will have little impact on operational safety. This is supported by accident data that shows that operational risk is dominated by other factors such as human error that are hard to quantify and correct. However, it is this area where attention and focus is required to improve safety for RNP operations such that improvements are made for situational awareness, human interface, and alerting.

5.7.3 Additionally for RNP aircraft, part of the certification demonstration is a performance and capability evaluation and analysis. This step is critical in demonstrating the aircraft provides the levels of performance, functionality, monitoring and alerting essential to the safe conduct of RNP operations.

5.7.4 It is clear that the contribution of the improvements in system functions, features and human interfaces to an operational safety cannot be quantified as they can for other elements in the traditional fault tree. Operational judgment and experience is that these features and improvements are an integral to cockpit operations and systems architecture, reducing exposure to operational errors and enhancing operational safety. Examples follow:

5.7.4.1 Situation Awareness to enhance Crew Operations and Detection

a) Electronic map display of flight path and other map information such a geographical reference points, airports, navaids, etc.
b) Displays of time to go, distance to go, winds, track etc for current flight situation and progress on electronic map display
c) Graphical displays, improved deviation scales, and numerical readouts for lateral and vertical deviation
d) Indications of the active RNP and the current level of navigation performance

5.7.4.2 System Functions and Capabilities to Reduce the Incidence of Errors

a) Path Definition using path terminators that are reliable, predictable and repeatable, minimal variability
b) Path Definition including altitude constraints and vertical angles reflecting procedure requirements and charts

5.7.4.3 Improved Human Interface to Reduce the Incidence of Operational Errors

a) Availability of route, departure, arrival, transition and approach procedures from the navigation database
b) Format and context checking for entries of waypoints and flight data.
c) Alerting messages:
   - when data entry is incorrect format, range or is not allowed, i.e. an invalid entry
   - when an attempted deletion is not allowed
   - when SID or arrival and runway not compatible
   - if flight plan change deletes waypoint altitude constraints defining the descent path
   - when the end of an active route is overflown
   - when the crew entry of an RNP exceeds the system default or database RNP value

5.7.4.4 Improved Monitoring and Alerting

a) Monitoring and alerting when actual performance exceeds RNP
b) Monitoring and alerting when calculated position differs between FMCs

6 Flight Operation Factors

6.1 RNP/RNAV approach procedures, whether AR or basic public procedures (regardless of RNP), have not seen jet transport accidents due to crew error or other causes. In large part, this is due to the greater assurance of the aircraft capability, crew training and procedures, and in the procedure design. The operational safety has also been significantly enhanced though:

a) Simplicity of flying the approaches relative to the traditional VOR/ADF. Fix to fix navigation using LNAV in conjunction with a MAP display is vastly simpler for crews than monitoring primitive VOR course or ADF bearing information while trying to combine this with DME information, crossing radials/bearings, etc.

b) Constant angle barometric path definition and the ability to fly this path automatically means that multiple crew errors must be made to result in a CFIT accident, as opposed to traditional "dive and drive" methods which only require one crew error to cause a fatal accident. The potential for multiple errors is removed by the capabilities and improvements in the flight systems.

c) The constant angle path also easily provides the crew a low-workload stabilized approach method to avoid landing accidents.

7 Procedure Design, Aircraft Qualification and Operator Approval

7.1 While all of the preceding information has been to rationalize why the system safety for RNP operations is well thought out and addressed by design, analysis and test, it is the step in assessing aircraft and operators relative to the procedure design criteria and application that completes the safety assessment for RNP AR operations.

7.2 The key aspects of procedure design for RNP AR are:

a) The RNP is scalable, with 0.1 NM minimum, 0.3 NM nominal for the final approach, and 1 NM nominal for initial, intermediate and missed approach.

b) Obstacle clearance of 2xRNP with no secondary areas.

c) Tailored and guided missed approaches

d) Fixed radius turns, where necessary

e) Vertical obstacle clearance based upon aircraft performance requirements, also known as the vertical error budget (VEB). It is a derivation and an extrapolation of existing obstacle clearance margins from FAA notice 8260.48, considering the added requirements for demonstrated navigation performance and aircraft operational capability.

f) Missed approach OCS tailored to aircraft climb performance

7.3 The aircraft qualification criteria is aimed at assuring the functions, features, and performance capabilities are matched to procedure design. Some of the specific and critical elements include:

a) the provision of on-board performance monitoring and alerting consistent with the performance requirement of the procedure, airspace, etc. There are a number of acceptable alternatives for this. For example, in a system with real-time estimation of position uncertainty and monitoring of flight technical error, this caution may be activated when the combination of position uncertainty and FTE exceeds the budgeted design limit for total system error. System compliance may also be demonstrated by allocating the performance requirements to each potential source and monitor those error sources separately. In this implementation, the caution could be activated when either the position uncertainty or FTE becomes unacceptable. Yet another implementation is to demonstrate through test and analysis that the FTE is inherently bounded, in which case the caution would be activated when the position uncertainty exceeds the allocated design limit. Implementation is left to the equipment designers.

b) demonstration that the aircraft is capable of meeting a 10^{-7} airspace containment, or that RNAV & Baro-VNAV performance and functionality are demonstrated to be consistent with the procedure design and operation.
c) GNSS or IRU as the main basis of performance accuracy and continuity, with allowance for DME/DME where appropriate.
d) Autoreversion to secondary sensor, for continuity
e) Altimetry System Error must satisfy $ASE = -8.8 \cdot 10^{-8} \cdot H^2 + 6.5 \cdot 10^{-3} \cdot H + 50$ feet, at 99.7%
f) Temperature Compensation, limitations for operations if the capability is not provided and the temperature is beyond that accounted for in the procedure design.
g) Path Definition: providing the essential predictability, repeatability and reliability with path terminators IF, RF, TF, DF, CF, FA, and VM. Considerations for fly-bys, Waypoint Resolution, Vertical Path specification, Altitude/Speeds, Database procedures & verification, Magvar, RNP changes, Leg Sequencing, altitude restrictions.
h) Path Steering performance, through specific criteria for displays and scaling
i) Situation Awareness, Progress information and Status for the desired path, path deviation, active waypoint, bearing/distance, Ground speed & Time, active fix, track, distance to go, baro-altitude, active sensors, and system failures
j) Design Assurance that the level of software is consistent with the criticality/hazard of the operation.
k) Database, must be valid, must be current, and have appropriate processes at the database supplier and operator for handling, management and control.

8 Guidance and criteria are provided for operational considerations

a) Equipment Required & Dispatch: This ensures the system performance capability is provided and available for the intended operations
b) Autopilot/Flight Director: This ensures that the level of performance if dependent on these is available and usable
c) Predicted RNP Assessment: This ensures tools and processes are in place to assure infrastructure will be available to enable the required level of performance.
d) Navaid Exclusion: Operators must ensure appropriate procedures to exclude navaids in accordance with NOTAMs.
e) Navigation Database Currency: Operators must ensure databases are current.
f) Database Flight Plan & Confirmation: Operator must use the correct procedures from the database
g) RNP Awareness & Management: Operators must ensure that the RNP is appropriate for the procedure

h) Sensor Use & Management: The appropriate sensor must be available for use.
i) Track Deviation Monitoring: Tracking and monitoring to RNP laterally and 75 feet vertically, consistent with the assumptions for procedure design.
j) System Crosscheck: depending on the hazard classification of the system, additional crosschecks may be necessary.
k) Procedures with RF Leg: considerations on the conduct of procedures with an RF and how aircraft system capabilities are a factor.
l) Altimeter Setting: current altimeter setting for a procedure
m) Altimeter Crosscheck: assurance that altimeters are consistent and within tolerance
n) Non-standard climb gradient: assurance that aircraft will meet the requirement of the procedure.
o) Engine Out: guidance and considerations
p) Go-Around/Missed Approach with RNP 1 and < 1 and considerations with GNSS Failure & Coasting
q) Contingency Enroute, Approach

8.1 Training must address all aspect of the operational considerations, use of the aircraft, crew procedures, etc.

8.2 RNP Monitoring Program: A process to ensure continued compliance

9 Conclusions and recommended actions

9.1 It should be evident that with RNP, there is tight coupling between the procedure and airspace design criteria for enroute and terminal operations and the assurance that only performance qualified aircraft and systems, and operators are allowed to conduct the operations. Together all requirements of the aircraft qualification and operator approval constitute specific aspects of the safety of the operation that must be addressed and approved.

9.2 The PBN SAM-WG is requested to consider these points when developing requirements for the risk analysis of the operations with the use of the PBN concept.

9.3 The PBN OPS/AIR-WG is requested to consider these points when developing standards for the aircraft and operators approval for the operations with the use of the PBN concept.

9.4 States are requested to analyze the importance of operational errors in an environment with PBN and invest all possible resources in the training of air traffic controllers aiming the reduction of these errors considering the future implementation of this concept in the CAR/SAM Regions.

APPENDIX H

INTERNATIONAL CIVIL AVIATION ORGANIZATION

Caribbean/South American Air Traffic Flow Management Concept of Operation

(CAR/SAM CONOPS ATFM)

Version	Draft 0.1
Date	October 2006

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:

ICAO NORTH AMERICAN, CARIBBEAN, AND CENTRAL AMERICAN OFFICE

MEXICO CITY, MEXICO

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

ICAO SOUTH AMERICAN OFFICE

LIMA, PERU

E-mail	:	mail@lima.icao.int
Web site	:	www.lima.icao.int
Fax	:	+511 575-0974 / 575-1479
Mail	:	P. O. Box 4127, Lima 100, Peru
Point of contact		
E-mail :		jf@lima.icao.int ao@lima.icao.int

The present edition (Draft Version 0.1) includes all revisions and modifications until October 2006. Subsequent amendments and corrigenda will be indicated in the Record of Amendment and Corrigenda Table, according to the procedure established in page 3.

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

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by

CORRIGENDA			
No.	Date applicable	Date entered	Entered by

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:

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

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

Page

Document content

GLOSARIO DE ACRÓNIMOS/ACRONYMS GLOSSARY

ACC	Centro de control de área 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 develop 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 previsions.

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%
Belice	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 is as follows:

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

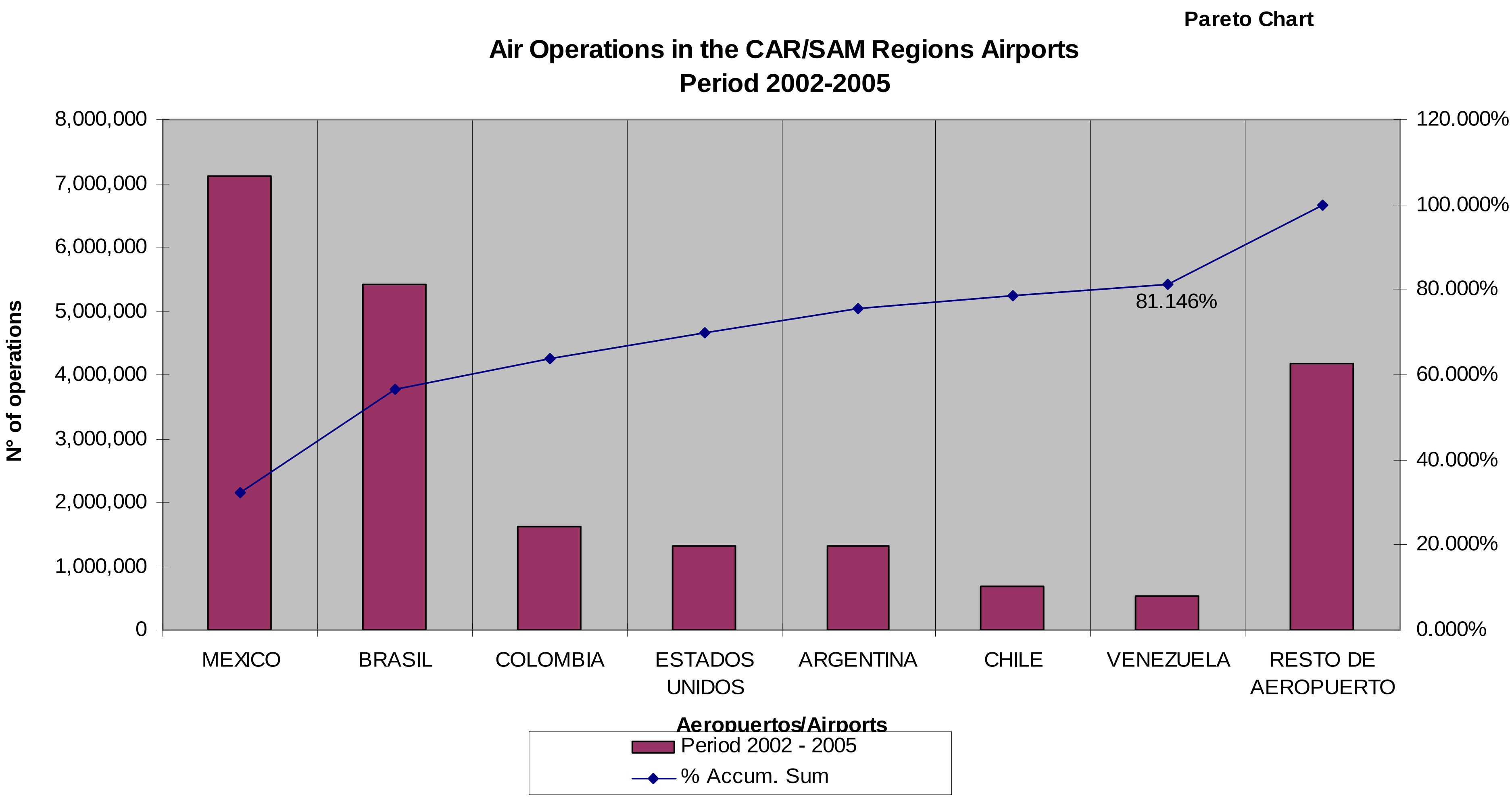
N°	AEROPUERTOS DE LAS REGIONES CAR/ SAM AIRPORTS IN THE CAR/SAM REGIONS	Periodo / Period 2002 - 2005	%
1	MEXICO	7,116,319.00	32.090%
2	BRASIL	5,412,758.00	24.408%
3	COLOMBIA	1,630,559.00	7.353%
4	ESTADOS UNIDOS/USA	1,328,879.00	5.992%
5	ARGENTINA	1,307,842.00	5.898%
6	CHILE	676,718.00	3.052%
7	VENEZUELA	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%**

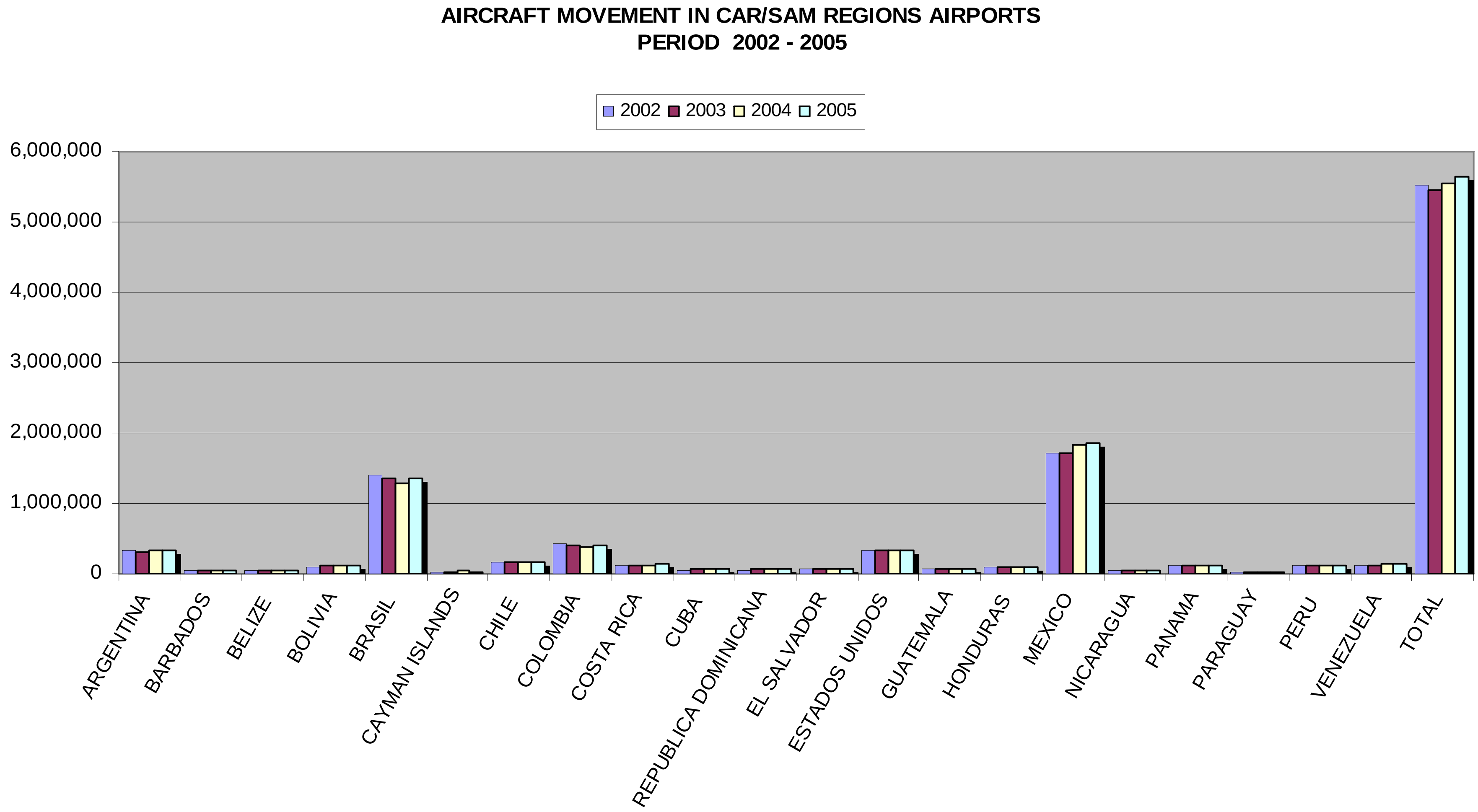
b) From these seven (7) countries, 2 belong to the CAR Region: México with the greatest percentage in the CAR/SAM Regions (32.09%) and United States which occupies fourth place 5.99%). The rest of the places belong to SAM Region States. The flight volume generated in Brazil should be highlighted, representing 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%.

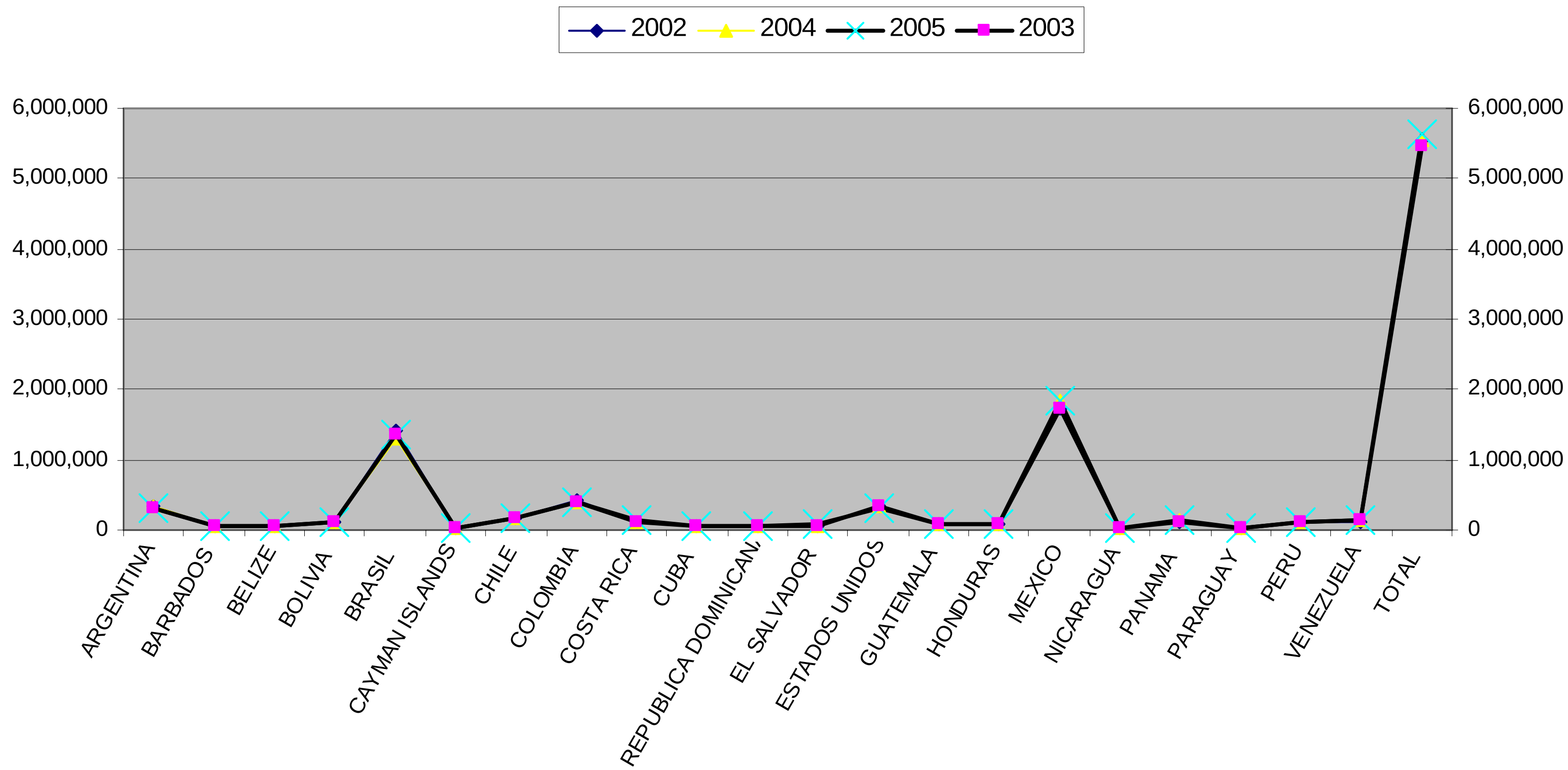
d) It is considered that percentages reflected in the table of numeral i) shall not vary, taking into consideration that States which did not submit information (50%) are mostly Caribbean States from which it is deemed that their flight volumes are below **5%**, which would not affect the table shown above.

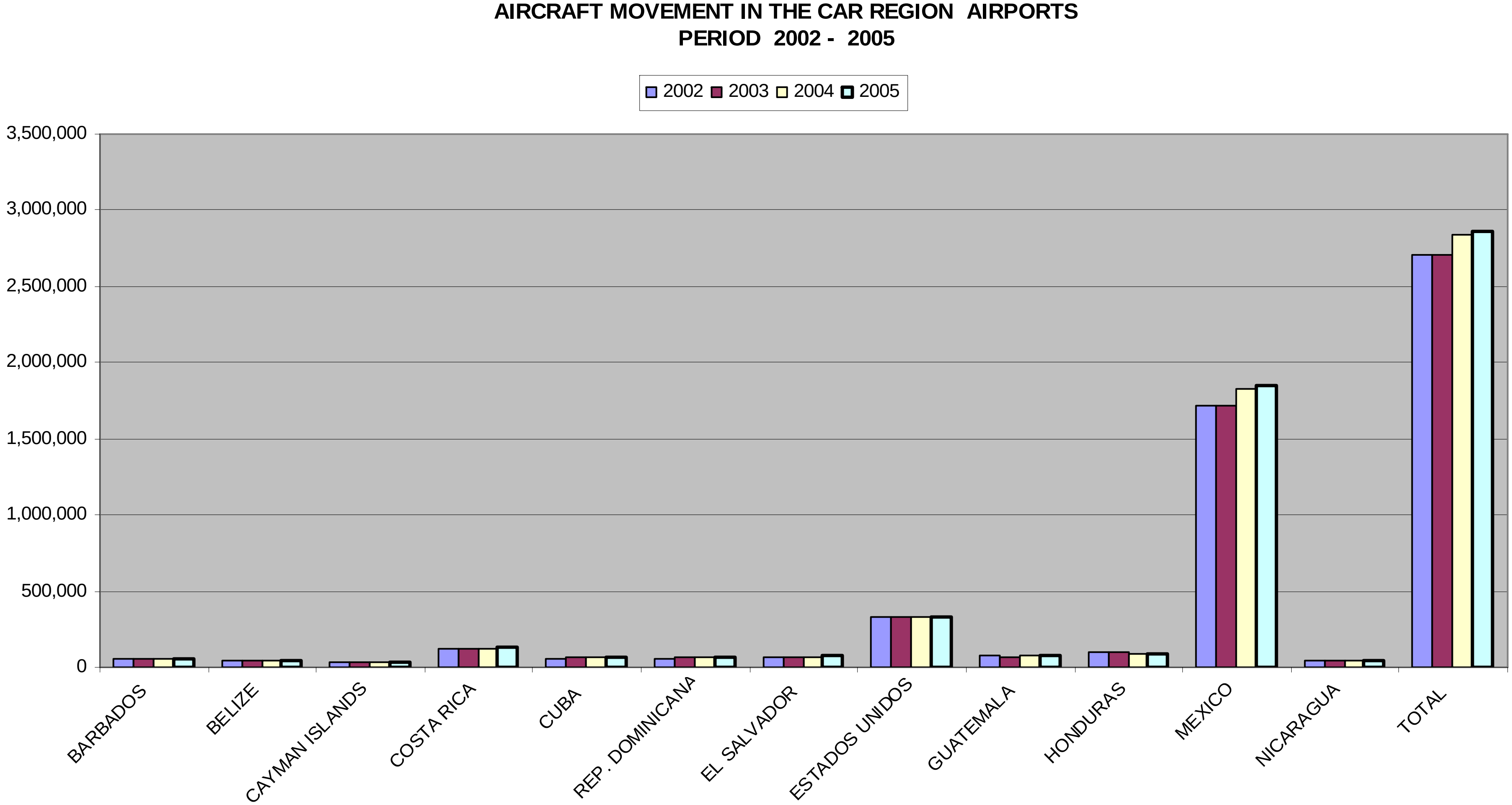
4. Resulting graphics


Pareto Chart
Air Operations in the CAR/SAM Regions Airports
Period 2002-2005
N° of operations
% acumulativo
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
120.000%
100.000%
80.000%
60.000%
40.000%
20.000%
0.000%
81.146%
MEXICO
BRASIL
COLOMBIA
ESTADOS UNIDOS
ARGENTINA
CHILE
VENEZUELA
RESTO DE AEROPUERTO
Aeropuertos/Airports
Period 2002 - 2005
% Accum. Sum

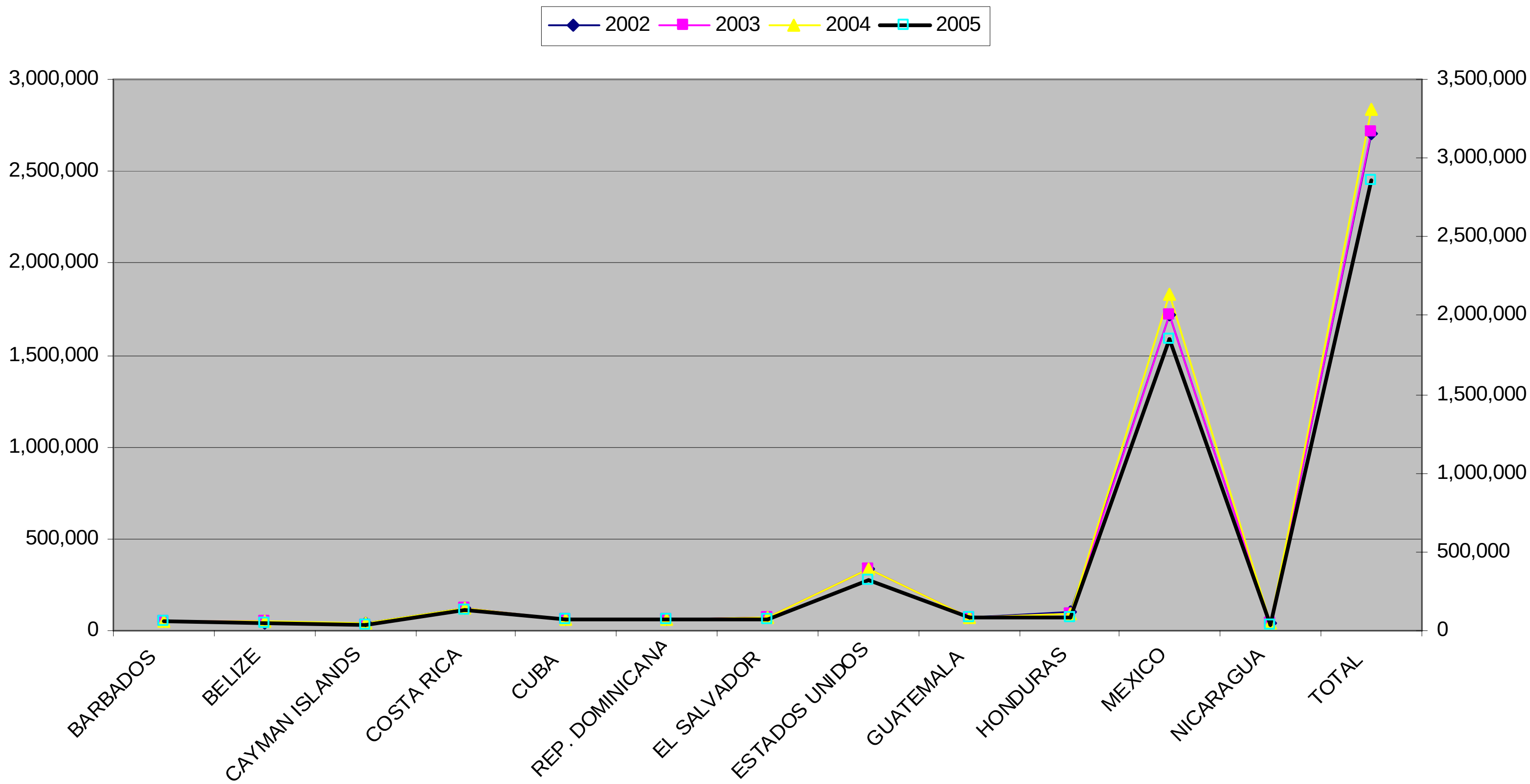

AIRCRAFT MOVEMENT IN CAR/SAM REGIONS AIRPORTS
PERIOD 2002 - 2005
2002
2003
2004
2005
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
ARGENTINA
BARBADOS
BELIZE
BOLIVIA
BRASIL
CAYMAN ISLANDS
CHILE
COLOMBIA
COSTA RICA
CUBA
REPUBLICA DOMINICANA
EL SALVADOR
ESTADOS UNIDOS
GUATEMALA
HONDURAS
MEXICO
NICARAGUA
PANAMA
PARAGUAY
PERU
VENEZUELA
TOTAL

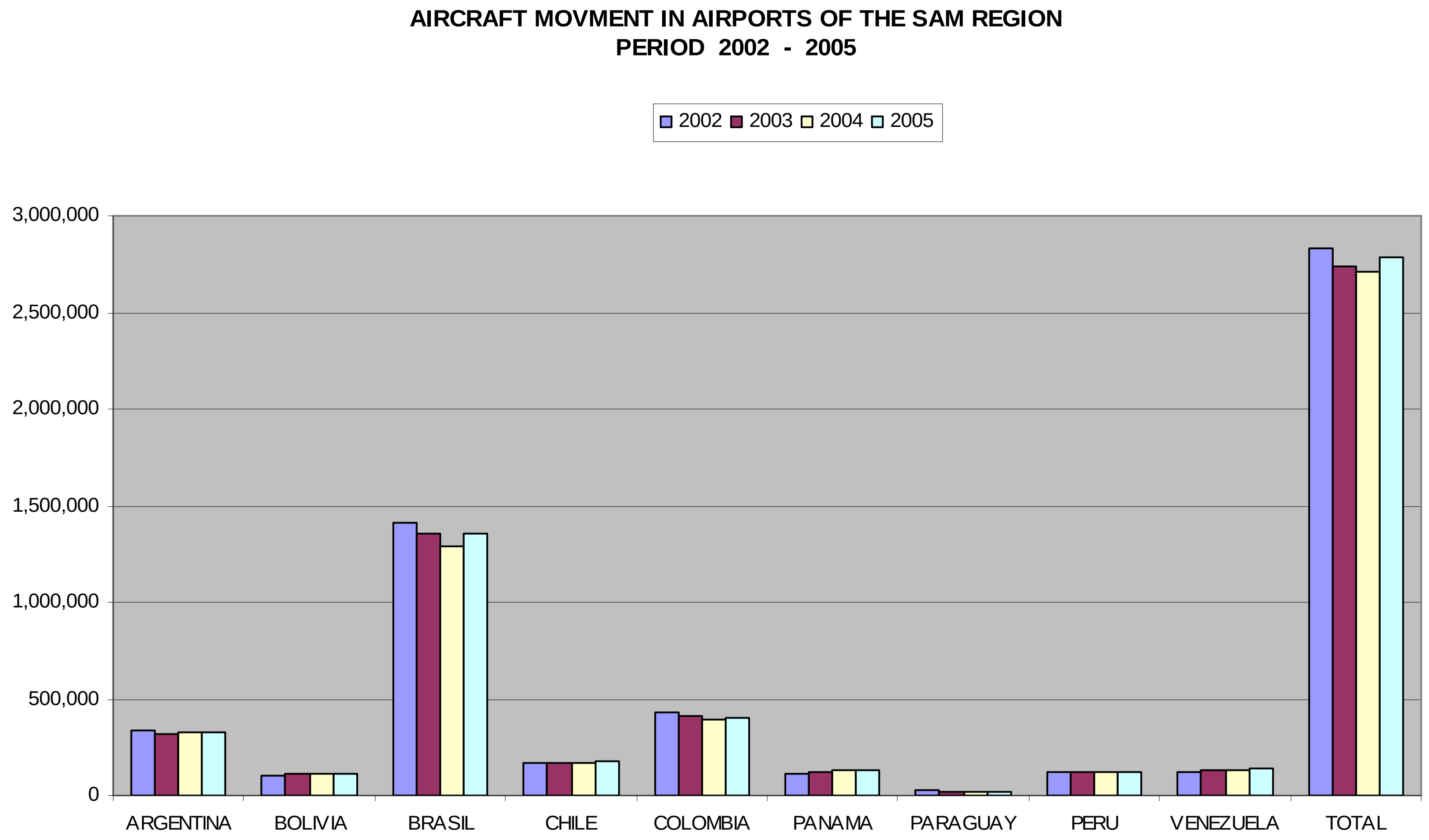
AIRCRAFT MOVEMENTS IN THE CAR/SAM REGIONS AIRPORTS
PERIOD 2002 - 2005

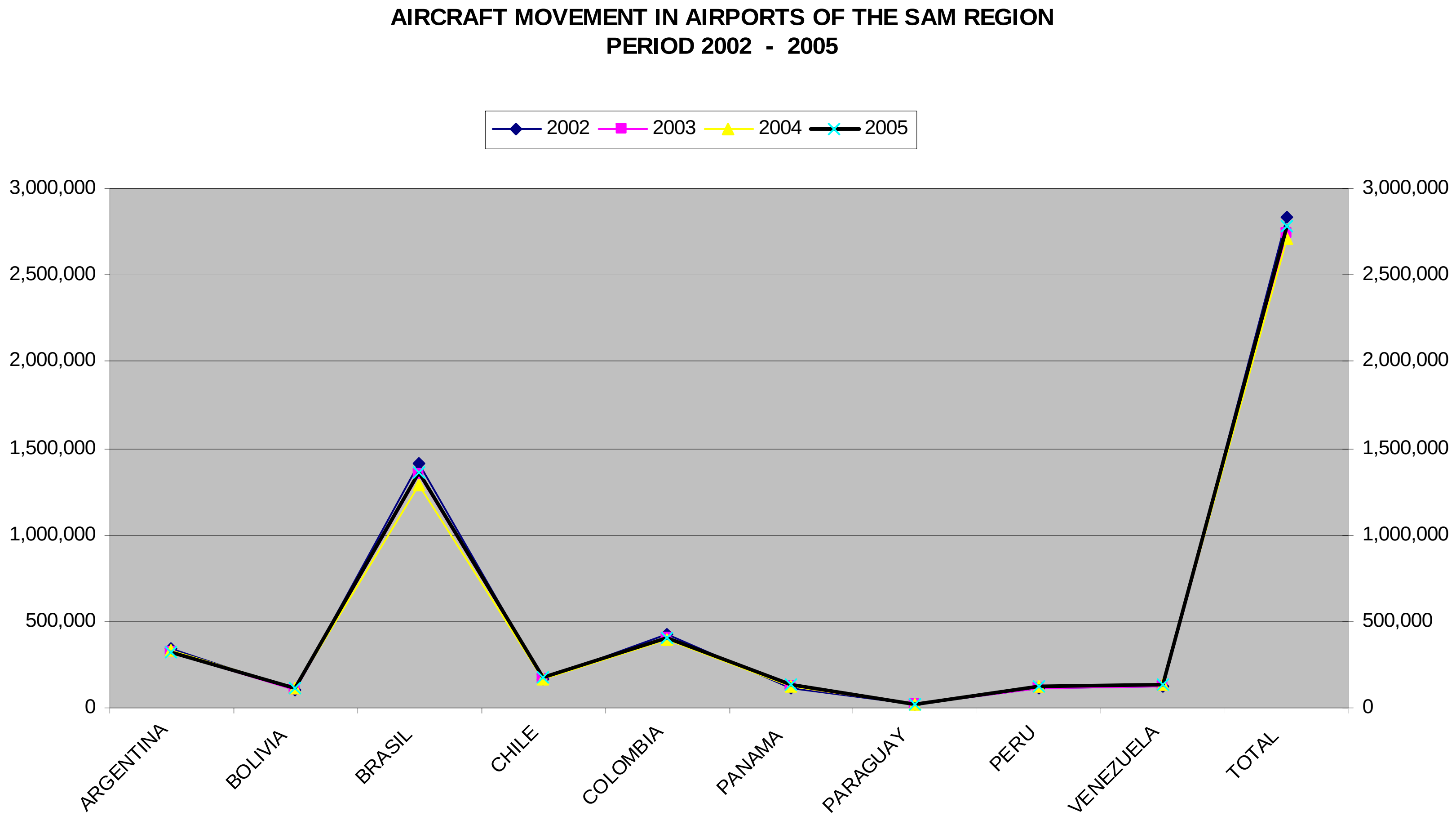



AIRCRAFT MOVEMENT IN THE CAR REGION AIRPORTS
PERIOD 2002 - 2005
2002
2003
2004
2005
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
BARBADOS
BELIZE
CAYMAN ISLANDS
COSTA RICA
CUBA
REP. DOMINICANA
EL SALVADOR
ESTADOS UNIDOS
GUATEMALA
HONDURAS
MEXICO
NICARAGUA
TOTAL

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




AIRCRAFT MOVMENT IN AIRPORTS OF THE SAM REGION
PERIOD 2002 - 2005
2002
2003
2004
2005
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
ARGENTINA
BOLIVIA
BRASIL
CHILE
COLOMBIA
PANAMA
PARAGUAY
PERU
VENEZUELA
TOTAL


AIRCRAFT MOVEMENT IN AIRPORTS OF THE SAM REGION
PERIOD 2002 - 2005
2002
2003
2004
2005
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
ARGENTINA
BOLIVIA
BRASIL
CHILE
COLOMBIA
PANAMA
PARAGUAY
PERU
VENEZUELA
TOTAL

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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/Rio de Janeiro	Santiago, Mendoza, Córdoba, Resistencia, Asunción, Curitiba, Brasilia	Low density Continental	SAM intra regional traffic flow
	Sao Paulo/Rio de Janeiro-Europe	Brasilia, Recife	Continental / Low density Oceanic	SAM/AFI/EUR inter regional traffic flow
AR 2	Sao Paulo/Río de Janeiro-Miami	Brasilia, Manaus, Maiquetía, Curacao, Kingston, Santo Domingo, Port au Prince, Habana, Miami	Continental / Low density Oceanic	CAR/SAM/NAM inter- and intra-regional traffic flow
	Sao Paulo/Río de Janeiro-New York	Brasilia, Belem, Paramaribo, Georgetown, Piarco, Rochambeau, San Juan (New York)	Continental / Low density Oceanic	CAR/SAM/NAM/NAT inter- and intra-regional traffic flow
AR 3	Sao Paulo/Río de Janeiro- Lima	Brasilia, Curitiba, La Paz, Lima	Low density Continental	SAM intra-regional traffic flow
	Sao Paulo/Río de Janeiro-Los Angeles	Brasilia, Porto Velho, Bogotá, Barranquilla, Panamá, Central América, Mérida, México, Mazatlán (Los Angeles)	Low density Continental	CAR/SAM/NAM inter- and intra-regional traffic flow
AR 4	Santiago - Lima - Miami	Santiago, Antofagasta, Lima, Guayaquil, Bogotá, Barranquilla, Panamá, Kingston, Habana, Miami.	Continental / Low density Oceanic	CAR/SAM/NAM inter- and intra-regional traffic flow

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

-1- Routing Area (AR)	-2- Traffic flows	-3- FIRs involved	-4- Type of area	-5- Remarks
	Europe	EUR		
	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.

APPENDIX I

MINIMUM REQUIREMENTS FOR THE PREPARATION OF A COST-BENEFIT ANALYSIS

What is a cost-benefit analysis?

1.1 The cost-benefit analysis is the process to place numbers in a reference currency in the different costs and benefits of an activity. When using it, we may calculate the financial impact of what we wish to achieve.

1.2 It should be used when comparing costs and benefits of the different decisions. A cost-benefit analysis by itself may not be a clear guide for making a good decision. There are other items to be taken into account; for example, the workload of ATCOs, safety oversight, legal obligations, environment protection, savings produced in users' operations, etc.

1.3 Cost-benefit analysis involves 6 basic steps:

a) Gather data from important factors related with each one of the decisions. This may be accomplised in brainstroming sessions.

b) Determine costs related with each factor. Some costs, such as labour will be accurate while others will be estimated.

c) Add total costs for each proposed decision.

d) Determine benefits in a reference currency for each deicsion.

e) Place the amounts of costs and total benefits in a relationship where benefits are the numerator and costs are the denomintor:

$$\frac{\text{BENEFITS}}{\text{COSTS}}$$

f) Compare the relationship for the different proposed decisions. The best solution, in financial terms, is that with the highest relationship between benefits to costs.

INFORMATION REQUIRED FOR THE EVALUATION OF AN ATFM IMPLEMENTATION PROJECT

Following is an example of some criteria and elements that ANSPs and users would be required to contribute with the information that is required in attention to Task 1.13 – Provide information for the cost-benefit analysis" of the Action Plan for ATFM implementation in the CAR/SAM Regions.

I. <u>By the service providers</u>

1. Situation with and without project (Impact)

a) Current situation.
b) Situation if ATFM were implemented.

2. Techcnical-operational aspects

a) Quantification of the demand in time. Historical data and forecasts.
b) Execution phases of the project and time required for each phase (study, coordination, quotation of equipment, obtaining of resources, acquisition, arrangements in hiring of personnel, training, acquisition/offices space, installation, operation, trials).
c) Time required for the system operation.
d) Requirements of the system in the short, mid and long terms.

3. Investment

a) Value of equipment acquired, with breakdowns for each system component.
b) Useful life cycle of each component
c) Value of intangible assets of the project (software, data entry information to feed the system), feasibility studies, technical-operational training, trials.
d) Physical value of infrastructure (if available)
e) Other investments: computers, printers, photocopying machine, office furniture, fax, etc.

4. Annual expenses

a) Professional, technical and administrative and security personnel required.

   i) Provision required per specialization in function of the operational hours of the system (H-24, H-12), upon requirement or other, such as administrative schedules.

b) Operational expenses

   i) acquisition of services, communications service, security, cleaning, etc.

ii) renting of offices and other facilities.
iii) Maintenance
iv) General services (in case the current provision is not sufficient):

- water
- energy supply
- cleaning
- telephone/fax

c) Supplies:

- desk supplies
- paper, etc.

II. <u>By the users</u>

1. Situation with and without project (impact)

a) Current situation
b) Situation if ATFM were implemented

2. Technical operational aspects

a) Assess the time demand. Historical data and forecasts.

3. Investment

a) Costs

i) Avionics equipment
ii) Supplies
iii) Planning
iv) Maintenance
v) Training
vi) Services acquisition

b) Benefits foreseen with ATFM

i) economy during flight hours
ii) expenses avoided
iii) others.

MINIMUM REQUIREMENTS FOR THE PREPARATION OF A COST-BENEFIT ANALYSIS

Following is an example of some of the criteria and elements that selected airports could require from selected airports to contribute with the information that shall be required in attention to *Task 1.13– Provide information for the cost-benefit analysis" of the Action Plan for ATFM implementation in the CAR/SAM Regions,* which the ATFM implementation groups shall execute.

Criterion	Elements
Non-regular traffic volume	Traffic arriving and departing
	Large amount of non-scheduled traffic (e.g. General Aviation)
Non-homogenous traffic mix	Integrated operations among heavy, medium and light aircraft
	Mixture of fast and slow aircraft
	Mixture of commercial and other traffic (e.g. training or General Aviation)
	Mixture of civil and military traffic
Delay situation unsatisfactory	Delays are higher than agreed with airlines as acceptable
	Delays are too high to achieve desired minimum connecting times
	Total delays per day and per month due to traffic congestion
Complex layout	Intersecting runways
	Converging runways
	Runways parallel but cannot be used independently of each other
	Aircraft need to cross active runway when taxiing
	Design permitting possible incursions in runway/taxiway.
	Complex deicing situation at airport (if applicable)
Airspace factors	Airspace surrounding airport limited, fragmented or used by neighboring airports
	SIDs and STARs over centres of population
Scope for efficiency improvement	Results achieved not sufficient relative to human resources employed
	Results achieved not sufficient relative to financial resources employed
Latent arrival capacity	Arrival demand is unsatisfied. Declared to attend arrivals capacity is sustained capacity less than existing daily normal capacity.?
Latent departure capacity	Departure demand is unsatisfied. Declared departure capacity to attend departures is less than existing daily normal capacity.?
High traffic volume	Every co-ordinated airport could be expected to have high traffic volume at least during peak periods of the day
	Estimate of traffic volume during peak hours of the day

Frequent low visibility conditions	Estimate number of days with low visibility
Technical improvements still to be implemented	Landing aids are not up to date
	Surveillance facilities are not up to date
	RNAV departures and arrivals have not been implemented
	Other facilities such as lighting, signs, etc. are not up to date and complete
Scope for improving work environment	ATCO working position does not have an optimised intelligent / ergonomic point of view, data presentation
	Tower to ground control and arrival/departure sector visibility has not been optimised (also from an ergonomic point of view)
	Social/contractual environment can be improved
Scope for optimising procedures	A strategic removal of conflicts between arrival and departure routes or sectors has not been implemented
	Reduced runway separation has not been implemented
	No adequate procedures to accelerate operations are used of aircraft in runway, keeping safety
	Conditional clearances have not been implemented
	Landing clearance is not based on adequate procedures to accelerate operations
	Non optimized runway occupancy time
	Visual turns are not carried out
Critical environmental sustainability issues	Airport in close proximity to residential areas
	Environmental regulations or constraints apply
	Major airport development envisaged

APPENDIX J

INTERNATIONAL CRICKET COUNCIL CRICKET WORLD CUP 2007 ATFM TASKS

1. Background

1.1 At the ICAO 30th Meeting of the Eastern Caribbean Working Group (E/CAR/WG/30), Castries, Saint Lucia, 7-11 August 2006, an ad-hoc group of the E/CAR ATM Committee deliberated on the impact the Match Schedule of the ICC CWC 2007 Tournament would have on ATM in the E/CAR.

1.2 The ad hoc group in its report to the E/CAR/WG/30 plenary noted that the Official Opening Ceremony for ICC CWC 2007 is scheduled for 2007 March 11 in Jamaica and the Tournament's Final Match taking place on 2007 April 28 (with April 29 being a reserved/contingency day) in Barbados and sixty-six (66) other matches (including warm-up matches) from 2007 March 05 up to and including the completion of the semi-finals on 2007 April 26 are being played in Jamaica, Guyana and seven other States (Antigua and Barbuda, Barbados, Grenada, Saint Lucia, St. Kitts/Nevis, St. Vincent and the Grenadines, and Trinidad and Tobago) which are located within the Piarco FIR.

1.3 It was acknowledged by the E/CAR/WG/30 that there would be significant air traffic movements in the sub-region over the period 2007 March 01 to 2007 May 05 and that there will a need to work towards the implementation of some degree of ATFM to treat with the increased traffic volume.

2. Discussion

2.1 For purposes of implementing ATFM measures during the ICC CWC2007 Tournament, an Action Plan was developed. Likewise a Team led by the Rapporteur (Trinidad and Tobago) of the E/CAR ATM Committee including ATM Points of Contacts (POCs) from the States and Territories within the Piarco FIR and the USA was established to progress the work.

2.2 In the planning for this major event three (3) phases, in relation to the methodologies and guidance for implementing ATFM Services have been taken into consideration. The Plan consists of the following phases:

- Strategic Phase - 2006 August to 2006 mid-November; Data collection and Analysis
  - 2006 September 15; issuance of a common initial Aeronautical Information Circular (AIC) about air operations during CWC 2007
  - 2006 Mid-November to 2007 January01; Development and Finalisation of E/CAR ATFM Strategy;
- Pre-tactical Phase - 2007 January 02 to February 28; ATFM Strategies finalised and promulgated;

- Tactical Phase - 2007 March 01 up to 2007 May 05; ATFM Operations.

2.3 It was further agreed that in order to conduct a proper analysis of projected air traffic; statistics will be required in respect of:

- Air traffic statistics for 2004, 2005, 2006 for the months of January to April;
- Airport capacity, including apron capacity;
- Approach capacity;
- En-route capacity, including that of the TMAs;
- Extra (World Cup) commercial air traffic demand where available; and
- Corporate/business jet (General Aviation) air traffic demand where available.

2.4 Arising from requirements to develop the project a Table depicting tasks, deadline dates, person or agency responsible and remarks was designed in order to keep track of the activities.

2.5 It was agreed that for early notification to airspace users, E/CAR States and Territories were to disseminate as early as possible, information concerning Cricket World Cup 2007 and the likely capacity constraints at airports and in the Air Traffic Services. E/CAR States and Territories were to send to the Piarco International NOTAM Office (NOF) the data required for the issue of a NOTAM in respect of any and all Ground and Air restrictions applicable to the respective Terminal Airspaces and Airports. Likewise it was agreed that existing flight planning deficiencies in the E/CAR must be corrected well in advance of CWC 2007. Further, consideration was given to the possibility that ATC and AIS Offices may require the filing of flight plans in a time period greater than that stipulated in PANS ATM Doc 4444 and that ATC may restrict the cancellation of IFR flight to VFR flight during this period. To cover those aspects related herein a common initial Aeronautical Circular was issued on 2006 September 15 by the Aeronautical Information Services of Barbados, the French Antilles and Trinidad and Tobago.

2.6 All E/CAR States and Territories have acknowledged the need to ensure the availability of adequate staff to handle the projected increase in air traffic over the period. E/CAR States and Territories have been urged to conclude and sign revised ATS Operational Letters of Agreement by 2006 December 01, as the provisions of the step-by-step method will create a more effective method for the coordination of air traffic in the E/CAR.

2.7 In order to effectively implement flow measures it was agreed that Piarco ACC establish an FMU for the purpose of managing air traffic during CWC 2007. Additionally, all other ATC Units (TMAs in particular) within the Piarco FIR will be required to establish FMPs in their respective Units. Towards this end, the United States offered to the E/CAR, use of the FAA Command Centre's telephone conference communication facilities to host Teleconferences from early November 2006 and continuing, to assist and support the planning initiatives, and in coordinating the day-to-day operations during CWC 2007. This offer has been graciously accepted. The teleconferencing facilities will make a significant contribution to the efficiency required for ATFM as fast-tracking the activities and implementing the service for CWC 2007 would have been very difficult.

3. Conclusion

3.1 In considering the ICAO GREPECAS initiatives for the implementation of ATFM in the CAR/SAM regions, the E/CAR through the outlined plan is working to ensure maximum efficiency of ATC demand/capacity balance and to foster a safe, orderly and timely traffic flow during the ICC CWC 2007. The objective of the ATFM measures to be implemented for ICC CWC 2007 is to balance demand with ATS service capacity and airport acceptance regime.

(Available in Spanish only)

APPENDIX K

IMPLANTACIÓN DE UN SISTEMA DE GESTIÓN DE AFLUENCIA DE TRÁNSITO (ATFM) EN LA REPÚBLICA DE CUBA

1. Introducción

1.1 En conformidad con el Anexo 11, la ATFM debería implementarse en espacios aéreos donde la demanda del tránsito aéreo exceda o se espera que exceda la capacidad declarada de los servicios de control de tránsito aéreo interesados. La ATFM debería implementarse a través de acuerdos regionales de navegación aérea o a través de acuerdos multilaterales.

1.2 La Décimo Tercera Reunión del Grupo Regional de Planificación y Ejecución CAR/SAM (GREPECAS 13), aprobó lo objetivos, principios u funciones de la ATFM centralizada y requisitos para su implantación (Decisión 13/64) y el modelo de plan de acción para la implantación ATFM en las Regiones CAR/SAM (Decisión 13/65). Además, la antes mencionada Reunión del Grupo Regional de Planificación formuló la Conclusión 13/66 relacionada con los planes nacionales para la implantación ATFM en las Regiones CAR/SAM.

2. Discusión

2.1 El Instituto de Aeronáutica Civil de Cuba, con la finalidad de lograr una implantación de la ATFM regional de forma armoniosa y oportuna, según se expresa en la Conclusión 13/66; ha iniciado el desarrollo de un Plan Nacional para la implantación de la ATFM.

2.2 Puede considerarse como una fortaleza esencial para la futura implantación de la ATFM en la República de Cuba el convencimiento que posee la alta gerencia en el Instituto de Aeronáutica Civil de Cuba de la necesidad de dedicar recursos tanto humanos como financieros a esta importante tarea.

2.3 La primera acción ejecutada por el Instituto de Aeronáutica Civil de Cuba en el proceso de implementación de un sistema de Gestión de la Afluencia de Tránsito (ATFM) ha sido establecer un Grupo de Trabajo ATFM. El grupo se encuentra formado esencialmente por personal de los Servicios de Control de Tránsito Aéreo y además se adiciona personal especializado en automatización y comunicaciones aeronáuticas.

2.4 El grupo de trabajo ATFM utiliza como documento de orientación el Modelo de Plan de Acción para la Implantación ATFM en las Regiones CAR/SAM y dio inicio con la recopilación de información técnica relacionada con los sistemas de Gestión de Flujo de Tránsito Aéreo. En la actualidad han sido impartidos dos seminarios con la participación de especialistas de distintas áreas de trabajo involucradas en la implementación.

2.5 Actualmente se dan los toques finales al establecimiento de una metodología nacional para la determinar la capacidad declarada de cada sector ATC e inmediatamente el Grupo de Trabajo debe iniciar la determinación de la capacidad por sectores o dependencias del sistema de control de tránsito aéreo.

2.6 Se trabaja paralelamente en el completamiento de bases de datos electrónicos requeridos para el sistema ATFM que incluya:

- Datos de planificación y procesamiento de planes de vuelo.
- Estructura del espacio aéreo y aeropuertos.
- Capacidad aeroportuaria y capacidad ATC.
- Demanda de tránsito.
- Datos AIS/MET y otros.

2.7 Como otro elemento importante a considerar para la implementación de un sistema ATFM se han iniciado trabajos para el intercambio automático, entre el ACC Habana y otros ACC adyacentes, de datos de planes de vuelos y datos radar.

2.8 El Grupo de Trabajo ATFM también tiene entre sus actividades la preparación del Manual de Procedimientos para la aplicación de la ATFM.

3.- Conclusiones

3.1 El Instituto de Aeronáutica Civil de Cuba está prestando especial atención a preparar condiciones para implantar la Gestión de Afluencia de Tránsito (ATFM) en nuestra FIR Habana, por lo que se invita a la reunión a tomar nota de la información proporcionada en este Apéndice.

APPENDIX L

TRAFFIC FLOW MANAGEMENT IN MEXICO

1. Introduction

1.1 Following ICAO's recommendations for the development and implementation of a regional and a worldwide air traffic flow management system, and in order to satisfy the need to regulate the increasing flow of air traffic for those high density international airports of the region.

1.2. Recognizing both the main air traffic flows within the CAR - W region, as those of the adjacent NAM and SAM regions, it has become necessary to adopt steps and adequate regional procedures to cope with the rising volume of operations to and from the main international airports of the aforementioned regions.

1.3. In Mexico, air traffic flow control has been in service since February 2001, working from a dedicated operational position inside MEX area control center, equipped with the appropriate communications tools, hardware and software, staffed with highly trained, supervisory level personnel, able to take adequate decisions, gathering in this way the essential elements to put through such important effort.

1.4 Currently we face demand exceeding the capacity of some airports, mainly Mexico City, Cancun, San Jose del Cabo, Guadalajara, Monterrey, Toluca and Tijuana, and also other airports which require it from time to time.

1.5 The operational position mentioned above is supported by hardware and software developed in house by SENEAM personnel. This software, called PROSAT (Spanish acronym for Saturation Forecast), gives timely and trustable information about the demand versus capacity status of those airports where saturation is likely to occur.

1.6 The position is served by AFTN, ETMS, FDP and RDP, weather information, NOTAMs, point to point communications among A TS units, and an array of messages like CPL, FPL, EST, ACT.

1.7. Several meetings have taken place, and agreements have been reached with the FAA, so as to count with the necessary technical assistance for the establishment, organization and operation of a facility to handle air flow at the national level, which we want to name *"Centro de Control de Flujo Mexico" (CCFMEX) (Mexico Flow Control Center).* We are also looking forward to identify the required technical and operational coordination needs.

2. Required Steps

2.1. Presently, PROSAT works out and displays the following information in a *Windows* environment:

- A dialog box to input or modify flight plan data.
- Arrival estimates to the airport.
- Passive flight plans with their expected departure times.
- Active flight plans with their expected arrival times.

- Entry posts to the airport, showing the number of aircraft coming in and their ETO's,
- Visual alarms which go off when the expected arrivals number exceeds the airport's capacity.
- A chronological scale which shows the arriving order of flights.

2.2. Even if nowadays the existing position in MEX area control center is enough to attend the airports mentioned above, studies are underway to determine the required number of A TFM positions to cover the needs of the CAR - W region, and also carry out data interchange with the adjacent countries. It is necessary to upgrade both the support and information equipment now in use, so as the graphic display of ETMS too. We have to set up communication lines with the airports in the CAR - W region.

2.3 It is noted that Mexico is actually carrying out a Radar Process and Flight Plan Systems modernization that allow to comply with the modern requirements of Regional Air Traffic Management.

3. Conclusion

3.1 Today Mexico has the technical and operational capacity to establish ATFM service within its national airspace and in the mid-term will be announcing the implementation of a FMU to manage national air traffic flow. It is also in the interest of Mexico to offer the international aeronautical community its technical and operational know-how and acquired expertise to assist in ICAO's effort to manage air traffic flow efficiently in the CAR - W region.

APPENDIX M

ACTION PLAN FOR ATFM IMPLEMENTATION IN CENTRAL AMERICA

1. Introduction

1.1 According to the guidelines resulting from different air navigation meetings coordinated by ICAO, among them GREPECAS, RAN CAR/SAM, AN-CONF/11, ATM/CNS Subgroup Meetings, ATM Committee ATFM Task Force, AP/ATM, as well as the concepts contained in the ATM Task – ATFM/400 of the ATM Committee: " Development of an ATFM system for future implementation in CAR/SAM Regions", and GREPECAS/13 Conclusion 13/66: "National Plans for the ATFM Implementation in CAR/SAM Regions", COCESNA has done a series of actions for the implementation of the ATFM in Central America.

1.2 The provisions of COCESNA for carrying out this implementation are based on the agreements and strategies established by States, Territories and International Organisms for the coordinated implementation of the ATFM in the CAR/SAM Regions.

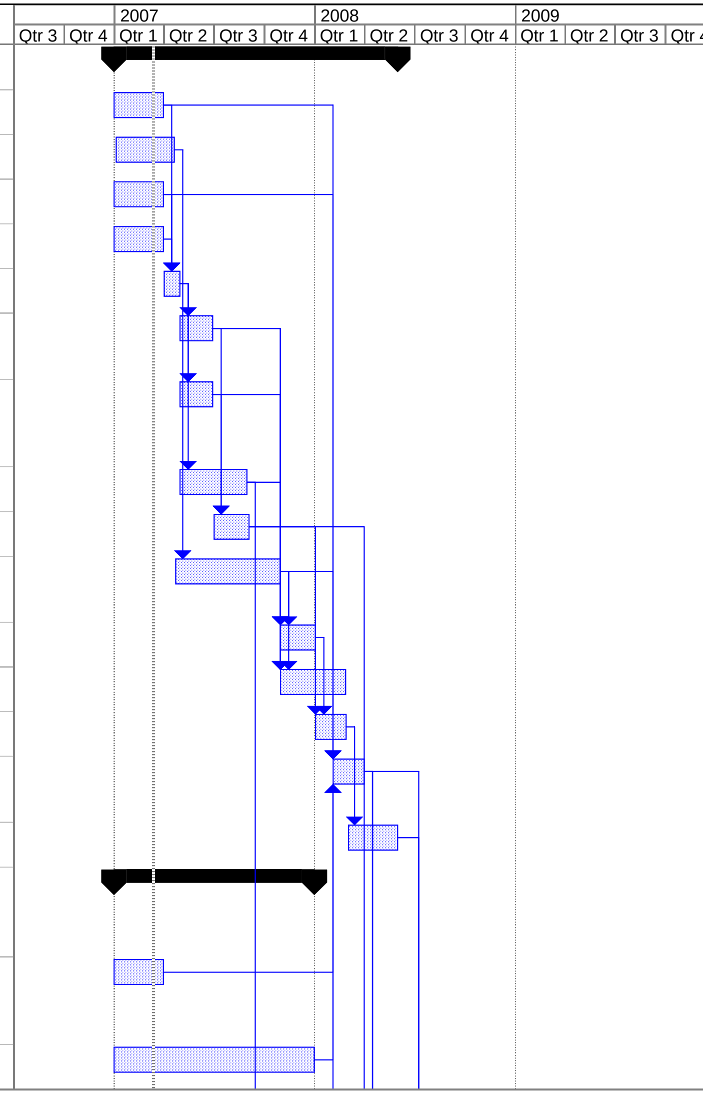
1.3 Considering the above mentioned, COCESNA has designed an Action Plan for the ATFM Implementation in Central America, which is in the **Attachment** to this document.

1.4 This action plan has been prepared by COCESNA based on GREPECAS/13 Decision 13/65: ACTION PLAN MODEL FOR THE ATFM IMPLEMENTATION IN CAR/SAM REGIONS, considering that this model is applicable for the ATFM implementation in the Central America region.

ATTACHMENT TO THE APPENDIX M TO THE REPORT ON AGENDA ITEM 2

PLAN DE ACCION DE COCESNA PARA LA IMPLANTACION DE LA ATFM EN CENTROAMERICA / COCESNA'S ACTION PLAN FOR ATFM IMPLEMENTATION IN CENTRAL AMERICA

ID	Nombre de tarea	Start	Finish	Resource Names
1	**Asuntos operacionales para la implantación del sistema ATFM / Operacional issues for ATFM implementation system**	**Mon 1/01/07**	**Sat 31/05/08**	
2	Identificar necesidades operacionales / Identify operacional needs	Mon 1/01/07	Sat 31/03/07	COCESNA,Estados CA y operadores Aereos
3	Desarrollar y actualizar el Concepto Operacional / Develop and update Operacional Concept	Thu 4/01/07	Fri 20/04/07	EN PROCESO: ATFM/TF,ATM/CNS/SG,GREPECAS
4	Definir el espacio aéreo afectado / Define airspace affected	Mon 1/01/07	Sat 31/03/07	COCESNA,Estados CA y operadores Aereos
5	Definir planes de recolección de datos / Define data collection plans	Mon 1/01/07	Sat 31/03/07	ATFM/WG/COCESNA
6	Recolección de datos para el análisis de ATFM/ Data collection for ATFM analysis	Mon 2/04/07	Mon 30/04/07	ATFM/WG/COCESNA
7	Definir y analizar escenarios para implantación del sistema ATFM / Define and analize of ATFM scenarios for implementation system	Tue 1/05/07	Fri 29/06/07	COCESNA,Estados CA
8	Examinar factores operacionales entre demanda y capacidad de servicio asociado con la implantación / Examine the operacional factors between demand of service and capacity associated with implementation	Tue 1/05/07	Fri 29/06/07	COCESNA,Estados CA
9	Determinar las herramientas requeridas / Determine required tools	Tue 1/05/07	Thu 30/08/07	ATFM/WG/COCESNA
10	Desarrollar las políticas y procedimientos ATFM / Develop ATFM policies and procedures	Mon 2/07/07	Mon 3/09/07	COCESNA,Estados CA
11	Detallar los requerimientos necesarios incluyendo los parámetros de performance / Detail the necessary requirements, including the performance parameters	Mon 23/04/07	Tue 30/10/07	COCESNA,Estados CA
12	Determinar los mensajes ATFM / Determine the ATFM messages	Wed 31/10/07	Wed 2/01/08	ATFM/WG/COCESNA
13	Proporcionar información para el análisis de Costo – Beneficio / Provide data to the Cost – Benedit Analysis	Wed 31/10/07	Tue 26/02/08	COCESNA,Estados CA
14	Preparar planes y material de capacitación ATFM / Prepare plans and ATFM training material	Thu 3/01/08	Wed 27/02/08	ATFM/WG/COCESNA
15	Establecer Cartas de Acuerdos ATFM con dependencias ATS adyacentes / Establish Letters of Agreement ATFM with ATS adjacent facilities	Mon 4/02/08	Mon 31/03/08	COCESNA,Estados CA
16	Capacitación de controladores de transito aéreo / Air traffic controllers training	Mon 3/03/08	Sat 31/05/08	COCESNA,Estados CA
17	**Coordinación con Estados, Organizaciones Internacionales e industria involucrados / Coordination with adjoining States, Internacional Organizations and Industry**	**Mon 1/01/07**	**Mon 31/12/07**	
18	Comunicarse con Estados, Proveedores ATS, proveedores de comunicaciones y usuarios del espacio aéreo / Comunícate with States, ATS Providers, Communication Service Providers and airspace users	Mon 1/01/07	Sat 31/03/07	ATFM/WG/COCESNA
19	Diseminación de información para los usuarios ATS / Information dissemination to ATS users	Mon 1/01/07	Mon 31/12/07	COCESNA,Estados CA

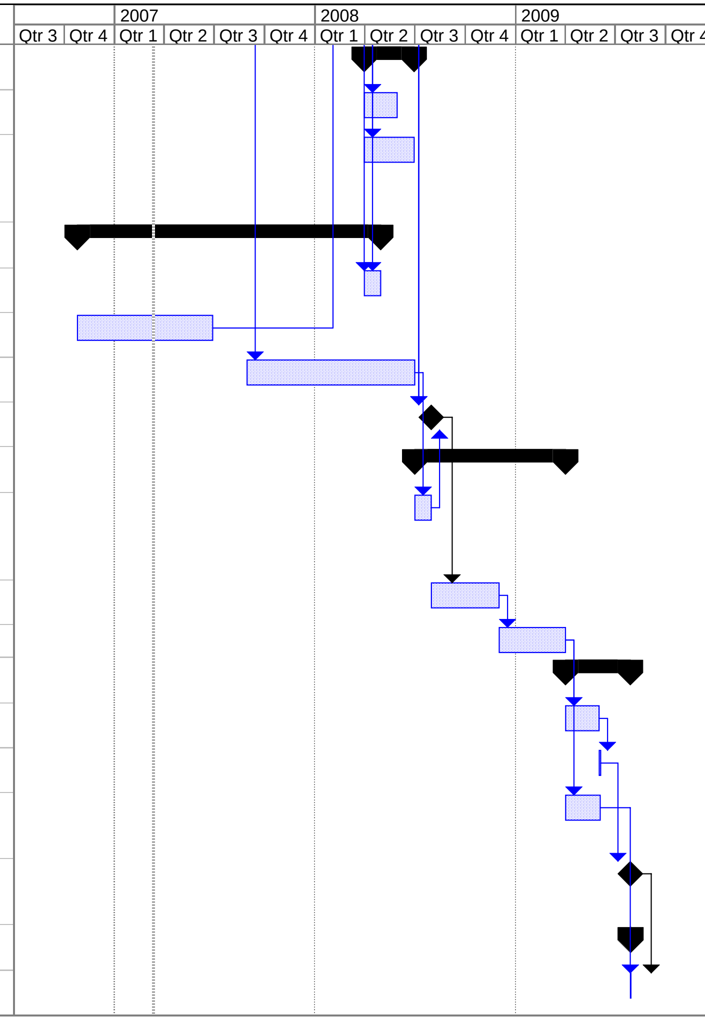


Proyecto: ATMC05_Cuestion 5_Ap
Fecha: Mon 12/03/07

Tarea	Hito	Tareas externas
División	Resumen	Hito externo
Progreso	Resumen del proyecto	Fecha límite

PLAN DE ACCION DE COCESNA PARA LA IMPLANTACION DE LA ATFM EN CENTROAMERICA / COCESNA'S ACTION PLAN FOR ATFM IMPLEMENTATION IN CENTRAL AMERICA

ID	Nombre de tarea	Start	Finish	Resource Names
20	**Desarrollo de procedimientos para usuarios del espacio aéreo / Develop aispace users procedures**	**Tue 1/04/08**	**Mon 30/06/08**	
21	Revisar Planes de Contingencia ATM / Review ATM contingency planning	Tue 1/04/08	Fri 30/05/08	COCESNA,Estados CA
22	Revisión de prácticas y procedimientos para la gestión de consumo de combustible y cuidado ambiental / Review of fuel and environmental management practices and procedures	Tue 1/04/08	Mon 30/06/08	COCESNA,Estados CA y operadores Aereos
23	**Desarrollar procedimientos ATC / Develop ATC Procedures**	**Thu 26/10/06**	**Wed 30/04/08**	
24	Determinar necesidades para simulaciones / Determine needs for simulations	Tue 1/04/08	Wed 30/04/08	ATFM/WG/COCESNA
25	Armonizar requerimientos de los ANPs / Harmonise ANPs requirements	Thu 26/10/06	Fri 29/06/07	ANP CAR/SAM - ANP COCESNA
26	Implementacion y ajustes CNS en funcion del ATFM CA/ CNS adjustments and implementations for CA ATFM	Fri 31/08/07	Tue 1/07/08	COCESNA,Estados CA
27	Operación Preliminar del ATFM CA/ Preliminary CA ATFM Operation	Thu 31/07/08	Thu 31/07/08	OPERACIÓN PRELIMINAR ATFM CA
28	**Realizar verificación del sistema / Perform system verification**	**Wed 2/07/08**	**Thu 2/04/09**	
29	Completar pruebas y evaluaciones de las herramientas ATFM y procedimientos de coordinación de la ATFM / Complete trials and evaluation of ATFM tools and coordination procedures for ATFM	Wed 2/07/08	Thu 31/07/08	COCESNA,Estados CA
30	Realizar evaluación de la performance del sistema / Carry out measuring performance system	Fri 1/08/08	Tue 2/12/08	ATFM/WG/COCESNA
31	Validación del sistema / System validation	Wed 3/12/08	Thu 2/04/09	COCESNA,Estados CA
32	**Decisión final de implantación / Final implementation decisión**	**Fri 3/04/09**	**Thu 30/07/09**	
33	Revisar factores que afectan la decisión de implantación / Review all factors affecting implementation decisión	Fri 3/04/09	Tue 2/06/09	ATFM/WG/COCESNA
34	Publicar los Suplementos AIP/NOTAM necesarios / Publish necessary AIP Supplements/NOTAM	Wed 3/06/09	Fri 5/06/09	COCESNA,Estados CA
35	Elaborar plan de seguimiento del sistema ATFM posterior a la implantación / Prepare Post-Implementation follow-up Plan for ATFM System	Fri 3/04/09	Thu 4/06/09	ATFM/WG/COCESNA
36	Declarar implantación operacional definitiva dentro de área definida / Declare full operational implementation within defined area	Thu 30/07/09	Thu 30/07/09	COCESNA,Estados CA OPERACION DEFINITIVO ATFM CA
37	**Monitorear performance del sistema / Monitor System performance**	**Thu 30/07/09**	**Thu 30/07/09**	
38	Inicio monitoreo del sistema / Start the monitoring of the system	Thu 30/07/09	Thu 30/07/09	ATFM/WG/COCESNA



Proyecto: ATMC05_Cuestion 5_Ap
Fecha: Mon 12/03/07

Tarea	Hito	Tareas externas
División	Resumen	Hito externo
Progreso	Resumen del proyecto	Fecha límite

APPENDIX N

INTERNATIONAL CIVIL AVIATION ORGANIZATION

INTERFACE CONTROL DOCUMENT
FOR
ATS INTER-FACILITY DATA COMMUNICATIONS
IN THE
CARIBBEAN AND SOUTH AMERICAN REGIONS

(CAR/SAM AIDC ICD)

Version	Draft 0.2
Date	13 November 2006

FOREWORD

The *Interface Control Document (ICD) for ATS Inter-Facility Data Communications (AIDC) in the Caribbean and South American Regions (CAR/SAM AIDC ICD)* is published by the ATM/CNS Subgroup of the Caribbean/South American Regional Planning and Implementation Group (GREPECAS). It describes a process and protocols for exchanging data between multiple States/Territories/International Organizations within and across regions.

Copies of the *CAR/SAM AIDC ICD* can be obtained by contacting:

ICAO NORTH AMERICAN, CARIBBEAN, AND CENTRAL AMERICAN OFFICE

MEXICO CITY, MEXICO

E-mail	:	icao_nacc@mexico.icao.int
Web site	:	www.icao.int/nacc
Fax	:	+5255 5203-2757
Mail	:	P. O. Box 5377, México 5 D. F., México
Point of contact		
E-mail :		vhernandez@mexico.icao.int
		amartinez@mexico.icao.int

ICAO SOUTH AMERICAN OFFICE

LIMA, PERU

E-mail	:	mail@lima.icao.int
Web site	:	www.lima.icao.int
Fax	:	+511 575-0974 / 575-1479
Mail	:	P. O. Box 4127, Lima 100, Peru
Point of contact		
E-mail :		jf@lima.icao.int
		ao@lima.icao.int
		os@lima.icao.int

AMENDMENTS TO THE DOCUMENT

The present edition (Draft Version 0.2) includes all revisions and modifications until November 2006. Subsequent amendments and corrigenda will be indicated in the Record of Amendment and Corrigenda Table.

Proposals for amendments to the document may be submitted to either of the ICAO Regional Offices for coordination and processing. The GREPECAS and its contributory bodies will issue revised editions of the Document as required.

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

Table of Contents

INTRODUCTION

HISTORICAL

Air Traffic Services providers in several regions have identified the requirement to exchange flight plan and radar data information between adjacent ATC facilities utilizing ATS Inter-Facility Data Communications (AIDC). This requirement stems from the increasing traffic levels crossing FIR boundaries and the need to improve efficiency and accuracy for the ATC providers. Developing a harmonized process and protocols for exchanging data between multiple States/Territories/International Organizations within and across regions is critical to satisfying this requirement. As ATS providers develop their automation systems, consideration should be given to meeting the capabilities identified within this Interface Control Document (ICD).

The CAR/SAM AIDC ICD is based on the North American Common Coordination Interface Control Document used by Canada, the United States and Mexico. The NAM region has advanced to the level of initial implementation of flight plan data exchange. Experience gained by the NAM region during their development process is incorporated here.

The GREPECAS/12 meeting held in Cuba, 07 – 11 June 2004 concluded that the CAR/SAM States/Territories/International Organizations should define an action plan for the application of a regional strategy for the integration of ATM automated systems. This document provides the basis for interfacing those ATM automation systems in the CAR/SAM regions.

The Interface Control Document for ATS Inter-Facility Data Communications for the Caribbean and South American Regions (CAR/SAM AIDC ICD) content is as follows:

Part I- Purpose, Policy, and Units of Measurement

This section provides an overall philosophical view of the Interface Control Document (ICD) and general information concerning the measurement units that are used. It also describes the process by which changes to this document are to be managed.

Part II- ATS Coordination Messages

This section describes in detail all the messages that may be used to exchange ATS data between Air Traffic Services (ATS) Units. In this version of the document, flight plan and radar handover messages have been defined.

Part III- Communications and Support Mechanisms

This section describes the technical and other requirements needed to support ATS message exchange.

Appendices

Appendix A includes a list of error messages.
Appendix B contains Implementation Guidance Material for the message sets.
Appendix C is a model describing a specific Common Boundary Agreement to be followed by ATS providers, noting the level of the interface that is supported and any deviations from the core message definitions.

GLOSSARY

Active Flight	A flight that has departed but has not yet landed. Note: This ICD assumes any flight with an entered actual departure time in the flight plan is active.
Adapted Route	A route whose significant points are defined in an automation system and associated with a name for reference purposes. Adapted routes normally include all ATS routes, plus non-published routes applied to flights by the system or by controllers.
Adapted Route Segment	Two significant points and the name of the adapted route connecting them.
Aircraft ID	A group of letters, numerics or combination thereof which is either identical to, or the coded equivalent of, aircraft callsign to be used in air-ground communication, and which is used to identify the aircraft in a ground-ground ATS communication..
Air Traffic Services Provider	For the purposes of this ICD means the responsible to provide air traffic services in the jurisdiction of State/Territory, such as own State, Agency or International Organization.
Airway	A route that is defined and published for purposes of air navigation.
Altitude	The vertical distance of a level measured from mean sea level (MSL).
Area Control Center/ Centre	An Air Traffic Services unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction.
Assigned SSR Code	A SSR code that has been assigned by an ATC facility to a flight. The flight may or may not be squawking this code. See Established SSR Code.
ATS Route	A specified route designed for channeling the flow of traffic as necessary for the provision of air traffic services.
Boundary Crossing Point	An intersection point between a route of flight and a control boundary.
Boundary Crossing Time	The time at which a flight is predicted to reach its Boundary Crossing Point.
Boundary Point	An agreed point on or near the control boundary at which time and altitude information is provided for purposes of coordination.
Character	A letter from A-Z or number from 0-9.

Control Boundary	The boundary of the Area Control Center (ACC) as defined in the local automation system. This is typically close to, but not the same as, the FIR boundary.
Direct Route Segment	A route segment defined solely by two significant points. The path between the points is implied, and depends on the navigation system used.
Element	Within a numbered field of an ICAO message there may be several sub-fields, called elements. These are referred to by sequential letters a, b, c, etc. For example Field 03 has elements a, b, and c.
Established SSR Code	The SSR code that a flight is now squawking.
Field	A numbered logical portion of a message. All references to fields in this document are to message fields defined in ICAO Doc. 4444 unless otherwise specified.
Fix-radial-distance	A method of specifying a geographic point. It includes the name of a fix, followed by a direction from the fix in degrees and then a distance in nautical miles.
Flight ID	The combination of aircraft ID (from Field 07) and most recent message number (from ICAO Field 03(b)) which uniquely identify a flight.
Flight Level	A surface of constant atmospheric pressure which is related to a specific pressure datum of 1,013.2 hPa (29.92 inches of mercury), and is separated from other such surfaces by specific pressure intervals (see Annex 11). Each is stated in three digits that represent hundreds of feet. For example, flight level 250 represents a barometric altimeter indication of 25,000 feet with the altimeter set to 29.92.
Letter	A letter from A-Z.
Numeric	A number from 0-9.
Off-Block Time	The time at which an aircraft expects to push back or has pushed back from the gate.
Proposed Flight	A flight which has a flight plan but which has not departed.
Reject	When this term is used, it means that an incoming message is not to be processed further and should be output to a specified location (either the message source, or a local adapted device or position). The message must be re-entered in total (after correction) in order for it to be processed.
Reported Altitude	The latest valid Mode C altitude received from an aircraft, or the latest reported altitude received from a pilot.
Route	A defined path consisting of one or more ordered route segments with successive segments sharing a common end/start point. (See also Adapted Route, Direct Route, Flight Plan (or Filed) Route, Route Segment, Direct Route Segment, Adapted Route Segment).

Route Segment	Two significant points and the path between them, the order of the points indicating the direction of flight. (See adapted and direct route segments.)
Selective Calling System	Techniques, or procedures, applied to radio communications for calling only one of several receiving stations guarding the same frequency (SELCAL).
Service	In the context of this interface, a service refers to type of interface service provided: message transfer, file transfer, data base query, etc.
SSR Code	A transponder code consisting of four octal digits.
Standard Arrival Route	A published route from a designated significant point to an aerodrome.
Standard Departure Route	A published route from an aerodrome to the first significant point on a route.
Significant Point	A specified geographical location used in defining an ATS route or the flight path of an aircraft and for other navigation and ATS purposes.
Symbol	Any of the symbols used within messages, including space “ ” oblique stroke “/”, single hyphen “-”, plus “+”, open bracket “(” , closed bracket “)”.
Transaction	The exchange of a message and a response.

LIST OF ACRONYMS

ACC	Area Control Center/Centre
ACID	Aircraft ID - the three to seven character callsign or registration number of an aircraft (e.g. MEX123)
ACP	Acceptance Message
ADF	Automatic Direction Finder
AFTN	Aeronautical Fixed Telecommunications Network
AIFL	Air filed **-** substitutes for departure aerodrome in flight plan Field 13 when IFR clearance is granted to airborne VFR aircraft
ARTCC	Air Route Traffic Control Center (see Area Control Center)
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
Bps	Bits Per Second
CAR	ICAO Caribbean Region
CHG	Modification message for **Proposed** Flight Plan
CNL	Flight Plan Cancellation message
CNS	Communications, Navigation and Surveillance
CPL	Current Flight Plan message
EST	Estimate message
FDP	Flight Data Processing
FIR	Flight Information Region
FPL	Filed Flight Plan message
FSAS	Flight Services Automation System
FSS	Flight Service Station
ICD	Interface Control Document
ICAO	International Civil Aviation Organization
ID	Identification
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IRQ	Initialization Request message
IRS	Initialization Response message
ISO	International Standards Organization

Kb	Kilobyte (= 1024 bytes)
LAM	Logical Acknowledgement message
LRM	Logical Rejection message
MIS	Miscellaneous Information message
MOD	Modification message for **Active** Flight Plan
MSN	Message Switched Network
NACC	ICAO North American, Central American and Caribbean Regional Office
NAM	ICAO North American Region (and Mexico)
NAT	ICAO North Atlantic Region
PAC	ICAO Pacific Region
PANS	Procedures for Air Navigation Services
PSN	Packet Switched Network (synonymous with PSDN)
PSDN	Packet Switched Data Network (synonymous with PSN)
RDP	Radar Data Processing
RLA	Radar Logical Acknowledgement
RNP	Required Navigation Performance
RTF	Radio Telephone
RTA	Radar Transfer Accept
RTI	Radar Transfer Initiate
RTU	Radar Track Update
RVSM	Reduced Vertical Separation Minimum
SAM	ICAO South American Region
SELCAL	Selective Calling System
SID	Standard Instrument Departure
SSR	Secondary Surveillance Radar
STAR	Standard Arrival Route
TBD	To Be Determined
TRQ	Termination Request message
TRS	Termination Response message
UTC	Universal Time Coordinated

VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omnidirectional Range
VSP	Variable System Parameter

REFERENCES

Document ID	Document Name	Date/ Version
ICAO Doc. 4444	Air Traffic Management, Doc. 4444 PANS-ATM/501	Always use latest version
ICAO Annex 10, Volume II	Aeronautical Telecommunications. Communication, Procedures including those with PANS status.	Always use latest version
ICAO Annex 11	Air Traffic Services	Always use latest version
ICAO Doc. 8643	Aircraft Type Designators	Always use latest version
ICAO Doc. 7910	Location Indicators	Always use latest version
ICAO Doc. 9705	Manual of Technical Provisions for Aeronautical Telecommunications Network	Always use latest version
ICAO Doc. 9426	ATS Planning Manual	Always use latest version

1. PART I – PURPOSE, POLICY, AND UNITS OF MEASUREMENT

1.1 PURPOSE

The purpose of this document is to ensure that data interchange between ATS units providing Air Traffic Services in the CAR and SAM Regions conforms to a common standard, and to provide a means to centrally coordinate changes to the standard.

1.2 POLICY

1.2.1 CONFIGURATION MANAGEMENT

The contents of this ICD must be approved by the GREPECAS. Proposed changes to this document will be submitted through the GREPECAS mechanism.

The ICAO secretariat will coordinate review through the GREPECAS mechanism. When all parties have agreed to a change, the document will be amended and distributed by the secretariat.

This document identifies the standards to be followed when the defined messages are implemented. A separate Common Boundary Agreement between each pair of ATS providers shall define which message sets are currently implemented.

1.2.2 SYSTEM PHILOSOPHY

The automation of flight data exchange between neighboring Air Traffic Services units will follow the standards set by ICAO Documents referenced above. In constructing the interface it is recognized that the ICAO standards address neither all required messages nor all required details of message content, and that existing ATS procedures and automation systems are not always fully compatible with parts of the ICAO standard. Therefore this document supplements ICAO Doc. 4444 as needed to meet the requirements of the ATS providers in the CAR/SAM Regions.

This document addresses messages exchanged between Area Control Centers (ACCs) and any other applicable facilities (e.g. Terminal or ATFM Units). Note that a message (e.g. FPL) from a user or operator to an ACC may have different requirements than those sent from ACC to ACC or ACC to ATFM Unit. This document defines the ATM messages that are needed for complete flight plan coordination.

Each pair of ATS providers planning to implement AIDC shall select the applicable message sets from those defined below. By implementing only those message sets necessary to meet the current needs and capabilities of the automation systems, the ATS providers can obtain benefits on an incremental basis.

1.2.2.1 FLIGHT PLAN DATA COORDINATION

The interface automates only the exchange of flight plan data agreed between the specific ATS providers involved. Additional to those messages contained in Doc 4444, the following messages defined in this document may be used:

- Active flight modification (MOD)
- Miscellaneous Information (MIS)
- Logical Rejection (LRM)
- Initialization Request (IRQ)
- Initialization Response (IRS)
- Termination Request (TRQ)
- Termination Response (TRS)

1.2.2.2 ATFM COORDINATION MESSAGES

As the requirement to coordinate ATFM information arises, specific messages may need to be developed and incorporated into this document.

1.2.2.3 RADAR HANDOVER

Transfer of Control includes the capability to perform a radar handover, using the messages defined in this ICD.

- Radar Transfer Initiate (RTI)
- Radar Track Update (RTU)
- Radar Transfer Accept (RTA)
- Radar Logical Acknowledgement (RLA)

The format of these messages is consistent with ICAO standards. The RLA message was introduced as a logical acknowledgement to an RTI, instead of LAM, because it needs to transmit information back to the sender.

1.2.2.4 ADS HANDOVER

As ADS surveillance is implemented and the requirement to perform ADS handovers arises, additional messages may need to be developed and incorporated into this document.

1.3 UNITS OF MEASUREMENT AND DATA CONVENTIONS

1.3.1 TIME AND DATE

All times shall normally be expressed in UTC as four digits, with midnight expressed as 0000. The first two digits must not exceed 23, and the last two digits must not exceed 59.

If higher precision is needed, then a field specification may designate additional digits representing seconds and then fractions of seconds (using decimal numbers) may be added.

For example, 092236 is 9 hours, 22 minutes, and 36 seconds.
11133678 is 11 hours, 13 minutes, and 36.78 seconds.

When used, dates shall be expressed in the form YYMMDD where YY are the last two digits of the year (e.g. 01 is 2001), MM is the month (e.g. 05 for May), and DD is the day of the month (e.g. 29).

1.3.2 GEOGRAPHIC POSITION INFORMATION

Geographic position information shall be expressed in one of the following forms.

- Items a) through d) are consistent with ICAO Doc. 4444 PANS-ATM/501 Appendix 3, section 1.6.3; and,
- item e) was added because the standard ICAO definition of Latitude/Longitude did not provide enough precision for exchange of radar identification.

a) A two to five character significant point designator**.**

b) Four numerics describing latitude in degrees and minutes, followed by “N” (North) or “S” (South), followed by five numerics describing longitude in degrees and minutes, followed by “E” (East) or “W” (West). The correct number of numerics is to be made up, where necessary, by the insertion of zeros, e.g. “4620N07805W”.

c) Two numerics describing latitude in degrees, followed by “N” (North) or “S” (South), followed by three numerics describing longitude in degrees, followed by “E” (East) or “W” (West). Again, the correct number of numerics is to be made up, where necessary, by the insertion of zeros, e.g. “46N078W”.

d) Two to three characters being the coded identification of a navigation aid (normally a VOR), followed by three decimal numerics giving the bearing from the point in degrees magnetic followed by three decimal numerics giving the distance from the point in nautical miles. The correct number of numerics is to be made up, where necessary, by the insertion of zeros, e.g. a point at 180° magnetic at a distance of 40 nautical miles from VOR “FOJ” would be expressed as “FOJ180040”.

e) When surveillance information with higher precision is necessary, use six numerics describing latitude in degrees, minutes, and seconds, followed by “N” (North) or “S” (South), followed by seven numerics describing longitude in degrees, minutes, and seconds followed by “E” (East) or “W” (West). The correct number of numerics is to be made up, where necessary, by the insertion of zeros, e.g. “462033N0780556W”.

1.3.3 ROUTE INFORMATION

All published ATS routes shall be expressed as two to seven characters, being the coded designator assigned to the route to be flown.

1.3.4 ALTITUDE/LEVEL INFORMATION

All altitude information shall be specified as flight level(s) or altitude(s) in one of the following formats (per ICAO Doc. 4444 PANS-ATM/501, Appendix 3, Section 1.6.2):

- F followed by three decimal numerics, indicating a Flight Level number.
- A followed by three decimal numerics, indicating altitude in hundreds of feet.

Each message description identifies which of these formats may be used.

Note: If adjacent FIRs have different transition altitudes, agreement may be reached between the ATS Units on specific use of F versus A with the agreed upon solution documented in their Common Boundary Agreement.

1.3.5 SPEED INFORMATION

Speed information shall be expressed as true airspeed or as a Mach number, in one of the following formats (ICAO Doc. 4444 PANS-ATM/501 Appendix 3):

- N followed by four numerics indicating the true airspeed in knots (e.g. N0485).
- M followed by three numerics giving the Mach Number to the nearest hundredth of unit Mach (e.g. M082).

1.3.6 HEADING INFORMATION

Heading information shall be expressed as degrees and hundredths of degrees relative to true north using five digits, and inserting zeros as necessary to make up five digits, e.g. “00534” is 5.34 degrees relative to true north.

1.3.7 FUNCTIONAL ADDRESSES

A functional address, which refers to a function or position (e.g. Supervisor position) within an ATS Unit, may be substituted in the MIS message for the aircraft identification found in Field 07. The functional address shall contain between one and six characters and shall be preceded by an oblique stroke (/), for a total length of two through seven characters (e.g. /S1) .

1.3.8 FACILITY DESIGNATORS

Facility designators shall consist of four letters. The ICAO Doc. 7910 location identifier for the facility shall be used. Any exceptions shall be incorporated into the Common Boundary Agreement between the two affected ATS Units.

2. PART II –ATS COORDINATION MESSAGES

2.1 INTRODUCTION

The following sections describe those messages used by ATS systems for exchange of information. Messages and fields conform generally to ICAO Doc. 4444, and differences are noted.

2.2 MESSAGE FIELDS

Table 1 provides a summary of all fields used in messages described by this document. The remainder of this section describes the format of each field element. Section 3 describes which elements are to be included in each ATS message type, and Appendix B describes rules for the semantic content of each field.

Table 1. Summary of Message Fields

Field	Element (a)	Element (b)	Element (c)	Element (d)	Element (e)
03	Message Type Designator	Message Number	Reference Data		
07	Aircraft Identification	SSR Mode	SSR Code		
08	Flight Rules	Type of Flight			
09	Number of Aircraft	Type of Aircraft	Wake Turbulence Category		
10	Radio, Comm., Nav., and Approach Aid Equipment	Surveillance Equipment			
13	Departure Aerodrome	Time			
14	Boundary Point	Time at Boundary Point	Cleared Level	Supplementary Crossing Data	Crossing Condition
15	Cruising Speed or Mach Number	Requested Cruising Level	Route		
16	Destination Aerodrome	Total Estimated Elapsed Time	Alternate Aerodrome(s)		
18	Other Information				
22	Field Indicator	Amended Data			
31	Facility Designator	Sector Designator			
32	Time of Day	Position	Track Ground Speed	Track Heading	Reported Altitude

2.2.1 FIELD 03, MESSAGE TYPE, NUMBER AND REFERENCE DATA

Field 03(a) format shall be per ICAO Doc. 4444 except that:
Only the message identifiers included in Table 2, Core Message Set, shall be permitted in element (a).

Field 03(b) and Field 03(c) format shall be per ICAO Doc. 4444 except that:
The ATS unit identifier in elements (b) and (c) shall be exactly 4 letters. The ATS unit identifier should correspond to the first four letters of the ICAO Doc. 7910 location identifier for the ATS unit, e.g. SKBO for the Bogota ACC.

2.2.2 FIELD 07, AIRCRAFT IDENTIFICATION AND TRANSPONDER CODE

Field 07(a) format shall be per ICAO Doc. 4444 except that:
The aircraft ID shall be at least two characters long.
Aircraft IDs that begin with "TEST" shall be used only for test flight plans.
In an MIS message, a functional address may be substituted for the flight ID.

Field 07(b) and Field 07(c) format shall be per ICAO Doc. 4444, with the clarification that each number in
Field 07(c) must be an octal digit (i.e. 0-7). Note that elements 07(b) and 07(c) are either both present or both absent.

2.2.3 FIELD 08, FLIGHT RULES AND TYPE OF FLIGHT

Field 08(a) format shall be per ICAO Doc. 4444.

Field 08(b) format shall be per ICAO Doc. 4444.

2.2.4 FIELD 09, NUMBER AND TYPE OF AIRCRAFT AND WAKE TURBULENCE CATEGORY

Field 09(a) format shall be per ICAO Doc. 4444.

Field 09(b) format shall be per ICAO Doc. 4444.

Field 09(c) format shall be per ICAO Doc. 4444.

2.2.5 FIELD 10, EQUIPMENT

Field 10(a) format shall be per ICAO Doc. 4444.

Field 10(b) format shall be per ICAO Doc. 4444.

2.2.6 FIELD 13, DEPARTURE AERODROME AND TIME

Field 13(a) format shall be per ICAO Doc. 4444.

Field 13(b) format shall be per ICAO Doc. 4444.

2.2.7 FIELD 14, ESTIMATE DATA

Field 14(a) format shall be per ICAO Doc. 4444.

Field 14(b) format shall be per ICAO Doc. 4444.

Field 14(c) format shall be per ICAO Doc. 4444.

Field 14(d) format shall be per ICAO Doc. 4444.

Field 14(e) format shall be per ICAO Doc. 4444.

2.2.8 FIELD 15, ROUTE

Field 15(a) format shall be per ICAO Doc. 4444 except that:
The designator “K” used for kilometers per hour will not be permitted.

Field 15(b) format shall be per ICAO Doc. 4444 except that:
The designators “S” and “M” used for metric altitude will not be permitted.

Field 15(c) format shall be per ICAO Doc. 4444.
(Note that even though metric speed and altitude information is not permitted in other fields, it is permissible in elements (c4) and (c6).

2.2.9 FIELD 16, DESTINATION AERODROME AND TOTAL ESTIMATED ELAPSED TIME, ALTERNATE AERODROME(S)

Field 16(a) format shall be per ICAO Doc. 4444.

Field 16(b) format shall be per ICAO Doc. 4444.

Field 16(c) format shall be per ICAO Doc. 4444.

2.2.10 FIELD 18, OTHER INFORMATION

Field 18(a) format shall be per ICAO Doc. 4444, except that:

Indicators other than those shown in ICAO Doc. 4444 may be used; however these indicators may not be processed correctly by all ATS units and/or may cause flight plans to reject.

This reflects the reality that flight plans are filed with indicators other than those defined by ICAO (e.g. DOF/000112 to identify date of flight is commonly filed) some of which may be mandated by other ICAO regions.

Multiple instances of the indicator RMK/ may be used. ICAO Doc. 4444 does not address the validity/invalidity of this; however instances of filed plans which use the same indicator multiple times have been identified. For example, “RMK/AGCS EQUIPPED RMK/TCAS EQUIPPED RMK/RTE 506”. The same may be true for some other indicators (e.g. STS/, NAV/ or COM/).

It must be noted that certain other indicators, for example DEP/, must only be used once to ensure successful processing of the flight plan.

2.2.11 FIELD 22, AMENDMENT

Field 22(a) format shall be per ICAO Doc. 4444.

Field 22(b) format shall be per ICAO Doc. 4444.

2.2.12 FIELD 31—FACILITY AND SECTOR DESIGNATORS

Field 31(a) shall contain a four-letter designator of the destination facility that is to receive the handover.
Note that this facility ID can be for a terminal facility that the parent en route system provides routing for. The four-letter designator should be the location identifier for the facility (from ICAO Doc. 7910) if one exists. If a location identifier does not exist, one should be assigned by mutual agreement between the implementing ATS providers and submitted to ICAO for inclusion in ICAO Doc. 7910.

Field 31(b) shall contain a two-character designator of the sector that is to receive the handover.
If 00 is designated, or the field element is not included then the receiving system is to determine the appropriate sector.
Example: MDCS00

2.2.13 FIELD 32—AIRCRAFT POSITION AND VELOCITY VECTOR

Each element of field 32 is fixed length; there is no separator between elements.

Field 32(a) shall contain time of day that the position is valid for, expressed in eight digits: HHMMSSDD where HH is hours from 00 to 23; MM is minutes from 00 to 59; SS is seconds from 00 to 59 and DD is hundredths of seconds from 00 to 99.

Field 32(b) shall contain the position of the referent flight expressed in Latitude/Longitude to the nearest second, in ICAO Doc. 4444 format extended to include seconds (e.g. 462034N0780521W).

Field 32(c) shall contain the ground speed of the flight expressed in knots, per ICAO Doc. 4444 format (e.g. N0456).

Field 32(d) shall contain the heading of the flight expressed in degrees and hundredths of a degree using five digits, from 00000 to 35999 relative to true north.

Field 32(e) shall contain the reported altitude expressed in ICAO Doc. 4444 format (e.g. A040, F330).

2.3 CORE MESSAGE SET

The core message set is summarized in Table 2 below.

Table 2. Core Message Set

Category	Msg.	Message Name	Description	Pri-ority	Source
Coordination of pre-departure flights	FPL	Filed Flight Plan	Flight plan as stored by the sending ATS unit at the time of transmission. Used only for proposed flights.	FF	ICAO Doc. 4444
	CHG	Modification message for **Proposed** Flight Plan	Changes previously sent flight data (before estimate data has been sent).	FF	
	CNL	Cancellation	Cancels an FPL	FF	
Coordination of active flights	CPL	Current Flight Plan	Flight plan as stored by the sending ATS unit at the time of transmission, including boundary estimate data. Used only for active flights.	FF	ICAO Doc. 4444
	EST	Estimate	Identifies expected flight position, time and altitude at boundary.	FF	
	CNL	Cancellation	Cancels a CPL.	FF	
	MOD	Modification message for **Active** Flight Plan	Changes previously sent flight data (after estimate data has been sent).	FF	New message, format per CHG.
General Information	MIS	Miscellaneous	Free-format text message with addressing options.	FF	NAT ICD
Interface Management	IRQ	Initialization Request	Initiates activation of the interface.	FF	Based on existing Canadian protocols.
	IRS	Initialization Response	Response to an IRQ.	FF	
	TRQ	Termination Request	Initiates termination of the interface.	FF	

Category	Msg.	Message Name	Description	Pri-ority	Source
	TRS	Termination Response	Response to a TRQ.	FF	
Radar Handover	RTI	Radar Transfer Initiate	Initiates a radar handover.	FF	New messages based on existing U.S. protocols and ICAO Doc. 4444 format
	RTU	Radar Track Update	Provides periodic position updates for a track in handover status.	FF	
	RLA	Radar Logical Acknowledgement	Computer acceptance of an RTI message.	FF	
	RTA	Radar Transfer Accept	Accepts or retracts a handover.	FF	
Acknowledgements (included in each of the above services)	LAM	Logical Acknowledgement	Computer acceptance of a message.	FF	ICAO Doc. 4444
	LRM	Logical Rejection	Computer rejection of an invalid message.	FF	NAT ICD

2.3.1 COORDINATION OF PRE-DEPARTURE FLIGHTS

2.3.1.1 FPL (FILED FLIGHT PLAN)

FPL Purpose
An FPL shall be addressed to the appropriate ATS Units according to the requested route as prescribed in Doc 4444.

In the case of near-border departures, an FPL may be sent from ATS unit to ATS unit under agreed conditions (e.g. for departures when the flight time to the boundary is less than the normal advance time for sending a CPL). In this case the FPL sent contains the latest flight plan information as entered by Air Traffic Control, and is not always the same as the original FPL filed by the user. This FPL may be used as advanced notification at the receiving ATS facility for planning purposes.

FPL Format

FPL Field	Required Elements	Optional Elements	Comments
03	a, b		
07	a	b, c	SSR code is only sent if one is (already) assigned and the aircraft is so equipped.

FPL Field	Required Elements	Optional Elements	Comments
08	a	b	Element (b) is included per requirements of the boundary agreement.
09	b, c	a	
10	a, b		
13	a, b		
15	a, b, c		
16	a, b	c	
18		a, other info.	Element (a) is included only if no other information is included. Either element (a) OR other information (but not both) must be included.

FPL Examples

This flight plan was sent from Bogota ACC (SKED) to Maiquetia ACC (SVZM). The flight is from La Mina Airport in Maicao, Colombia to La Chinita International Airport in Maracaibo, Venezuela. Because the departure airport is at the border between Colombia and Venezuela, a FPL needed to be sent before departure.

(FPLSKED/SVZM381-HK2Z5-IG-C172/L-S/C-SKLM1235-N0110A080 DCT CJN G445 MAR DCT-SVMC0036-EET/SVZM0007)

This flight plan was filed by TACA International Airlines for a flight from Toncontin International Airport in Tegucigalpa, Honduras to Boa Vista International Airport in Boa Vista, Brazil.

(FPL-TAI128-IS-B752/M-DGIJLORVW/S-MHTG1735-N0447F290 DCT TNT UA552 NOL UW27 RONER UL304 BVI DCT-SBBV0403-EET/MPZL0039 SKSP0044 MPZL0054 ALPON0122 SKEC0135 SVZM0157 SBMU0344 SEL/CDHQ DAT/S)

2.3.1.2 CHG (MODIFICATION MESSAGE FOR PROPOSED FLIGHT PLAN)

CHG Purpose

A CHG is used to transmit a change to one or more fields of previously sent flight data for a flight that has not had boundary estimate data sent. When boundary estimate data has been sent (via CPL or FPL followed by EST), a MOD message must be used for flight data changes.

CHG Format

CHG Field	Required Elements	Optional Elements	Comments
03	a, b, c		Element (c) shall contain the reference number of the first message sent for this flight.
07	a	b, c	If a SSR code has been assigned and sent in a previous CHG, it should be included.
13	a		

CHG Field	Required Elements	Optional Elements	Comments
16	a		Fields 07, 13, and 16 must contain the values of these fields before the flight data was changed.
22	a, b		

CHG Examples

This amendment changes the equipment in Field 10 adding a DME equipment.

(CHGSKED/SVZM395SKED/SVZM381-HK2Z5-SKLM-SVMC-10/SD/C)

This amendment changes the ACID of a flight from HK2Z5 to HK2X5. Note that when Field 07(a) is changed, it is the only change allowed in the message.

(CHGSKED/SVZM412SKED/SVZM381-HK2Z5-SKLM-SVMC-07/HK2X5)

2.3.1.3 CNL (CANCELLATION)

CNL Purpose
A CNL is used to notify the receiving ATS unit that a flight, for which an FPL or CPL was sent earlier, is no longer relevant to that ATS unit.

CNL Format

CNL Field	Required Elements	Optional Elements	Comments
03	a, b, c		Element (c) shall contain the reference number of the first message sent for this flight.
07	a		Elements (b) and (c) are not used in this context.
13	a		
16	a		

CNL Example

This message was sent from Bogota ACC (SKED) to Maiquetia ACC (SVZM) to indicate that flight HK2X5 from La Mina Airport in Maicao, Colombia to La Chinita International Airport in Maracaibo, Venezuela will no longer be entering Maiquetia ACC airspace.

(CNL SKED/SVZM452SKED/SVZM381-HK2X5-SKLM-SVMC)

2.3.2 COORDINATION OF ACTIVE FLIGHTS

2.3.2.1 CPL (CURRENT FLIGHT PLAN)

CPL Purpose

A CPL is used to inform the receiving center of the cleared flight plan and boundary estimate information for coordination purposes. This message may only be sent as the initial transmission of an active flight plan (i.e. a flight that has departed and for which a boundary estimate based on the actual departure time is available).

CPL Format

CPL Field	Required Elements	Optional Elements	Comments
03	a, b		
07	a	b, c	SSR code is only sent if one is (already) assigned and the aircraft is so equipped.
08	a	a	Element (b) is included per requirements of the boundary agreement.
09	b, c	a	
10	a, b		
13	a		
14	a, b, c	d, e	
15	a, b, c		
16	a		
18		a, other info.	Element (a) is included only if no other information is included. Either element (a) OR other information (but not both) must be included.

CPL Example

This flight plan was sent from Bogota ACC (SKED) to Maiquetia ACC (SVZM). It indicates that the flight is expected to cross the coordination fix ORTIZ at 1932UTC, that the assigned beacon code is 2617, and that the flight has been cleared to flight level 290.

(CPLSKED/SVZM172-TAI128/A2617-IS-B752/M-DGIJLORVW/S-MHTG-ORTIZ/1932F290-N0447F290 ORTIZ UA552 NOL UW27 RONER UL304 BVI DCT-SBBV0403-EET/MPZL0039 SKSP0044 MPZL0054 ALPON0122 SKEC0135 SVZM0157 SBMU0344 SEL/CDHQ DAT/S)

2.3.2.2 EST (ESTIMATE)

EST Purpose
An EST is used to provide boundary estimate information for a flight when the basic flight plan information was previously transmitted via an FPL (instead of a CPL). Note that the EST is sent only when a flight becomes active.

EST Format

EST Field	Required Elements	Optional Elements	Comments
03	a, b, c		Element (c) shall contain the reference number of the last message sent for this flight.
07	a	b, c	SSR code is only sent if one is (already) assigned and the aircraft is so equipped. Aircraft ID and beacon code sent in an EST message must match the values previously sent in the FPL or the last CHG that modified the FPL.
13	a		Departure aerodrome must match the value previously sent in the FPL or the last CHG that modified the FPL.
14	a, b, c	d, e	
16	a		Destination aerodrome must match the value previously sent in the FPL or the last CHG that modified the FPL.

EST Example

This message was sent from Bogota ACC (SKED) to Maiquetia ACC (SVZM) upon departure of HK2X5. It indicates that the flight is expected to cross the coordination fix OSOKA at 1245UTC, that the assigned beacon code is 4322 and that the flight has been cleared to an altitude of 8,000 feet.

(ESTSKED/SVZM452SKED/SVZM381-HK2X5/A4322-SKLM-OSOKA/1245A080-SVMC)

2.3.2.3 CNL (CANCELLATION)

CNL Purpose
A CNL is used to notify the receiving ATS unit that a flight, for which an FPL or CPL was sent earlier, is no longer relevant to that ATS unit.

CNL Format
The CNL message is used for both active and proposed flights.

2.3.2.4 MOD (MODIFY MESSAGE FOR ACTIVE FLIGHT PLAN)

MOD Purpose
A MOD is used to transmit a change to one or more fields of previously sent flight data after boundary estimate data has been sent. The MOD is therefore used for any flight data changes after a CPL or an EST has been sent.

MOD Format

MOD Field	Required Elements	Optional Elements	Comments
03	a, b, c		Element (c) shall contain the reference number of the first message sent for this flight.
07	a	b, c	SSR code is only sent if one is (already) assigned or the aircraft is so equipped. Fields 07, 13, and 16 must contain the values of these fields before the flight data was changed.
13	a		
16	a		
22	a, b		

MOD Example

This amendment removes the RVSM capability from field 10 and changes the assigned altitude to flight level 240.

(MODSKED/SVZM218SKED/SVZM172-TAI128-MHTG-SBBV-10/DGIJLORV/S-15/N0447F240
UA552 NOL UW27 RONER UL304 BVI DCT)

2.3.3 GENERAL INFORMATION MESSAGES

2.3.3.1 MIS (MISCELLANEOUS)

MIS Purpose
A MIS is used to transmit a free text message to a specific functional position, or to the position responsible for a specific flight, at another facility.

MIS Format

MIS Field	Required Elements	Optional Elements	Comments
03	a, b		
07	a		Note that element (a) in the MIS may contain a flight ID or a functional address
18	RMK/ followed by free text		

MIS Example

In this example, Bogota ACC (SKED) informs Maiquetia ACC (SVZM) that TACA flight 128 has lost its RVSM capability.

(MISSKED/SVZM221-TAI128-RMK/TACA128 HAS LOST RVSM CAPABILITY)

2.3.4 INTERFACE MANAGEMENT MESSAGES

2.3.4.1 IRQ (INITIALIZATION REQUEST)

IRQ Purpose
An IRQ is used to request transition of an interface from a non-operational to an operational state.

IRQ Format

IRQ Field	Required Elements	Optional Elements	Comments
03	a, b		

IRQ Example

In this example, Bogota ACC (SKED) has sent a request to Maiquetia ACC (SVZM) to initialize the interface.

(IRQSKED/SVZM266)

2.3.4.2 IRS (INITIALIZATION RESPONSE)

IRS Purpose
An IRS is used as a response to an IRQ message.

IRS Format

IRS Field	Required Elements	Optional Elements	Comments
03	a, b, c		Element (c) should contain the reference number of the previously sent IRQ.

IRS Example

In this example, Maiquetia ACC (SVZM) has responded to Bogota ACC's (SKED) request to initialize the interface.

(IRSSVZM/SKED817SKED/SVZM266)

2.3.4.3 TRQ (TERMINATION REQUEST)

TRQ Purpose
A TRQ is used to request transition of an interface from an operational to a non-operational state.

TRQ Format

TRQ Field	Required Elements	Optional Elements	Comments
03	a, b		
18		a, other info.	Element (a) is included only if no other information is included. Either element (a) OR other information (but not both) must be included. Other information, if included, must include RMK/ followed by free text.

TRQ Example

In this example, Bogota ACC (SKED) has sent a request to Maiquetia ACC (SVZM) to terminate the interface.

(TRQSKED/SVZM348)

2.3.4.4 TRS (TERMINATION RESPONSE)

TRS Purpose
TRS is used as a response to an TRQ message.

TRS Format

TRS Field	Required Elements	Optional Elements	Comments
03	a, b, c		Element (c) should contain the reference number of the previously sent TRQ.
18		a, other info.	Element (a) is included only if no other information is included. Either element (a) OR other information (but not both) must be included. Other information, if included, must include RMK/ followed by free text.

TRS Example

In this example, Maiquetia ACC (SVZM) has responded to Bogota ACC's (SKED) request to initialize the interface.

(TRSSVZM/SKED912SKED/SVZM348)

2.3.5 ACKNOWLEDGEMENTS

2.3.5.1 LAM (LOGICAL ACKNOWLEDGEMENT)

LAM Purpose
An LAM is sent from ACC to ACC to indicate that a message has been received and found free of syntactic and semantic errors. It does not indicate operational acceptance by a controller. Element (c) contains the reference number (i.e. element 3(b)) of the message being responded to.

LAM Format

LAM Field	Required Elements	Optional Elements	Comments
03	a, b, c		

LAM Example

In this example, Maiquetia ACC (SVZM) has accepted message number 739 from Bogota ACC (SKED).

(LAMSVZM/SKED629SKED/SVZM739)

2.3.5.2 LRM (LOGICAL REJECTION)

LRM Purpose
An LRM is used to indicate that a message sent from ATS system to ATS system contained an error and has been rejected by the receiving system.

LRM Format

LRM Field	Required Elements	Optional Elements	Comments
03	a, b, c		
18	text as shown in Comments		Describes the error code and the error per Appendix A guidelines: after RMK/, include two digits comprising the error code; (note that error code 57 will be used for any error that is not field specific and that is not identified in Appendix A - Error Codes) two digits comprising the field in error (or 00 if the error is not field-specific); and the erroneous text, i.e. the contents of the message that caused the error when the error is field specific. When the error is non-field specific, a descriptive error message shall be included. Separate the above items by an oblique stroke (/).

LRM Example

In this example, Maiquetia ACC (SVZM) has rejected message number 392 from Bogota ACC (SKED) because the aircraft identification in field 7 of message 392 was too long.

(LRMSVZM/SKED519SKED/SVZM392-RMK/06/07/TACA1745)

2.3.6 RADAR HANDOVER MESSAGES

2.3.6.1 RTI MESSAGE (RADAR TRANSFER INITIATE)

RTI Purpose
An RTI message is sent from one ATS unit to another to initiate the transfer of radar identification for a flight. Logical acknowledgement of an RTI is an RLA or LRM.

RTI Format

RTI Field	Required Elements	Optional Elements	Comments
03	a, b, c		
07	a, b, c		Must include ACID and established SSR code
13	a		
16	a		

RTI Field	Required Elements	Optional Elements	Comments
31	a	a	If no sector designated or sector 00 is designated, then receiving system determines
32	a, b, c, d, e		

RTI Examples
This is an example of a handover initiated by Merida ACC to Cenamer ACC. No sector is designated, so Cenamer will determine who should receive it.

(RTIMMMD/MHTG812MMMD/MHTG801-TAC210/A3407-MMMX–MPTO–MHTG
-13242934162000N0912401WN043327629F349)

This is an example of a handover directed to sector 01 in Cenamer ACC, from Merida ACC.

(RTIMMMD/MHTG812MMMD/MHTG801-TAC210/A3407-MMMX–MPTO–MHTG01
-13242934162000N0912401WN043327629F349)

2.3.6.2 RLA MESSAGE (RADAR LOGICAL ACKNOWLEDGEMENT)

RLA Purpose
The Radar Logical Acknowledgment message is used to acknowledge computer receipt of an RTI message. The facility sending this message is indicating that the referenced message has been received and has no format or logic errors, and to indicate which sector the handover was routed to. The RLA is an acknowledgement message in response to RTI and therefore is not responded to.

RLA Format

RLA Field	Required Elements	Optional Elements	Comments
03	a, b, c		
31	a, b		

RLA Examples

In this example Cenamer ACC has indicated to Merida ACC that it has received a handover and routed it to sector 01.

(RLAMHTG/MMMD202MHTG/MMMD445-MHTG01)

In this example Cenamer ACC has indicated to Merida ACC that it has received a handover and routed it to the Guatemala Radar Approach Control

(RLAMHTG/MMMD202MMMD/MHTG445-MGGT)

2.3.6.3 RTU MESSAGE (RADAR TRACK UPDATE)

RTU Purpose
An RTU message may be sent from one ATS unit to another to update the radar position of a flight during transfer of radar identification. RTU messages are sent periodically after an RTI, until an RTA is received or the handover is retracted. There is no logical acknowledgement of an RTU.

RTU Format

RTU Field	Required Elements	Optional Elements	Comments
03	a, b, c		Element (c) shall refer to the message number of the RTI message that initiated the handover.
07	a ,b ,c		Include established SSR code.
13	a		
16	a		
32	a, b, c, d, e		

RTU Examples
This is an example of an RTU message initiated by Cenamer ACC to Merida ACC. The message MHTG/MMMD801 was the RTI message that initiated the handover.

(RTUMHTG/MMMD000MHTG/MMMD801-TAC211/A3407-MPTO-MMMX
-13242934154412N0905100WN043327629F341)

2.3.6.4 RTA MESSAGE (RADAR TRANSFER ACCEPT)

RTA Purpose
An RTA message may be sent from one ATS unit to another as an application response to an RTI. This message signifies that a controller has accepted radar identification of a flight. An RTA is also sent by the facility that initiated a handover to retract the handover. Logical (computer) acknowledgement of an RTA is an LAM or LRM.

RTA Format

RTA Field	Required Elements	Optional Elements	Comments
03	a, b, c		Element (c) refers to the message number of the RTI that is being responded to.
07	a, b, c		Include assigned SSR code (i.e. code assigned by the accepting center).
13	a		
16	a		
31	a, b		Note accepting facility may be a Radar Approach Control serviced by the sending ACC.

RTA Examples

This is an example of a handover accepted by Merida ACC. Handover was initiated by Cenamer ACC.

(RTAMMMD/MHTG438MHTG/MMMD812-TAC211/A4222-MPTO-MMMX-MMMD01)

This is an example of a retraction by Cenamer ACC:

(RTAMHTG/MMMD222MHTG/MMMD812-TAC211/A4222-MPTO-MMMX-MHTG01)

3. PART III – COMMUNICATIONS AND SUPPORT MECHANISMS

3.1 INTRODUCTION

The communications protocols and physical path are not dictated by this ICD. This ICD addresses only the application message content.

3.2 TELECOMMUNICATIONS REQUIREMENTS AND CONSTRAINTS

3.2.1 USE OF AERONAUTICAL FIXED TELECOMMUNICATIONS NETWORK (AFTN)

AFTN may be used as a flight plan data interface, subject to verification of performance. Any interface exchanging radar position data, including radar handovers, shall not use AFTN.

When AFTN is used as the communications mechanism:

a) The AFTN IA-5 Header as described in ICAO Annex 10, vol. 2 will be used for exchange of messages.

b) ATS messages will be addressed to each ATS unit using an eight-character facility address where the first four characters are the appropriate location indicator from ICAO Doc. 7910, and the last four characters are routing indicators defined by the ATS unit in accordance with ICAO Annex 10, vol. 2.

Each message shall be sent with the priority indicated in Table 2 of Part II.

3.2.2 USE OF A WIDE-AREA NETWORK

Use of existing wide-area networks (e.g. X.25 or Frame Relay packet-switched network) may be used if the speed, capacity, and security characteristics are verified as adequate to support the interface.

3.2.3 USE OF DIRECT LINES

In cases where speed, capacity, and/or security require it, a direct line interface may be used between facilities.

3.2.4 CHARACTER SET

The IA-5 character set shall be used for all application message content. Certain characters have special meaning and must only be used as indicated below:

Open parenthesis “(”and close parenthesis “)” shall be used only to begin and terminate the application message.

A single hyphen “-” shall be used only as a field separator and shall not be used within any field.

3.3 ENGINEERING CONSIDERATIONS

3.3.1 ASSOCIATED AUTOMATION FUNCTIONALITY

Each ATS service provider participating in this interface must have a supporting automation system. The supporting automation shall:

- Error check all inbound messages for proper format and logical consistency.
- Ensure only messages from authorized senders are accepted and processed.
- As required, alert the responsible controller(s) of flight data that has been received.
- Notify the responsible personnel when any message sent is rejected or not acknowledged within a variable system parameter (VSP) period of time (see 4.5.1 Response time).

3.3.2 FAILURE AND RECOVERY SOLUTIONS

Automation systems may have different failure avoidance and failure recovery mechanisms. Each participating system shall have the following characteristics:

- If the recovery process preserves the current message number in the sequence with each facility, no notification is necessary.
- If the recovery process requires reset of the sequence number to 000, a means of notifying the receiving facility that the message numbers have been reset is required. This may be procedural rather than automated.

The recovery process shall not automatically re-send any CPL for which an LAM had been received. This is relevant if the system was able to recover state information about which flight plans have been coordinated, and did not need to reset the message sequence numbers.

3.3.3 DATA REQUIREMENTS

Certain data must be defined and maintained to support all features of the interface. Depending on the data, it should be coordinated on a Regional, National, or Local (facility) basis. Data requirements are identified in Table 3 below.

Table 3. Summary of Data Definitions Needed to Support the Interface

Field	Data	Purpose	Source	Coordination
03	Facility Identifiers	Identify the sending/receiving facility.	ICAO Doc. 7910 (first four characters) and local definition (second four characters)	Local
07	Functional Address	Agree on functional addresses to be used in MIS messages.	Local Data	Local
10	Equipment Codes	Identify ATS-specified equipment qualifiers that are not specified in ICAO Doc. 4444.	CAR and SAM 7030 Supplements	Regional
14	Boundary Point	Identify the coordination fixes to be sent for each airway.	Local Data	Local
15	Adapted Routes and Fixes	Identify airway and fix information that is adapted by both systems.	Local Data	Local
18	Requirements for other data to be included	Identify any requirements for data that must be included in Field 18.	CAR and SAM 7030 Supplements	Regional

3.4 SECURITY CONSIDERATIONS

3.4.1 PRIVACY

This ICD does not define mechanisms that guarantee privacy. It should be assumed that any data sent over this interface may be seen by unintended third parties either through interception of the message or through disclosure at the receiving facility.

Any communications requiring privacy must be identified and appropriate communications and procedures defined.

3.4.2 AUTHENTICATION

Each system shall authenticate that messages received are from the source that is identified in Field 03.

3.4.3 ACCESS CONTROL

Each system participating in the interface shall implement eligibility checks to ensure that the source of the message is eligible to send the message type and is the appropriate authority for the referenced flight.

3.5 TEST CONSIDERATIONS

Before an automated flight data interface becomes operational between any two facilities, the following set of tests shall be completed:

Test of the telecommunications system and addressing:

> Off-line tests using development or test (i.e. non-operational) systems. These may include test systems at non-operational facilities, and/or operational systems that are in an off-line mode. Note: If off-line testing is not possible, extreme care should be used when conducting first round testing on operational systems.

Test of non-operational message sets:

> Tests using the operational systems in off-line (recommended) or operational mode in which TEST messages are exchanged. (Note: If off-line testing is not possible, extreme care should be used when conducting second round testing on operational systems.)

Test of operational message sets:

> Tests using the operational systems in operational mode in which manual coordination verifies each flight data message sent.

Before each test, a document specifying purpose, procedures and data to be collected, must be agreed to by both/all facilities. To ensure success/failure is clearly defined, specific criteria should be included in the document.

Data transmitted during test phases should include both correct and incorrect formats/data fields to verify that correct data is processed correctly and incorrect data is rejected.

For diagnostic purposes, each side of the interface should be able to isolate the source of interface problems.

3.6 PERFORMANCE CONSIDERATIONS

3.6.1 RESPONSE TIME

For flight planning messages, controllers require indication of an unsuccessful message transmission within 60 seconds of the message being sent. Therefore, the response time from the time a message is sent until an LAM (or LRM) is received shall be under 60 seconds <u>at least</u> 99% of the time under normal operations. A faster response time is desirable, and will result in operations that are more efficient.

For messages involving transfer of control and surveillance data (e.g. RTI, RTA, and RTU) the data must be transmitted in time for the receiving system to display the track position with acceptable accuracy. Communication across the interface shall be less than six seconds maximum.

3.6.2 AVAILABILITY / RELIABILITY

The hardware and software resources required for providing service on the CAR/SAM interfaces should be developed such that the inherent reliability will support interface availability which is at least equal to the end systems of that interface (e.g. 99.7% availability for end systems that both operate with 99.7% reliability).

3.6.3 CAPACITY AND GROWTH

Before implementing this interface between two ACCs, an analysis of the traffic expected between the centers shall be performed and the proposed communications links verified for appropriate capacity. Traffic estimates should consider current and future expected traffic levels.

For initial planning purposes the following estimates of message size and messages per flight are provided.

Table 4. Expected Message Rates and Sizes

Message	Avg. per Flight	Avg. Size	Max Size	Comments
Messages per near-border departure flight:				
FPL	1	275	2,000	
CHG	0.5	160	1,000	Assumed 1 of 2 flights amended after coordination, before departure.
EST	1	120	200	
MOD	2	120	1,000	Assumed each flight has an average of one change after coordination due to amendment and two time updates.
Messages per non near-border departure flight:				
CPL	1	275	2,000	
MOD	2	120	1,000	Assumed each flight has an average of one change after coordination due to amendment and two time updates.
Messages per every flight:				
CNL	0.01	100	150	Assumed 1 in 100 flight plans are cancelled.
RTI	1	150	200	
RTU	5	140	200	Assumed 1 RTU every 6 seconds for 30 seconds.
RTA	1	110	160	
MIS	0.1	130	625	
Responses (not per flight):				
LAM/RLA	Sum of all above except	80	130	

Message	**Avg. per Flight**	**Avg. Size**	**Max Size**	**Comments**
	RTU			
LRM		100	230	

The hardware and software developed for the interfaces shall be capable of asynchronously exchanging the messages defined in Part III, Table 2 simultaneously with all adjacent automated systems.

APPENDIX A – ERROR CODES

The error codes for use with LRM messages are defined in Table A-1 below.

Table A-1. LRM Error Codes and Explanations

Error Code	Field Number	Supporting Text
1	Header	INVALID SENDING UNIT (e.g., AFTN address)
2	Header	INVALID RECEIVING UNIT (e.g., AFTN address)
3	Header	INVALID TIME STAMP
4	Header	INVALID MESSAGE ID
5	Header	INVALID REFERENCE ID
6	07	INVALID ACID
7	07	DUPLICATE ACID
8	07	UKNOWN FUNCTIONAL ADDRESS
9	07	INVALID SSR MODE
10	07	INVALID SSR CODE
11	08	INVALID FLIGHT RULES
12	08	INVALID FLIGHT TYPE
13	09	INVALID AIRCRAFT MODEL
14	09	INVALID WAKE TURBULENCE CATEGORY
15	10	INVALID CNA EQUIPMENT DESIGNATOR
16	10	INVALID SSR EQUIPMENT DESIGNATOR
17	13, 16	INVALID AERODROME DESIGNATOR
18	13	INVALID DEPARTURE AERODROME
19	16	INVALID DESTINATION AERODROME
20	17	INVALID ARRIVAL AERODROME
21	13, 16	EXPECTED TIME DESIGNATOR NOT FOUND
22	13, 16	TIME DESIGNATOR PRESENT WHEN NOT EXPECTED
23	13, 14, 16	INVALID TIME DESIGNATOR
24	13, 14, 16	MISSING TIME DESIGNATOR
25	14	INVALID BOUNDARY POINT DESIGNATOR
26	14, 15	INVALID ENROUTE POINT
27	14, 15	INVALID LAT/LON DESIGNATOR
28	14, 15	INVALID NAVAID FIX
29	14, 15	INVALID LEVEL DESIGNATOR
30	14, 15	MISSING LEVEL DESIGNATOR
31	14	INVALID SUPPLEMENTARY CROSSING DATA
32	14	INVALID SUPPLEMENTARY CROSSING LEVEL
33	14	MISSING SUPPLEMENTARY CROSSING LEVEL
34	14	INVALID CROSSING CONDITION
35	14	MISSING CROSSING CONDITION
36	15	INVALID SPEED/LEVEL DESIGNATOR
37	15	MISSING SPEED/LEVEL DESIGNATOR
38	15	INVALID SPEED DESIGNATOR
39	15	MISSING SPEED DESIGNATOR
40	15	INVALID ROUTE ELEMENT DESIGNATOR

Error Code	Field Number	Supporting Text
41	15	INVALID ATS ROUTE/SIGNIFICANT POINT DESIGNATOR
42	15	INVALID ATS ROUTE DESIGNATOR
43	15	INVALID SIGNFICANT POINT DESIGNATOR
44	15	FLIGHT RULES INDICATOR DOES NOT FOLLOW SIGNIFICANT POINT
45	15	ADDITIONAL DATA FOLLOWS TRUNCATION INDICATOR
46	15	INCORRECT CRUISE CLIMB FORMAT
47	15	CONFLICTING DIRECTION
48	18	INVALID OTHER INFORMATION ELEMENT
49	19	INVALID SUPPLEMENTARY INFORMATION ELEMENT
50	22	INVALID AMENDMENT FIELD DATA
51		MISSING FIELD nn
52		MORE THAN ONE FIELD MISSING
53		MESSAGE LOGICALLY TOO LONG
54		SYNTAX ERROR IN FIELD nn
55		INVALID MESSAGE LENGTH
56		NAT ERRORS
57		INVALID MESSAGE
58		MISSING PARENTHESIS
59		MESSAGE NOT APPLICABLE TO zzzz ACC
60		INVALID MESSAGE MNEMONIC (i.e., 3 LETTER IDENTIFIER)
61	Header	INVALID CRC
62		MESSAGE REJECTED, MANUAL COORDINATION REQUIRED
63-255		Reserved for future use.

Error Code 57 shall be used for any error that is not field-specific and is not identified in the table.
Each ATS provider may propose additional error codes as needed and submit them through the GREPECAS mechanism for approval and inclusion in this Table.

APPENDIX B – IMPLEMENTATION GUIDANCE MATERIAL

B.1 USE OF THE CORE MESSAGE SET

B.1.1 FILED FLIGHT PLAN (FPL) MESSAGES

A user must file a filed flight plan message (FPL) with the initial ATS unit that will service the flight as well as with the ATS unit for each FIR that the flight will cross. The format and content of this FPL is subject to the rules of the receiving country and is not defined by this ICD.

It is expected that an FPL will be filed by an airspace user, and a subsequent CPL will be received from an adjacent ATS unit. It is the responsibility of each country to design their automation to ensure that an FPL or CPL from an adjacent ATS unit always takes precedence over a user-filed FPL for the flight so that second-order flight data messages are applied to the ATS unit-supplied flight plan and not the user-filed flight plan.

B.1.2 COORDINATION OF ACTIVE FLIGHTS (CPL)

Normally, an agreed upon number of minutes before a flight reaches a control boundary the sending ATS unit will send a CPL message to the receiving ATS unit.

The normal computer response to a CPL is an LAM sent by the receiving automation system to signify that the plan was found to be free of syntactic or semantic errors. Controller acceptance is implied (i.e. the ACP message defined in ICAO Doc. 4444 is not implemented). This is permitted per ICAO Doc. 4444, Part IX, section 4.2.3.5.1 and Part VIII, section 3.2.5. If the receiving computer cannot process a CPL then an LRM will be returned if that message has been implemented. Alternatively, no response will be generated.
ICAO Doc. 4444 states, in Part IX, section 4.2.3.2.5 "A CPL message shall include only information concerning the flight from the point of entry into the next control area or advisory airspace to the destination aerodrome". However ICAO Doc. 4444 provides no guidelines for choosing the exact point at which the CPL should start.

The nature of ATC automation systems is that they have differing requirements for the starting point of a route relative to the facility boundary, necessitating some agreement on allowable route tailoring. The relationship between the start of the route in Field 15 and the coordination fix in Field 14 must also be established so that the receiving center can accurately process the route. Agreements on these points are provided in the attached boundary agreements for each ATS provider.

B.1.3 CHANGES AFTER COORDINATION

Any change to a flight plan after initial coordination requires a message that can be mapped to the correct flight plan. Every message sent after an initial CPL should have the same Aircraft ID, departure point, and destination point. The message reference data should point to the previous message in the sequence for this flight. For example, if the CPL is message number KZMP/CZWG035 then the reference data for the first MOD sent after the CPL should be KZMP/CZWG035. The second MOD sent for that flight should refer to the message number of the original CPL.. The messages that represent valid changes to the original flight plan include CHG, EST, MOD, RTI, and RTA (when used for retraction; see Section B.1.8).

If a flight for which a CPL has been sent will no longer enter the recipient's airspace, a CNL message should be sent.

After acceptance of a CNL message, the receiving system should not accept any changes regarding the subject flight.

Any change to flight data for a flight that has been coordinated (i.e. a CPL or EST has been sent) must be forwarded via a MOD message. The MOD message is identical to the ICAO CDN message in format and content, but does not require an ACP response (only LAM or LRM).

The expected computer response to a CNL, CHG, EST, or MOD is an LAM or LRM (if the latter has been implemented).

Each system should implement rules as to whether an amendment on a particular flight should be accepted from a neighboring ACC. For example, an amendment from the sending ACC typically is not accepted once transfer of control has been initiated.

It is expected that the content of a field sent in a flight data change message (e.g. CHG or MOD) will completely replace the content of the field currently stored in the receiving center. So, for example, if Field 18 is amended the entire contents of the field should be sent and not only the changed elements.

An aircraft placed into a hold should result in a MOD message being sent with new Field 14 Estimate Data (boundary time) based on the Expect Further Clearance (EFC) time. If no EFC time is established by ATC, an agreed upon default EFC time may be used (e.g. 2 hours) to ensure the flight plan data is maintained by the receiving facility. If necessary, a second MOD message should be sent with the revised Estimate Data time once it is known.

Upon acceptance of an RTI message the receiving system should accept only an RTA, RTU, or MIS message for the flight. If an RTA signifying retraction is accepted, then the system may once again accept a MOD message.

Upon receipt of a logical acknowledgement to an RTA message signifying handover acceptance, the sender of the RTA should not accept any messages regarding the subject flight.

B.1.4 NEAR-BORDER DEPARTURES

ATS units implementing automated coordination for near-border departures may also exchange FPLs to coordinate flights pre-departure when the flight time from the departure point to the boundary point is less than the normal CPL notification time.

ATS units will send an FPL message pre-departure followed by an EST message upon departure. Additional coordination procedures may be defined in an inter-facility Letter of Agreement.

If an FPL has been sent and changes are subsequently made, then a CHG message should be used to modify the changed fields. Only the ATS unit that sent an FPL message may send a CHG message (i.e. the receiving unit cannot send a CHG back to the sending unit). Once an EST message is sent, a MOD must be used instead of a CHG for transmission of flight data changes.

The expected computer response to an FPL is an LAM or LRM.

If a previously sent FPL is to be cancelled, a CNL message should be sent.

B.1.5 INTERFACE MANAGEMENT

ATS units implementing an AIDC interface will nominally be expected to accept messages at any time when the system is available. Each system is responsible for providing the capability of inhibiting received messages, if needed. Each system is expected to be able to inhibit outgoing messages. Manual coordination between facilities may be needed for one facility to request the other to inhibit messages.

ATS units which implement AIDC interfaces may exchange messages to request initialization or termination of the AIDC interface via automated messages. Only when an initialization request has been sent and responded to affirmatively will each system be expected to accept messages.

Any message received when the interface is not initialized shall be ignored (i.e. not processed and not responded to), except for IRQ.

To request initialization one system shall send an IRQ message to the other. The IRQ may be repeated a predetermined number of times if no response is received, with each repeated IRQ receiving the same message number.

If the receiving system is ready to communicate (i.e. it has already sent an IRQ) when it receives an IRQ, it shall send an IRS in response. There is no LAM or LRM response to an IRQ. The reference number in Field 03 should refer to the message number of the IRQ being responded to. Each system becomes active when it receives an IRS from the other system. There is no response to an IRS.

If no response to an IRQ is received and the maximum number of retries exceeded, the interface is considered failed by the initiating system.

A system requests orderly termination of the interface by sending a TRQ message. After sending a TRQ, a system shall accept only a TRS or TRQ message. There is no LAM or LRM response to a TRQ. Upon receipt of a TRS the interface shall be deactivated. There is no response to a TRS. Upon receipt of a TRQ the system shall respond with a TRS and deactivate the interface immediately (even if a TRQ is outstanding). When messages are exchanged between two ATS units that cause successful termination of the interface, the two systems shall not send or accept any messages on the interface until a successful initialization transaction has been completed.

B.1.7 ERROR CHECKING, RESPONSES, AND RESENDS

Upon receiving a message, the receiving system shall check that the format and content of each field are in accordance with this ICD. Other logic checks may be performed per the rules defined by the ATS provider.

Whenever a message is received and passes all syntactic and semantic checks an LAM (or RLA for handover initiation) shall be returned to the sender for those messages designated for LAM/LRM responses.

ATS units implementing only LAM acknowledgement messages will not send any response to the sender when a message fails a syntactic or semantic check. The sending ATS Unit must infer message rejection by failure to receive an LAM. Agreement on one minute as a maximum operationally acceptable time-out value (from the time a message is sent to receipt of an LAM) is recommended.

ATS units implementing only LAM acknowledgement messages cannot productively use message resend as a technique, since the lack of an LAM may infer a lost message or message rejection. Therefore use of message resends after timeout of an LAM receipt is not recommended.

ATS units implementing both LAM and LRM acknowledgement messages will send an LRM when a received message fails a syntactic or semantic check, using the error codes in Appendix A. In the case of a radar handover initiation (see B.1.8) an RLA is used instead of an LAM.

When no response to a message is received within a VSP period of time a unit may optionally choose to resend the original message—using the same message number—a VSP number of times before declaring failure. The same message number should be used so that the receiving station can easily distinguish exact duplicates should the same message be received more than once.

B.1.8 RADAR HANDOVERS

- RTI Message

An RTI shall be used to initiate a transfer of radar identification from a controller in one ACC to a controller in another ACC. An RLA or LRM shall be returned in response to an RTI, based on acceptance checks by the receiving computer.

If no logical response (RLA or LRM) to an RTI is received after a specified number of retries, the handover should be marked as failed to the initiating controller.

Upon acceptance of an RTI message the receiving system should not accept any flight data messages regarding the subject flight except for an RTA, RTU, or MIS.

- RTU Message

The transferring center shall begin sending RTU messages once an RLA is received for an RTI. RTU messages shall be sent once every tracking cycle. The expected track update rate must be coordinated between the implementing countries.

An RTU message should not be sent when current track data is not available for a flight, e.g. if the flight enters a coast mode.

Upon retraction of the transfer or receipt of an RTA from the receiving center the sending of RTUs shall stop. There will be no response to an RTU (i.e. no LAM, RLA, or LRM).

- RTA Message

An RTA message shall be sent by the receiving center in response to an RTI when the receiving controller has accepted the transfer. An RTA message shall be sent by the sending center when the initiating controller retracts a previously issued RTI. An LAM or LRM shall be returned in response to an RTA, based on acceptance checks by the receiving computer.

If no response is received within a VSP period of time (e.g. 6 seconds), the transfer shall be considered failed and the accepting controller notified.

If the sending center receives an RTA after retracting a handover, it shall reject the RTA by returning an LRM.

If the receiving center receives an RTA after accepting a handover, it shall reject the RTA by returning an LRM.

After an RTA is rejected, the controller that attempted to accept or retract control shall be notified that the handover failed. Note that it is possible for an accept and retract to be entered simultaneously, resulting in both RTA messages being rejected.

B.1.9 MIS MESSAGE

The MIS message can be addressed to either a functional address, or to an aircraft ID. The functional addresses to use will be exchanged between adjacent centers. Each functional address will map to a workstation or set of workstations, and the types of information that should be sent to each address should accompany the exchange of addresses.

When an MIS message is addressed to a flight ID, the receiving system shall route the message to the sector that currently controls the flight. If no sector controls the flight the message shall be rejected. The intent is that an MIS message does not modify the flight record for the subject flight (i.e. it is not treated as an amendment to Field 18 for that flight).

B.2 DEVELOPMENT OF FIELD CONTENT

The following sections provide implementation notes on the expected semantic content of each field, how to generate the fields and how to interpret the fields.

B.2.1 FIELD 03

Each message sent to each interface should receive an incrementally higher number. Thus, a system must maintain a separate sequence for each facility with which it interfaces.

The message following number 999 will be 000, and then the number sequence repeats.

The message number in Field 03 and the Aircraft ID in Field 07 combined, must be unique for any CPL or FPL. A flight plan received that has the same message number and ACID as a previously received plan shall be rejected. Note that it is possible to have duplicate message numbers if the sending computer system fails and is restarted in a cold start mode (i.e. no previous state data is retained). In this case the message numbers would restart and may repeat.

Implementers of the AIDC interface should consider a check for out-of-sequence messages (i.e. a message received has a message number that is not one greater than the previous message number). Since messages may be resent if a response is not received within a VSP period of time, it may also be possible to receive a message more than once. Therefore implementers should consider a check for duplicate messages based on the message number. Any such checks should also consider the behavior after a system failure/restart.

B.2.2 FIELD 07

If the aircraft does not have Mode A capability, omit elements (b) and (c) and the preceding oblique stroke. Also omit these elements if the aircraft has Mode A capability but the SSR code is unknown (or not assigned).

B.2.3 FIELD 09

When the aircraft type is “ZZZZ”, there may be no certificated maximum take-off weight. In this case the pilot and/or controller are expected to determine what the value should be per the ICAO guidelines and the estimated weight of the aircraft.

Allowable values for the aircraft type should include any type designator in ICAO Doc 8643.

Note that implementers may choose to validate the wake turbulence category based on the aircraft type, since these are published in ICAO Doc 8643.

B.2.4 FIELD 10

Agreement on ATS-prescribed indicators is to be specified in the CAR and SAM Doc 7030 Supplements.

B.2.5 FIELD 13

The aerodrome in Field 13 must match a location indicator in ICAO Doc 7910, or must match one that is agreed to per the relevant boundary agreement, or agreed to by the implementing facilities. (Note: Some States permit International flights to depart from other than international aerodromes. These aerodromes may not have location indicators in ICAO Doc 7910.)

If ZZZZ or AFIL is used, then additional information should be present in Field 18 per ICAO Doc 4444. This ICD imposes no specific requirements on the content of DEP/.

B.2.6 FIELD 14

Field 14(a) contains a Boundary Point, which is an agreed point on or near the control boundary. The boundary agreement between implementing ATS providers identifies any specific requirements governing the choice of boundary point.

B.2.7 FIELD 15

A CPL, per ICAO Doc. 4444 Part IX, Section 4.2.3.2.5 “shall include only information concerning the flight from the point of entry into the next control area or advisory airspace to the destination aerodrome”. In practical terms, each automation system generally has restrictions on the starting point of the route.

Each boundary agreement will define where the route of flight shall begin so as to meet the above requirement.
After the initial point, Field 15(c) should contain the remainder of the route of flight.

B.2.8 FIELD 18

In an FPL or CPL, all Field 18 content must be delimited by elements constructed as shown in ICAO Doc 4444, each of which is a three to four-letter identifier followed by an oblique stroke.

Field 18 shall not contain the character “-”, which is used to delineate fields in the message.

When used in an LRM, only the RMK/ element should be identified; only the text of the rejection message shall be included.

B.3 SUMMARY OF EXPECTED RESPONSES TO MESSAGES

Table B-1 identifies the expected responses to each message. The computer logical responses represent acceptance or rejection based on computer checks for message validity. An application response is a response that is initiated by a person or the application software to provide semantic response to a message. Note that an LRM can be sent in response to a message with no computer response identified if the message ID (e.g. RTU) cannot be determined by the receiving computer.

Table B-1. Summary of Expected Message Responses

Msg	Computer Logical Response		Application Response
	Accept	Reject	
FPL	LAM	LRM	None
CHG	LAM	LRM	None
EST	LAM	LRM	None
CPL	LAM	LRM	None
CNL	LAM	LRM	None
MOD	LAM	LRM	None
MIS	LAM	LRM	None
IRQ	None	None	IRS
IRS	None	None	None
TRQ	None	None	TRS
TRS	None	None	None

Msg	Computer Logical Response		Application Response
	Accept	Reject	
RTI	RLA	LRM	RTA
RTU	None	None	None
RLA	None	None	None
RTA	LAM	LRM	None
LAM	None	None	None
LRM	None	None	None

APPENDIX C – MODEL OF COMMON BOUNDARY AGREEMENT

C.1 INTRODUCTION

This section documents the AIDC interface planned between (…XXX and XXX...) automation systems. The initial interface may have limited message capability. Future evolutions may include additional messages.

C.2 MESSAGE IMPLEMENTATION AND USE

C.2.1 MESSAGES IMPLEMENTED

The AIDC interface between the (…XXX and XXX...) automation systems will include CPL and LAM. A CPL will be sent when a flight departs, or when it is within a VSP flying time from the boundary, whichever occurs later. Each CPL that is received and successfully checked for syntactic and semantic correctness will be responded to with an LAM.

C.2.2 ERROR HANDLING

An LAM will be sent in response to each CPL unless the receiving automation system detects an error. The automation system that sent the CPL will wait a VSP period of time for an LAM, and if none is received within the time parameter, it will notify the appropriate position that a failure occurred. Automatic retransmission of the message will not be attempted.

C.2.3 CHANGES TO A CPL

All changes to a previously sent CPL will be coordinated manually between the sending and receiving sectors.

C.2.4 FIELD 08, FLIGHT RULES AND TYPE OF FLIGHT

Regardless of the value in Field 08(a), all CPLs sent on this interface will be assumed to be IFR at the boundary between (…XXX and XXX...) airspace. Each center is only to send flight plans for flights that are IFR at the boundary.

C.2.5 FIELD 09, NUMBER AND TYPE OF AIRCRAFT AND WAKE TURBULENCE CATEGORY

When a specific aircraft type is used, the wake turbulence indicator sent to (XXX) must match the value stored for the aircraft type in the (XXX) database. When "ZZZZ" is used as the aircraft type, the wake turbulence category may be H, M, or L as appropriate.

C.2.6 FIELD 13, DEPARTURE AERODROME AND TIME

Field 13(b), normally only present in FPLs, will be allowed as an optional element for CPLs on this interface. (XXX) expects to include this element in messages; the (XXX) does not.

C.2.7 FIELD 14, ESTIMATE DATA

If a flight is on an adapted route segment when it crosses the control boundary, Field 14(a) will reference the last significant point in the sending center's airspace.

If a flight is on a direct route segment when it crosses the control boundary Field 14(a) will reference the last significant point in the sending center's airspace.

If there is no significant point between the departure aerodrome and the boundary, the departure aerodrome will appear in Field 14(a).

All flights are expected to cross the boundary in level flight, at the altitude in Field 14(c). Elements (d) and (e) will not be used, and manual coordination will be required for any flight not in level flight at the boundary.

For flights from …..to …..:

If a flight is on an adapted route segment when it crosses the control boundary, Field 14(a) will reference the first significant point in the receiving center's airspace.

If a flight is on a non-adapted direct route segment when it crosses the control boundary Field 14(a) will reference the intersection of the route with the control boundary.

C.2.8 FIELD 15, ROUTE

Element type (c6) will not be used on this interface.

Element 15(c) will be constructed the same way whether the flight is from ….or from ….:

If a flight is on an adapted route segment when it crosses the control boundary then Field 15(c) will begin with the same significant point as is in Field 14(a).

If a flight is on a direct route segment when it crosses the control boundary then Field 15(c) will begin with the last significant point in the sending center's airspace, if one exists.

If there is no significant point between the departure aerodrome and the boundary then Field 15(c) will begin with "DCT".

After the initial point, Field 15(c) will contain the remainder of the route of flight.

C.2.9 FIELD 16, DESTINATION AERODROME AND TOTAL ESTIMATED ELAPSED TIME, ALTERNATE AERODROME(S)

Fields 16(b) and (c), normally only present in FPLs, will be allowed as optional elements on this interface.

C.3 PHYSICAL INTERFACE

Messages will be exchanged across this interface between the following facilities:
…Center to …
…Center to ….

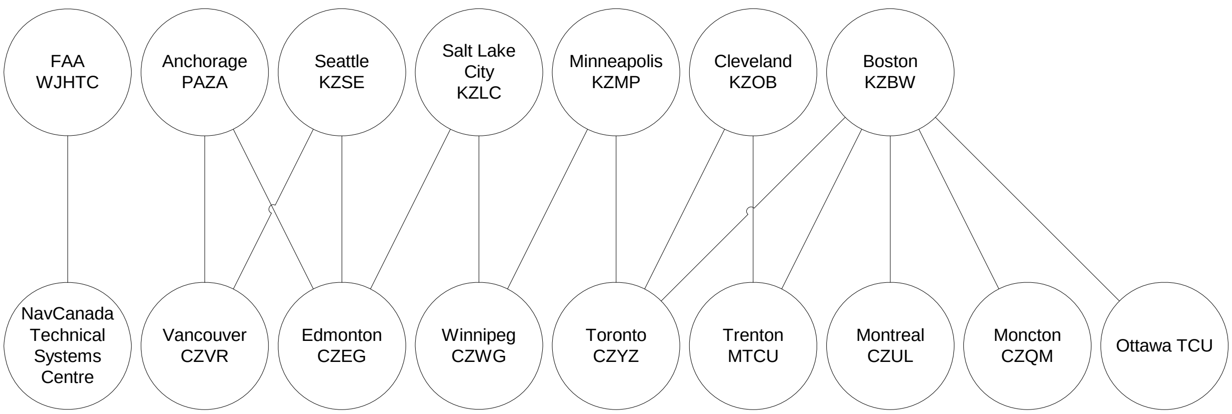


Figure 1. Expected FAA/NAV CANADA Interfaces Governed by this ICD

- END/FIN -

APPENDIX O

(Based on Appendix K to the Report on Agenda Item 3 of the GREPECAS/12 Meeting Report)

States should develop automation architecture requirements according to the level of service required for each ATS airspace classification and international aerodrome, as follows:

ATS Operational requirements for automated systems (ATC, FIS, SAR)							
APPLICABLE /NEED ATS REQUIREMENTS	**ATS Airspace Classification**						
	A	**B**	**C**	**D**	**E**	**F**	**G**
Identification of aircraft							
Separation							
Navigation guidance							
Surveillance							
Transfer							
Coordination							
Information of flight plans in real time							
Visualization of the geographical position of the aircraft (latitude, longitude, history)							
Statistical data of flight plans (past, current and future information).							
Surveillance data processing system (i.e. RDPS or ADS) a. considering future expansion capability; and b. considering format compatibility							
Flight data processing system (FDPS)							
ATS inter-facility data communications (AIDC)							
Controller-pilot data link communications (CPDLC)							
Flight track profile information (altitude, vertical speed, offset speed, predictive vector, turn angle, etc.)							
Alerting systems (STCA, MSAW, DIAW, emergency, communication failure, unlawful interference, etc.)							
Aeronautical Information Services (AIS) Interface							
Meteorological information							

a) successively determine the different operational applications from the functional level or lowest interface to the upper interface;

b) define the current and future operational applications needs; and

c) determine the short-term and future operational requirements.

Agenda Item 3: Contingency plans

3.1 For the discussion of this Agenda Item, the Meeting kept in mind that Annex 11 establishes standards that became effective on 27 November 2003, according to which the States/Territories/International Organisations need to draft and publish ATS contingency plans to ensure air navigation safety in case of a potential partial or total interruption of air traffic services (ATS) and/or related support services for international civil aircraft operations. Also, the Meeting kept in mind that Attachment D to Annex 11 contains ATS contingency planning material, including information on responsibilities, preparatory activities, coordination, drafting, publication, implementation, etc., aimed at ensuring the non-degrading of services during such interruptions.

3.2 Likewise, Doc 4444, PANS-ATM, Chapter 15, provides the procedures that must be applied by ATC units in their respective jurisdiction for contingencies such as failures in communication, air-ground communication and ground radio, blocked frequencies, unauthorised use of ATC frequencies, failure of ATS surveillance equipment; emergency separation; use of automated alerts (STCA, MSAW, GPWS) ACAS; and other special procedures for flight contingencies. For this reason, every ATS contingency plan should be in accordance with both documents..

3.3 The Fourth Meeting of the ATM Committee of the GREPECAS ATM/CNS Subgroup took note of the applicable provisions of Annex 11 and Doc 4444 concerning ATS contingency plans, and recalled that, at recent meetings of the ATM Authorities and Planners, and at bilateral meetings and other events, several States had exchanged their draft contingency plans with a view to harmonising them for their implementation in the CAR/SAM Regions.

3.4 In view of the above, the Meeting felt that such exchange would be the best course of action and that those States, Territories and International Organisations that had problems coordinating their contingency plans should carry out bilateral or multilateral meetings with the assistance of ICAO in order to duly update and harmonize their plans with the adjacent FIRs.

3.5 Subsequently, GREPECAS/13, through Conclusion 13/68 *–ATM Contingency Plans for the CAR/SAM Regions*, in addition to reaffirming the need for States to harmonize their contingency plans with adjacent States, urged them to use the guidelines approved by said Group.

3.6 The Meeting took note that the Air Navigation Commission, in addition to congratulating GREPECAS/13 for developing the contingency plans, and considering that Conclusion 13/68 was consistent with Strategic Objective E: *Continuity – Maintain the continuity of aeronautical operations*, requested the ICAO Secretary General to ask GREPECAS to develop a regional catalogue of contingency plans to support said Strategic Objective.

3.7 During the discussions held, participants kept in mind that some States in the CAR/SAM Regions already have their respective ATS contingency plans standardized, as indicated in Attachment D to Annex 11, and that others are under preparation, thus not precluding the development of a Regional Catalogue to be presented to the GREPECAS/14 Meeting.

3.8 In view of the above, the Meeting revised and approved the Regional Catalogue model shown in **Appendix A** to this part of the report, and agreed on the following draft conclusion:

DRAFT CONCLUSION ATM/5/11 **CATALOGUE OF CAR/SAM ATS CONTINGENCY PLANS**

That:

a) the Catalogue of CAR/SAM ATS contingency plans, shown in **Appendix A** to this part of the Report, is adopted; and

b) CAR/SAM States/Territories/International Organization send the updated information to ICAO, before 1 June 2007, for its inclusion in said document.

APÉNDICE / APPENDIX A

Catálogo de los Planes de contingencia de los Estados, Territorios y Organizaciones Internacionales CAR/SAM
Catalogue of Contingency Plans of the CAR/SAM States, Territories and International Organisations

Estado State	Estado adyacente Adjacent Sate	Situación Status		Punto de Contacto Contact Point	Descripción general de facilidades y servicios que garantizan la continuidad General description of facilities and services available which ensure continuity	Observaciones Remarks
		Borrador Draft	Final			
1	2	3	4	5	6	7
Argentina	Bolivia					
	Brazil					
	Chile					
	Paraguay					
	Uruguay					
Bolivia	Argentina					
	Brazil					
	Chile					
	Paraguay					
	Perú					
Brazil	Argentina					
	Bolivia					
	Paraguay					
	Perú					
	Colombia					
	Guyana					
	Guyana Francesa French Guiana					
	Suriname					

Estado State	Estado adyacente Adjacent Sate	Situación Status		Punto de Contacto Contact Point	Descripción general de facilidades y servicios que garantizan la continuidad General description of facilities and services available which ensure continuity	Observaciones Remarks
		Borrador Draft	Final			
1	2	3	4	5	6	7
	Uruguay					
	Venezuela					
Chile	Argentina					
	Bolivia					
	Perú					
Colombia	Curazao					
	Brazil					
	Ecuador					
	Jamaica					
	Panamá					
	Perú					
	Venezuela					
	COCESNA					
Cuba	Estados Unidos United States					
	Haiti					
	Jamaica					
	México					
	COCESNA					
Curazao	Colombia					
	Estados Unidos United States					
	Jamaica					

Estado State	**Estado adyacente Adjacent Sate**	**Situación Status Borrador Draft**	**Final**	**Punto de Contacto Contact Point**	**Descripción general de facilidades y servicios que garantizan la continuidad General description of facilities and services available which ensure continuity**	**Observaciones Remarks**
1	**2**	**3**	**4**	**5**	**6**	**7**
	Haiti					
	Rep. Dominicana					
	Venezuela					
Ecuador	Colombia					
	Perú					
	COCESNA					
Estados Unidos United States	La Habana					
	México					
	Haití					
	Rep. Dominicana					
	Trinidad & Tobago					
	Curazao					
	Venezuela					
Guyana	Brazil					
	Suriname					
	Trinidad & Tobago					
	Venezuela					
Guyana Francesa French Guiana	Brazil					
	Suriname					
	Trinidad & Tobago					
	Senegal (AFI)					

Estado State	**Estado adyacente Adjacent Sate**	**Situación Status**		**Punto de Contacto Contact Point**	**Descripción general de facilidades y servicios que garantizan la continuidad General description of facilities and services available which ensure continuity**	**Observaciones Remarks**
		Borrador Draft	**Final**			
1	**2**	**3**	**4**	**5**	**6**	**7**
Haití	Cuba					
	Estados Unidos United States					
	Jamaica					
	Curazao					
	Rep. Dominicana					
Jamaica	Curazao					
	Colombia					
	Panamá					
	Haití					
	COCESNA					
México	Cuba					
	Estados Unidos United States					
	COCESNA					
Panamá	Colombia					
	COCESNA					
	Jamaica					
Paraguay	Argentina					
	Bolivia					
	Brazil					
Perú	Bolivia					
	Brazil					

Estado **State**	**Estado adyacente** **Adjacent Sate**	**Situación** **Status**		**Punto de Contacto** **Contact Point**	**Descripción general de facilidades y servicios que garantizan la continuidad** **General description of facilities and services available which ensure continuity**	**Observaciones** **Remarks**
		Borrador **Draft**	**Final**			
1	**2**	**3**	**4**	**5**	**6**	**7**
	Chile					
	Colombia					
	Ecuador					
República Dominicana	Curazao					
	Haití					
	Estados Unidos United States					
Suriname	Brazil					
	Guyana					
	Guyana Francesa French Guiana					
	PIARCO					
Trinidad & Tobago	Estados Unidos United States					
	Guyana					
	Guyana Francesa French Guiana					
	Venezuela					
	Suriname					
	Curazao					
Uruguay	Argentina					
	Brazil					
Venezuela	Curazao					
	Brazil					
	Colombia					

Estado State	**Estado adyacente Adjacent Sate**	**Situación Status**		**Punto de Contacto Contact Point**	**Descripción general de facilidades y servicios que garantizan la continuidad General description of facilities and services available which ensure continuity**	**Observaciones Remarks**
		Borrador Draft	**Final**			
1	**2**	**3**	**4**	**5**	**6**	**7**
	Estados Unidos United States					
	Guyana					
	Trinidad & Tobago					
COCESNA	Colombia					
	Cuba					
	Ecuador					
	Jamaica					
	México					
	Panamá					

Nota/Note:

Columna 1: Indicar Estado, Territorio u Organismo Internacional / Indicate State, Territory or International Organization

Columna 2: Indicar Estado, Territorio u Organismo Internacional con quien debe coordinarse el Plan de Contingencia del Estado citado en la Columna 1/ Indicate State, Territory or International Organization with whom the contingency plan of the State mentioned in column 1 should be coordinated

Columna 3: Marcar con **X** en el caso que el Plan de contingencia se encuentre en proceso para su armonización con el Estado en cuestión / Mark with an X in case the contingency plan is in process for its harmonization with the referred State.

Columna 4: Marcar con **X** en el caso que el Plan de contingencia se encuentre armonizado con el Estado en cuestión / Mark with an X in case the contingency plan is in process for its harmonization with the referred State.

Columna 5: Indicar Cargo del Punto de Contacto y medio de comunicación a utilizar en caso de ser necesario / Indicate position of the point of contact and communications means to be used, if necessary.

Columna 6: Indicar cuáles son, en general, las facilidades y los servicios disponibles mientras el Plan de Contingencia se encuentra activado / Indicate which are, in general, the facilities, available services while the contingency plan is activated.

Columna 7: Comentarios adicionales, si los hubiera / Additional comments, if any

Agenda Item 4: Review of Deficiencies and outstanding GREPECAS Conclusions/Decisions in the ATM and SAR fields (Task ATM-GRAL/100)

Review of deficiencies in the ATM and SAR fields

4.1 Based on the standardized methodology for the identification, evaluation and reporting of air navigation deficiencies formulated by the ICAO Council and by GREPECAS, the Meeting took note of the updated information regarding deficiencies with priority "A","B" and "U" in the ATM and SAR areas of CAR/SAM States, Territories and International Organizations, as well as action plans for their correction.

4.2 The Meeting took note that not all States have reported their Action Plans to solve ATM and SAR deficiencies to Regional Offices. It was recognized that advantage has not been taken of the GREPECAS air navigation deficiencies database (GANDD) available electronically on the websites of the NACC and SAM Offices; therefore States should make the greatest efforts to update the information of this database. The Secretariat recalled the procedures established to maximize the utilization of the GANDD and invited States to contact the focal points of the NACC Office, Mr. Gabriel Meneses (gmeneses@mexico.icao.int) and of the SAM Office, Sr. Arturo Martínez (am@lima.icao.int), in order to provide the assistance required, as necessary.

4.3 Likewise, the Meeting recalled Conclusion 13/92 in which GREPECAS urged CAR/SAM States, Territories and International Organizations to make their greatest effort to eliminate urgent deficiencies by December 2007, since GREPECAS/15 will review the status of deficiencies with the intent to consider the application of last resort action, after exhausting all alternatives, wherever applicable.

Review of outstanding Conclusions/Decisions of previous GREPECAS Meetings

4.4 In accordance with the GREPECAS Procedural Handbook, the Meeting reviewed the Conclusions and Decisions in order to update them and to eliminate any completed or superseded ones based on the progress achieved.

4.5 The result of the analysis of Conclusions/Decisions in the ATM and SAR fields is detailed in **Appendix A** to this part of the Report.

APPENDIX A

ANALYSIS OF THE OUTSTANDING GREPECAS CONCLUSIONS/DECISIONS IN THE ATM/SAR FIELD

GREPECAS/12

CONCLUSION 12/9 IMPLEMENTATION OF SIDs AND STARs

Responsibility for follow-up: States/International Organizations
Target date for implementation: GREPECAS/14
Status: **Valid**

SID and STARs required for connection with RNAV routes have been implemented in several airports. There are difficulties in both regions, in view of the few availability of experts in this type of procedures. RNAV/GNSS course and basic courses with regional institutions have been coordinated.

CONCLUSION 12/10 USE OF REPORTING POINT AND ATS ROUTE DESIGNATORS

Responsibility for follow-up: States/International Organizations and RO's
Target date for implementation: GREPECAS/14
Status: **Valid**

In view of the RNAV routes implementation process continues, it is pertinent to maintain the conclusion until it ends.

CONCLUSION 12/31 REGIONAL STRATEGY FOR THE INTEGRATION OF ATM AUTOMATED SYSTEMS

Responsibility for follow-up: States/International Organizations
Target date for implementation: GREPECAS/13
Status: **Valid**

So far some action plans from States/International Organizations have been received at the regional offices for the integration of ATM automation.

CONCLUSION 12/32 ADS-B IMPLEMENTATION IN THE CAR/SAM REGIONS

Responsibility for follow-up: States/International Organizations
Target date for implementation: GREPECAS/14
Status: **Valid**

GREPECAS/13

CONCLUSION 13/56 RNAV/RNP ACTION PLAN MODEL FOR EN-ROUTE AND TERMINAL AREA OPERATIONS

Responsibility for follow-up: States/States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

RNAV/RNP action plan models for en-route and terminal area operations were incorporated with some amendments to the ATM Committee work plan.

CONCLUSION 13/57 RNAV/RNP QUESTIONNAIRE

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

As a follow-up of Conclusion GREPECAS 13/57 RNAV/RNP, a questionnaire was sent to all States and International Organizations on 23 January 2006. Answers obtained were used in the development of PBN roadmap.

CONCLUSION 13/58 MONITORING OF RVSM OPERATIONS

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

As a follow-up of Conclusion GREPECAS 13/58, a letter was sent to States and International Organizations on 24 January 2006 so that they take appropriate measures to comply with this conclusion (Ref SAM LT 11/3.19.18-SA044).

CONCLUSION 13/59 ESTABLISHMENT OF STATE DATA BANKS (SDB)

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

As a follow-up of Conclusion GREPECAS 13/59, a letter was sent to States and International Organizations on 24 January 2006 in order to take appropriate measures to comply with this conclusion (Ref. SAM LT11/3.1.18-SA044).

CONCLUSION 13/60 MINIMUM MONITORING REQUIREMENTS

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

As a follow-up of Conclusion GREPECAS 13/60, a letter was sent to States and International Organizations on 24 January 2006 in order to take appropriate measures to comply with this conclusion (Ref. SAM LT11/3.1.18-SA044).

CONCLUSION 13/61 MEASURES TO REDUCE OPERATIONAL ERRORS IN THE ATC COORDINATION LOOP BETWEEN ADJACENT ACCs

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Valid**

Some States/Territories and International Organizations have taken actions. ATM/CNS/SG/5 [ATM/COMM/5]-WP/03 is presenting additional actions.

CONCLUSION 13/62 ADOPTION AND UTILIZATION OF THE FORM FOR REPORTING LARGE HEIGHT DEVIATIONS (LHD)

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

The form was adopted by States/Territories and International Organizations and reports are regularly received at CARSAMMA.

CONCLUSION 13/63 PROPOSAL FOR AMENDMENT TO THE DOC 4444 – PANS/ATM FOR AERONAUTICAL PHRASEOLOGY IN SPANISH

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

ICAO HQ has taken action on this conclusion.

DECISION 13/64 CENTRALIZED ATFM OBJECTIVES, PRINCIPLES AND FUNCTIONS AND REQUIREMENTS FOR ITS IMPLEMENTATION

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

This decision has been complied and the objectives, principles and functions of the Centralised ATFM and requirements for its implementation were incorporated into the CONOPS ATFM for CAR/SAM Regions.

DECISION 13/65 MODEL ACTION PLAN FOR ATFM IMPLEMENTATION IN THE CAR/SAM REGIONS

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

This decision was complied and the model action plan for ATFM implementation was incorporated in the ATM Committee work programme as models for implementation groups.

CONCLUSION 13/66 NATIONAL PLANS FOR ATFM IMPLEMENTATION IN THE CAR/SAM REGIONS

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Valid**

CAR and SAM States are developing their national plans. Notwithstanding this, this conclusion may be considered as valid.

CONCLUSION 13/67 ATFM EVENTS

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

ATFM seminars were carried out, one in the CAR Region and the other one in the SAM Region.

CONCLUSION 13/68 ATM CONTINGENCY PLANS FOR THE CAR/SAM REGIONS

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Valid**

Several CAR/SAM States have prepared their contingency plans harmonized with adjacent States. Also, as a follow-up and general information tool, the development of a catalogue showing the highlighting aspects of these plans as well as points of contact, is being proposed.

DECISION 13/69 EFFICIENCY IN THE USE OF FUEL

Responsibility for follow-up: States/Territories and International Organizations
Target date for implementation: GREPECAS/14
Status: **Completed**

The ATM/CNS Subgroup and the corresponding Committees have taken into account this decision in their regional planning.

CONCLUSION 13/93 FOLLOW UP OF ATM DEFICIENCIES

Responsibility for follow-up: States/International Organizations
Target date for implementation: GREPECAS/14
Status: **Valid**

Pending of execution. Coordination is required between international organizations responsible for the follow-up.

Agenda Item 5: Draft amendment to the CAR/SAM Regional Plan for the Implementation of CNS/ATM Systems

Global Air Navigation Plan for CNS/ATM Systems

5.1 As the evolution of the CNS/ATM systems continue, it is clear that the planning of a system of such characteristics goes beyond the CNS and ATM systems. The second amendment of the Global Air Navigation Plan for CNS/ATM Systems (Doc 9750) integrates all elements of the air navigation infrastructure, therefore, it will be renamed "Global Air Navigation Plan" eliminating the reference to the CNS/ATM systems, which would also allow to maintain a logical alignment with the regional air navigation plans. Furthermore, the homogeneous ATM areas and major traffic flows/routing areas remain valid and will continue to be used as the basis for implementation planning.

5.2 The Air Navigation Commission reviewed on January 17 2006, a second proposal of amendment to the Air Navigation Global Plan for the CNS/ATM systems (Doc 9750) (Global Plan) and agreed to send Chapters 1, 2 and 3 to the States and the concerned international organizations to obtain their comments. The three chapters of the amended Global Plan contain a roadmap and guidelines for a continued evolution toward a global ATM system, as well as changes in the planning process that such evolution entails; also the compilation of 23 "initiatives" extracted from the industry roadmaps. The technical chapters dealing with the aeronautical information services (AIS), air traffic management (ATM), communications, navigation and surveillance (CNS) and meteorology (MET) were integrated in Chapter 1 of the amended Global Plan.

5.3 The Global Plan Initiatives (GPI) are a logical progression of the evolutionary work already accomplished by the Planning and Implementation Regional Groups (PIRGs) and will integrate into the present planning framework. Global Plan Initiatives are designed to contribute to achieving the regional performance objectives and support the regional implementation programmes, which should be developed based on well identified performance objectives.

5.4 The Global Plan will be supported by planning tools (e.g. software applications, planning documentation, web-based reporting forms and project management tools). As States/Territories/International Organizations consider implementation of initiatives, they may use the common programme templates contained in the planning tool as the basis for establishing performance objectives and implementation time lines, as well as to develop a comprehensive schedule and programme of planning activities to accomplish the work associated with the GPIs.

5.5 Planning in accordance with the revised Global Plan will facilitate a deliberate and coordinated approach for the implementation of air navigation infrastructure and will encourage complete transparency. It will also ensure effective interaction between ICAO Headquarters and Regional Offices, resulting in harmonization and alignment of regional programmes and implementation activities. In addition, milestones and time lines associated with implementation of the initiatives will serve ICAO in its business planning activities.

5.6 The Global Plan is therefore being gradually transformed into the baseline for measurable achievements and implementation of a global ATM system as the evolution continues from a systems-based to a performance-based approach to planning and implementation of air navigation infrastructure.

5.7 The Meeting recalled that AP/ATM/12, after analysing the agreements reached at the NAM/CAR ATM Meeting, and based on work projects already started in the SAM Region, formulated *Conclusion AP/ATM/12/02 Implementation of Work Programmes to Support Strategic Performance,* in which seven projects for the CAR/SAM Regions were established, with a view to supporting the transition from a system-based to a performance-based approach. In Chapter 4 of the Transition Plan towards the ATM system 4, included in the Appendix to this Report, the ATM performance objectives are included, which will serve as the basis to develop the work projects and to update the Terms of Reference and Work Programme of the ATM Committee. These ATM performance objectives are the following:

a) Optimisation of the ATS route structure

b) Improve demand and capacity balancing

c) Alignment of the upper airspace classification (CAR Region)

d) Implementation of RNP approaches

e) Improving ATS inter-facility data communication

f) Improving situational awareness

g) Implementing the flexible use of airspace

5.8 The "*Plan for the Transition to the ATM System in the CAR/SAM Regions*" presented to the Meeting was developed taking into account the Global Air Navigation Plan. Its objective is to apply the Global Plan Initiatives (GPIs) in order to begin the transition towards the ATM Operational Concept, and totally update the CAR/SAM Regional Plan for Implementation of ATM/CNS Systems.

5.9 Furthermore, this Plan seeks to establish an implementation strategy aimed at deriving short- and medium-term benefits for the ATM community based on ATM-related infrastructure and available and foreseen aircraft capabilities. The document will also describe in detail the air navigation infrastructure (CNS, AIS, MET, AGA/AOP) and the institutional aspects involved, which are necessary to accompany this evolution.

5.10 Chapter 2, related with traffic forecasting in the CAR/SAM Regions, will be completed taking into account the result of the meetings of the CAR/SAM Traffic Forecasting Group and with information obtained from States, Territories and International Organizations. The specific chapters related to the aforementioned navigation infrastructure and institutional aspects should be developed by the AGA/AOP, AIS, HRT and MET Subgroups, by the CNS Committee and by the Institutional Aspects Task Force, taking into account the operational requirements established in Chapter 4 as well as the guidance of the GPIs involved and the introductory text to each of the specific chapters based on the ATM operational requirements as per the following table:

Chapter 2 – Air Traffic in the CAR/SAM Regions	Traffic Forecasting Group
Chapter 5 – Communication	CNS Committee
Chapter 6 – Navigation	CNS Committee
Chapter 7 - Surveillance	CNS Committee
Chapter 8 – Meteorology	MET Subgroup
Chapter 9 – AIS	AIS/MAP Subgroup
Chapter 10 – Aerodromes and Ground Aids/Aerodrome Operational Planning	AGA/AOP Subgroup
Chapter 11 – Training of human resources	HRT Subgroup
Chapter 12 – Institutional aspects	Institutional Aspects Task Force

5.11 In view of the above, the Meeting analysed the *Plan for the Transition to the ATM System in the CAR/SAM Regions*, proposing some changes considered necessary, and approved Chapters 1, 3 and 4, which correspond to the ATM Committee. Likewise, the Meeting considered the delivery of this document through the GREPECAS ACG express mechanism to AGA/AOP, AIS, HRT and MET Subgroups, the CNS Committee and the Institutional Aspects Task Force, for the drafting of the remaining chapters.

5.12 The Meeting considered that the performance objectives currently being reviewed by ICAO Headquarters should be incorporated once ICAO issues the new Document on the ATM performance requirements currently being developed by the ATMRPP; and also considered that this should be a living and dynamic document in order to reflect changes generated at the global level as well as at the regional level.

5.13 Consequently, the Meeting concluded in the following:

DRAFT
DECISION ATM/5/12 **APPROVAL OF THE PLAN FOR THE TRANSITION TO THE ATM SYSTEM IN THE CAR/SAM REGIONS**

That *"Plan for the Transition to the ATM System in the CAR/SAM Regions"*, Chapters 1, 3 and 4 shown in **Appendix A** to this part of the Report, be approved; through the GREPECAS Administration and Coordination Group (ACG) fast track mechanism.

DECISION ATM 5/13 **DEVELOPMENT OF CHAPTERS 2 and 5 TO 12 OF THE PLAN FOR THE TRANSITION TO THE ATM SYSTEM IN THE CAR/SAM REGIONS**

That, in order to present it to GREPECAS and once Draft Decision ATM/5/13 is approved, the ATM/CNS Subgroup Secretariat is requested to submit to the consideration of the CNS Committee, the AGA/AOP, AIS, HRT and MET Subgroups, and to the Institutional Aspects and Air Traffic Forecasts Task Forces, the "*Plan for the Transition to the ATM System in the CAR/SAM Regions*" to develop the chapters corresponding to their areas of the mentioned document.

APPENDIX A

INTERNATIONAL CIVIL AVIATION ORGANIZATION

PLAN FOR THE TRANSITION TO THE ATM SYSTEM IN THE CAR/SAM REGIONS

Version 1.1

November 2006

TABLE OF CONTENTS

Chapter 1: Introduction

1.1 Objective

1.1.1 The Plan for the Transition to the ATM System in the CAR/SAM Regions has been developed taking into account the Global Air Navigation Plan. Its objective is to apply the Global Plan Initiatives (GPIs) in order to start the transition to the ATM System.

1.1.2 This Plan also aims to establish an implementation strategy that will yield benefits for the ATM community in the short and long term, based on the ATM-related infrastructure and existing and foreseeable aircraft capabilities. The document contains the air navigation infrastructure (CNS, AIS, MET, AGA/AOP) and considers the institutional aspects needed for that evolution.

1.2 Scope

1.2.1 This transition plan extends to the boundaries of the CAR/SAM Regions and in the short and medium term, respectively, will last up to 2010 and from 2011 to 2015, as indicated in the guidelines of the Global Air Navigation Plan. As they are gradually developed and approved, the long-term initiatives required for the evolution to a global ATM system, as shown in the global ATM operational concept, will be added to this Plan.

1.3 Background

1.3.1 It was recognised, after the progress made in the implementation of the CNS/ATM System by States and Regional Planning and Implementation Groups within the framework of the Global Navigation Plan for CNS/ATM Systems (Doc. 9750), that technology does not constitute an end in itself and that a complete, integrated global ATM system concept was needed, based on clearly-established operational requirements. This concept, in turn, was to constitute the grounding for the coordinated implementation of CNS/ATM technologies, also based on clearly-established requirements. The ICAO Air Navigation Commission set up the Air Traffic Management operational concept Panel (ATMCP) to develop the concept.

1.3.2 The global ATM operational concept developed by the above-cited panel was approved by the Eleventh Air Navigation Conference published as Doc. 9854 AN/458 through recommendation 1/1, which stipulates the following:

a) ICAO, the States and the planning and regional implementation groups (PIRGs) should consider the concept as the common global framework to guide ATM system implementation and concentrate ATM development efforts;

b) The global ATM concept should be used as high-level guidance for the development of ICAO CNS/ATM provisions;

c) States, with the support of other members of the ATM community, should undertake the task of validating the seven components of the global ATM operational concept;

d) ICAO, the States and the PIRGs should develop transition strategies for ATM systems implementation based on the global ATM operational concept; and

e) ICAO should align its technical programme to facilitate future efforts regarding the ATM operational concept.

1.3.3 The sixth consultation meeting between the Air Navigation Commission and the industry took place in Montreal after the AN-Conf/11, on the topic of "Promoting the implementation of the recommendations of the 11th Air Navigation Conference". Among the issues addressed, "The global ATM – from concept to reality" produced the following conclusion:

"That all partners that are in a position to do so, work together to prepare a common road map or a global action plan, in order to generate operational benefits in the short and medium term, and that the said document be made available to ICAO in mid October 2004 for presentation to the Air Navigation Commission and so that its inclusion in the Global Plan may be considered."

1.3.4 The industry road map included CNS/ATM implementation activities for the short and medium term, while the long-term objectives are considered in the operational concept. As a result, the Commission declared that the road map was perfectly in line with the operational concept and that continued positive results would ensure its convergence with the ATM system envisaged in the operational concept and the formation of a complete planning structure, together with the Global Plan and that concept.

1.3.5 ICAO started developing the new Global Air Navigation Plan to adjust global planning to the conclusions of the Eleventh Air Navigation Conference, particularly insofar as the Global ATM Operational Concept and the Industry Road Map were concerned. The Global Air Navigation Plan not only includes the global ATM operational concept, but focuses on a series of "Global Plan Initiatives (GPIs)" that offer the necessary conditions for the implementations aimed at benefiting the ATM community in the short and medium term.

1.4 Deficiencies of the current System in the CAR/SAM Regions

1.4.1 Air Traffic Management (ATM)

1.4.1.1 The ATM currently available in the CAR/SAM Regions suffers from some inconveniences, including the following:

a) The lack of a harmonized airspace operations concept with broad use of performance-based navigation through an RNAV and/or RNP navigation specification for en-route and TMA flights, hinders airspace design and management, by not permitting the implementation of an optimum airspace structure.

b) Failure to use the navigation capability of currently available aircraft creates an unfavourable cost-benefit ratio for aircraft operators.

c) Lack of systemic use cost-benefit analyses for the implementation of new airspace structures creates problems for the establishment of air navigation infrastructure implementation priorities and impedes the measurement of the benefits obtained by the ATM community.

d) Lack of a policy and procedures for flexible airspace use makes airspace design and management difficult by not allowing for the application of an optimum airspace structure and use of optimum flight trajectories.

e) Lack of air traffic flow management services in most airspaces in the CAR/SAM Regions causes congestion in some airspaces and airports and does not permit to maximise the use of ATC and airport capacities, to the detriment of their users.

f) Lack of coordination in the provision of current CNS/ATM services can occasionally result in a duplication of resources and services.

g) Inadequate quality of means of communication and language problems create problems in the provision of Air Traffic Services.

h) The lack of ATS surveillance in some parts of the airspace of the Regions does not permit a harmonised reduction of aircraft separation due to application of different separation criteria in FIR boundaries , and limiting the use of optimum flight profiles.

i) Lack of interfacing of ATM automation systems in the CAR/SAM Regions and the little sharing of ATS surveillance data create discontinuity in ATS services.

1.5 **Evolution and Transition**

1.5.1 In considering the overall system concept, the questions of evolution and transition are most important. It will be necessary to ensure inter- and intra-regional CNS/ATM system harmonisation in order to optimise investments in airborne systems and ensure that aircraft are not unnecessarily required to carry a multiplicity of equipment and operators are not obliged to request multiple operational approvals. Furthermore, there is a need to ensure that differences in the pace of development around the world do not lead to incompatibility between elements of the ATM operational concept among the ICAO Regions. Particularly because of the wide scope of these components, , the above considerations call for judicious coordination of regional and worldwide planning and implementation if such systems are to be optimised.

Chapter 2: Air Traffic in the CAR/SAM Regions

2.1 Traffic Forecasts in the CAR/SAM Regions

TBD

Chapter 3: Planning Considerations

3.1 Introduction

3.1.1 As traffic volumes grow worldwide, the demands made on air navigation service providers in a given airspace increase, as do the complexities of air traffic management. With the increase in traffic density, the number of flights unable to follow optimum flight trajectories rises.

3.1.2 Implementation of the components of the ATM operational concept is expected to provide sufficient capacity to meet the growing demand, while generating additional benefits in the way of more efficient flight profiles and increased levels of safety. The potential of new technologies to significantly reduce service costs, however, calls for the establishment of clearly-defined operational requirements.

3.1.3 Considering the benefits to be derived from the ATM operational concept, many timely decisions are required for its implementation. There will be a need for unprecedented global and regional cooperation.

3.1.4 The regional planning process is the principal factor of the planning and implementation work of ICAO. It is here that the top-down approach, comprising global guidance and regional harmonisation measures converges with the bottom-up approach constituted by States/Territories/International Organizations and aircraft operators and their proposals for implementation options.

3.1.5 In its most elementary way, the output from the regional planning process is a listing of air navigation facilities, together with their achievable time frames. This data is essential for implementation of the Global Plan Initiatives that will guide the gradual transition to the ATM operational concept. These lists will be incorporated into the CAR/SAM Regional Air Navigation Plan (ANP) and kept up to date by the CAR/SAM Regional Planning and Implementation Group (GREPECAS), with the assistance of ICAO Regional Offices.

3.1.6 This Plan calls for the gradual, coordinated, timely and cost-effective global implementation of the ATM operational concept components, bearing in mind the Global Plan Initiatives (GPIs) that could be implemented in the short and medium term. The Plan fulfils two important functions in this connection:

a) It offers regional planning institutions, States/Territories, service providers and users guidelines for the transition to the ATM operational concept.

b) It operates as a measuring stick to gauge progress.

3.1.7 Planning the implementation of ATM operational concept components, as well as the elaboration of orientation guidelines to ensure a harmonious and integrated implementation, should be basically a regional responsibility, while the implementation is the responsibility of the States/Territories or groups of States/Territories and International Organisations, working together within the framework of the concept and implementation strategy developed by GREPECAS for the two Regions. However, it is imperative for each State in the CAR and SAM Regions to develop and publish its own plan for the transition to the ATM operational concept.

3.1.8 Regional planning should take into consideration the features intrinsic to the components of the ATM operational concept, the scope of whose facilities may transcend national boundaries, making it necessary to implement multinational facilities to avoid duplicating resources and services. In establishing multinational facilities, the institutional aspects involved, which generically encompass all technical, operational, administrative, financial and legal matters, should be taken into account.

3.1.9 The establishment of Regional Multinational Organisations is to be expected, given the aspects cited in the previous paragraph and the need to develop a suitable structure for the planning and implementation of multinational facilities. These bodies, made up of groups of States, would guarantee that optimum use is made of the investments needed to implement and maintain air navigation services.

3.2 ATM **Homogeneous areas and main international traffic flows**

ATM Homogeneous area

3.2.1 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. Homogeneous ATM areas may extend over States, specific portions of States or groups of States. They may also extend over large oceanic and continental areas. They are considered areas of common interests and requirements.

3.2.2 According to the ATM operational concept, homogeneous ATM and/or routing areas should be reduced to a minimum and consideration should be given to merging adjacent areas.

Main traffic flows

3.2.3 A main traffic flow refers to the concentration of a significant volume of air traffic on the same or proximate flight paths. Main traffic flows may cross several homogeneous ATM areas with different characteristics.

3.2.4 Homogeneous ATM areas and main traffic flows are related primarily to en-route airspace. However, addressing capacity and efficiency improvements in the terminal control area (TMA) and at aerodromes and working on the basis of a set of common initiatives will serve as an important building block toward achieving a homogeneous ATM system. Therefore, several of the Global Plan Initiatives were developed specifically to improve aerodrome and TMA operations.

3.2.5 The most significant air traffic flows in the CAR/SAM Regions extend over both Regions and many of them reach the boundaries of the CAR/SAM Regions with the AFI, EUR, NAM, NAT and PAC Regions. **Appendix 1** to this chapter shows the Main Traffic Flows identified in Homogeneous Areas.

3.3 Planning methodology

3.3.1 After identifying the homogeneous ATM areas and main traffic flows, a task in which the CAR/SAM Regions have already progressed significantly, GREPECAS conducted a survey of the current and foreseen aircraft population and its capabilities, predicted traffic figures, and also the ATM infrastructure, including human resource availability and requirements, among other things. An analysis of the data collected made it possible to identify performance “gaps”. The Global Plan Initiatives were then evaluated against those gaps to identify those that would most appropriately provide the operational improvements necessary to meet performance objectives in the CAR/SAM Regions and will be described in further detail in the following chapters.

3.3.2 This planning process would continue with development of scenarios for the implementation of initiatives, a cost-benefit analysis of the various scenarios and preliminary development of infrastructure support requirements. Additional steps would include development of implementation plans and funding profiles, further review of human resource requirements to support the identified initiatives, followed by further cost-benefit analyses. Finally, national and regional implementation plans would be developed or amended based on the selected initiatives. This is an iterative process, which may require repetition of several steps until a final choice of initiatives is made. Once available, the planning tools will assist planners in carrying out the above steps. Figure 1 is an illustration of a planning flow chart.

3.3.3 The work for the CAR and SAM Regions should evolve based on the new project management techniques described and performance objectives clearly defined in support to strategic objectives of the Global Plan, aligned with ICAO strategic plan. The work programmes must be common for both regions, taking into consideration the progress, characteristics and needs of each CAR and SAM Region. The strategies agreed shall serve as CAR and SAM inter-regional work programmes; each Region will be able to adapt them to their own characteristics and needs for implementation.

3.3.4 All the activities indicated in the performance objectives will be designed through strategies, concepts, action plan models and roadmaps which could be shared to align the interregional work with the fundamental objective to achieve interoperability and seamlessness to the highest level.

3.3.5 In the activities planning, it should be ensured that the resources will be efficiently used avoiding in the planning activities, duplicated or unnecessary work, so that the work/activities could easily be adapted to each CAR and SAM Regions. The planning activities should encourage optimizing human resources, savings as well as dynamic use of electronic communication means between States such as the Internet, videoconferences, teleconferences, e-mail, telephone and facsimile.

3.3.6 The new work process and methods should ensure that the performance objectives could be measure with time lines and the regional work progress achieved be easily reported to the ICAO Council and to the Air Navigation Commission.

3.3.7 In the basis to this Transition Plan, States, Territories and International Organizations should develop their own implementation strategy or action plan that reflects work programme, date lines, individual parties responsible and status to monitor progress and to report advances of those activities. Additionally, they should consider detailed information on required activities to complete implementation, means to provide feedback on progress of work through annual report process, which will help administrations to prioritize activities and support needed, and also help to detect annual needs and assistance in each ICAO Region.

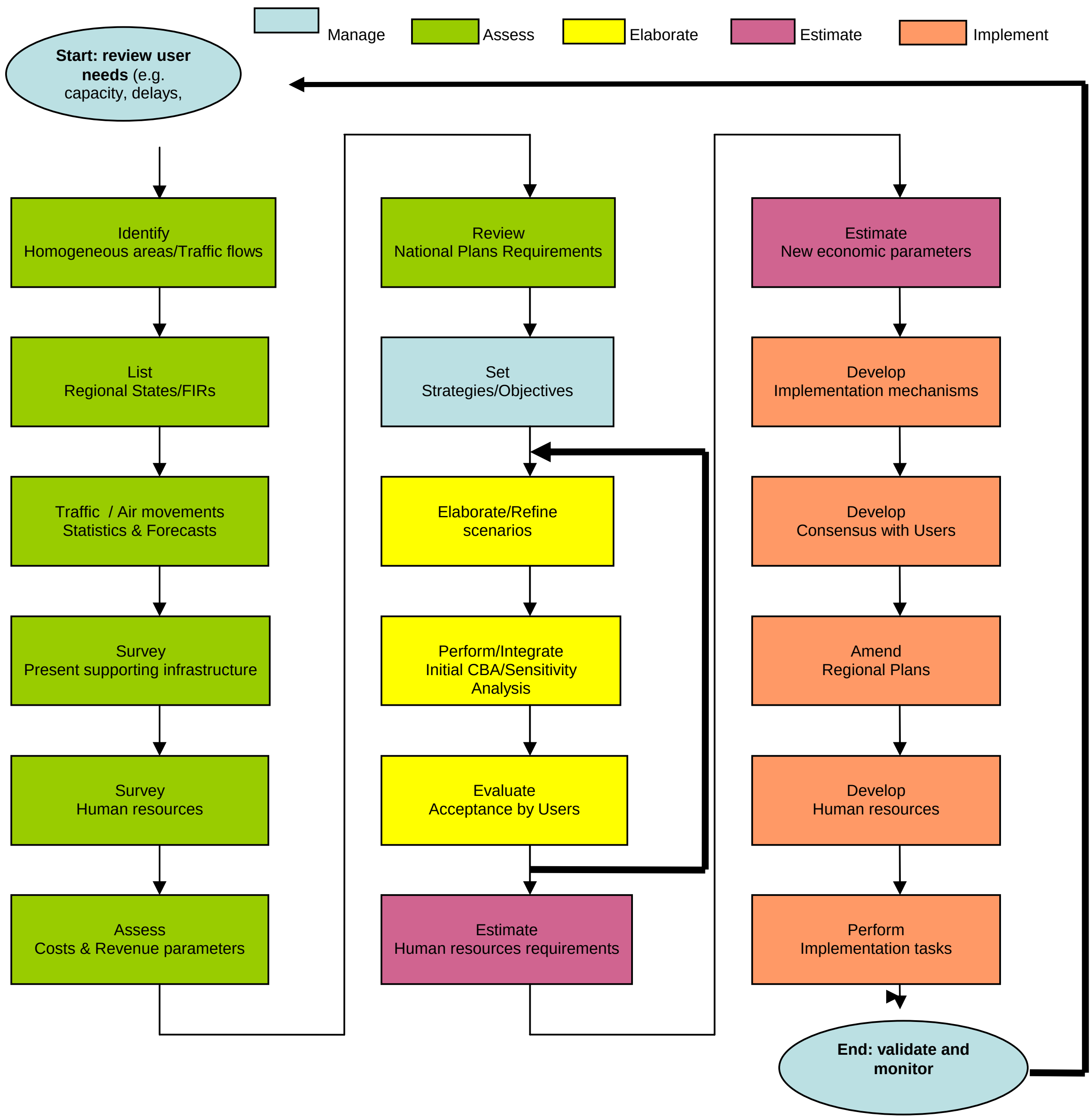


Figure 1. Planning Flow Chart

3.3.8 Development of work programmes is based on the experience and lessons learned in the previous cycle of the CNS/ATM implementation process. This Plan therefore, focuses efforts toward maintaining consistent regional harmonisation and improving implementation efficiencies by drawing on the existing infrastructure capabilities and regional implementations.

3.4 Planning tools

3.4.1 This Transition Plan will be supported by planning tools of the Global Plan which will provide various electronic formats (*e.g.*, software applications, planning documentation, web-based reporting forms, project management tools, etc.), with a view toward following up on and ensuring the coordination of performance objectives and implementation timelines, together with the resulting timetables and action plans. As States consider the implementation of initiatives, they will be able to use common templates of programmes as a basis to establish performance objectives and timelines for implementation, and also develop exhaustive schedules and planning activities to comply with the work programme associated with the global initiatives (GPIs).

3.5 Evolution

3.5.1 Achieving the global ATM system sought after will be accomplished through the implementation of many initiatives over several years on an evolutionary basis. These initiatives were established to support planning and implementation of performance objectives in the CAR/SAM Regions. The set of initiatives contained in this Transition Plan are meant to facilitate and harmonise the work already underway within the CAR/SAM Regions and to bring needed benefits to aircraft operators over the near and medium term. ICAO will continue to develop new initiatives on the basis of the operational concept that will be included in the Global Plan and, which will be included also in this Transition Plan.

3.5.2 The ATM System in the CAR/SAM Regions shall be based on the provision of integrated services. In order to describe how these services shall be provided, seven components of the ATM operational concept, jointly with key concept services are described in Doc 9854. The performance objectives were logically linked to the components of the ATM operational concept, in order to ensure that the work has as a goal to reach the ATM system described in the operational concept. Thus, the term Components of the ATM Operational Concept used in the current plan are referred to the seven components described in the ATM operational concept. These are: Airspace Organization and Management (AOM), Demand and Capacity Balancing (DCB), Aerodrome Operations (AO), Traffic Synchronization (TS), Conflict Management (CM), Airspace User Operations (AUO) and ATM Service Delivery Management (ATMSDM).

3.5.3 In all cases, initiatives must meet global objectives based on the operational concept. On this basis, planning and implementation activities begin with the application of available procedures, processes and capabilities. The evolution would progress to application of emerging procedures, processes and capabilities and ultimately, migrate to the ATM system based on the operational concept. Figure 2 depicts the Global Plan evolution.

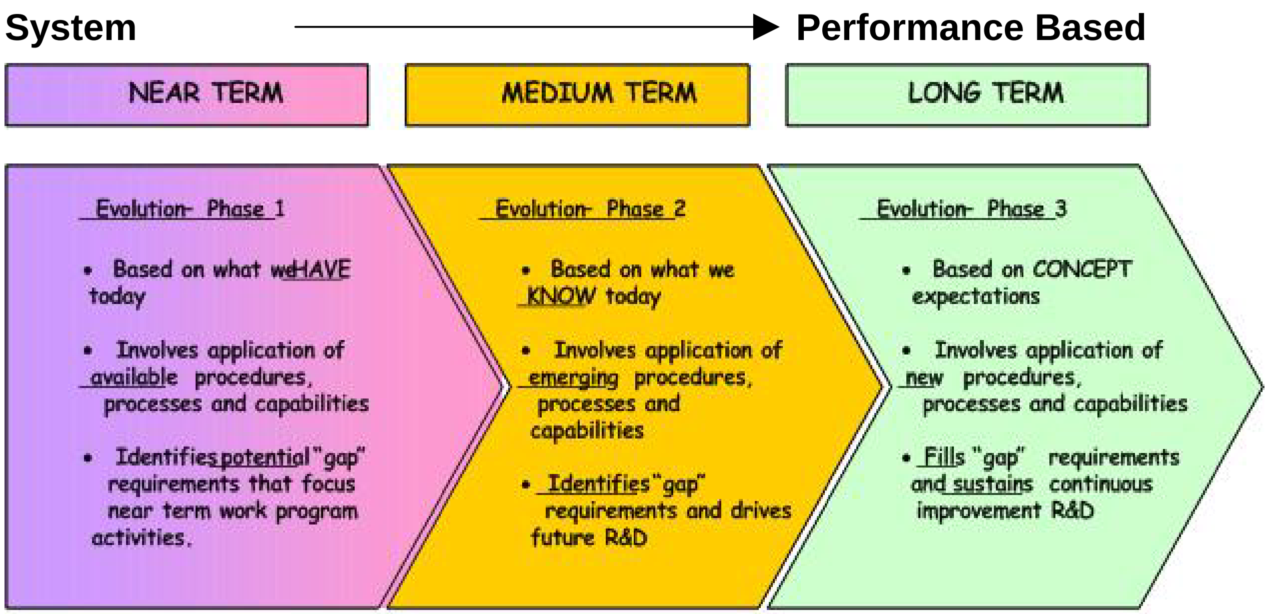


Figure 2. Global Plan Evolution

3.6 Global Plan Initiatives

3.6.1 Table 3-1 sets out the Global Plan Initiatives (GPIs) that can be considered by GREPECAS and by States, Territories and International Organisations. The initiatives in this Transition Plan will be inserted into each of the following chapters, broken down by ATM, CNS, AGA, MET, AIS, and other areas of operation. Planning and implementation of performance objectives should be started in the near term and progressed in an evolutionary manner. Long-term initiatives, necessary to guide the evolution of the global ATM system as envisioned in the operational concept, will be added to the Global Plan and, therefore, to this Transition Plan, as they are developed and agreed to.

Note: The Global Plan contains the objective and relevant implementation strategy for each initiative.

3.7 Integration of initiatives

3.7.1 The GPIs are provided to facilitate the planning process and should not be viewed as stand-alone tasks, but rather, in many cases, as interrelated. Therefore, initiatives are quite capable of integrating with and supporting each other. In fact, integration is a sought after goal of a global ATM system.

GPI		En-route	Terminal area	Aerodrome	Supporting infrastructure	Related Operational Concept Components
GPI-1	Flexible use of airspace	X	X			AOM, AUO
GPI-2	Reduced vertical separation minima	X				AOM, CM
GPI-3	Harmonise level	X				AOM, CM,

GPI		En-route	Terminal area	Aerodrome	Supporting infrastructure	Related Operational Concept Components
	systems					AUO
GPI-4	Uniform upper airspace classifications	X				AOM, CM, AUO
GPI-5	RNAV and RNP (Performance based navigation)	X	X	X		AOM, AO, TS, CM, AUO
GPI-6	Air traffic flow management	X	X	X		AOM, AO, DCB, TS, CM, AUO
GPI-7	Dynamic and flexible ATS route management	X	X			AOM, AUO
GPI-8	Collaborative airspace design and management	X	X			AOM, AUO
GPI-9	Situational awareness	X	X	X	X	AO, TS, CM, AUO
GPI-10	Terminal area design and management		X			AOM, AO, TS, CM, AUO
GPI-11	SIDs and STARs with RNP and RNAV		X			AOM, AO, TS, CM, AUO
GPI-12	Functional integration of ground systems with airborne systems		X		X	AOM, AO, TS, CM, AUO
GPI-13	Aerodrome design and management			X		AO, CM, AUO
GPI-14	Runway operations			X		AO, TS, CM, AUO
GPI-15	Match IMC and VMC operating capacity		X	X	X	AO, CM, AUO
GPI-16	Decision support systems	X	X	X	X	DCB, TS, CM, AUO

GPI		En-route	Terminal area	Aerodrome	Supporting infrastructure	Related Operational Concept Components
GPI-17	Implementation of data link applications	X	X	X	X	DCB, AO, TS, CM, AUO, ATMSDM
GPI-18	Aeronautical information	X	X	X	X	AOM, DCB, AO, TS, CM, AUO, ATMSDM
GPI-19	Meteorological systems	X	X	X	X	AOM, DCB, AO, AUO
GPI-20	WGS-84	X	X	X	X	AO, CM, AUO
GPI-21	Navigation systems	X	X	X	X	AO, TS, CM, AUO
GPI-22	Communication infrastructure	X	X	X	X	AO, TS, CM, AUO
GPI-23	Aeronautical radio spectrum	X	X	X	X	AO, TS, CM, AUO, ATMSDM

Table 3-1 Global Plan Initiatives and their links to the main groups

Appendix 1 to Chapter 3

Homogeneous Areas and Main Traffic Flows Identified

-1- Routing area (RA)	-2- Traffic flows	-3- FIRs involved	-4- Type of area covered	-5- Remarks
Caribbean/South American (CAR/SAM) Regions				
AR 1	Buenos Aires-Santiago, Chile	Ezeiza, Mendoza, Santiago	Low-density continental	SAM intra-regional traffic flow
	Buenos Aires-Sao Paulo/Rio de Janeiro	Ezeiza, Montevideo, Curitiba, Brasilia	High-density continental	SAM intra-regional traffic flow
	Santiago, Chile-Sao Paulo/Rio de Janeiro	Santiago, Mendoza, Córdoba, Resistencia, Asunción, Curitiba, Brasilia	Low-density continental	SAM intra-regional traffic flow
	Sao Paulo/Rio de Janeiro-Europe	Brasilia, Recife, Atlantic	Low-density continental / oceanic	SAM/AFI/EUR inter-regional major traffic flow
AR 2	Sao Paulo/Rio de Janeiro-Miami	Brasilia, Amazónica, Maiquetía, Curacao, Kingston, Santo Domingo, Port au Prince, Havana, Miami	Low-density continental / oceanic	CAR/SAM/NAM inter- and intra-regional traffic flow
	Sao Paulo/Rio de Janeiro- New York	Brasilia, Amazónica, Paramaribo, Georgetown, Piarco, Rochambeau, San Juan (New York)	Low-density continental / oceanic	CAR/SAM/NAM /NAT inter- and intra-regional traffic flow
AR 3	Sao Paulo/Rio de Janeiro - Lima	Brasilia, Curitiba, La Paz, Lima	Low-density continental	SAM intra-regional traffic
	Sao Paulo/Rio de Janeiro - Los Angeles	Brasilia, Amazónica, Bogotá, Barranquilla, Panama, Central America, Mexico, Mazatlán Oceanic (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, Panama, Kingston, Havana, Miami	Low-density continental / oceanic	CAR/SAM/NAM inter- and intra-regional traffic flow
	Buenos Aires - New York	Ezeiza, Resistencia, Asunción, La Paz, Amazónica, Maiquetía, Curacao, Santo Domingo, Miami (New York)	Low-density continental / oceanic	CAR/SAM/NAM /NAT inter- and intra-regional traffic flow
	Buenos Aires - Miami	Ezeza, Resistencia, Córdoba, La Paz, Amazónica, Bogotá, Barranquilla, Kingston, Havana, Miami	Low-density continental / oceanic	CAR/SAM/NAM inter- and intra-regional traffic flow

-1- **Routing area (RA)**	-2- **Traffic flows**	-3- **FIRs involved**	-4- **Type of area covered**	-5- **Remarks**
AR 5	Northern South America - Europe	Guayaquil, Bogotá, Maiquetía, Piarco (NAT-EUR)	High-density continental / oceanic	SAM/CAR/NAT/ EUR inter-regional traffic flow
AR 6	Santiago - Lima - Los Angeles	Santiago, Antofagasta Lima, Guayaquil, Central America, Mexico, Mazatlán Oceanic	Low-density oceanic	CAR/SAM/NAM inter- and intra-regional traffic flow
AR 7	South America – South Africa	Ezeiza, Montevideo, Brasilia, Atlantic Johannesburg (AFI)	Low-density oceanic	SAM/AFI inter-regional traffic flow
	Santiago, Chile – Easter Island - Papeete (PAC)	Santiago, Pascua, Tahiti	Low-density oceanic	SAM/PAC inter-regional traffic flow
G-1	Mexico, Toluca, Guadalajara, Monterrey, Mazatlán, La Paz, Acapulco, Puerto Vallarta, Huatulco, Cancún Gulf of Mexico — North America	Mexico, Houston, Miami; Albuquerque; Los Angeles	High-density continental/oceanic	CAR/NAM inter-regional main traffic flow
	Cancún, Guatemala, El Salvador, Nicaragua, Honduras, Costa Rica - Miami	Mexico, Central America, Havana, Miami	High-density continental/ oceanic	CAR/NAM inter-regional traffic flow
GM-2	Mexico, Cancun, Havana, Nassau — Europe	Mexico, Havana, Miami –(NAT-EUR)	High-density continental/ oceanic Main traffic flow	CAR/NAM/NAT /EUR inter-regional traffic flow
GM-3	Costa Rica, Panama, Honduras, Kingston, Haiti, Santo Domingo, San Juan, Caribbean — Europe	Central America, Panama, Kingston, Port-au-Prince, Curacao, Santo Domingo, San Juan – EUR	High-density oceanic	CAR/ NAT/EUR intra- and inter-regional main traffic flow
	North America – Eastern Caribbean	New York, Miami, Havana, San Juan, Santo Domingo, Piarco	High-density oceanic	West Atlantic Route System CAR/NAM inter-regional traffic flow

Chapter 4: Air Traffic Management (ATM)

4.1 Introduction

4.1.1 The general purpose of ATM, according to the Global ATM Operational Concept, is to achieve an inter-functional global air traffic management system for users during all flight phases that meets agreed operational safety levels, provides optimum operations, is environmentally sustainable and fulfils national security requirements.

4.1.2 The future system should evolve from the current system in such a way that user requirements are met as fully as possible, according to clearly-established operational requirements. The fact is that the most difficult problems ATM system designers must resolve are transition and integration. It is virtually impracticable to evolve from one system to another over a period of less than several years.

4.1.3 The design of the airspace structure should not be restricted by airspace boundaries and divisions. Planning should be coordinated between adjacent areas in order to achieve a continuous airspace in which the user will not perceive any divisions. That airspace should be free from operational discontinuities and inconsistencies and should be organised to meet the needs of different types of users when the time comes. Transition between areas should be seamless to users at all times.

4.1.4 Planning and implementation of ATM Operational Concept components should include study of their impact on and requirement for human resources.

4.1.5 Some benefits to be expected from implementation of these components are enhanced safety, fuel savings for users, less delays and gas emissions and an increase in system capacity.

4.1.6 Air traffic management evolution in the CAR/SAM Regions has been carefully planned to avoid degradation of current system performance. It is necessary, as progressive improvements are made in air navigation efficiency throughout the transition period, to ensure at least the present operational safety level. Aircraft should not be unnecessarily burdened with the need to carry a multiplicity of CNS equipment, both existing and new, over the lengthy transition cycle.

4.2 General principles

4.2.1 All States, Territories and International Organisations in the CAR/SAM Regions should be guaranteed unrestricted access to the air navigation services covered by this document.

4.2.2 It is recognised that CAR/SAM States/Territories and International Organizations need to comply fully with national plans and with standards governing use of the new systems.

4.2.3 States/Territories and International Organizations should accept the global nature of the ATM operational concept and have the firm intention to facilitate the integration mechanisms needed for its timely implementation.

4.2.4 Depending on the requirements identified for an adequate air traffic management level in the CAR/SAM Regions, CNS infrastructure should be carefully planned.

4.2.5 CNS elements should be introduced progressively in the light of the benefits they will provide to the ATM community.

4.3 Implementation strategy

4.3.1 ATM evolution for the CAR/SAM Regions has been planned taking into account the GPIs that could be implemented in the short and medium term. These Initiatives will be applied to the main international traffic flows identified in homogeneous areas as well as in the main terminal areas and will produce operational benefits for the ATM community. The ATM performance objectives not only set forth the necessary requirements for ATM improvements, but also specify the implementation dates for planned improvements, together with performance goals and the main GPI implementation tasks.

4.4 ATM evolution in the CAR/SAM Regions

4.4.1 General

4.4.1.1 ATM evolution is based on Global Plan Initiatives applied to:

a) Air operations in general

b) En-route operations; and

c) TMA operations

4.4.2 Air operations in general

4.4.2.1 This portion of the Plan includes Global Plan Initiatives that are applied to air operations in general that cannot be considered en-route and/or TMA operations.

4.4.2.2 Flexible use of airspace (FUA)

4.4.2.2.1 Strategic coordination and dynamic interaction will facilitate an optimum, balanced and equitable civil/military use of airspace, which, in turn will permit the establishment of optimum flight paths, while reducing operational costs for airspace users.

4.4.2.2.2 CAR/SAM States, Territories and International Organisations should establish policies on the use of temporary or permanent restricted airspace in order to avoid, as much as possible, the adoption of airspace restrictions, particularly on a permanent basis.

4.4.2.2.3 The first step in the process of implementing the Flexible Use of Airspace should be to evaluate dangerous, restricted and prohibited airspaces that impede or that could prevent aircraft flow.

4.4.2.2.4 The establishment of letters of agreement between ATS units and military units or other users for the dynamic and flexible use of airspace should eliminate restrictions on airspace use, thus making it possible to accommodate the needs of all airspace users.

4.4.2.2.5 Where airspace restriction is unavoidable, the letters of agreement should stipulate that the blockage will last no longer than necessary. In such cases, other paths should be developed for the dynamic re-routing of aircraft to enable them to avoid those airspaces.

4.4.2.2.6 Those paths should then be published in the AIPs to warn users of the need to consider said deviations in their flight planning.

4.4.2.2.7 FUA implementation involves convincing military authorities of the States involved that their needs will be met, independently of the application of airspace restrictions. It will, therefore, be necessary to hold seminars/meetings with those authorities to demonstrate the importance of optimised airspace use.

4.4.2.3 **Air traffic flow management**

4.4.2.3.1 The application of timely demand and capacity balancing measures will avoid overburdening the ATM system and provide the necessary conditions for maximising the use of airport and ATC capacity. This will significantly increase airspace capacity and enhance operational efficiency.

4.4.2.3.2 Inasmuch as air traffic congestion and saturation problems in the CAR/SAM Regions are still very specific, the application of air traffic flow management measures should start gradually to allow States, Territories and International Organisations to gain experience, particularly in calculating and maximising ATC and airport capacities.

4.4.2.3.3 The implementation of ATFM in the CAR/SAM Regions should take into account the objective and principles established in Appendix AL to Item 3 of GREPECAS/13, stressing that ATFM measures should foster maximum use of existing capacity without jeopardising safety. Furthermore, it is important to emphasise that AFTM measures should not be used to resolve the occasional deficiencies intrinsic to the ATM system.

4.4.2.3.4 The CAR and SAM ATFM Operational Concept, establishes a simple implementation strategy which should be developed in stages, in such a way to ensure the maximum utilisation of the available capacity and permit all parties concerned to obtain sufficient experience.

4.4.2.3.5 The experience acquired in other Regions and by some States/Territories and International Organizations of the CAR/SAM Regions, permits the application of ATFM basic procedures in airports, without the immediate need for a Centralised ATFM. A Centralised ATFM shall demand ample studies to define operational concepts, requirements of the systems and institutional aspects for ATFM implementation in the CAR/SAM Regions.

4.4.2.3.6 In this way, ATFM will be implemented by stages in the CAR/SAM Regions, in response to established operational requirements, as foreseen in the ATFM Operational concept for the CAR/SAM Regions.

Centralised ATFM

4.4.2.3.7 The implementation of the Centralised ATFM should take into account two scenarios, CAR and SAM but which could be modified as progress is made in the development of implementation plans. The strategy is to develop harmonised planning in an ATFM inter-regional CAR and SAM System.

4.4.2.3.8 In order to maximise its efficiency, a Centralised ATFM should have the responsibility to provide service on the maximum extension of possible airspace, provided that it is homogeneous. According to ATFM planning in the CAR and SAM Regions, at least two Centralised ATFMs will be available, one for each Region.

4.4.2.3.9 It is necessary that procedures during all the process of implementation be developed in a harmonious manner between ATFM units to avoid risks in safety. This implies to establish a regional and inter-regional strategy which facilitates and harmonises all the implementation process. Each phase should be implemented, based on operational configurations, descriptive documents of the systems and operational models, as per the established strategy.

4.4.2.3.10 In order to harmonise National Plans with the CAR/SAM ATFM Regional Plan, it is necessary that civil aviation administrations take measures required and make a closer follow-up of the ATFM regional development and prepare an ATFM Implementation Programme, where the needs for implementation are determined analysed, and the impact is analysed as regards ATC national system, airspace, air traffic services, operations, and airport services.

4.4.2.3.11 Most States, Territories and International Organisations are expected, when centralised ATFM becomes available, to implement tactical airspace ATFM by making the relevant institutional arrangements and considering the most favourable cost-benefit ratio.

4.4.2.3.12 In order to provide Air Traffic Flow Management (ATFM) service, the centralised ATFM in the CAR and SAM Regions should perform the following activities:

a) Set up and maintain a database in the region where it operates, regarding:

- ✓ air navigation infrastructure, air traffic service (ATS) units and registered aerodromes
- ✓ relevant ATC and airport capacity; and
- ✓ data on foreseen flights

b) Establish a coherent table of predicted traffic demand, its comparison with available capacity and determination of critical traffic overload zones and durations foreseen;

c) Coordinate as needed to increase the available capacity where necessary;

d) When deficiencies in available capacity cannot be eliminated, determine and duly implement ATFM measures where needed, coordinated beforehand with interested aircraft operators and aerodromes;

e) Monitor the outcome of the measures implemented;

f) Coordinate ATFM service with the other centralised ATFM units where needed.

4.4.3 <u>En-route operations</u>

4.4.3.1 ATM evolution for en-route operations took into account the main GPIs applicable to the CAR/SAM Regions and was planned in such a way as to permit optimum airspace management and organisation.

4.4.3.2 Homogeneous areas and main continental and oceanic traffic flows were taken into account and an ATM evolution table was prepared.

4.4.3.3 <u>Implementation of performance-based navigation</u>

4.4.3.3.1 Implementation of PBN will foster use of advanced aircraft navigation capabilities which, when combined with air navigation infrastructure, will make it possible to optimise the airspace, including the route network. This, in turn, will contribute to the establishment of an ATS routing environment that meets the needs of airspace users and reduces controller and pilot workload and aircraft concentration in portions of the airspace.

4.4.3.3.2 PBN implementation for en-route operations will require establishing exclusionary airspaces because they offer the conditions for making the necessary changes in airspace structure. The vertical boundaries of the airspace where PBN is to be implemented should be thoroughly analysed, in order not to exclude a large number of users.

<u>Short term</u>

4.4.3.3.3 No major changes are expected in the existing airspace structure, given the low density of air traffic in the oceanic airspaces. The sole exception will be the application of RNP-10 in the region known as WATRS, which will provide significant benefits in the CAR Region. No changes are expected in the short term in airspaces where RNP-10 (EUR/SAM Corridor, Lima-Santiago de Chile routes and South Atlantic Random Route System) is applied.

4.4.3.3.4 It is expected that RNAV-5 will be implemented in selected continental airspaces where operational benefits can be obtained and the existing CNS infrastructure is capable of supporting its use.

Medium term

4.4.3.3.5 It is expected that RNP-4 will be applied in the EUR/SAM Corridor and in the Santiago de Chile/Lima route segment, with the utilisation of ADS/CPDLC to permit a 30 NM lateral and longitudinal separation. Materialisation of this application will depend upon the evolution of the aircraft fleet operating in these airspaces.

4.4.3.3.6 It is expected that in this phase RNP-2 will be applied in selected continental airspaces, with the exclusive use of GNSS, since the ground infrastructure will not support RNAV. It will be necessary to establish a GNSS back-up system and develop contingency procedures for the possible failure of the GNSS. RNP-2 implementation will facilitate PBN application in airspaces without ATS surveillance service. Exclusive GNSS use will mean that the GNSS signal will need to broadcast more information.

4.4.3.4 ATM Situational awareness and implementation of data link applications

4.4.3.4.1 ADS-C and CPDLC application in oceanic airspaces will promote the necessary conditions for use of 30 NM horizontal separation minima in the EUR/SAM Corridor and in the Santiago de Chile/Lima route segment. Furthermore, in other oceanic airspaces with less air traffic density, ADS-C and CPDLC will provide reliable means of surveillance and communication, thereby reducing controller and pilot workload.

4.4.3.4.2 Application of improved surveillance techniques (ADS-B and/or multilateration) in continental airspace will make it possible to reduce horizontal separation minima, improve safety, increase capacity and improve flight efficiency profitably. Use of other data link applications instead of voice communications offers significant advantages in terms of safety and pilot and controller workload.

4.4.3.4.3 These benefits can be obtained by providing surveillance in areas not equipped with primary or secondary radars, when justified by cost-benefit analysis. In airspaces where radar is used, improved surveillance can enhance the quality and reliability of surveillance information both on the ground and in the air. States, Territories and International Organisations should make a consistent cost-benefit analysis to determine whether when the time comes for PSR and/or SSR systems to be replaced, it would be desirable to replace them with ADS-B systems or multilateration.

4.4.3.4.4 CPDLC use in continental airspace with high traffic density should be evaluated, considering that the characteristics of ATC interventions could make it unviable.

4.4.3.4.5 Gradual implementation of ATS inter-facility data communication (AIDC) will improve airspace safety and reduce coordination errors between ATS units.

4.4.3.4.6 In implementing ATS surveillance systems and data link applications, consideration should be given to the corresponding aspects of automation, particularly the need to harmonise the systems applied in order to ensure their interoperability.

4.4.3.4.7 Furthermore, ATM automation tools (minimum safe altitude warning; conflict prediction; conflict alert; conflict resolution advisory; path conformance control; functional integration of ground systems with aircraft systems, etc.) should also be considered when implementing ATS surveillance systems and data link applications.

4.4.4 **TMA operations**

4.4.4.1 Evolution of air traffic management in terminal areas should be harmonised with ATM evolution for en-route operations, making it possible to obtain a harmonious and integrated ATM system.

4.4.4.2 ATM evolution for TMA operations took account of the combination of different GPIs applicable to the CAR/SAM Regions and was planned to allow for optimum airspace management and organisation.

4.4.4.3 The table on the Optimisation of TMA structure combined GPIs 5, 10, 11 and 12, all of which concern the optimisation of TMA airspace structure, using SIDs and STARs based on RNAV-, RNP- and/or FMS based approach procedures, as well as application of TMA design and management techniques and the functional integration of ground and on board systems.

4.4.4.4 The table referring to situational awareness and data link application combined GPIs 9 and 17 in view of the close relationship between the application of improved surveillance techniques (ADS-B and/or multilateration) and the use of data link applications.

4.4.4.5 Many elements must be taken into account in planning the requirements for an air navigation service infrastructure in a TMA. In addition to traffic volume, other factors to be considered include, *inter alia*, the number and location of aerodromes, traffic characteristics, topography, meteorological conditions, etc. Consequently, States, Territories and International Organisations should be responsible for studying each TMA in particular and determining, in coordination with users, the requirements for implementing the corresponding air navigation services.

4.4.4.6 Optimisation of TMA structure

4.4.4.6.1 The following measures will optimise TMA airspace structure:

a) Implementing PBN, including SIDs and STARs with RNP and RNAV, and RNP approach procedures.

b) Functional integration of ground and on board systems.

c) Using improved design and management techniques.

4.4.4.6.2 Implementation of performance-based navigation

4.4.4.6.2.1 TMA operations have unique features because of the separation minima applicable between aircraft and between aircraft and obstacles. All aircraft are involved, including low-performance aircraft and use the same or nearby paths for their arrival and departure procedures as those of high-performance aircraft.

4.4.4.6.2.2 In this sense, States/Territories and International Organisations need to develop their own national plans for implementing PBN in TMAs, based on the CAR/SAM PBN Road Map. An effort will be made to harmonise aircraft separation criteria and applicable RNAV and/or RNP criteria, to avoid the need to obtain multiple approvals for intra- and inter-regional operations.

4.4.4.6.2.3 The efficiency with which TMA operations are carried out in a PBN environment will depend upon Aerodrome Design and Management (GPI 13) and Runway Operations (GPI 14), inasmuch as the airport infrastructure will have to absorb any increase in air traffic flow in TMA operations.

Short term

4.4.4.6.2.4 RNAV-1 is expected in TMAs selected by States/Territories and International Organizations in environments equipped with ATS surveillance and appropriate ground navigation infrastructure that will permit the performance of DME/DME and DME/DME/INS operations. Both equipped and non-equipped aircraft will be allowed to operate during this phase and once a suitable percentage of approved air operations have been reached, RNAV-1 operations should be started.

4.4.4.6.2.5 RNP-1 application is expected in TMAs selected by, States/Territories and International Organizations, where there is no ATS surveillance service and/or appropriate ground navigation infrastructure, with exclusive application of GNSS, provided that there are a suitable percentage of approved air operations. Even so, when the corresponding operational benefits are confirmed, both approved and not approved aircraft will be allowed to operate. Whether overlay or exclusive RNP procedures are applied will depend upon air traffic complexity and density.

4.4.4.6.2.6 RNP 0.3 (basic GNSS) approach procedures are expected in as many airports as possible, particularly those where international flight operations are conducted, while not-equipped aircraft will continue to use conventional approach procedures.

4.4.4.6.2.7 RNP AR approach procedures are also expected in airports where their operational benefits are evident because of the existence of significant obstacles.

Medium term

4.4.4.6.2.8 During this phase, the expansion of RNAV or RNP 1 application is expected in TMAs selected by States/Territories and International Organizations, depending upon the ground infrastructure and aircraft navigation capabilities. RNAV or RNP 1 equipment will be mandatory in the more complex TMAs (exclusionary airspace), while in the less complex TMAs the operations of equipped and non-equipped aircraft will still be allowed.

4.4.4.6.2.9 The expanded application of RNP 0.3 and RNP AR procedures is expected in selected airports during this phase. The application of the GLS procedure is also expected to start, which will improve the transition from the TMA to the approach phase, basically using the GNSS for both phases.

4.4.4.6.3 Functional integration of ground and on board systems

4.4.4.6.3.1 States, Territories and International Organisations are expected to study the feasibility of using functional integration of ground and on board systems, with a view to apply flight procedures that provide the most efficient trajectory during approach of an aircraft to the destination aerodrome. These procedures shall enable an un-interrupted flight trajectory from the beginning of the descent until the aircraft is stabilized for the landing.

4.4.4.6.3.2 The optimization of efficiency in TMAs shall depend of the major possible use of automation. Also, in addition to the application of the continuous descent capacities, aircraft shall be each time more equipped with calculation in arrival time. This capacity shall be integrated with ground automated systems, in order to identify specific flight schedules. These schedules should assist in the landing sequence process enabling aircraft to stay near their 4D preferred trajectories.

4.4.4.6.4 The use of improved design and management techniques

4.4.4.6.4.1 Airspace planners should apply design techniques to TMA restructuring, in order to:

a) Validate the proposed airspace structure.

b) Evaluate the impact of implementing PBN, including RNAV and/or RNP SID and STAR procedures, RNP approach procedures and FMS-based arrival procedures, using ATC simulations where necessary.

c) Ensure a favourable cost-benefit ratio.

d) Optimise sectorisation to make it seamless to users and balanced in terms of workload.

4.4.4.6.4.2 To improve TMA management, consideration should be given to implementing the WGS-84 and taking measures to optimise air traffic management and capacity, including a collaborative decision-making process involving the tower, TMA and en-route sectors, while strategically encompassing airspace users.

4.4.4.7 **ATM Situational awareness and implementation of data link applications**

4.4.4.7.1 In addition to the considerations set out in paragraph 4.4.3.4, which are also applicable to TMA operations, the States, Territories and International Organisations should consider the following aspects when implementing ATS surveillance services and data link applications in the TMA:

4.4.4.7.2 The implementation of improved surveillance techniques (ADS-B and/or multilateration) in TMAs will permit the integration of en-route and TMA operations.

4.4.4.7.3 The use of ATS surveillance systems (SSR, ADS-B and/or multilateration), it will be possible to apply RNAV-based navigation techniques without having to rely on RNP because that surveillance will allow the monitoring of flights in order to detect any possible deviation from their path. Thus, users that would not be approved for RNP operations could be included in TMA operations.

4.4.4.7.4 Implementation of improved surveillance techniques would facilitate the operation of aircraft without RNAV/RNP approval because it would allow controllers to route them through vectors up to their final approach.

4.4.4.7.5 CPDLC is not expected in TMAs, given the characteristics of ATC intervention in these airspaces. Data link applications, such as D-ATIS and digital flight plan clearances (DCL), however, will reduce the workload of controllers and pilots.

4.4.4.7.6 The fact that TMA users may not be equipped with data link systems must be considered, given that a large number of low-performance aircraft fly in this airspace and may not have the capacity to be properly equipped. In that case, procedures should be developed to permit the flight of unequipped aircraft, unless the air traffic density justifies use of exclusionary airspaces.

Appendix 1 to Chapter 4

ATM PERFORMANCE OBJECTIVES

<table>
<tr><td colspan="4">OPTIMIZE THE ATS ROUTE STRUCTURE IN BOTH
TERMINAL AND EN-ROUTE AIRSPACE</td></tr>
<tr><td colspan="4">Benefits</td></tr>
<tr><td>Environment
Efficiency</td><td colspan="3">• reductions in fuel consumption;
• ability of aircraft to conduct flight more closely to preferred trajectories;
• increase in airspace capacity;
• facilitate utilization of advanced technologies (e.g., FMS based arrivals) and ATC decision support tools (e.g., metering and sequencing), thereby increasing efficiency.</td></tr>
<tr><td colspan="4">Strategy
Short term (2010)
Medium term (2011 - 20015)</td></tr>
<tr><td>TASK</td><td>DESCRIPTION</td><td>START-END</td><td>STATUS</td></tr>
<tr><td>AOM</td><td>En-route airspace
• analyze the en-route ATS route structure and implement all identifiable improvements;
• implement all remaining regional requirements (e.g. RNP 10 routes); and
• finalize implementation of WGS-84
• monitor implementation progress
• develop a strategy and work programme to design and implement a trunk route network, connecting major city pairs in the upper airspace and for transit to/from aerodromes, on the basis of PBN and, in particular, RNAV/5, taking into account interregional harmonization;
In terminal airspace
• develop a regional strategy and work programme for implementation of optimized standard instrument departures (SIDs), standard instrument arrivals (STARs), instrument flight procedures, holding, approach and associated procedures, on the basis of PBN and, in particular RNAV/1 and 2; and
• monitor implementation progress</td><td>2005-2008

2008-2011</td><td></td></tr>
<tr><td>References</td><td colspan="3">GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management, GPI/10: terminal area design and management, GPI/11: RNP and RNAV SIDs and STARs and GPI/12: FMS-based arrival procedures.</td></tr>
</table>

IMPLEMENT RNP APPROACHES			
Benefits			
Efficiency **Safety**	• Improvements in capacity and efficiency at aerodromes. • Improvements in safety at aerodromes.		
Strategy **(2008-2015)**			
TASK	**DESCRIPTION**	**START-END**	**STATUS**
AOM	• development of a regional strategy and work programme for implementation of RNP approaches at aerodromes where aircraft weighing 5700 kg or more are operated, on the basis of the transition plan as follows: **Stage 1 –** Evaluate existing procedures, determine compatibility of use with RNAV overlay routes **Stage 2 –** Carry out cost benefit analysis and safety assessments of RNAV procedures **Stage 3** – Use existing radar vectoring patterns as the basis for RNAV departure and arrival tracks **Stage 4** – Evaluation and simulation of procedures **Stage 5** – Design stand-alone RNAV procedures **Stage 6 –** Training phase **Stage 7 –** Publish new procedures and introduce into new service, meet AIRAC dates **Stage 8** – Operational review **Stage 9 –** Removal of conventional procedures • monitor implementation progress		
References	GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management, GPI/10: terminal area design and management, GPI/11: RNP and RNAV SIDs and STARs and GPI/12: FMS-based arrival procedures.		

<table>
<tr><td colspan="4">ENHANCE CIVIL/MILITARY COORDINATION AND CO-OPERATION</td></tr>
<tr><td colspan="4">Benefits</td></tr>
<tr><td>Efficiency</td><td colspan="3">• increase airspace capacity;</td></tr>
<tr><td>Continuity</td><td colspan="3">• allow a more efficient ATS route structure
• ensure safe and efficient action in the event of unlawful interference;
• make available military restricted airspace more hours of the day so that aircraft can fly on their preferred trajectories; and
• improve search and rescue services.</td></tr>
<tr><td colspan="4">Strategy
(2008-2012)</td></tr>
<tr><td>TASK</td><td>DESCRIPTION</td><td>START-END</td><td>STATUS</td></tr>
<tr><td>AOM</td><td>• develop guidance material on civil/military coordination and co-operation to be used by States/Territories to develop national policies, procedures and rules;
• establish civil/military coordination bodies;
• arrange for permanent liaison and close cooperation between civil ATS units and appropriate air defense units;
• conduct a regional review of special use airspace;
• develop a regional strategy and work programme for implementation of flexible use of airspace in a phased approach beginning with more dynamic sharing of restricted airspace while working towards full integration of civil and military aviation activities by 2012; and
• monitor implementation progress</td><td></td><td></td></tr>
<tr><td>References</td><td colspan="3">GPI/1: flexible use of airspace.</td></tr>
</table>

<table>
<tr><th colspan="4">ALIGN UPPER AIRSPACE CLASSIFICATION</th></tr>
<tr><th colspan="4">Benefits</th></tr>
<tr><td>Efficiency

Continuity</td><td colspan="3">• better utilization of data link communication;
• optimize use of flight plan data processing systems;
• enhance airspace management coordination, message exchange capabilities and utilization of flexible and dynamic airspace management techniques;
• harmonization of interregional coordination processes;
• improvement of airspace interoperability and seamlessness; and
• ensure the provision of positive air traffic control services to all aircraft operations.</td></tr>
<tr><td colspan="4">Strategy
(Target: 2008)</td></tr>
<tr><td>TASK</td><td>DESCRIPTION</td><td>START-END</td><td>STATUS</td></tr>
<tr><td>AOM</td><td>• Develop a regional implementation strategy and work programme for the implementation of ICAO Annex 11 airspace Class A above FL 195.
• identify key stakeholders, ATCOs, pilots, and relevant international organisations for coordination and cooperation on changes for new airspace organization, using a CDM process;
• develop new national airspace organization in accordance with ICAO provisions, as needed;
• Coordinate changes for regional and national documents;
• Doc 8733, CAR/SAM ANP;
• AIP; and,
• ATS letters of agreement
• carry out improvements in ground systems to support new airspace organization configurations, as necessary;
• publish national regulatory material for implementation of new rules and procedures to reflect airspace organizational changes;
• train ATCOs and pilots in new procedures, including all civil and military airspace users, as required;
• monitor implementation progress.</td><td></td><td></td></tr>
<tr><td>References</td><td colspan="3">GPI/4: align upper airspace classification.</td></tr>
</table>

<table>
<tr><td colspan="4">IMPROVE DEMAND AND CAPACITY BALANCING</td></tr>
<tr><td colspan="4">Benefits</td></tr>
<tr><td>Environment

Efficiency

Safety</td><td colspan="3">• reduction in weather- and traffic-induced holding, leading to reduced fuel consumption and emissions;
• improved and smoother traffic flows;
• improved predictability;
• improved management of excess demand for service in ATC sectors and aerodromes;
• improved operational efficiency;
• enhanced airport capacity;
• enhanced airspace capacity; and
• improved safety management.</td></tr>
<tr><td colspan="4">Strategy
Near term (2008)</td></tr>
<tr><td>TASK</td><td>DESCRIPTION</td><td>START-END</td><td>STATUS</td></tr>
<tr><td>DCB</td><td>• identify key stakeholders (ATC service providers and users, military authorities, airport authorities, aircraft operators and relevant international organisations) for purposes of coordination and cooperation, using a CDM process;
• identify and analyse traffic flow problems and develop methods for improving efficiencies on a gradual basis, as needed, through enhancements in current:
o airspace organization and management (AOM) and ATS routes structure (unidirectional routes) and SID and STARS,
o communication, navigation and surveillance systems,
o aerodrome capacity,
o ATS capacity,
o training for pilots and Controllers; and
o ATS letters of agreement;
• define common elements of situational awareness between FMUs;
o common traffic displays,
o common weather displays (Internet),
o communications (teleconferences, web), and
o daily teleconference/messages methodology advisories;
• develop methods to establish demand/capacity forecasting;
• develop a regional strategy and work programme for harmonized implementation of ATFM service; and,</td><td></td><td></td></tr>
</table>

Medium term (2010)			
	• develop a regional strategy for the implementation of flexible use of airspace (FUA); o assess use of airspace management processes; o improve current national airspace management to adjust dynamic changes in tactical stage to traffic flows; o introduce improvements in ground support systems and associated procedures for the extension of FUA with dynamic airspace management processes; o implement dynamic ATC sectorization in order to provide the best balance between demand and capacity to respond in real-time to changing situations in traffic flows, and to accommodate in short-term the preferred routes of users; • define common electronic information and minimum databases required for decision support and alerting systems for interoperable situational awareness between Centralized ATFM units; • develop regional procedures for efficient and optimum use of aerodrome and runway capacity; • develop a regional ATFM procedural manual to manage demand/capacity balancing; • develop a regional strategy and framework for the implementation of a Centralized ATFM unit; • develop operational agreements between Centralized ATFM units for interregional demand/capacity balancing; and, • monitor implementation progress.		
References	GPI/1: flexible use of airspace; GPI/6: air traffic flow management; GPI/7: dynamic and flexible ATS route management; GPI/9: Situational awareness; GPI/13: aerodrome design and management; GPI/14: runway operations; and GPI/16: decision support and alerting systems.		

<table>
<tr><th colspan="4">IMPROVE ATM SITUATIONAL AWARENESS</th></tr>
<tr><th colspan="4">Benefits</th></tr>
<tr><td>Efficiency

Safety</td><td colspan="3">• enhanced traffic surveillance;
• enhanced collaboration between flight crew and the ATM system;
• improved collaborative decision-making through sharing electronic aeronautical data information;
• reduced of workload for both pilots and controllers;
• improved operational efficiency;
• enhanced airspace capacity;
• improved implementation on a cost-effective basis;
• improved available electronic terrain and obstacle data in the cockpit;
• reduced of the number of controlled flight into terrain related accidents; and
• improved safety management.</td></tr>
<tr><th colspan="4">Strategy
Near term (2010)</th></tr>
<tr><th>TASK</th><th>DESCRIPTION</th><th>START-END</th><th>STATUS</th></tr>
<tr><td>SDM</td><td>• identify parties concerned

• identify the automation level required according to the ATM service provided in airspace and international aerodromes, assessing
o operational architecture design,
o characteristics and attributes for interoperability,
o data bases and software, and
o technical requirements;
• improve ATS interfacility communication
• implement flight plan data processing system and electronic transmission tools
• implement radar data sharing programs where benefits can be obtained
• develop situational awareness training programmes for pilots and controllers
• implement ATM surveillance systems for situational traffic information and associated procedures
• implement ATS automated message exchanges, as required
o FPL, CPL, CNL, DLA, etc.
• implement automated radar handovers, where able;
• implement ground and air electronic warnings, as needed
o Conflict prediction
o Terrain proximity
o MSAW
o DAIW
o Surveillance system for surface movement
• implement data link surveillance technologies and applications: ADS, CPDLC, AIDC, as required.</td><td></td><td></td></tr>
</table>

Medium term (2015)			
	• implement additional/advanced automation support tools to increase sharing of aeronautical information o ETMS or similar o MET information o AIS/NOTAM dissemination o Surveillance tools to identify airspace sector constraints o A-SMGC in specific aerodromes, as required • implement teleconferences with ATM stakeholders • monitor implementation progress		
References	GPI/1: flexible use of airspace; GPI/6: air traffic flow management; and GPI/7: dynamic and flexible ATS route management; GPI/9: Situational awareness; GPI/13: aerodrome design and management; GPI/14: runway operations; and GPI/16: decision support and alerting systems; GPI/17: implementation of data link applications; GPI/18: aeronautical Information; GPI/19: meteorological systems.		

- END -

Chapter 5: Communications

5.1 Introduction

5.1.1 CAR/SAM States, Territories and International Organisations should, when implementing communications systems, consider the operational requirements set out in Chapter 4 of this Plan.

5.1.2 Implementation of communications systems in the CAR/SAM Regions should be planned considering GPIs 22 and 23 and bearing in mind the functionalities that could be implemented in the short and medium term.

5.1.3 Consideration should be given, in the evolution of the aeronautical mobile and fixed communications infrastructure, to applying voice and data communications so that that infrastructure can adapt to the new functions and offer the appropriate service capacity and quality to support ATM requirements.

5.1.4 Communications systems should be implemented based on the results of cost-benefit analyses of the different scenarios available, by comparing the existing structure with the improvements to be obtained if the new systems are implemented. Two or more technologies that meet the same operational requirement should also be studied.

5.1.5 Implementation of the communication systems in the short and medium term should give consideration to the established operational requirements that would meet future ATM expectations, using the following tools, among others:

a) Aeronautical message handling system (AMHS).

b) Very high frequency digital link (VDL).

c) Satellite digital link.

d) Air traffic services interfacility data communications (AIDC).

e) Controller-pilot data link communication (CPDLC).

5.1.6 Communications systems planning should still take into consideration the necessary communications required to effectively support centralised air traffic flow management as regards:

a) Other centralised ATFM systems

b) FMUs, FMPs and/or ATS units involved

c) Operators and users

d) Airport authorities

e) Meteorological authorities

f) Aeronautical information services

g) Radar and ADS data transmission for ATFMC

5.1.7 Implementation of communications systems should be based on a harmonised strategy for the CAR/SAM Regions, taking into account operational requirements and relevant cost-benefit analyses. It should, furthermore, be based on Action Plans to ensure that CAR/SAM States, Territories and International Organisations implement the necessary systems in keeping with consistent timescales.

Planning details for the implementation of communication systems – CNS COMMITTEE

Chapter 6: Navigation

6.1 Introduction

6.1.1 CAR/SAM States, Territories and International Organizations should, when implementing navigation systems, consider the operational requirements set out in Chapter 4 of this Plan.

6.1.2 Implementation of navigation systems in the CAR/SAM Regions should be planned considering GPI 21 and take into account the functionalities that could be implemented in the short and medium term.

6.1.3 Consideration should be given, in the evolution of navigation infrastructure, to technologies that provide the appropriate service capacity and quality for supporting ATM requirements.

6.1.4 Navigation systems should be implemented based on the results of cost-benefit analyses of the different scenarios available, by comparing the existing structure with the improvements to be made if the new systems are implemented. Two or more technologies that meet the same operational requirement should also be studied.

6.1.5 Implementation of the navigation systems in the short and medium term should give consideration to the established operational requirements that would meet future ATM expectations, taking into account, *inter alia*, the following aspects:

a) The ground navigation infrastructure needed for the operations envisioned in the CAR/SAM PBN Road Map.

b) Application of the GNSS for en-route operations without the use of precision values, together with RNAV-5 (continental airspaces) and RNP-4 (oceanic airspaces).

c) Application of the GNSS for TMA operations (RNAV 1).

d) Application of the GNSS for approach operations (RNP 0.3, RNP AR and GLS).

e) The need to apply the SBAS to meet the requirements of the CAR/SAM PBN Road Map.

f) The cost-benefit analysis of SBAS use, bearing in mind the effects of the implementation of GALILEO and of frequency L5 in the GPS.

6.1.6 Implementation of navigation systems should be based on a harmonised strategy for the CAR/SAM Regions that would take into account the operational requirements and relevant cost-benefit analyses. It should, furthermore, be based on Action Plans to ensure that CAR/SAM States, Territories and International Organisations implement the necessary systems in keeping with consistent timescales.

Planning details for the implementation of navigation systems – CNS COMMITTEE

Chapter 7: Surveillance

7.1 Introduction

7.1.1 CAR/SAM States, Territories and International Organisations should, when implementing surveillance systems, consider the operational requirements set out in Chapter 4 of this Plan.

7.1.2 Implementation of surveillance systems in the CAR/SAM Regions should be planned considering GPIs 9 and 17 and bearing in mind the functionalities that could be implemented in the short and medium term.

7.1.3 Consideration should be given, in the evolution of surveillance infrastructure, to technologies that provide the appropriate service capacity and quality for supporting ATM requirements.

7.1.4 Surveillance systems should be implemented based on the results of cost-benefit analyses of the different scenarios available, by comparing the existing structure with the improvements to be made if the new systems are implemented. Two or more technologies that meet the same operational requirement (*e.g.* ADS/B or multilateralism) should also be studied.

7.1.5 Implementation of surveillance systems in the short and medium term should give consideration to the established operational requirements that would meet future ATM expectations, using the following tools, among others:

a) ADS-B

b) ADS-C

c) Multilateralism

d) SSR

e) The combination of the cited tools.

7.1.6 Implementation of surveillance systems should be based on a harmonised strategy for the CAR/SAM Regions that would take into account the operational requirements and relevant cost-benefit analyses. It should, furthermore, be based on Action Plans to ensure that CAR/SAM States, Territories and International Organisations implement the necessary systems in keeping with consistent timescales.

Planning details of the implementation of surveillance systems – CNS COMMITTEE

Chapter 8: Meteorology

8.1 Introduction

8.1.1 CAR/SAM States, Territories and International Organizations should, when implementing meteorological systems, consider the operational requirements set out in Chapter 4 of this Plan.

8.1.2 Implementation of meteorological systems in the CAR/SAM Regions should be planned considering GPI 19 and bearing in mind the functionalities that could be implemented in the short and medium term.

8.1.3 The improvement of the world area forecasting system (WAFS), the international airways volcano watch (IAVW) and the ICAO tropical cyclone warning system will contribute to airspace optimisation by improving the precision, timely distribution and usefulness of the information developed by those systems. At the same time, by increasing the use of data links for transmitting meteorological information through uplinks and downlinks to help in the automatic sequencing of aircraft for their approach procedure, capacity will be maximised.

8.1.4 The global ATM system requires immediate access to world meteorological information in real time. These strict requirements will demand the automation of most meteorological systems. The automatic downloading, by means of downlinks, of MET data included in ADS messages will provide precise information about upper wind fields and wind profiles in real time. Increasing use should be made of data links to transmit information about meteorological conditions to aircraft by means of uplinks during approach and departure procedures, including the application of the data link-automatic terminal information service (D-ATIS) and D-VOLMET.

8.1.5 These improvements will give ATC units display access to precise upper wind fields both in the form of WAFS world upper wind forecasts and wind fields and wind profiles "in real time," derived from wind information automatically transmitted by aircraft through the automatic dependent surveillance (ADS) system and reports and forecasts of hazardous meteorological conditions, particularly volcanic ash, tropical cyclones, storms, clear air turbulence, icing and wind shear. This information will help ATM make tactical decisions for aircraft surveillance, air traffic flow management and flexible and dynamic aircraft routing and will contribute to the optimisation of airspace use.

Planning details of the implementation of meteorological systems – MET Subgroup

Chapter 9: Aeronautical Information Services

9.1 Introduction

9.1.1 CAR/SAM States, Territories and International Organisations should, when implementing Aeronautical Information Services, consider the operational requirements set out in Chapter 4 of this Plan.

9.1.2 Implementation of Aeronautical Information Services in the CAR/SAM Regions should be planned considering GPI 18, taking into account the functionalities that could be implemented in the short and medium term.

9.1.3 ATM, RNAV, RNP and FMS requirements introduced the need for corresponding new AIS requirements to ensure the quality and timely distribution of the information. In order to be able to provide information and meet these new requirements, the traditional aeronautical information service function will become an information management service, modifying its obligations and responsibilities.

9.1.4 Real-time quality electronic data (aeronautical information about the terrain and obstacles) is needed to facilitate coordination, enhance efficiency and safety and ensure that the different members of the ATM community possess the same information when they make collaborative decisions. By equipping aircraft with geographical reference data sets containing information for the en-route, terminal and aerodrome phases, pilots will have enhanced situational awareness during those operations, thanks to electronic data. The same information can be provided at different ATC positions and pre-flight planning units, and airline flight planning departments or general or private aviation users can have access to it. Electronic data can be adapted and their format modified to meet the requirements of ATM users and adjust to its applications. Standard data formats will be used to create databases into which data sets of an assured quality will be entered.

Planning details of the implementation of aeronautical information services – AIS/MAP Subgroup

Chapter 10: Aerodromes and Ground aids / Aerodrome Operational Planning

10.1 Introduction

10.1.1 CAR/SAM States, Territories and International Organisations should consider the operational requirements set out in Chapter 4 of this Plan when undertaking Aerodrome Operational Planning, including Ground Aids.

10.1.2 Aerodrome operational planning in the CAR/SAM Regions should be undertaken considering GPIs 13 and 14, taking into account the functionalities that could be implemented in the short and medium term.

10.1.3 The efficiency of TMA operations in a PBN environment will depend upon aerodrome design and management (GPI 13) and runway operations (GPI 14), inasmuch as aerodromes will have to absorb any increases in TMA air traffic flow.

10.1.4 Aerodrome operational planning should consider use of simulation tools to ensure the efficiency of runway and apron operations. To foster integrated design and management, it is also necessary to consider the use of combined airport and airspace simulations.

10.1.5 Activities to improve design and management, including coordination and collaboration among ATM service providers, vehicle operators and aircraft operators, can have an important impact on safety and aerodrome capacity.

10.1.6 Local collaborative decision-making should seek the sharing of key data on flight scheduling, so that all participants (aerodromes, ATC, ATFM, aircraft operators, and ground service providers) will have a more precise knowledge of aircraft status throughout the entire process. This would permit the adoption of minimum and precise ATFM measures and make flight scheduling more predictable. Some of the benefits to be obtained include a more efficient use of aerodrome and ground service resources, reduction of delays and greater predictability of flight schedules.

10.1.7 As an integral part of the air navigation system, the aerodrome must provide ground infrastructure including, among others, lights, taxiways, landing and departure runways and surface precision orientation systems, in order to improve safety and maximise the airport capacity in any weather condition. The ATM system must permit the efficient use of the airport infrastructure, in order to ensure the optimum use of airports, through the following actions:

a) runway occupation time must be reduced, where efficiency and capacity benefits may be obtained

b) ensure the execution of safe manoeuvres in any weather condition, in order to maintain VMC and IMC capacity

c) where necessary, surface precision orientation systems from/to the runway shall improve capacity and efficiency.

d) The position (with the appropriate precision level) and intentions of all vehicles and aircraft operating in the movement and manoeuvring areas must be known and available for the ATM community members in those aerodromes where it is possible to obtain a cost-benefit relationship showing a significant increase in the capacity and efficiency.

10.1.8 The first step in improving runway operation performance is to establish runway capacity reference values, which are usually defined as the maximum number of flights for which an aerodrome can provide routine services in one hour of operations with meteorological minima superior to Category I. These reference values are calculations that vary according to the runway configurations and combination of aircraft types involved. The goal should be the most appropriate use of aircraft capabilities and available runways to bring the number of all-weather operations as close as possible to the number of operations under visual meteorological conditions.

10.1.9 Reaching optimum capacity for each runway is a complex task that encompasses many factors, both tactical and strategic. In order to perform this task effectively, it is essential to gauge the effects of the changes and to monitor the performance of airspace users and ATM providers. Pilot and controller performance analysis would be applied in the latter case, recognising the need to maintain the trust of users and to work within the existing safety culture. A system of performance indicators should be designed to serve as the basis for taking the measurements and performing the analyses. Flight operations and ATM factors are among the tactical elements that affect runway occupancy. The aspects relating to flight operations include operator performance, effects of company procedures, use of airport infrastructure and issues of aircraft performance.

10.1.10 Limitations in runway capacity are defined by the procedures, the design of the surface area, aircraft performance capabilities, surveillance capability, aircraft spacing and meteorological limitations. Application of improved procedures to minimise spacing, such as the application of reduced runway separation minima, precision runway monitoring (PRM) and RNP and RNAV approaches for parallel runways not far from one another, will optimise spacing capacity.

Details of Aerodrome Operational Planning – AGA/AOP Subgroup

Chapter 11: Development of Human Resource Training requirements

11.1 Adequate provision of Air Navigation Services will depend upon the training of technical and operational personnel, together with their availability in large enough numbers to handle the different services.

11.2 Introducing ATM Operational Concept components will have a major impact on aeronautical personnel, both ground personnel and flight crews. For that reason, training is one of the key elements for a successful transition.

11.3 In the past, aeronautical technologies evolved gradually and instructors were generally able to meet the challenges created by change, even though they did not always have refined training methodologies and instruments available. The new CNS/ATM systems, however, are based on many new concepts that affect all areas of air navigation services and for that reason their implementation poses an even more serious challenge for instructors.

11.4 Many aeronautical disciplines will be modified as a result of the introduction of ATM Operational Concept components and it is likely that new training will be needed for several of these disciplines. The most important changes appear to have resulted form the need for a greater use of computers, data communications and automation.

11.5 New aeronautical disciplines will emerge with the introduction of ATM Operational Concept components. It will be necessary, from the viewpoint of human resource planning, to redistribute and train personnel.

11.6 The plans to study and complexity of the different disciplines has increased in such a manner that it deserves implementation of a professional status within the educational framework of States.

11.7 The need for training and course preparation will be especially strong during the transition stage. Not only will a large number of personnel have to be recycled or trained in new technologies, equipment and procedures, but a large enough number of skilled personnel will have to maintain their competence in the necessary skills to keep the older systems running and in good repair.

11.8 In planning the training of human resources for the implementation of the ATM Operational Concept components, it will be necessary to keep the specific requirements of each of the implementation activities in mind. An example that can be used are the PBN training requirements that involve airspace planning activities, design of air navigation procedures, airspace safety assessment, aircraft and operator approval and controller and pilot training.

11.9 Training planning in the CAR/SAM Regions should be handled at two duly coordinated levels. The first is GREPECAS, through the Human Resources and Training Subgroup (HRT/SG) and the second are the Civil Aviation Training Centres, where the necessary courses would be taught in a coordinated manner to avoid duplicating efforts.

Planning details of the implementation of communication systems – Human Resources and Training Subgroup (HRT/SG)

Chapter 12: Institutional Aspects

12.1 Introduction

12.1.1 CAR/SAM States, Territories and International Organisations should, when analysing the institutional aspects involved in implementing the ATM Operational Concept components, consider the operational requirements set out in Chapter 4 of this Plan.

12.1.2 In analysing those institutional aspects, consideration should be given to the information set forth in appendices C, D, E, F, G and H of the Global Air Navigation Plan.

12.1.3 Regional planning should take into consideration the characteristics intrinsic to ATM Operational Concept components, the impact of whose facilities may transcend national boundaries, making it necessary to implement multinational facilities to avoid duplication of resources and services. In establishing multinational facilities, the institutional aspects involved, which generically encompass all technical, operational, administrative, financial and legal matters, should be taken into account.

12.1.4 In view of the aspects cited in the previous paragraph and the need to develop a suitable structure for the planning and implementation of multinational facilities, the establishment of Regional Multinational Organisations is to be expected. These bodies, made up of groups of States, would guarantee optimum use of the investments needed to implement and maintain air navigation services.

Details of the institutional aspects involved in the implementation of the ATM operational concept components – Institutional Aspects Task Force

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Agenda Item 6: Matters related to the organization of the ATM Committee

6.1 Review of the ATM Committee Terms of Reference and Work Programme and its Task Forces

6.2 ATM Committee Future Work Programme

ATM performance objective for CAR and SAM Regions related with the ICAO Global Plan Initiatives (GPI)

6.1.1 The Meeting noted that during the Regional NAM/CAR ATM Meeting (Santo Domingo, Dominican Republic 19 to 21 April 2006), and in the AP/ATM/12 Meeting (Lima, Peru, 17 to 21 March 2006), the Chief of Air Traffic Management Section at ICAO Headquarters gave comprehensive presentations on the Second Amendment to the *Global Air Navigation Plan (Doc 9750)* and the Global Plan Initiatives (GPI) that were developed by the Air Navigation Commission aiming to bring near and medium term benefits to the ATM community, taking advantage of currently available aircraft capabilities and ATC infrastructure and technology.

6.1.2 During the presentation, it was stressed that the work programmes of GREPECAS and its subgroups were very well organized, however, a review process should be undertaken to align the work programme into specific projects that would have the advantage of focusing all regional work activities, ensuring that resources are efficiently utilized. Noting that although ATM related projects were often overarching, Regions may also establish AGA, AIS, CNS or MET projects.

6.1.3 It was recognized that the work of GREPECAS should evolve based on the new processes described and that there would have to be a transition among this review process. It was also agreed that both CAR and SAM Regions should agree on a common set of work projects with specific high level strategic objectives. At the same time however, it was recognized that the Regions have differences and that implementation activities could vary to some degree on the basis of their specific requirements and may be progressed through Regional task forces of each Region.

6.1.4 As a follow-up to the discussions in the mentioned meetings, it was agreed to adopt a performance-based approach to the work programme and to take steps to ensure that the work fully supports the regional planning processes, the directives of the ICAO Council and the ALLPIRG/5 Conclusions.

6.1.5 Some guidelines considered for the performance objectives planning are:

- The work for the CAR and SAM Regions should be re-organized on the basis of project management techniques and performance-based objectives in support of the Global Plan strategic objectives in alignment with the ICAO Strategic Action Plan (SAP). The work programmes should be common for both Regions in accordance with the progress, characteristics and needs of each Region. The strategies agreed will serve as the CAR and SAM inter-regional work programmes; each one may adapt them to their own characteristics and needs for implementation.

- All the activities indicated in the performance objectives will be designed through strategies, concepts, action plan models and roadmaps which could be shared to align the inter-regional work with the fundamental objective of achieving interoperability and transparency to the highest level.

- In planning the activities, including those of the Secretariat, it should be ensured that the resources will be efficiently used, avoiding duplicated or unnecessary work and that the work/activities can easily be adapted to each Region. The planning should encourage optimization of human resources, financial savings as well as dynamic use of electronic communication means between States such as the Internet, videoconferences, teleconferences, e-mail, telephone and facsimile.

- The new work process and methods should ensure that the performance objectives can be measured with time lines and the regional work progress achieved can be easily reported to the ICAO Council and to the Air Navigation Commission.

6.1.6 The ANC has initiated actions in order to update the Terms of Reference of the different study groups in Headquarters as well as the ICAO Technical Work Programme (TWP) in the field of air navigation, which has been evolving toward an Air Navigation Integrated Programme (ANIP). The goal is to align all the work programmes in support of the strategic objectives of the ICAO Strategic Action Plan (SAP).

6.1.7 Each of the performance objectives describes benefits expected and their relation to the strategic objectives of ICAO, tasks designator in accordance with Doc 9854 together with regional work programme to be completed in short and medium term by the implementation groups involved, including description of strategic tasks and their relation to the GPIs of the Global Plan.

6.1.8 As a consequence of the above, and particularly considering the global plan initiatives (GPI) and the current work programme for the CAR and SAM Regions, the Meeting agreed to consider new implementation projects taking into account that, in the planning process, tasks should be focused on performance, supporting the processes of the ICAO business plan and considering guidelines from the ICAO Council and ALLPIRG/5 Conclusions.

6.1.9 When the new tasks were added to the previously agreed Regional plan, i.e. optimization of ATS route structure, improvement of the balance between demand and capacity, implementation of RNP approaches, improvement of data communications between ATS facilities, improvement of situational awareness, and implementation of the flexible use of airspace, it was necessary to introduce the pertinent changes in the ATM Committee Work Programme, and as a consequence, it was also necessary to amend the Terms of Reference and Work Programme of the current task forces, as well as the proposal to activate new groups in order to execute the proposed work plan. Together with the referred tasks, the initiatives of the global plan associated with each of them have been identified.

6.1.10 It was be mentioned that GREPECAS/13, when reviewing the Work Programme and Terms of Reference of GREPECAS and its contributory bodies, particularly those related to the ATM/CNS Subgroup, took note of a proposal to develop planning documentation for a gradual implementation of the communications, navigation and surveillance infrastructure that would take into account the ATM requirements and therefore the operational requirements of the users in the CAR and SAM Regions.

6.1.11 This proposal was based on CNS/ATM planning systems taking into account the new Global ATM Operational Concept, and on the premise that the new ATM systems implementation would be framed within this concept and it was also based on the premise that the Subgroup should develop a CAR/SAM strategy for navigation followed by strategies for communications and surveillance. It was sustained that in order to carry out these new tasks the Subgroup needed to add tasks to develop such strategies and to consider the possibility of modifying the methodology of the Subgroup to allow it to form task groups comprising ATM and CNS experts.

6.1.12 The Meeting recognized that in the ATM Committee Work Programme, several tasks, particularly those related with communications, navigation and surveillance and automation which are in progress, would be executed jointly with the CNS Committee. In this connection, the ATM Committee reviewed each of them, and introduced the changes proposed during the Meeting and decided that the same be submitted to the CNS Committee for its study.

6.1.13 The Meeting also noted that each task is accompanied by an initial work programme, and therefore analysed each one of them and introduced the changes deemed pertinent, as well as the possible dates of implementation.

6.1.14 The Meeting recalled that GREPECAS deemed pertinent that the planning of ATFM tasks and PBN be developed in a harmonized manner between CAR and SAM Regions, recognising at the same time that the implementation shall be executed according to the operational needs of each Region. In this connection, some action plan models have been approved by GREPECAS which will serve as reference material for the CAR and SAM Regional implementation groups.

6.1.15 As a consequence of the above, and after a fruitful exchange of opinion on the Work Programme and Composition of the ATM Committee and its task forces, the Meeting deemed pertinent to reflect the necessary changes in the corresponding tables and approved the following:

DRAFT
DECISION ATM/5/14 **TERMS OF REFERENCE, WORK PROGRAMME AND COMPOSITION OF THE ATM COMMITTEE**

That the Terms of Reference, Work Programme and Composition of the ATM Committee, presented as **Appendix A** to this part of the Report, are adopted.

DECISION ATM/5/15 **TERMS OF REFERENCE, WORK PROGRAMME AND COMPOSITION OF THE ATM COMMITTEE TASK FORCES**

That the Terms of Reference, Work Programme and Composition of the Task Forces, as presented in **Appendix B** to this part of the Report, are adopted.

6.1.16 Based on the performance objectives which describe expected benefits, States, Territories and International Organizations should develop their own strategy or action plan for implementation that reflects work programme, timelines, individual parties responsible and status of progress and to report advances of those activities, taking into account Chapter 4 of the *Plan for the Transition to the ATM System in the CAR/SAM Regions*. Additionally, they should consider detailed information on required activities to complete implementation and a means to provide feedback on progress of work through an annual reporting process, which will help administrations to prioritize activities and identify support needed. The annual reports will also help in determining any assistance required for the ICAO Regions.

6.1.17 Taking into account the above, States, Territories and International Organizations of the CAR and SAM Regions, in coordination with ICAO, should continue the process to develop, reorganize and implement regional and national ATM work programmes, therefore the following Draft Conclusion was agreed:

DRAFT CONCLUSION ATM/5/16 RE-ORGANIZATION OF THE WORK PROGRAMMES TO SUPPORT THE ATM PERFORMANCE OBJECTIVES FOR THE CAR AND SAM REGIONS

That, to support the evolution from a system-based towards a performance-based approach for the planning and implementation of air navigation infrastructure:

a) CAR/SAM States, Territories and International Organizations take the necessary actions to develop and implement national ATM work programmes in accordance with the performance objectives identified in Chapter 4 of the *Plan for the Transition to the ATM System in the CAR/SAM Regions*; and

b) ICAO continue the coordination to re-organize the CAR/SAM ATM Work Programmes in accordance with the new Global Plan Initiatives (GPI) and to support ICAO Strategic Objectives.

APPENDIX A

TERMS OF REFERENCE AND WORK PROGRAMME OF THE ATM COMMITTEE

1. **Terms of reference**

a) Assist and guide CAR and SAM States/Territories/International Organisations in the implementation of ATS safety management programmes.

b) Study, analyse, propose, and do the follow-up of projects that allow the optimisation of Airspace Organisation and Management (AOM), Air Traffic Services (ATS), Air Traffic Flow Management (ATFM), and Search and Rescue (SAR) in the CAR/SAM Regions, with a view to comply with ICAO strategic objectives, based on Global Plan Initiatives (GPI).

c) Be informed and analyse guidance material developed on ATM systems by other ICAO experts group for its posible adoption in the CAR and SAM Regions.

Number	**Task description**	**Priority**	**Date**	
			Start	**End**
General				
ATM-1	Based on the methodology standardised by the ICAO Council, identify, assess, and report air navigation deficiencies, assigning priorities.	N/A	Permanent	N/A
ATM- 2	Monitor the corresponding ATM parts of the CAR/SAM Regional CNS/ATM Implementation Plan, and keep them updated as a working document.	N/A	Permanent	N/A
ATM-3	Analyse and evaluate 300 ft or more large-height deviations (LHD)	A	Permanent	N/A
ATM-4	Identify activities for the implementation of new meteorological services related to both training and the implementation of the new CNS/ATM systems. Note: Joint MET/ATM Task Force (AERMETSG Decision 6/24)	B	2005	2009

Number	Task description	Priority	Date	
			Start	**End**
Performance-based navigation (PBN) - GPI 5, 7, 8, 10, 11, 12, 20, 21				
ATM-5	Prepare a performance objective for RNAV and RNP implementation, taking into account the ICAO performance-based navigation concept.	A	PHASE 1	
			2005	2010
			PHASE 2	
			2011	2015
Flexible use of airspace - GPI 1				
ATM-6	Prepare a performance objective for the implementation of the flexible use of airspace, based on the Global Air Navigation Plan guidelines.	B	2007	2010
Air traffic flow management (ATFM)- GPI 6, 7				
ATM-7	Prepare a performance objective for the implementation of CAR and SAM harmonized inter-regional air traffic flow management (ATFM), based on the Global Air Navigation Plan guidelines.	A	2006	2015
ATM automation - GPI 6, 7, 9, 17, 18, 19				
ATM-8	Develop a performance objective for the implementation/integration of ATM automated systems, based on Global Air Navigation Plan guidelines	Together with CNSC	2006	2015
Search and rescue				
ATM-9	Develop a quality assurance programme for search and rescue services (SAR), according to the IAM/SAR manual, for its future implementation in the CAR/SAM Regions.	B	August 2003	ATMC/6

APPENDIX B

TERMS OF REFERENCE AND WORK PROGRAMME OF THE ATM COMMITTEE TASK FORCES

TERMS OF REFERENCE AND WORK PROGRAMME OF THE PERFORMANCE-BASED NAVIGATION TASK FORCE (PBN/TF)

1. Terms of reference

Carry out specific studies and develop guidance material for RNAV/RNP implementation in the en-route, terminal, and approach flight phases, taking into account the performance-based navigation (PBN) concept, according to the ICAO Strategic Objectives and Global Plan Initiatives (GPI) on this matter (GPI 5, 7, 10, 11, 12, 20, 21).

2. Work Programme

a) Develop a Model PBN Implementation Action Plan for En-Route Operations, taking into account the CAR/SAM Roadmap, with a view to optimising the ATS route structure.
Note: Implementation by CAR/SAM implementation groups.
b) Develop a Model Action Plan for PBN Implementation in the TMA.
Note: Implementation by CAR/SAM States.
c) Develop a Model Action Plan for PBN Implementation for approach operations.
Note: Implementation by CAR/SAM States.
d) Develop guidelines for PBN implementation for TMA and approach operations.
e) Analyse the application of GNSS to support all flight phases.
f) Establish training requirements.
g) Verify the status of implementation of WGS-84.
h) Follow-up of PBN implementation for en-route, TMA, and approach operations to ensure its harmonisation intra- and inter-regionally, as well as among the States involved.
i) Submit the developed PBN work to the ATM Committee.

3. Composition

TBD

4. Rapporteur

TBD

TERMS OF REFERENCE AND WORK PROGRAMME OF THE FLEXIBLE USE OF AIRSPACE TASK FORCE

1. Terms of reference

Conduct specific studies and develop guidance material for the implementation of the flexible use of airspace, to support the implementation of the CAR/SAM Regional Air Navigation Plan, in keeping with ICAO Strategic Objectives and Global Plan Initiatives on this matter (GPI 1).

2. Work Programme

a) Develop a Model Action Plan for the Flexible Use of Airspace
b) Develop guidelines for the implementation of procedures for the flexible use of airspace.
c) Develop a model letter of agreement between ATS units and military units or other users.
d) Present the work carried out to the ATM Committee

3. Composition

TBD

4. Rapporteur

TBD

TERMS OF REFERENCE AND WORK PROGRAMME OF THE ATFM TASK FORCE

1. Terms of reference

Carry out specific studies in order to determine and elaborate guidance material on an Air Traffic Flow Management (ATFM) system to ensure an optimum air traffic flow in the CAR/SAM Regions.

2. Work Programme

a) Review the documentation on air traffic flow management and the policies globally established;
b) Review the ATFM regional plans of other regions;
c) Review the existing ATFM national plans;
d) In coordination with the GREPECAS Task Force on Institutional Aspects consider, in the development of all its activities the institutional aspects involved in a multinational environment;
e) Review the ATFM technical and operational aspects;
f) Identify the minimum requirements to implement ATFM;
g) Define the principles in which the CAR/SAM ATFM service will be based;
h) Evaluate different alternatives and strategies that may satisfy the future air traffic flow management in the CAR/SAM Regions;
i) Prepare the necessary ATFM documentation for the CAR/SAM Regions;
j) Harmonize the ATFM implementation plans among the CAR and SAM Regions as well as with other ICAO Regions; and
k) Present not later than ATM/6 Committee the documentation for their approval.

3. Composition

Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Haiti, Jamaica, Mexico, Panama, Paraguay, Peru, Trinidad and Tobago, United States, Uruguay, Venezuela, COCESNA, IATA and IFALPA.

4. Rapporteur

Joe Hof

TERMS OF REFERENCE AND WORK PROGRAMME OF THE ATM AUTOMATION TASK FORCE (AUTOM/TF)

1. Terms of reference

Conduct specific studies and develop guidance material for the implementation of automated ATM systems to support the implementation of the CAR/SAM Regional Air Navigation Plan, in keeping with ICAO Strategic Objectives and Global Plan Initiatives (GPI) on this matter (GPI 6, 7, 9, 17, 18 and 19).

2. Work Programme

a) Review and update the Interface Control Document (ICD) for its use in short and medium term in the CAR/SAM Regions.
b) Analyse and prepare proposals for updating the regional strategy for the evolutionary implementation of ATM automation in the CAR/SAM Regions according to the new ICAO Global Air Navigation Plan (Doc 9750) and other related initiatives.
c) Review and make recommendations on proposals from the RLA/98/003 or other Subregional groups pertaining to ATM automation.
d) Prepare general guidance material containing references on the ATM automation functions and its improvement levels for ATS units.
e) Develop and document an action plan that facilitate the implementation of new ATM automated systems, as well as the interfacing among existing ATM automated systems.

3. Composition

Arrile Torino (Brazil), José Arturo García Torres (Colombia), Ramón Navarro (Cuba), José Luis Fernández Rosario (Dominican Republic), Roger Prudent (France), Marc Paulemon (Haiti), Sergio Valencia (México), Panama, Juan de Mata (Spain), C. Martin Cacioppo (United States), José Ramón Oyuela (COCESNA) and IFATCA.

Note: *Composed by ATM and CNS experts.*

4. Rapporteur

Sergio Valencia (México).

* * * * * *

Agenda Item 7: Other matters

West Atlantic Route System (WATRS-Plus) Airspace Redesign and separation reduction initiative

7.1 The United States has begun to coordinate plans and requirements to implement an airspace redesign and lateral separation reduction in the West Atlantic Route System including the Miami Oceanic airspace and the San Juan Flight Information Region (FIR) airspace (WATRS-Plus airspace). This initiative can enhance airspace capacity, air traffic control (ATC) flexibility and aircraft operating efficiency. **Appendix A** to this part of the report presents details are provided on tasks to be accomplished, a draft airspace redesign chart and discussion of operational requirements under development. **Appendix B** to this part of the report shows a presentation of the guidance to operators.

APPENDIX A

WEST ATLANTIC ROUTE SYSTEM (WATRS) PLUS AIRSPACE REDESIGN AND SEPARATION REDUCTION INITIATIVE

1. Introduction

1.1 The West Atlantic Route System (WATRS) was redesigned in 1995 to provide more efficient operations. This revision eliminated many restrictive routing requirements, and prepared the airspace for the introduction of Reduced Vertical Separation Minima. We now see the opportunity to further enhance WATRS operations by implementing a reduced lateral separation minimum and redesigning the route system to increase both capacity and operating efficiency. Improvements to aircraft navigation and ground ATC capability including the use of the Ocean21 automation system at New York Center, enable us to pursue this opportunity. We have designated this effort as the "WATRS-Plus[1] Airspace Redesign and Separation Reduction Initiative" (WATRS-Plus airspace is depicted in **Attachment A)**.

1.2 To progress international coordination, the Federal Aviation Administration (FAA) is working with the International Civil Aviation Organization (ICAO) North American, Central American, and Caribbean (NACC) Regional Office and with the ICAO European and North Atlantic (EUR/NAT) Office to provide inputs to the appropriate North Atlantic (NAT), Caribbean (CAR), and South America (SAM) working groups and to revise the appropriate ICAO documents. In addition, the NACC and the FAA convened a NAT/CAR ATS Routes Group meeting in September 2006 to progress work on this initiative and have coordinated to establish a Routes Working Group for this project.

1.3 The initial meeting of the NAT/CAR ATS Routes Working Group was held on 19-21 September, 2006 in Miami, Florida. The meeting was attended by technical and operational representatives from four CAR States, the International Air Transport Association (IATA), five major operators, the U.S. Air Transport Association, the National Business Aviation Association, IFATCA and the U.S. Department of Defense. The group reviewed basic program plans and requirements, reviewed and re-worked a draft airspace redesign chart and conducted discussions to harmonize the redesign plan with adjoining ATS route structures.

1.3.1 During the meeting, the group reviewed project progress to date, provided inputs concerning supporting tasks and events, discussed operator and aircraft Required Navigation Performance 10 (RNP 10) requirements, developed airspace redesign chart draft 060921 (see **Attachment B**) and identified ATS provider/airspace operator issues to be addressed. The group reached the following basic agreements:

a) The coordination and will progress work on the project through coordination with affected States, Air Traffic Service Providers (ATSP), and airspace operators;

b) ICAO/NACC will conduct international coordination as needed; and

[1] WATRS Plus refers to the designated route system and surrounding FAA-controlled airspace.

c) information dissemination including an action plan with timelines is vital to success of the WATRS-Plus project.

Note: Draft redesign chart 060921 will require further coordination. For example, route "Q" will probably not be anchored at BETIR as is shown on the current draft.

1.3.2 In addition, the United States took the action to coordinate with ATSPs that were unable to attend the Miami meeting. This action and others are documented in the list of tasks and action items included in the meeting report.

1.3.3 Working papers from the meeting are posted on the NACC Office Website (www.icao.int/nacc) under "Meetings". Presentations given at the meeting can be found at: www.faa.gov/ats/ato/natcar_wg.htm

2. Program Overview

2.1 The United States announced the WATRS-Plus Airspace Redesign and Separation Reduction Initiative at the Twelfth Meeting/Workshop of ATM Authorities and Planners in the CAR/SAM Regions (AP/ATM/12) in Lima, Peru, at the North Atlantic Implementation Management Group (NAT/IMG) in May 2006, and in June 2006 at the North Atlantic System Planning Group (NAT/SPG) in Paris. The initiative is led by the United States (FAA Oceanic Separation Reduction Working Group - OSRWG), which is chaired by FAA's Oceanic Standards office.

2.2 The project has the following major objectives:

a) Reduce lateral separation from 90 nm to 50 nm for aircraft/operators approved for RNP 10 or better;

b) have WATRS-Plus operators obtain operational approval for RNP 10 or better from the appropriate State authority;

c) redesign WATRS-Plus airspace to enable more efficient operations and enhance enroute efficiency/capacity; and

d) harmonize WATRS-Plus transition to/from Caribbean and North Atlantic Regions' airspace and/or route structures.

2.3 **Target Implementation Date**. The United States plans to announce the target implementation date later this year after a final review of all technical and operational factors affecting the implementation schedule. In consideration of various implementation issues, the United States is now considering an implementation date in June 2008.

2.4 **United States - FAA Center Participation**. The following FAA centers are participating in the project: New York, San Juan, Miami, Jacksonville and Washington Centers.

2.5 **ICAO and International Group Coordination**. As noted above, in coordination with the ICAO NACC and EUR/NAT offices, the United States will provide inputs, updates and obtain feedback from the appropriate ICAO groups.

2.6 **Industry Coordination**. As the project progresses, the United States will continue to coordinate with the appropriate national and international industry groups and operators.

2.7 **Key Tasks**. The following are key tasks that the United States has identified to date to progress the project to implementation:

a) Establish a concept of operations (see draft WATRS-Plus Concept of Operations at **Attachment C**);

b) assess United States rulemaking requirements;

c) publish and coordinate aircraft/operator authorization requirements/documents for use by United States and international operators as well as State aviation authorities;

d) conduct airspace analysis, redesign, and ATC simulations;

e) address impacts to ATC automation and make modifications, as needed;

f) conduct operator information and education programs as needed;

g) coordinate program requirements and issues with adjoining ATSPs, other State regulators, and ICAO;

h) conduct safety analysis to support document revisions and implementation decision making;

i) revise appropriate ICAO and FAA documents;

j) educate FAA Flight Standards Field Offices and Inspectors;

k) complete necessary FAA ATC Center actions; and

l) track and assess operator/aircraft fleet readiness for reduced lateral separation to be applied.

3. Concept of Operations

3.1 A draft "WATRS-Plus Concept of Operations" is posted at Appendix C. This draft was reviewed at the ATS Routes Working Group in Miami. The draft proposes: vertical and horizontal boundaries of WATRS-Plus Airspace; operational policies for transition airspace and application of lateral separation standards; operator/aircraft requirements for RNP 10 and timeframes for implementation target dates.

3.2 The draft document states that RNP 10 will be the minimum operator/aircraft navigation requirement for 50 nm lateral separation to be applied. An FAA survey of equipage for aircraft operating in WATRS airspace has indicated that a significant majority of the aircraft will meet RNP 10 technical requirements without modification.

3.2.1 The following are the basic operator and aircraft requirements for RNP 10:

a) Operators/aircraft must meet the authorization criteria published in ICAO Doc 9613 (Manual on RNP), Appendix E or FAA Order 8400.12A (RNP 10 Operational Approval) (as amended);

b) aircraft must be equipped with two operational Long-Range Navigation Systems (LRNS) meeting RNP 10 standards; and

c) there is a 6.2 hour time limit between position updates for aircraft on which Inertial Navigation System (INS) or Inertial Reference Unit (IRU) serve as the only LRNS, unless an extended time limit has been approved. (Extended RNP 10 time limits of 10 hours & greater have been approved for many IRU systems. The RNP 10 time limit should only be an issue in WATRS-Plus airspace for INS only equipped aircraft on westbound flights entering the airspace from Europe, Africa and the Mid-East).

3.2.2 Aircraft that do not have RNP 10 approval or better can file Flight Plan in WATRS-Plus airspace at any altitude, however, the FAA anticipates that aircraft approved for RNP 10 may have a better likelihood of obtaining their preferred route and altitude. The FAA is conducting investigation, including traffic simulation with the purpose to establish appropriate measures to accommodate non-RNP 10 approved aircraft.

4. Significant Near Term Actions

4.1 The following are United States priority efforts for the remainder of this year:

a) Coordinate the initial version of the Action Plan for implementation;

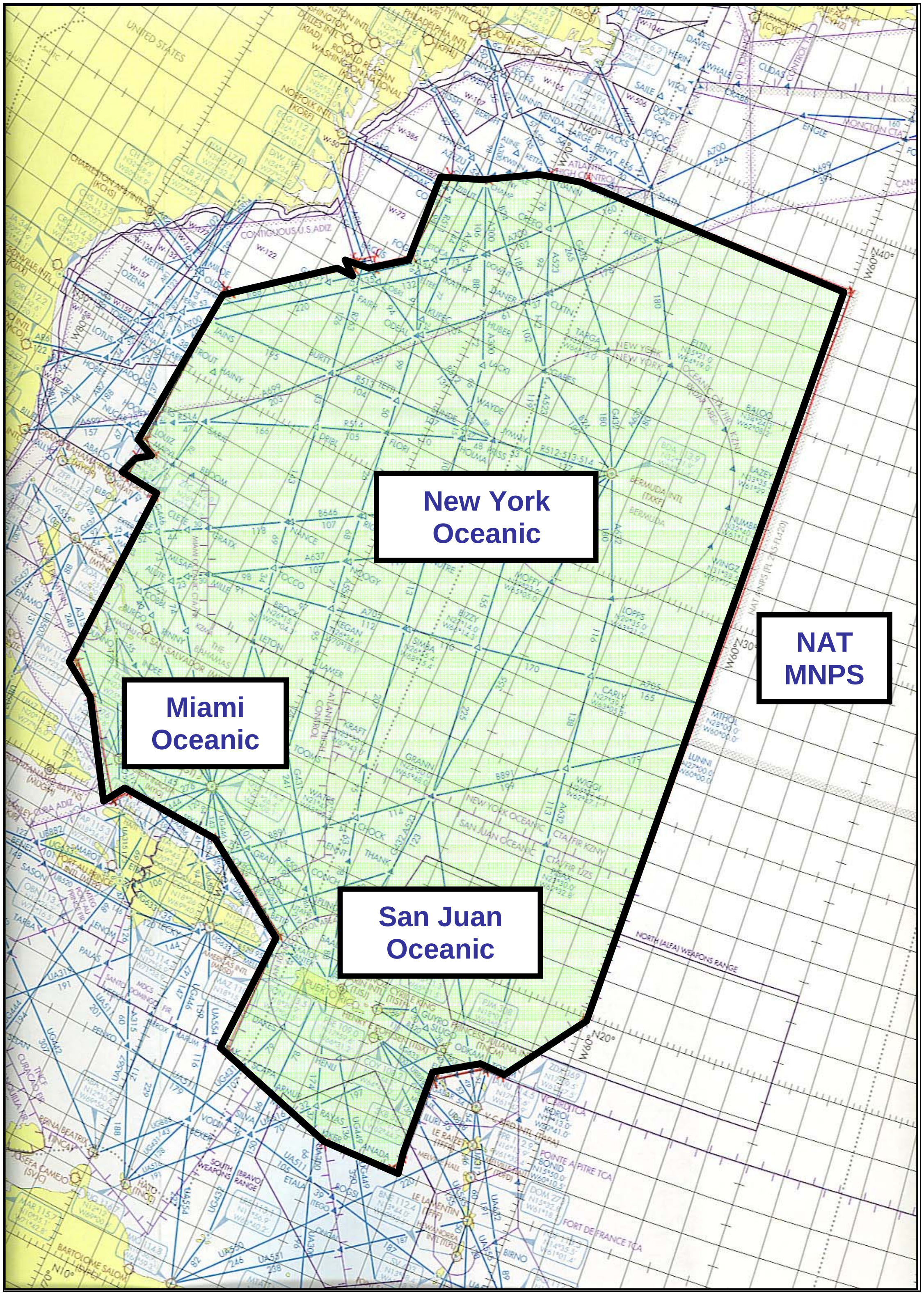
b) progress and continue to coordinate the Concept of Operations document;

c) progress studies and simulations to validate policies and procedures to accommodate a small percentage of non-RNP 10 aircraft; and

d) finalize and announce target implementation date and basic operator/aircraft requirements for implementation of the airspace redesign, reduced lateral separation and RNP 10.

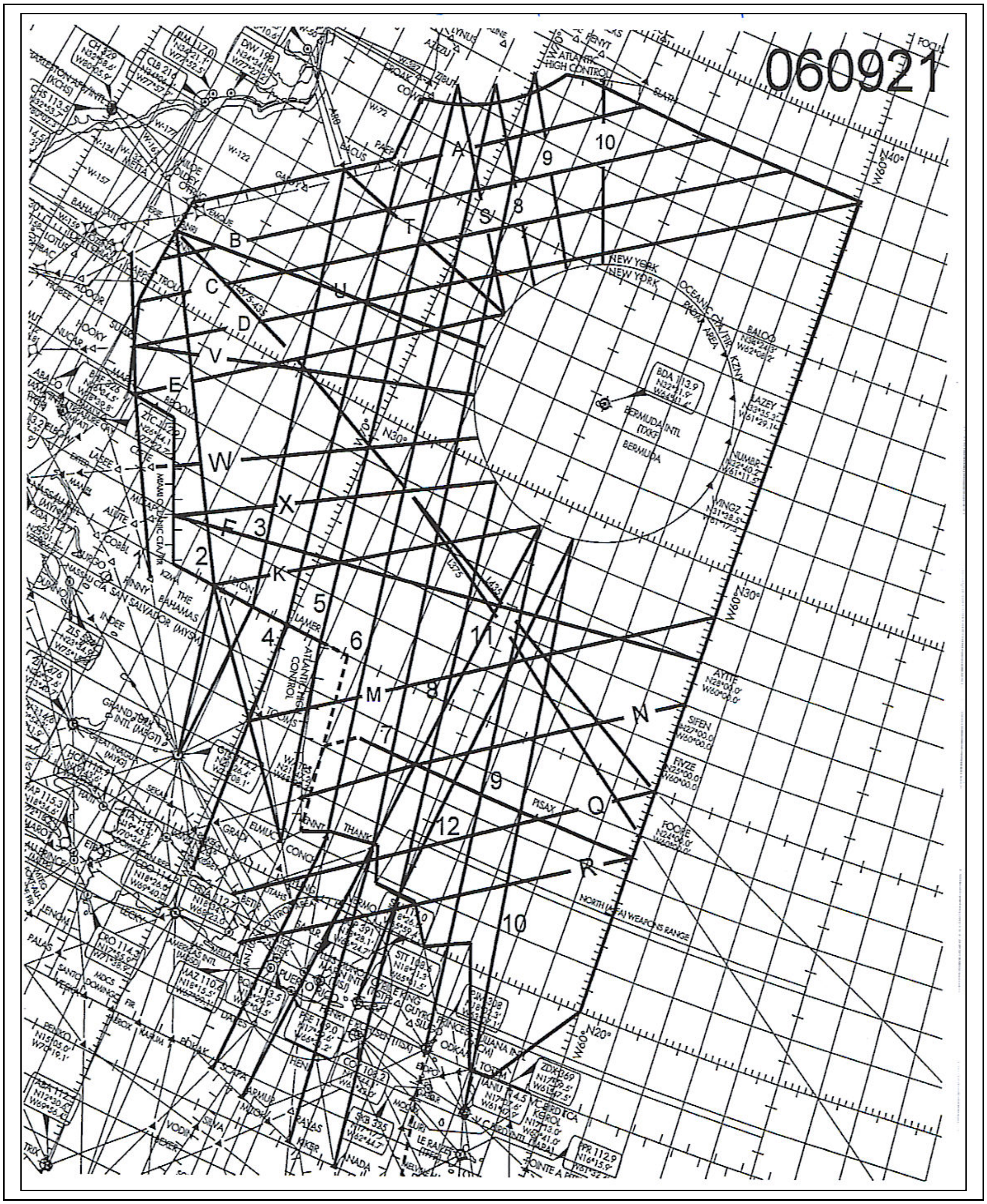
ATTACHMENT A

WATRS-PLUS AIRSPACE BOUNDARY CHART



ATTACHMENT B

AIRSPACE REDESIGN CHART DRAFT 060921



ATTACHMENT C

FAA Draft WATRS-Plus Concept of Operations

1. Vertical and horizontal boundaries of airspace

a. Horizontal Boundary. The coordinates defining the horizontal boundary of WATRS airspace are published in ICAO Doc 7030, NAT and CAR Supplementary Procedures and on the WATRS-Plus Webpage (www.faa.gov/ats/ato/xxxx.htm). "Plus" refers to airspace in Miami Oceanic, New York Oceanic and the San Juan FIR through which fixed ATS routes transit to WATRS. A chart depicting the WATRS-Plus boundaries is published on the WATRS-Plus Webpage.

b. Vertical Boundary. WATRS-Plus airspace extends from the floor of controlled airspace to FL ________TBD.

2. Transition airspace

a. Transition airspace is defined as airspace adjoining WATRS-Plus airspace where 50 nm lateral separation may be applied between aircraft approved to RNP 10 or better that are in transit to or from WATRS-Plus airspace.

b. The following areas are considered transition airspace: TBD

3. Lateral separation standard(s) to be applied

a. 50 nm Lateral Separation.

(1) WATRS Plus Airspace. 50 nm lateral separation will be applied between aircraft pairs approved for RNP 10 or better regardless of their altitude in WATRS-Plus airspace.

(2) Transition airspace. 50 nm lateral separation may be applied between aircraft approved to RNP 10 or better that are in transit to or from WATRS-Plus airspace.

b. 90 nm Lateral Separation. 90 nm lateral separation will be applied whenever one or both aircraft in a pair are not authorized RNP 10.

c. Operator Filing Requirement. Operator/aircraft that are approved RNP 10 (or better) that file an **oceanic route** that falls within WATRS-Plus airspace boundaries must file a flight plan equipment suffix that shows that capacity. Operators must file the flight plan equipment suffix on their (ICAO) flight plan that correctly indicates their approved navigation capability.

4. Provisions for accommodating aircraft not meeting RNP 10 or better

a. Aircraft that do not have RNP 10 approval or better can file in WATRS-Plus airspace at any altitude, however, the FAA anticipates that aircraft approved for RNP 10 may have a better likelihood of obtaining their preferred route and altitude. The FAA is conducting investigation, including traffic simulation with the purpose to establish appropriate measures to accommodate non-RNP 10 approved aircraft.

5. Aircraft Population RNP 10 Authorization Objective

a. Implementation Objective: Percentage of Flights Authorized RNP 10 or better. The WATRS-Plus Task Force will progress its work with the objective of having approximately **85% of flights** in WATRS-Plus airspace approved for RNP 10 or better by one month prior to the project implementation date.

b. RNP 10 or Better Compliance To the Maximum Extent Possible. The WATRS Plus Task Force will advocate that all operators/aircraft that fly in WATRS-Plus airspace obtain RNP 10 or better approval.

6. Concept for use of Ocean21 in New York Oceanic Airspace

a. Ocean21 will provide the New York Oceanic air traffic controller with a set of automated tools to assist in assuring that the correct separation is applied between aircraft with a mix of navigation capabilities (i.e., RNP 10 or better, non-RNP 10). Automated tools will include: automated conflict prediction and reporting (CPAR), graphic dynamic situation display to the controller and interactive electronic flight strips, aircraft labels and aircraft position symbols.

7. Concept for use of fixed tracks or routes

a) Fixed tracks will be planned based on a 50 nm lateral separation minima.

8. Concept for transfer of control to adjoining FIR's

a. Transfer of Flights into non-U.S. Controlled NAT MNPS Airspace. New York Center will provide currently established (60 nm) lateral separation minima when transferring aircraft transiting to non-US controlled NAT MNPS airspace.

b. Transfer to Other Oceanic FIRs. Aircraft transiting FAA controlled airspace to other Oceanic FIRs will be transferred with the applicable separation standard per regional documentation.

c. Transition airspace. TBD

9. Flight Plan Equipment Suffix Requirements

a. ICAO Flight Plans. To inform ATC and to key Ocean21 automation that they have RNP 10 or better authorization and are eligible for 50 nm separation, operators must annotate item 10 (Communication, Navigation and Approach Equipment) of the ICAO Flight Plan with the appropriate equipment suffix.

Note 1: The ICAO Flight Plan, letter "R" currently indicates that the aircraft will maintain the appropriate RNP type for the entire flight through airspace where the RNP type is applied.

Note 2: The ICAO Flight Plan Study Group is reviewing flight plan policies including aircraft equipment suffixes. The WATRS-Plus Task Force will maintain contact with the appropriate FAA and ICAO organizations to track pertinent ICAO flight plan change developments.

10. Aircraft/operator authorization requirements (equipage, RNP 10 authorization documents)

a. For 50 nm lateral separation to be applied, operators will be required to obtain RNP 10 or better approval from the appropriate State authority.

b. Guidance To Be Used, ICAO Document 9613, FAA Order 8400.12 (as amended) and FAA Order 8400.33 will be used as guidance for States and operators.

Note: ICAO Doc 9613 is in the process of being incorporated into the ICAO Performance Based Navigation Manual.

11. Target Dates:

a. Implementation Decision Date: calendar date, 3 months prior to target implementation date.

b. Operator/aircraft RNP 10 or better Approval Date: AIRAC date, 1 month prior to target implementation date.

c. Target Implementation Date: AIRAC date, when the new 50 nm lateral separation standard and airspace redesign will be applied. Currently planned for June 2008.

WATRS Plus Airspace Redesign and Separation Reduction

Federal Aviation Administration

Operational Approval for RNP 10

Presented by: Robert Swain
Representing FAA Flight Technologies and Procedures Division (AFS-400)

Date: 19 September 2006

Introduction

- RNP 10 applied to enable 50NM lateral separation in Pacific oceanic operations since 1998
- RNP 10 applied in EUR/SAM Corridor since Oct 2001
- This briefing provides an overview of:
  - operator and aircraft RNP 10 requirements and…
  - policy and processes for operators to obtain operational approval for RNP 10

WATRS Plus Operational Approval for RNP-10
September 2006
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APPLICABLE ICAO DOCUMENTS

- ICAO Document 9613 (Manual On Required Navigation Performance (RNP)
  - **Appendix E: Guidance Material For The Development Of An RNP 10 Operational Approval Process**
- ICAO Performance Based Navigation (PBN) Manual…..under development
  - **Draft Vol. II, Chapter 1 is "RNP 10 Operations"**

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ICAO DOCUMENTS (CONT.)

ICAO Doc 9613 offers as example State approval processes:

– **FAA Order 8400.12** (Required Navigation Performance 10 (RNP 10) Operational Approval) and…

– **Australian Civil Aviation Advisory Publication RNP 10-1**

APPLICABLE FAA Documents

- **FAA Order 8400.12A**
  - Will be updated to delete dated material
  - Do not anticipate significant policy changes
- **FAA Order 8400.33** (Authorization for RNP-4 in Oceanic and Remote Area Operations).
- **Both documents now posted on FAA Webpage:** CNS Requirements & Options & Operational Policy in Pacific Oceanic Airspace, Sections 2 & 3
  - **www.faa.gov/ats/ato/cns.htm**

FAA Documents (Cont.)

- **Handbook Bulletin** (HBAT 98-16A, HBGA 98-03A) (Approval of Aircraft and Operators for Flight in Airspace Where RNP-10 Is Applied)
  - Will be updated & incorporated into FAA Inspector Handbooks
- **Operations Specifications Paragraph:** B036 (Class II Navigation Using Multiple Long-Range Navigation Systems (LRNS))
- **IGA Automated Letter of Authorization (LOA):** LOA B036 (Operations in Required Navigation Performance Airspace)

Content of Application For RNP-10 Operational Approval

1. **RNP 10 Aircraft Eligibility Group:** airworthiness documents that establish aircraft/navigation system group, its RNP-10 approval status, and list of airframes
2. **Approved RNP 10 Time Limit For Aircraft Equipped With Only INS or IRU Systems**

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Content of Application For RNP 10 Operational Approval

3. **RNP 10 Area of Operations For INS or IRU Only Aircraft:** documentation that establishes RNP 10 area of operations or tracks for which the specific aircraft/navigation system is eligible

- Show method and effect of aircraft position updating enroute
- Conduct route evaluation in accordance with 8400.12, paragraph 15

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Content of Application For RNP 10 Operational Approval

4. **Operating Practices and Procedures:** documentation that operator has adopted operating practices and procedures related to RNP 10 operations
5. **Pilot and Dispatcher Training:** documentation that operator pilot and if applicable, dispatcher knowledge of RNP 10 policy & procedures will be adequate.

- For commercial Air Transport operators: training programs updated

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Content of Application For RNP 10 Operational Approval

6. **Maintenance Practices and Procedures:** documentation that appropriate maintenance practices and procedures have been adopted
7. **Minimum Equipment List (MEL):** MEL updates, if applicable.
8. **Operating History:** operating history identifying past problems and incidents, if any, and actions taken to correct the situation.

Content of Application For RNP 10 Operational Approval

9. **Follow-up Action After Navigation Error Reports and Potential For Removal of RNP 10 Operating Authority:** awareness of necessity for follow up action after navigation error reports and the potential for removal of RNP 10 operating authority.

RNP 10 Navigation System Requirements

- Two operational Long-Range Navigation Systems (LRNS) meeting RNP 10 standards required
- **RNP 10 time limit for INS & IRU systems:**
  6.2 hour time limit between position updates for aircraft on which INS or IRU's serve as the only LRNS
  - **unless extended time limit approved in accordance with 8400.12**

RNP 10 Time Limit for INS & IRU Systems (cont.)

- Extended RNP 10 time limits of 10 hours & greater already approved for many IRU systems
- Time limit may be issue for INS only equipped aircraft on westbound flights entering WATRS Plus airspace from Europe, Africa and the Mid-East.

8400.12 Aircraft RNP 10 Eligibility Groups

<u>Eligibility Group 1</u> – Aircraft Eligibility Through RNP Certification

- RNP compliance documented in Airplane Flight Manual (AFM)
  - Typically not limited to RNP 10
  - Example: B747-400 or A-340 incorporating FANS 1/A package

8400.12 Aircraft RNP 10 Eligibility Groups

<u>Eligibility Group 2</u> – Eligibility Though Prior Navigation System Certification

1. Dual INS or IRU's approved in accordance with **Part 121, Appendix G** (6.2 hour RNP 10 time limit, unless action taken to extend)
2. Dual INS or IRU **approved for NAT MNPS or Australian RNAV operations (**6.2 hour RNP 10 time limit unless action taken to extend)

RNP 10 Eligibility Group 2 (cont.)

3. Dual GPS approved for **primary means of navigation in oceanic and remote areas**

- Approved in accordance with **AC 20-138 (as amended)** (34-minute limit on Fault Detection & Exclusion (FDE) non-availability
- GPS/WAAS systems installed in accordance with AC 20-138A incorporate primary means capability
  - **TSO-C145a and TSO-C146a are applicable**

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RNP 10 Eligibility Group 2 (cont.)

4. Multi-sensor systems integrating GPS (GPS integrity provided by RAIM or Aircraft Autonomous Integrity Monitoring (AAIM))….approved in accordance with **AC 20-130A**
5. Single INS or IRU and single TSO C-129 authorized GPS with approved FDE

- 34-minute FDE non-availability time limit

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8400.12 Aircraft RNP-10 Eligibility Groups

Eligibility Group 3 – Aircraft Eligibility Through Data Collection

1. **8400.12, Appendix 1 (Sequential Method):** uses Pass/Fail graphs to assess INS or IRU performance and RNP-10 time limit
2. **8400.12, Appendix 6 (Periodic Method):** allows use of hand-held GPS to assess INS or IRU performance and RNP-10 time limit

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Contacts

- **Madison Walton (AFS-400)**
  - 202-385-4596; madison.walton@faa.gov
- **Roy Grimes (CSSI, Inc., FAA Program Support)**
  - 202-863-3692; RGrimes@cssiinc.com

Questions?