SAM/IG/7

INTERNATIONAL CIVIL AVIATION ORGANIZATION

South American Office

**Seventh Workshop/Meeting of the SAM Implementation Group
Regional Project RLA/06/901**

(SAM/IG/7)

FINAL REPORT

Lima, Peru, 23 to 27 May 2011

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HISTORY OF THE MEETING

ii-1 PLACE AND DURATION OF THE MEETING

The Seventh Workshop/Meeting of the SAM Implementation Group (SAM/IG/7) was held at the premises of the ICAO South American Regional Office in Lima, Peru, from 23 to 27 May 2011, under the auspices of Regional Project RLA/06/901.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Oscar Quesada, Regional Deputy Director of the ICAO South American Office, greeted the participants for the continuous support provided to activities developed at regional scale by the South American Office, as well as to the civil aviation authorities and national and private organizations of the ICAO South American Region for the continuous support to the activities of the SAM Implementation Group. He highlighted the importance of Regional Project RLA/06/901, which hosts these events, as well as the new GREPECAS methodology based on results through programmes and projects. He finally highlighted the importance of issues to be dealt with in the agenda of the Seventh Workshop/Meeting, and emphasized that the teamwork shown by the Implementation Group is essential to execute the projects that have been adopted by the Region.

ii-3 SCHEDULE, ORGANIZATION, WORKING METHODS, OFFICERS AND SECRETARIAT

The Meeting agreed to hold its sessions from 09:00 to 15:00 hours, with appropriate breaks. The work was done with the Meeting as a Single Committee, Working Groups and Ad-hoc Groups.

Mr. Fernando Hermoza, delegate from Perú, was unanimously elected as Chairman of the Meeting

Mr. Jorge Fernández, ATM/SAR Expert by the ICAO Regional Office in Lima acted as Secretary, assisted by Messrs. Onofrio Smarrelli, RO/CNS, Celso Figueiredo, RO/ATM/SAR and Roberto Arca, RO/ATM/SAR/AIM, from the Lima Office. Likewise, the Secretariat had the support of Messrs. Julio de Souza Pereira Andrés Prado, Juárez Franklin Gouveia, José Tristão Mariano Obdulio Gouarnalusse, Alessander de Andrade Santoro y Jorge Wilson de Avila, PBN, OPS/AIR, ATFM, ATSRO, CNS, AUTO and FPL, respectively, to analyse de different agenda items.

ii-4 WORKING LANGUAGES

The working language of the Meeting was Spanish, with simultaneous interpretation in English, and its relevant documentation was presented in Spanish and English.

ii-5 **AGENDA**

The following agenda was adopted:

Agenda Item 1: Follow up to Conclusions and Decisions adopted by SAM/IG Meetings

Agenda Item 2: Optimization of the ATS routes

Agenda Item 3: Implementation of performance-based navigation (PBN) in the SAM Region

Agenda Item 4: Standards and procedures for performance-based navigation operations approval

Agenda Item 5: Air Traffic Flow Management Implementation (ATFM) in the SAM Region

Agenda Item 6: Assessment of operational requirements in order to determine the implementation of communications and surveillance (CNS) capabilities improvement for en-route and terminal area operations

Agenda Item 7: Operational implementation of new ATM automated systems and integration of the existing systems

Agenda Item 8: Implementation of the new flight plan format

Agenda Item 9: Other business

ii-6 **ATTENDANCE**

The meeting was attended by 54 participants from 10 States of the SAM Region Argentina, Brazil, Chile, Colombia, Paraguay, Perú, Suriname, Uruguay and Venezuela, and 3 International Organizations, ARINC, IATA and METRON Aviation. The list of participants is shown in pages iii-1 to iii-10.

ii.7 LIST OF CONCLUSIONS

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Agenda Item 1: Follow up to Conclusions and Decisions adopted by SAM/IG Meetings

Review of the status of compliance withthe conclusions formulated by SAM/IG meetings and pending activities

1.1 The Workshops/Meetings of the SAM Implementation Group have produced a series of agreements, translated into conclusions, indicating the actions to be carried out by the Implementation Group and/or the States, as well as the activities assumed by the working groups.

1.2 The six SAM/IG meetings carried out so far have formulated some conclusions and have adopted a series of activities aimed at the implementation of different functions that will enable the Region to evolve steadily towards the application of the Global ATM Operational Concept.

1.3 The implementation programmes foreseen for the implementation of the global ATM Operational Concept in the SAM Region have initially focused on the following:

a) SAM ATS route network optimisation;
b) Performance-Based Navigation (PBN) for en-route, terminal area and approach areas, including aircraft and operator approval;
c) Air Traffic Flow Management (ATFM);
d) Automation;
e) CNS system improvements; and
f) New FPL format.

1.4 In view of the above, and with the information provided by the Secretariat, the Working Groups, and the States on the conclusions and actions adopted, the status of compliance was updated and is shown in **Appendices A and B** to this part of the Report.

APPENDIX A

STATUS OF APPLICATION OF CONCLUSIONS AND/OR TASKS ORIGINATED IN SAM/IG MEETINGS

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
1. ATS Routes Implementation							
1-1	That States examine: a) Impact of RNAV routes implementation in t he airspace b) Aircraft fleet c) Air traffic services, and d) Establish pertinent coordination so as to enable integrated, harmonious and timely implementation of more direct RNAV routes.	Analyse airspace Evaluate national and international fleet Evaluate ATS Coordinate with authorities involved Coordinate with adjacent States, if necessary	Adequate information will be available to execute PBN action plan. A new ATS routes network will be available, based on RNAV with necessary PBN values, so as to respond to current requirements of airspace users	SAM/IG/7	States	RO/ATM RO/AIM	**Completed**
1-2	Route RNAV VOR CRR/VOR FNO (UM 661)	Coordinate the implementation. Issue AIC. Train personnel. Amend CAR/SAM ANP	Route implemented	TBD Information from Brazil is pending	States Secretariat	RO/ATM RO/AIM	Completed

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
1-3	UM 662 Guayaquil – Madrid	Coordinate the implementation. Issue AIC. Train personnel. Amend CAR/SAM ANP	Route implemented	Agreement with FAV Venezuela is pending	States Secretariat	RO/ATM RO/AIM	**Valid** (see Agenda Item 2)
1-4	UM 527 Lima – Madrid	Coordinate the implementation. Issue AIC. Train personnel. Amend CAR/SAM ANP	Route implemented	Implementation agreement on 24 September 2009	States Secretariat	RO/ATM RO/AIM	**Completed** 24/09/09
1-5	Santiago-Miami	Coordinate the implementation. Issue AIC. Train personnel. Amend CAR/SAM ANP	Route implemented	Finalise coordination with States involved and IATA	States IATA Secretariat	RO/ATM RO/AIM	**Completed** Appendix A to Agenda Item 2, was modified. An analysis will continue within the SAM ATS routes network optimization programme.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2. Optimisation of ATS routes in the SAM Region							
2-1	**Conclusion SAM/IG/3-1 ATS Route Network Optimising in the South American Region** That the ICAO SAM States take relevant action to follow the guidelines and meet the target dates established in the ATS Route Network Optimising Programme in the South American Region that appears in Appendix B to this part of the report. (Action adopted in SAM/IG/2) Optimize the airspace structure, reorganizing the red or implementing new routes based on strategic objectives of the airspace, taking into consideration "airspace modelling", ATC simulations (accelerated time and/or real time), life trials, etc.	See action plan from the ATS routes network optimisation programme (Appendix B, Attachment 1 to SAM/IG/3 Meeting Report on Agenda Item 2)	Optimised ATS routes network	As per action plan	States RLA/06/901 IATA Regional Office	RO/ATM RO/AIM	**Completed** Conclusion and action adopted in SAM/IG/2 are oriented towards achieving the same results. The Action plan was updated (see Appendix B on Agenda item 2 of SAM/IG/4.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2-2	Prepare the preliminary evaluation of airspace safety	Collect necessary data. Carry out safety assessment applying the methodology adopted.	PBN will be implemented showing that agreed safety levels will be kept or maintained	SAM/IG/6	CARSAMMA	RO/ATM	**Completed** The SAMRA Workshop was carried out with the assistance of an expert.
2-3	Flexibility in special use airspace.	ANSPs will Establish coordination mechanism with military authorities Discuss matters such as location, altitudes, and validity periods of special use airspaces.	Obtain the efficient use of the airspace in terms coordinated and agreed between civil and military authorities, contemplating the benefit of all users	SAM/IG/7	States	N/A	**Valid** The SAM civil/military seminar/ workshop will be carried out from 16 to 19 August 2011.
2-4	Handling of air transport environmental problems	Obtaining of objective data over benefits that will be reached in terms of reduction of harmful gas emissions into the atmosphere.	Known data Availability of information required for monitoring of environmental protection.	SAM/IG/6	States	N/A	**Valid.** Check fuel savings estimate chart.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2-5	Prepare a measurable plan of performance, including gas emissions safety, efficiency, etc.	Check available tools to carry out this task Prepare a measurable plan	A measurable plan will be available which will permit a clear vision of the current and future status of performance regarding gas emissions, safety and efficiency	SAM/IG/6	RLA/06/901	RO/ATM	**Valid.** This task was included in the optimisation programme of the action plan.
2-6	**Conclusion SAM/IG/3-2 Data Collection** That SAM States: a) collect data on all flights carried out in the SAM Region upper airspace (FL 245 or above) in national and international routes in the period **1-31 July 2009** and send them to the SAM Regional Office before **30 September 2009.** b) use a sample consistent with the **form and the instructions for completing the form**, contained in **Attachment 2 to Appendix B** to this part of the report, using the EXCEL format.	The Secretariat should send a letter to States States should collect information as agreed. States should send information to the Regional Office. Information received must be assessed	A data base containing – - movement in ATS routes per FIR - movement between pairs of cities, - peak hours - movement in TMA - FL most used - air operators and type of aircraft used.	SAM/IG/5	Regional Office States RLA/06/901	RO/ATM RO/AIM CARSAMMA	**Completed** Letter LT 2/3A.13- LN 3/24.6.1- SA364 dated 8 June 2009 Except for French Guyana and Suriname, all States replied this survey.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2-7	Determine entry/exit points of main TMAs in the SAM Region	States shall determine entry/ exit points of main TMAs Shall present information at SAM/IG/4	Adequate information will be available to prepare Version 1 of ATS routes network	SAM/IG/4	States	RO/ATM	**Completed** States informed that they will not carry out changes in their TMA. Except Brazil and Guyana shall reply on March 2010.
2-8	Determine and obtain necessary tools for the development of Version 1 of routes network (aeronautical charts, specific software)	Evaluate necessary tools	Basic elements will be available for the development of Version 1 of ATS routes network	SAM/IG/6	SAM PBN RLA/06/901	RO/ATM	**Completed** The ATSRO/2 was held in August 2010 and the proposal for amendment is presented in WP/06.
2-9	Interphase between ATS routes network of the CAR and SAM Regions	Evaluate interphase options in the ATS routes network in the CAR and SAM Regions	Develop Version 1 of ATS routes network to respond to users requirements	SAM/IG/5	SAM PBN TF Regional Office	RO/ATM	**Completed**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2-10	Carry out a detailed study of the ATS routes network, with a view to prepare Version 1 of routes network (ref 2.2.2 of the Action plan of the ATS routes optimization programme of the SAM Region.	Carry out a workshop among SAM experts, in order to review and validate the study of item 2.2.5 of the action plan of the ATS routes optimization programme of the SAM Region.	Initial draft of proposal Version 1 of routes network ready	March 2010	RLA/06/901 Regional Office IATA	RO/ATM	**Completed**
2-11	Prepare safety assessment required applying a qualitative methodology through the use of SMS (Ref 2.2.3 of the Action Plan – Programme for optimisation of the ATS Routes Network of the SAM Region)	Carry out safety assessment	Version 1 of ATS routes network will be implemented; demonstrating that agreed safety level will be maintained or improved.	October 2010	RLA/06/901	RO/ATM CARSAMMA	**Completed**
2-12	**Conclusion SAM/IG/4-1 – SAM routes network point of contact** That SAM States designate a point of contact to support the development of task 2.2.5 of the Action Plan for optimisation of the SAM Routes Network, and send the corresponding data (email and telephone) until 31 January 2010.	Data base completed	The list of contacts will be available to coordinate ATS routes network optimisation.	SAM/IG/5	States	RO/ATM	**Completed**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2-13	**Ref para. 2.1 of SAM/IG/5 Report** The meeting noted the status of implementation of RNAV routes as approved by the First SAM Workshop on ATS Routes Network Optimisation (SAM ATSRO/1), as well as other routes that were reviewed and agreed to implement during bilateral or multilateral meetings**.**	Deliver information to process ANP amendment.	ANP amendment with Version 01 of the ATS routes network processed.	August 2010	States	RO/ATM	**Completed** The meeting was carried out as programmed and the amendment is being processed to circulate it among States and international organizations (See 2-8).
2-14	**Ref Para. 2.7 SAM/IG/5 Report** Also, the meeting agreed that the routes that have not been included in Version 01, will be part of Version 01, to be dealt with during the Second SAM Workshop on ATS Routes Network Optimisation (SAM ATSRO/2).	Routes not agreed on time will be incorporated into Version 02 of the routes network	Version 01 of the ATS routes network finalised. Version 02 of the routes network in process of revision	August 2010	States	RO/AIM RO/ATM	**Completed** ATS routes network that were not coordinated or that required further coordination were transferred to Version 02 of the ATS routes network.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2-15	**Ref Para. 2.8 SAM/IG/5 Report** The following routes be implemented in advance, since these routes have been coordinated for several years. UM661: UM532, UM403, Lima/Miami, UM662; UM400.	Implement route as agreed	Implemented routes	August 2010	States	RO/AIM RO/ATM	**Completed** Mentioned routes were implemented or incorporated in Version 01.
2-16	**Ref Para. 2.10 SAM/IG/5 Report** Coordination for ATS routes should be carried out in a bilateral or multilateral manner among involved; the use of e-mails is recommended for the exchange of information and other communication tools, such as Skype or similar, among focal points.	Previously coordinate ATS routes trajectory among parties involved.	ATS routes presented to implement, realign or eliminate are duly coordinated and ready to be introduced in the respective amendments.	2012	States and Focal points	RO/AIM RO/ATM	**Completed** The process of coordination of Phase 1 was completed and Version 01 of the ATS routes network was implemented in March 2011
2-17	**Ref. para. 2.13 SAM/IG/5 Report.** Update letters of operational agreement (LOAs) and ATS Contingency Plans	Review and coordinate with adjacent States and contingency plans	LOAs agreed before the implementation of new ATS routes, contingency plans duly updated	2012	States and Focal points	RO/AIM RO/ATM	**Completed.** The process was made during implementation of Version 01 of the ATS Routes network.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2-18	**Conclusion SAM/IG/6-1 Application of further actions to reduce the risk and risk rate resulting from the SAM ATS routes network optimisation safety plan** That States, ATS providers and aircraft operators, take the necessary measures to apply recommendations and further actions in order to reduce the risk and resulting risk rate as shown in Appendix 1 to Chapter 4 of the Safety Plan for the SAM Region ATS routes network, as shown in Appendix A to this part of the report.	Implement ulterior actions as required	Safe implementation of Version 01 of the ATS routes network.	March 2011	States	RO/ATM	**Completed**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
2-19	**Conclusion SAM/IG/7-1 ATS routes network optimisation programme of the South American Region, Phase 3, Version 02** That ICAO SAM States take pertinent actions to follow the guidelines and comply with established deadlines to continue with Phase 3, Version 02 of the ATS routes network optimisation programme of the South American Region, shown in Appendix A to this part of the report.	See ATS routes network optimisation programme (version 02 SAM/IG/7)	Version 02 ATS routes nework optimisation	As per action plan	States RLA/06/901 IATA Regional Office	RO/ATM RO/AIM	**Valid**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3. Implementation of Performance Based Navigation (PBN) in the SAM Region							
3-1	**SAM/IG/1-1 CAR/SAM PBN Roadmap** That ICAO SAM States, in implementing RNAV/RNP, take the pertinent actions to follow guidelines contained in the CAR/SAM PBN Roadmap as shown in Appendix C to this part of the report.	Shall facilitate implementation at a regional level Each State should comply with the actions agreed in the PBN Roadmap	States will have a National en-route, TMA and APP PBN implementation Plan.	SAM/IG/3	States	N/A	**Completed.** States adopted the PBN roadmap.
3-2	**Conclusion SAM/IG/2-1 PBN implementation Programme for en-route operations** That the ICAO SAM States take appropriate actions to follow the guidelines and comply with the targets established in the PBN implementation for en-route operations, which is shown in **Appendix B** to this part of the Report.	Execution of the action plan	RNAV 5 implemented in the SAM Region	SAM/IG/6	PBN focal points of the States.	RO/ATM	**Valid.**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-3	**Conclusion SAM/IG/2-4 PBN Implementation Model for TMA and Approach** That States/Territories and International Organizations use the PBN Implementation Model for TMA and Approach in the preparation of their PBN implementation programmes for TMA and Approach, shown in **Appendix E** to this part of the Report.	Prepare action plans for PBN implementation in TMA and approach	Action plans accompanying regional implementation	SAM/IG/6	PBN focal points of the States	RO/ATM	**Completed** States have received the action plan models for TMA and approach, except for 4 States of the Region have prepared their national implementation plans
3-4	Evaluate regulations for the use of GNSS, and if such were the case, proceed to its publication	Review information available.	All SAM States with regulations for the use of GNSS available	SAM/IG/3	Secretariat	RO/CNS	**Completed**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-5	**Conclusion SAM/IG/3-3 PBN Implementation National Plans** That States of ICAO South American Region, present their PBN Implementation National Plans to SAM/IG/4 Meeting, using PBN Implementation Plan Model, shown in Appendix B of this part of the Report, as well as using the action plan models and information contained PBN Implementation Project TMA Operations and Short Term Approximations of SAM Region, approved by SAM/IG/2 Meeting.	Prepare national PBN plans	All SAM States will have a PBN implementation plan aligned with the regional PBN plan	SAM/IG/6	States	RO/ATM	**Valid** 10 States in the SAM Region presented their national PBN plan for its harmonization. States that have updated their plans will send them fo the Regional Office. It is expected that the 4 remaining States (Ecuador, French Guiana, Panama and Suriname) send their national plans as soon as possible. The Secretariat must encourage their submission

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-6	**Conclusion SAM/IG/2-3 Survey on the Fleet Navigation Capacity** That States conduct a survey on the fleet navigation capacity, using, to that end, the form contained in **Appendix D** to this part of the Report, and send the information collected to the ICAO South American Regional Office, on the following dates: a) Aircraft operating commercial flights, which have more than 5 700 kg. of MTOW – 15 February 2009 b) Aircraft operating commercial flights, which have less than 5 700 kg. of MTOW – 15 May 2009; c) Other aircraft registered in the Region – 15 August 2009.	States must carry out this survey. Secretariat should upload Form of SAM/IG/2 Appendix 2 on Agenda item 2.	Fleet navigation capacity flying in the SAM Region	It was re-programmed and unified the date for delivery of literals a), b) and c) until 31 July 2009	Focal points designated by States RO	RO/ATM RLA/99/901 RO/FLS RO/ATM RLA/99/901 RO/FLS	**Completed** regarding a) Valid. Regarding b) and c) the delivery date should be modified (see Conclusion SAM/IG/4-3).
3-7	Analyse aircraft fleet navigation capacity	Prepare data base	Aircraft fleet capacity analysed	SAM/IG/4	RLA/99/901	RO/ATM RLA/99/901 RO/FLS	**Completed** Regarding a) Pending b) and c).

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-8 Prev. 2-13	Collect air traffic data to understand air traffic flows in a specific airspace.	States shall collect air traffic flow data	States will have a clear view of the type of traffic operating in a specific airspace	SAM/IG/4	States PBN focal points	RO/ATM RO/AIM	**Completed**
3-9	Analyse communications, navigation means and surveillance (VOR, DME) ground to attend navigation specifications and reverse navigation	Prepare a CNS data base (geographical DME DME coverage to support RNAV5)	Navigation specification and reverse navigation mode	SAM/IG/6	RLA/06/901	RO/CNS and SAM States (Brazil, Peru)	**Completed** CNS task. Geographical DME DME coverage to support RNAV5 was completed. Information is presented in WP/16. In addition, a VOR/DME data base was created, which was presented at SAM/IG/5 meeting

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-10	Design procedures training - RNP Approach with required authorization (AR)	Prepare SIP to have FAA instructors	Experts from States duly qualified in RNP, APCH AR matters	SAM/IG/4	Regional Office SIP RLA/06/901	Brazil/Chile RO/ATM	**Completed.** RNAV/RNP courses were dictated: RNAV/RNP and ARNP AR APCH. Brazil and Chile provided the instructors. Support was obtained from a SIP and from Regional Project RLA/06/901 for the participation of the students. Also, the APV Baro VNAV was provided.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-11	**Conclusion SAM/IG/2-2 Initial AIC** That States of ICAO SAM Region using as model the AIC presented in Appendix C to this part of the Report: a) publish in the AIRAC date of 9 April 2009 an Aeronautical Information Circular (AIC) informing the aeronautical community on their intention to implement RNAV 5 on 18 November 2010; b) reflect in this AIC the specific situations within the airspace under their jurisdiction.	Prepare AIC Publish AIC	Aeronautical community duly informed on States plans for RNAV 5 implementation.	SAM/IG/6	States	RO/ATM RO/AIM	**Completed** at 23 October 2009. French Guyana, Guyana, Panama, Suriname had not implemented yet.
3-12	**Ref. para. 3.9 of SAM/IG/5 Report** Develop an AIP Supplement model containing applicable standards and procedures, including the corresponding flight contingencies	Request RLA/06/901 to estimate hiring of an expert for the preparation of the SUPP AIP Model	SUPP AIP Model available to be used as reference by SAM States	SAM/IG/6	RLA/06/901	RO/ATM RO/AIM	**Completed** SUPP AIP Model was prepared and submitted for consideration of the meeting through WP/08.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-14	**Ref. 3.11 of SAM/IG/5 Report.** Develop a training and documentation programme for air traffic controllers and AIS operators	Request RLA/06/901 to estimate hiring of an expert for the preparation of the Amendment to Doc 7030.	Regional documentation duly approved	SAM/IG/6	RLA/06/901	RO/ATM	**Completed** Amendment to Doc 7030, Regional Supplementary Procedures was prepared and has been circulated among States and submitted to the consideration of the meeting through WP/08.
3-15	**Conclusion SAM/IG/5 - Training programme and documentation for air traffic controllers and AIS operators** That SAM States use the material shown in Appendix A to this part of the report as guidance material for air traffic controllers and AIS operators.	States should provide training required to staff in order to prepare them for implementation.	States and personnel trained for RNAV5 implementation in the dates agreed	18 November 2010	States	Focal points	**Completed**
3-16	**Ref. 3.15 of SAM/IG/5 Report.** That the RLA/06/901 develops a post-implementation monitoring programme for en-route operations.	Develop a monitoring programme and pertinent forms to collect lateral deviation information.	Monitoring programme and corresponding forms available to be used by States.	SAM/IG/6	CARSAMMA	RO/ATM	**Completed** See WP/04.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-17	**Conclusion SAM/IG/5-4 Implementation of Continuous Descent Operations** That, recognizing the efficiency and environmental benefits of Continuous Descent operations, and the need to harmonize these operations in the interest of safety, States are encouraged to include the implementation of Continuous Descent operations (CDO) as part of their PBN implementation plans and to implement CDO in accordance with the ICAO CDO Manual.	States should include in their PBN programmes the CDO concept.	CDO implemented as per national requirements.	SAM/IG/8	States	RO/ATM	**Valid.** Some States introduced CDO in their national plans.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-18	**Conclusion SAM/IG/6-2 Application of subsequent actions to reduce the RNAV5 safety plan risk and the resulting risk rate** That States, ATS providers and aircraft users take the necessary measures to apply further action to reduce the RNAV5 safety plan risk and the resulting risk rate, as shown in Appendix 1 to Chapter 4 of the safety plan for RNAV5 implementation in the SAM Region, shown in Appendix I to this part of the report.	Assess and apply ulterior measures	Safe implementation of RNAV5	September 2011	States	RO/ATM	**Valid** States assessed ulterior actions and an analysis was made and is shown in **Appendix B** of Agenda Item 3.
3-19	**Para3.9 SAM/IG/6** To coordinate planning and implementation needs with air navigation service providers, users, aircraft operators and military authorities.	Coordinate with air navigation service providers, regulatory bodies, users, aircraft operators and military authorities.	Safe RNAV5 implementation	September 2011	States	RO/ATM	**Valid**
3-20	Para 3.10 SAM/IG/6 To published national regulations to implement RNAV5 navigation specification.	Carry out publications	Safe RNAV5 implementation	September 2011	States	RO/ATM	**Valid**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-21	Para 3.11 SAM/IG/6 Establish and maintain updated an approved an aircraft operators registry	Submit the information to CARSAMMA as aircraft and operators are approved	Safe RNAV5 implementation	First Phase September 2011	States	RO/ATM	**Valid** States should implement procedures to keep data base updated.
3-22	Para 3.11 SAM/IG/6 Establish and maintain updated an approved an aircraft operators registry	Carry out approvals	Safe RNAV5 implementation	First Phase September 2011	States	RO/ATM	**Valid** States should implement procedures to keep data base updated.
3.23	**Conclusion SAM/IG/6-3** That SAM States take pertinent action in order to apply forms CMA F5 and CMA F6, attached as **Appendices A and B** to this part of the report, and send them to CARSAMMA as soon as the PBN approval of aircraft and operators is established.	Use Forms CMA F5 and CMA F6	Safe RNAV5 implementation	First Phase September 2011	States	RO/ATM	**Valid** States should implement procedures to keep data base updated.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3.24	**Conclusion SAM/IG/6-4 ENR 3.3 – Table model of the AIPs** That SAM States, in publishing in their AIPs RNAV routes, use the ENR table model shown in **Appendix D** to this part of the report.	Publish amendment in AIP	Safe RNAV5 implementation	First Phase September 2011	States	RO/ATM	**Superseded by Conclusión SAMIG/7/3** ENR 3.3 Table was modified and the new version was submitted for the consideration of States for its application.
3-25	**Conclusion SAM/IG/6-5 Lateral navigation deviation reporting form** That SAM States take the corresponding action in order to use the monitoring programme and particularly lateral navigation deviation reporting form attached as **Appendix F** to this part of the report, and send it to CARSAMMA on the tenth day of each month.	Collect information of lateral deviations and send it to CARSAMMA	Safe RNAV5 implementation	SAMIG/10	States	RO/ATM/	**Valid**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-26	**Conclusion SAM/IG/6-6 Publication of an AIC/NOTAM announcing the postponement of the RNAV5 implementation date in the SAM Region** That SAM States take the corresponding action in order to publish an AIC/NOTAM announcing the postponement of the RNAV5 implementation date in the SAM Region for 22 September 2011.	Publish AIC/NOTAM	ATM Community, duly informed	December 2010	States	RO/ATM	**Completed** States published the postponement

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-27	Para. 3.41 SAM/IG/6 Carry out at least once a month a TELCON through the use of the SAM Office's GO TO MEETING tool	Carry out virtual meetings	Appropriate follow-up for RNAV5 implementation	September 2010	States Task Rapporteur PBN Implementation	RO/ATM	**Valid** So far, 4 TELCONs have been carried out. Information on the result is presented at t he SAM/IG/7. Information on the result was presented at the SAM/IG/7 meeting This task is included in the RNAV5 action plan.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4. Standards and procedures for performance based navigation operations approval							
4-1	Analyse aircraft approval requirements and operators (pilots, dispatchers, and maintenance personnel) as established in PBN manual, and develop necessary documentation. Note: See Agenda Item 3, SAM/IG/2 and SAM/IG/3 Agenda Item 4.	Develop LAR with regard to PBN approvals	Guidelines at States disposal	SAM/IG/3 SAM/IG/4	Regional Project RLA/06/901	RO/ATM RLA/99/901 RO/FLS	**Completed** In charge of RLA/99/901. CAs were completed on RNAV 10, RNAV 5, RNAV 1 and 2, Basic RNP 1, RNP APCH, RNP AR APCH and APV Baro VNAV. A new working plan has been established for the development of the CA on RNP4, RNP2 and RNP1, in progress.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4-2	**Conclusion SAM/IG/3-4 Advisory Circulars CA 91-008, CA 91-009 and CA 91-010** That States of the SAM Region: a) use as acceptable means of compliance in aircraft approval and exploiters for RNP APCH, RNP AR APCH and APV/baro-VNAV operations, Advisory Circulars CA 91-008, CA 91-009 and CA 91-010, shown in **Appendices B, C and D,** respectively to this part of the report; and b) publish the corresponding national regulations until **5 October 2009**.	Develop the procedures related to aircraft and users approval regarding RNP, APCH, RNP AR APCH and APV/Baro-VNAV operations	National regulation ready for approval of aircraft and users	SAM/IG/4	States Regional Project RLA/06/901	RO/ATM RLA/99/901 RO/FLS	**Replaced by Conclusion SAM/IG/4-2**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4-3	**Conclusion SAM/IG/4-2 Advisory Circulars for Aircraft approval and operators for RNP 10 operations, RNAV 5, RNAV 1 and 2, Basic RNP 1, RNP APCH, RNP AR APCH and APV/baro-VNAV** That States of ICAO South American Region, according to the PBN implementation plans: a) use the Advisory Circulars (AC), in developing their acceptable means of compliance of approval of aircraft and operators for RNP 10 operations, RNAV 5, RNAV 1 and 2, Basic RNP 1, RNP APCH, RNP AR APCH and APV/baro-VNAV, that are shown in Appendices A1, A2, B1, B2, C1, C2, D1, D2, E1, E2, F1, F2, G1 and G2 of this part of the report; and b) that job aids of aforesaid circulars be incorporated into Inspector's manuals of Operations and airworthiness.	Publish Advisory circulars for aircraft and operators approval	Advisory circulars and Work Aids used for aircraft approval	SAM/IG/5	State	N/A	**Completed**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4-4	**Conclusion SAM/IG/4-3 Continued data collection about PBN Fleet Capacity in the South American Region** The Meeting considered that: a) efforts should be continued in order that each State, through its PBN Focal Points, conduct such actions to send, as soon as possible, information, about its PBN fleet capacity to ICAO Regional Office. The information collected by States should, as far as possible, be sent to the Regional Office in a file with Excel format. b) that each State is responsible for providing data and, as time passes, updates or further details on the submitted data should be made; c) to facilitate the updating of data, the file of the survey of each state be posted on the website of the SAM Office, in order that each State,	Complete data collection on PBN fleet capacity in SAM	Data base available	SAM/IG/6	States	N/A	**Valid** See Conclusion SAM/IG/2-3. Data base has been modified since beginning. No additional information has been received by States.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	through a code, can have access to information on its fleet , and thus can perform the update of the data entered, and send it, via e-mail, to the Regional Office.						
4-5	**Ref Para. 3.8 of SAM/IG/5 Report.** Establish and keep up to date a record of approved aircraft and operators	Contact CARSAMMA to verify if it is possible to have available a PBN data base. Review and present form for PBN approval and cancellation of approval	Data base coordinated with CARSAMMA Form for PBN approval and cancellation of approval implemented	SAM/IG/6	CARSAMMA Secretariat	RO/ATM Expert RLA/99/901	**Completed** The form was evaluated and sent to States for its use through LT 11/30.2-SA455 dated 8 July 2010 (See WP/18).
4-6	**PBN/RNAV5 seminars for operators** That SAM States, in view of the few operators that have requested the approval, and the need to encourage them to start this process, conduct PBN seminars in which operators are informed about the corresponding approval procedures.	States must provide seminars to operators	Operators trained to comply with necessary tasks for RNAV5 implementation	SAM/IG/6	States	Focal points	**Valid**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4-7	**Conclusion SAMIG/5-3 Data Collection** That: a) SAM States collect data on flights conducted on domestic and international routes in the upper airspace (FL 245 or above) of the SAM Region during the period 1 to 15 July 2010, and send them to the SAM Regional Office before 13 August 2010; and b) That the sample be consistent with the form and the guidelines for completing the form described in Appendix B to this part of the Report, using the Excel format.	States collect data in the indicated date	Data collected and analysed	SAM/IG/6	States	RO/ATM	**Completed**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4-8	**Conclusion SAM/IG/4-5 Prediction Program for the FDE Availability** That: a) Progress be made in the study and application of the tool AUGUR (EUROCONTROL) by the States of the region. b) Considering that AUGUR tool (EUROCONTROL), incorporates the Airports and Navaids in the SAM, it is suggested that through the Regional Office of ICAO, make contact with EUROCONTROL in order to establish the feasibility of extending the validity of calculating prediction made with the AUGUR tool for the different stages of flights, in the SAM Region. c) to establish the feasibility of extending the validity of calculating prediction made with the AUGUR tool for the different stages of flights, in the SAM Region.	That ICAO contact Eurocontrol, FAA and other organizations in order to evaluate application of forecast FDE tools and related procedures Evaluate the possibility to lead a forecast development programme for FDE availability	Information related with FDE availability available Regional forecasting FDE availability programme	SAM/IG/7	Regional Office	RO/CNS	**Valid** The Meeting took note of three implementation options for RAIM prediction availability, and their respective costs (provided by Volpe). With the aim of completing the task, the Meeting deemed it convenient to request for another quotation from another company providing RAIM prediction availability.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	d) Through the ICAO Regional Office, establish contact with the FAA, in order to receive guidance on the procedures for approval of a prediction program for the FDE availability and the procedures used by their operators when performing operations such as RNAV based in GNSS out of United States; and e) ICAO Regional Office evaluate the possibility to lead a development process for development of an availability forecasting FDE programme for the SAM Region for its use in all flight phases.						

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4-9	**Conclusion SAM/IG/5-6 Application of national standards for approval of operators and aircraft for PBN operations** That the Secretariat, through their official channels, encourage those States to publish national standards for approval of operators and aircrafts for PBN operations and, in particular, for RNAV 5 navigation specification, as well as to send to the ICAO Regional Office, details on the potential capacity of their fleets, if still not done.	States must publish national standards for approval of operators and aircraft for PBN operations and send this information to the Regional Office	National standards published for its application	SAM/IG/6	States	RO/ATM	**Valid**
4-10	**Para 4.20 SAM/IG/5 Report** Course for aircraft and operators approval during 2010.	Airspace users prepared for aircraft and operators approval in PBN issues	Airspace users duly prepared for PBN approval and operators and aircraft	SAM/IG/6	RLA/99/901	RO/ATM	**Completed** Courses were provided at a regional and national level in PBN approval.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4-11	**Para 4.9 SAM/IG/6** Establish standard criteria for the Regional System on ground and flight validation of flight procedures through satellite-based PBN instruments	Prepare standardised criteria	Uniform application of validation criteria on ground and flight procedures with	SAM/IG/9	RLA/99/901	RO/FS	**Valid** The draft CA 91-012 – Flight Validation (FV) of satellite-supported instrument flight procedures (IFP) of performance based navigation (PBN) was presented during the SAM/IG/6. To this respect, the Meeting requested the Secretariat to send a survey of flight inspection experts for comments and further approval.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5-1	**Conclusion SAM/IG/2-6 ATFM Roadmap** That, a) the ATFM Roadmap in **Appendix B** to this part of the Report be adopted, with the aim of providing orientation to the ATFM community with regard to ATFM applications to be implemented in the short and medium term in the SAM Region; and b) the ICAO Secretariat send the ATFM Roadmap to the GREPECAS ATFM Task Force for the analysis and actions deemed pertinent.	States must adopt ATFM Roadmap sheet and inform on the intentions to national aeronautical community	Aeronautical Community in knowledge of regional and national activities related to ATFM ATFM roadmap shall be presented to the ATFM/5 Meeting	SAM/IG/3	States ATFM Focal points ATFM Rapporteur	ATFM Rapporteur/ RO/ATM RO/AIM	**Completed.**
5-2	Carry out the tasks to be developed by Regional Project RLA/06/901. See SAM/IG/3 Report	Hire experts through Regional Project RLA/06/901	Tasks identified by the meeting to be executed by Regional Project RLA/06/901 carried out.	SAM/IG/4	RLA/06/901 Experts	JF/OQ	**Completed**
5-3	Publish initial AIC ATFM using the model prepared by SAMIG	States publish AIC	Community informed on States plans regarding ATFM		States	JF	Completed. Except for Suriname.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5-4	ATFM Manual – First Part	Continue developing ATFM manual	States will have a manual for its harmonized application in the SAM Region	SAM/IG/8	RLA/06/901 Expert	RO/ATM RO/AIM	Completed (SAM/IG/4-WP/10)
5-5	**Conclusion SAM/IG/3-5 Runway capacity of an international airport and ATC associated sector** SAM States are encouraged to carry out at least an exercise to determine the runway capacity of an international airport and ATC sector, associated or another one selected for each State, to present the results to the SAM/IG/4 Meeting, providing the following information: a) Amount of personnel trained for the exercise b) Methodology applied c) Result of the exercise, providing the declared capacity for each runway and ATC selected sector. d) Identification of problems found in the methodology applied.	Carry out estimate capacity in an airport and its associated ATC sector	States shall put into practice the course dictated on this matter and shall obtain the necessary experience to evaluate capacity at a national level.	SAM/IG/4	States	RO/ATM	**Valid** Bolivia, Brazil, Colombia, Paraguay, Peru and Venezuela presented its preliminary exercise. A second course on airport capacity and ATC sectors was dictated in Brazil from 21 to 25 March 2011.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5-6	Guidance document for the application of a common methodology for the estimation of airport capacity and ATC sectors for the SAM Region	Prepare a guidance document for the application of a common methodology for the estimation of airport capacity and ATC sectors for the SAM Region	States will have a guide for the application of a common methodology for the estimation of airport capacity and ATC sectors for the SAM Region	SAM/IG/4	RLA/06/901 Expert	JF/AO	**Completed** (SAM/IG/4-WP/05)
5-7	**Conclusion SAM/IG/4-5 Guidance for the application of a common methodology for calculating airport and ATC sector capacity** The Guidance for the application of a common methodology for calculating airport and ATC sector capacity, shown in Appendix C to this part of the report, which recommends that SAM States apply the Brazilian methodology for calculating airport and ATC sector capacity, is approved.	Use of guidelines for application of a common methodology for calculating airport and ATC sector capacity.	Calculating airport and ATC sectors capacity carried out	SAM/IG/6	States	ATFM/WG	**Completed** Guidelines were approved. SAM States have guidelines to carry out the corresponding calculation.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5-8	**Para 5.4 SAM/IG/5 Report** Development of the second part of ATFM Manual for the SAM Region	Prepare second part of ATFM Manual	ATFM Manual improved	SAM/IG/6	RLA/06/901	RO/ATM	**Completed** With the assistance of Colombia and RLA/06/901 the ATFM manual was revised.
5-9	**Para 5.4 SAM/IG/5 Report** ATFM course	Carry out second ATFM course	Personnel from AAC trained in ATFM	SAM/IG/6	RLA/06/901	RO/ATM	**Valid** Course was dictated in November 2010.
5-10	**Para 5.4 SAM/IG/5 Report** Workshop related with Collaboration in decision making oriented towards ATFM	Carry out CDM workshop	Personnel from AAC trained in CDM concept	SAM/IG/6	RLA/06/901	RO/ATM	**Completed** The course was dictated in November 2010.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5-11	**Conclusion SAMIG/5-7 ATFM Teleconferences in the SAM Region** That SAM States continue to hold weekly ATFM teleconferences between flow management units or flow management positions (FMU / FMP) to improve the exchange of information among participating States.	Implement ATFM tele-conferences	Coordination between FMU/FMP carried out	SAM/IG/6	States	RO/ATM	**Valid** States maintain web conferences due to communication problems in TELCONs held. The use of SKYPE is planned.
5-12	**Para. 5.28 of SAM/IG/5 Report** The Secretariat is requested to consider in year 2011, under Project RLA/06/901, the inclusion of the Course Runway Capacity Calculation and ATC Sector, to be held in the first semester.	Request RLA/06/901 to carry out a new course on runway capacity and ATC sectors for the first semester of 2011	AAC personnel trained to carry out a runway capacity and ATC sectors	SAM/IG/8	Secretariat RLA/06/901	RO/ATM	**Completed** The course was dictated in March 2011.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5.13	**Para. 5.4 SAM/IG/6** Present an ATFM Manual during the CNS/ATM/SG/2 Meeting for analysis and approval	Present ATFM Manual to the CNS/ATM/SG/2	Manual approved for its application in the CAR and SAM Regions	June 2011	RO/ATM	RO/CNS	**Completed** The manual was presented to the CNS/ATM/SG/2 and its application in the CAR and SAM Regions was approved.
5.14	**Para. 5.5 SAM/IG/6** Inclusion of ATFM messages exchange in the ATFM Manual	Once the analysis is concluded, include procedures for its revision to the SAM/IG/7 Meeting	Procedures for ATFM Messages exchange included in the Manual	SAM/IG/7	ATM Implementation Group	RO/ATM	**Completed** It was agreed at SAM/IG/7 to establish a MOU between States for ATFM messages exchange and the MOU should be handled as attachments to the ATFM Manual
5-15	**Conclusion SAM/IG/6-7 Manual on Collaborative Decision-Making (CDM) for ATFM** That SAM States adopt the Manual on Collaborative Decision-Making (CDM) for ATFM shown in **Appendix B** to this part of the report.	Adopt CDM Manual	States will apply CDM in the Region in a harmonised manner	September	States	RO/ATM	**Completed** CDM Manual was presented in the CNS/ATM/SG/2 Meeting and its use was also approved for CAR States.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5-16	**Conclusion SAM/IG/6-8 ATFM AIP SUPP/AIC MODEL** That the States of the ICAO South American Region, when preparing their national AIC, use as a reference the ATFM AIP SUPP/AIC model shown in **Appendix E** to this part of the report.	Prepare AIC	Harmonised publications in t he SAM Region	December 2012	States	RO/ATM	**Valid**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
6. Assessment of operational requirements in order to determine the implementation of communications and surveillance (CNS) capabilities improvement for en-route and terminal area operations							
6-1	**SAM/IG/1-5 - Adoption of Action Plan Models for the improvement of communications and surveillance systems for en-route and terminal area operations** When carrying out activities for the improvement of communications and surveillance systems for en-route and terminal area operations, the action plan models are to be taken into account for the improvement of ground-air, ground-ground communications and surveillance systems being presented as Appendices D, F and I to the report of this agenda item.	Action plans for the improvement of CNS systems	Improvement of the communications, navigation and surveillance systems	Jun 2010	SAM States/ Territories and ICAO SAM Regional Office	RO/CNS	**Completed** States, upon elaborating their national action plans, took under consideration the action plans for the improvement of communications, navigation and surveillance systems

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
6-2	**SAM/IG/4-7 - Drafting of pending Action Plans for the Improvement of CNS Systems to meet Short- and Medium-Term Operational Requirements for En Route and Terminal Area Operations** That the aeronautical administrations of Colombia, French Guiana and Panama draft their respective action plans for the improvement of CNS systems, following the model action plan presented at the SAM/IG/3 meeting (Appendix A to agenda item 6) and send them to the ICAO SAM Regional Office no later than 30 November 2009.	National action plan for the improvement of CNS systems	National action plan for CNS improvements	30 Nov 2009	SAM States/ Territory	RO/CNS RLA/06/901 project CNS experts	Valid All SAM States, with the exception of French Guiana (France) and Panama, have elaborated their action plans for the improvement of CNS systems. The action plans have been published in this Regional Office's website.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
6-3	**SAM/IG/4-8 - Updating of the Action Plans for the improvement of CNS Systems to meet Short- and Medium-Term Operational Requirements for En Route and Terminal Area Operations** That SAM States, with the aim of keeping updated the Action Plans for the improvement of CNS Systems to meet Short- and Medium-Term Operational Requirements for En Route and Terminal Area Operations, present their updated versions twice a year, if any, in the dates corresponding to the holding of SAM/IG meetings.	Updating of the national plans for the improvement of CNS systems	Updating of the action plans for SAM CNS national improvements updated	Continuous	SAM States/ Territory ICAO SAM Regional Office	RO/CNS	Valid

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
6-4	**SAM/IG/4-10 - AMHS interconnection between Argentina-Chile, Argentina-Peru, Brazil-Colombia, Brazil-Peru, Chile-Peru and Colombia-Peru** The respective administrations are urged to operationally interconnect AMHS between Argentina-Chile, Argentina-Peru, Brazil-Colombia, Brazil-Peru, Chile-Peru and Colombia-Peru, and that, to that end, they: a) Use the model Memorandum of Understanding (MoU) shown in Appendix B to this part of the report; b) Complete the information in the MoU, taking into account the action plan for AMHS interconnection in Appendix C to this part of the Report; c) Present the MoU to the ICAO SAM Regional Office by 15 December 2009; and d) Sign the model MoU at the SAM/IG/5 meeting.	Interconnection of AMHS	MoU for the implementation of AMHS systems between Argentina-Chile, Argentina-Peru, Brazil-Colombia, Brazil-Peru, and Colombia-Peru	15 Dec 2010	SAM States/ Territory ICAO SAM Regional Office	RO/CNS RLA/06/901 project CNS experts	**Valid** To date, AMHS has been interconnected between Colombia and Peru through REDDIG. It is expected that remaining AMHS will be interconnected by the end of 2011. Following MoUs have been drafted and signed: Argentina-Brazil; Argentina-Chile; Argentina-Paraguay; Argentina-Peru; Brazil-Paraguay; Brazil-Peru; and Colombia-Peru.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
6-5	Study for the regional implementation of a new communications network	Improvement in the communications systems	a) Study for a SAM ATN network b) Technical specifications for an IP ATN network	a) Jun 2011 b) Dec 2011	SAM/IG Group	RO/CNS RLA/06/901 project CNS experts	a) Completed b) Valid
6-6	**Conclusion SAMIG/5-8 - Review of the SAM VOR/DME stations line-of-sight coverage database** **That the SAM States/Territory:** a) Review the information in the database delivered during the Meeting containing line-of-sight diagrams of the VOR/DME stations corresponding to their State; b) Send the comments corresponding to the database to the ICAO South American Regional Office no later tan 30 June 2010; c) Use the calculated line-of-sight coverage data as an element for the PBN operations feasibility study (RNAV 5, RNAV 1 and RNAV 2).	CNS infrastructure available with corresponding coverage	Line of site coverage at VOR/DME stations	30 Jun 2012	SAM States/ Territory ICAO SAM Regional Office	RO/CNS RLA/06/901 project CNS experts	**Completed** VOR/DME coverage study was presented during SAM/IG/5 meeting

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
6-7	**Conclusion SAM/IG/6-9 - Actions required for AMHS interconnection** That SAM States, in view of the delays in the interconnection of the AMHS, proceed with the following actions: a) Require from their AMHS providers the necessary support to successfully end the necessary interconnections; b) Make necessary arrangements to train personnel in the interconnection tasks, with the aim of minimizing the dependency with their providers; c) Maximize pertinent coordinations; and d) States that have not yet done so, complete the drafting and signature of the MoU.	Interconnection of CNS systems	Interconnection of AMHS	End of 2011	SAM States	SAM States AMHS providers RO/CNS	**Valid** Coordination has been carried out with providers to complete the interconnection AMHS MoU have been drafted and signed – see WP/12

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
6-8	**Conclusion SAM/IG/6-10 - Review to the study for a new SAM digital network** That SAM States analyze the study for the implementation of a new digital network for the SAM Region shown in Appendix B to this part of the Report, and send their comments to the ICAO SAM Regional Office by 31 January 2011.	Review of the study for the implementation of a new digital network for the SAM Region	Study examined	31 Jan 2011	SAM States	CNS experts and SAM RO/CNS	**Completed** Many SAM States have examined the study and sent comments of the ICAO SAM Office. In addition, the study was reviewed during REDDIG RCC/14 meeting

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
7. Operational implementation of new ATM automated systems and integration of the existing systems							
7-1	**SAM/IG/3-8 - Preparation of specific implementation plans for the interconnection of automated systems** That States of the SAM Region start the development of specific plans for the implementation of automated systems interconnection, considering the implementation dates indicated in Regional Interconnection Plan for Automated Systems in adjacent ACCs, specified in Appendix B of this part of the Report, and information contained in the following documentation: a) Memorandum of Understanding for the implementation of automated systems interconnection between two States having adjacent ACCs, Interface Control Document (ICD) for data communication between	Operational implementation of ATM automated systems and interconnection of automated systems installed between adjacent ACCs	Memorandum of Understanding (MoU) between SAM pairs of States for the interconnection of automated systems	2012	SAM States	RO/CNS RLA/06/901 project CNS experts	Valid To date, the following MoUs for the interconnection of automated systems have been drafted and signed: Argentina-Brazil, Argentina-Chile; Argentina-Uruguay; Brazil-Uruguay; and Brazil-Venezuela

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	ATS dependencies in Caribbean and South American Regions (CAR/SAM ICD); b) Interface control document (ICD) for data communications between ATS units in the Caribbean and South American Regions (CAR/SAM ICD); c) System Interface Control Document (SICD); and d) Regional interconnection initial plan for ACC automated systems. e) Preliminary reference system/ subsystem specification for the air traffic control automation system (SSS).						

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
7-2	**SAM/IG/4-11 - Action plan for the implementation of Amendment 1 to Doc. 4444** That SAM States, taking into account the actions indicated in the strategy document for the implementation of Amendment 1 to ICAO PANS ATM, 15th Edition (Doc. 4444), contained in Appendix D to this part of the Report, draft their respective action plans for the implementation of the amendment, and send them to the ICAO SAM Regional Office by 30 March 2010, for their presentation at SAM/IG/5 Meeting.	Implementation of the new flight plan format	National Action plans for implementation of Amendment 1 to the 15th Edition of the PANS ATM (Doc 4444).	30 Nov 2012	SAM States	RO/CNS RLA/06/901 project CNS experts	**Superseded** Superseded by Conclusion SAM/IG/6-12

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
7-3	**Conclusion SAM/IG/5-9 - Analysis on the impact of Amendment 1 to the PANS/ATM on the automated systems** That the SAM States, through their national committees, take into account the contents of Appendix B, with views that it serve as reference for an initial analysis on the impact it will have on the automated systems involved in the flight plans process, in view of the implementation of the new flight plan format in accordance with Amendment 1 to the PANS/ATM, and that they send the results to the ICAO SAM Regional Office by 30 August 2010, for their presentation at the Seminar/Workshop for the Implementation of Amendment 1 to the 15th Edition of the a PANS/ATM, to be held in Lima from 13 to 15 September 2010.	Implementation of the new flight plan format	Analysis to the impact of the implementation of the new FPL on automated systems	30 Aug 2010	SAM States/ Territory	RO/CNS RLA/06/901 project CNS experts	**Completed** Most SAM Sates have analyzed the impact of the new FPL implementation in automated systems

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
7-4	**Conclusion SAM/IG/6-12 - Action plan for the implementation of Amendment 1 to Doc. 4444** That SAM States, taking into account the actions indicated in the strategy for the implementation of Amendment 1 to the 15th Edition of the ICAO PANS/ATM (Doc 4444), and using as reference the action plan model presented by the Secretariat and the action plan presented by Brazil during the Seminar/Workshop, which appear as Appendices E and F to this part of the report, draft their action plans for the implementation of the Amendment and send it to the ICAO SAM Regional Office no later than 30 November 2010.	States' drafting of action plan for the implementation of Amendment 1 to Doc 4444, 15th Edition	Action plan for the implementation of Amendment 1 to Doc 4444, 15th Edition	30 Nov 2011	SAM Sates	RO/CNS	**Valid** Until SAM/IG/6 meeting, the following States have drafted action plans for the implementation of Amendment 1: Argentina, Brazil, Chile, Guyana, Panama, Paraguay, Peru, Uruguay and Venezuela

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
7-4	**Conclusion SAM/IG/6-13 – Establishment of the Implementation Group for the New flight Plan Format** That SAM/IG establish a new group, to be named Implementation Group for the New Flight Plan Format, which would be in charge of the analysis on the actions to take for the implementation of the new flight plan format in the SAM Region, in order that in each SAM/IG meeting to be held in 2011 and 2012, the Group will have the opportunity of having a specific forum for the follow-up of this activity.	Establishment of Implementation Group for the New Flight Plan Format	Implementation Group for the New Flight Plan Format	SAM/IG/7	Coordinator of Implementation Group	RO/CNS; RO/ATM	**Completed** Implementation in SAM/IG/7

APPENDIX B

FOLLOW-UP OF CONCLUSIONS AND PENDING TASKS OF THE SAM/IG MEETING

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
1-1 **SAM/IG/1-1** **CAR/SAM PBN Roadmap** That ICAO SAM States, in implementing RNAV/RNP, take the pertinent actions to follow guidelines contained in the CAR/SAM PBN Roadmap as shown in **Appendix C** to this part of the report.	YES	YES	YES	YES	YES	OG	--	YES	OG	YES	OG	YES	YES	YES	**PER:** Dec 2009
1-1 That States examine: a) Impact of RNAV routes implementation in t he airspace Aircraft fleet, Air traffic services, and b) Establish pertinent coordination so as to enable integrated, harmonious and timely implementation of more direct RNAV routes.	OG	OG	OG	YES	YES	OG	--	OG	OG	OG	OG	OG	YES	YES	**COL:** June **ECU**: Local coordination with corresponding area. **PAR:** SAM/IG 5 **PER**: Dec 2009 **VEN:** Mar.2010
2-1 Implementation of RNAV routes	YES	YES	YES	YES	YES	YES	--	YES	YES	YES	OG	YES	YES	OG	**ECU:** Missing pronouncement of Venezuela in regard of the effective date for the

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
															implementation of the route Guayaquil / Madrid**.** **PER:** Chile and Peru in agreement with the part corresponding to their FIRs. RNAV5 Nov 2010.
2-3 **Conclusion SAM/IG/2-1** **PBN implementation Programme for en-route operations** That the ICAO SAM States take appropriate actions to follow the guidelines and comply with the targets established in the PBN implementation for en-route operations, which is shown in **Appendix B** to this part of the Report.	**YES**	**YES**	**YES**	**YES**	**YES**		**--**	**YES**	**YES**	**YES**	**OG**	**YES**	**YES**	**YES**	**PER**: Nov 2010
2-10 **Conclusion SAM/IG/2-2** **Initial AIC** That States of ICAO SAM Region using as model the AIC presented in Appendix C to this part of the Report: a) publish in the AIRAC date of 9 April 2009 an Aeronautical Information Circular (AIC)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**--**	**YES**	**OG**	**YES**	**YES**	**OG**	**YES**	**YES**	**GUY:** Nov. 2009 **SUR:** Will inform Nov.15,2009

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
informing the aeronautical community on their intention to implement RNAV 5 on 18 November 2010; b) reflect in this AIC the specific YEStuations within the airspace under their jurisdiction.															
2-12 Conclusion SAM/IG/2-3 Survey on the Fleet Navigation Capacity That States conduct a survey on the fleet navigation capacity, using, to that end, the form contained in **Appendix D** to this part of the Report, and send the information collected to the ICAO South American Regional Office, on the following dates: a) Aircraft operating commercial flights, which have more than 5 700 kg. of MTOW – 15 February 2009; b) Aircraft operating commercial flights, which	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**--**	**YES**	**OG**	**YES**	**YES**	**OG**	**YES**	**YES**	**COL:** Initially had same problem as Venezuela but after holding PBN seminars we have started the approval process. **PAR**: completed a) pending b) and c). **VEN**: fruitless surveys have been carried out in view of the few knowledge that operators and aircraft owners have on PBN concept. A dissemination campaign is being carried to, to enable the improvement of data provided by the same.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
have less than 5 700 kg. of MTOW – 15 May 2009; c) Other aircraft registered in the Region – 15 August 2009.															
2-13 **1.2** 1.2 Collect air traffic data to understand air traffic flows in a specific airspace	**YES**	**NO**	**YES**	**YES**	**YES**	**YES**	**--**	**YES**	**OG**	**YES**	**YES**	**YES**	**YES**	**YES**	**PER**: carried out Jul 2009. Delivered to SAM Office.
2-14 **Conclusion SAM/IG/2-4** **PBN Implementation Model for TMA and Approach** That States/Territories and International Organizations use the PBN Implementation Model for TMA and Approach in the preparation of their PBN implementation programmes for TMA and Approach, shown in **Appendix E** to this part of the Report	**YES**	**OG**	**YES**	**YES**	**YES**	**OG**	**--**	**YES**	**OG**	**YES**	**OG**	**OG**	**YES**	**OG**	**ECU**: Developing **PER:** Dec 2009, this model is being used **SUR**: 15 Nov 2009 **VEN**: 18 Nov 2010
3-1 **Conclusion SAM/IG/2-5** **Advisory Circular CA 91-002 and Job Aid for Aircraft and operators**	**YES**	**YES**	**YES**	**YES**	**YES**	**OG**	**--**	**OG**	**OG**	**YES**	**YES**	**--**	**YES**	**YES**	**BRA and PAN:** publication is being harmonized with CA LAR. **ECU**: Coord. with OPS COL: Information circular was

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
RNAV 5 operational *approval* That States of ICAO South American Region: a) Use as an acceptable compliance source in aircraft and operators RNAV 5 operational approval Advisory Circular CA 91-002 and Job Aid for Aircraft and operators RNAV 5 operational approval, presented in **Appendices A** and **B**, respectively, to this part of the Report. b) Publish respective national regulations up to April 2009.															published and may be seen at the hyperlink:CI 5102-082-002 **PAR:** signature pending Oct. 2010 **PER**: Dec 2009
3.5 Conclusion SAM/IG/3-3 PBN Implementation National Plans That States of ICAO South American Region, present their PBN Implementation National Plans to SAM/IG/4 Meeting, using PBN Implementation Plan	**YES**	**YES**	**YES**	**YES**	**YES**					**YES**	**YES**		**YES**	**YES**	**BOL:** delivered Dec. 2009 **VEN:** finalised and delivered.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Model, shown in Appendix B of this part of the Report, as well as using the action plan models and information contained PBN Implementation Project TMA Operations and Short Term Approximations of SAM Region, approved by SAM/IG/2 Meeting.															
4-2 Conclusion SAM/IG/2-6 ATFM Roadmap That, a) the ATFM Roadmap in **Appendix B** to this part of the Report be adopted, with the aim of providing orientation to the ATFM community with regard to ATFM applications to be implemented in the short and medium term in the SAM Region; and b) the ICAO Secretariat send the ATFM Roadmap to the GREPECAS ATFM Task Force for the analyses and	OG	OG	YES	YES	YES	OG	--	OG	OG	YES	NO	OG	YES	YES	**ECU:** ATFM **PER:** Mar 2010

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
actions deemed pertinent															
4-5 INITIAL ATFM AIC Model	**YES**	**YES**	**N/A**	**NO**	**YES**	**YES**	**--**	**YES**	**OG**	**YES**	**YES**	**OG**	**YES**	**YES**	**BRA:** information published in the AIP. **GUY**: 22 Oct 2009
Conclusion SAM/IG/3-1 ATS Route Network Optimising in the South American Region That the ICAO SAM States take relevant action to follow the guidelines and meet the target dates established in the ATS Route Network Optimising Programme in the South American Region that appears in Appendix B to this part of the report.		**YES**	**YES**	**YES**	**NO**					**YES**	**YES**		**YES**	**YES**	**VEN:** pertinent actions taken
Conclusion SAM/IG/3-4 Advisory Circulars CA 91-008, CA 91-009 and CA 91-010 That States of the SAM Region: a) use as acceptable means of compliance in aircraft approval and exploiters for RNP APCH, RNP AR APCH and APV/Baro-VNAV operations, Advisory	**OG**	**YES**	**OG**	**YES**	**YES**	**OG**	**OG**	**OG**	**OG**	**YES**	**YES**	**OG**	**YES**	**YES**	**BOL**: published in RAB91 **COL:** published the following information circular: CI-5102-082-008 CI-5102-082-009 CI-5102-082-010 **PAR:** in final process of publication. **VEN:** published in September 2010 CA RNAV5, RNP-1, RNP AR APCH and APV-BARO/VNAV

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Circulars CA 91-008, CA 91-009 and CA 91-010, shown in Appendices B, C and D, respectively to this part of the report; and b) publish the corresponding national regulations until 5 October 2009.															
3-5 Conclusion SAM/IG/3-5 Runway capacity of an international airport and ATC associated sector SAM States are encouraged to carry out at least an exercise to determine the runway capacity of an international airport and ATC sector, associated or another one selected for each State, to present the results to the SAM/IG/4 Meeting, providing the following information: a) Amount of personnel trained for the exercise b) Methodology applied c) Result of the exercise, providing the declared capacity	OG	OG	YES	YES	YES	YES				YES	YES		NO	YES	**ECU:** has trained personnel and calculation Quito and Guayaquil airports **PAR**: has trained personnel and Airport calculation in Asunción airport. **VEN:** exercise requested was made, personnel from Venezuela has participated in ATFM training workshops

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
for each runway and ATC selected sector. d) Identification of problems found in the methodology applied.															
Conclusion SAM/IG/4-1 – SAM routes network point of contact That SAM States designate a point of contact to support the development of task 2.2.5 of the Action Plan for optimisation of the SAM Routes Network, and send the corresponding data (email and telephone) until 31 January 2010.	**YES**	**YES**	**YES**	**YES**	**YES**					**YES**	**YES**		**YES**	**YES**	**BOL:** César Varela **URU:** Adriana San Germán Tel.5982 604 0408 Int 5204 asangerman@gmail.com **VEN**: Carlos Gonzalez and Pablo Rattia
Conclusion SAM/IG/4-2 Advisory Circulars for Aircraft approval and operators for RNP 10 operations, RNAV 5, RNAV 1 and 2, Basic RNP 1, RNP APCH, RNP AR APCH and APV/baro-VNAV That States of ICAO South American Region, according to the PBN implementation plans:	**OG**	**YES**	**OG**	**YES**	**YES**	**OG**	**OG**	**OG**	**OG**	**YES**	**YES**	**OG**	**YES**	**YES**	**BOL**: published in RAB 91. **COL**: Following information circulars: CI-5102-082-001 CI-5102-082-002 CI-5102-082-003 CI-5102-082-008 CI-5102-082-009 CI-5102-082-010 **PAR**: in final process of publication. **VEN**: RNP10, RNAV2, RNP APP AR pending.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
a) use the Advisory Circulars (AC), in developing their acceptable means of compliance of approval of aircraft and operators for RNP 10 operations, RNAV 5, RNAV 1 and 2, Basic RNP 1, RNP APCH, RNP AR APCH and APV/baro-VNAV, that are shown in Appendices A1, A2, B1, B2, C1, C2, D1, D2, E1, E2, F1, F2, G1 and G2 of this part of the report; and b) that job aids of aforesaid circulars be incorporated into Inspector's manuals of Operations and airworthiness.					**YES**										COL: Airworthiness inspector guide can be consulted at hyperlink: Guía inspector Aeronavegabilidad
Conclusion SAM/IG/4-3 Continued data collection about PBN Fleet Capacity in the South American Region The Meeting considered that: a) efforts should be continued in order that each	**OG**	**OG**	**OG**	**YES**	**YES**	**OG**	**OG**	**OG**	**OG**	**OG**	**NO**	**OG**	**YES**	**YES**	**COL:** Had the same difficulties as Venezuela, and finally the information was collected. However, we believe this item should be considered as completed since it was pre-assessment and we are now in the implementation

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
State, through its PBN Focal Points, conduct such actions to send, as soon as possible, information, about its PBN fleet capacity to ICAO Regional Office. The information collected by States should, as far as possible, be sent to the Regional Office in a file with Excel format. b) that each State is responsible for providing data and, as time passes, updates or further details on the submitted data should be made; c) to facilitate the updating of data, the file of the survey of each state be posted on the website of the SAM Office, in order that each State, through a code, can have access to information on its fleet , and thus can perform the update of the data entered , and send it, via e-mail, to															process. **VEN:** fruitless surveys have been carried out in view of the poor knowledge that operators and aircraft owners have. A dissemination campaign is being carried out to enable improvement of data provided by the same.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
the Regional Office.															
Conclusion SAM/IG/4-5 – Guidance for the application of a common methodology for calculating airport and ATC sector capacity The Guidance for the application of a common methodology for calculating airport and ATC sector capacity, shown in Appendix C to this part of the report, which recommends that SAM States apply the Brazilian methodology for calculating airport and ATC sector capacity, is approved.	**YES**	**YES**	**YES**	**YES**	**YES**	**NO**				**YES**	**YES**		**YES**	**YES**	**BOL:** adopted Brazilian method. **VEN:** there is no sufficient personnel yet to comply this task in 100%, currently working on data collection.
Conclusion SAM/IG/4-11 Action plan for the implementation of Amendment 1 to Doc. 4444 That SAM States, taking into account the actions indicated in the strategy document for the implementation of Amendment 1 to ICAO PANS ATM, 15th Edition (Doc. 4444), contained in	**YES**		**YES**	**YES**	**YES**			**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**BRA:** Superseded by Conclusion SAM/IG/6-12 **COL**: training is being provided to controllers and flight plan staff. There will be a transition period, since this amendment is effective as of April 2012.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Appendix D to this part of the Report, draft their respective action plans for the implementation of the amendment, and send them to the ICAO SAM Regional Office by 30 March 2010, for their presentation at SAM/IG/5 Meeting.															
Conclusion SAM/IG/5-1 Training programme and documentation for air traffic controllers and AIS operators That SAM States use the material shown in Appendix A to this part of the report as guidance material for air traffic controllers and AIS operators.	OG	YES	YES	YES	YES			OG		YES	NO		YES	YES	**BOL:** PBN and ATC recurrent seminars were held. **COL**: Training for controllers and flight plan personnel has already started. There will be a transition period, since this amendment is effective as of April 2012. **URU**: August 2011 **VEN:** final training phase at the IUAC
Conclusion SAMIG/5-2 PBN/RNAV5 seminars for operators That SAM States, in view of the few operators that have requested the approval, and the need to encourage them to start this process, conduct PBN seminars in which operators are informed about the	OG	YES	YES	YES	YES	OG	OG	OG	OG	YES	YES	OG	YES	YES	**BOL**: PBN seminars were carried out at all levels. **COL**: Several seminars were conducted for operators and several commercial operators have already started the process. It is suggested that the restrictions to be applied to uncertified operators as of 22 Sep 2011, be published.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
corresponding approval procedures.															**URU**: August 2011 **VEN**: continuously.
Conclusion SAMIG/5-3 **Data Collection** That: a) SAM States collect data on flights conducted on domestic and international routes in the upper airspace (FL 245 or above) of the SAM Region during the period 1 to 15 July 2010, and send them to the SAM Regional Office before 13 August 2010; and b) That the sample be consistent with the form and the guidelines for completing the form described in Appendix B to this part of the Report, using the Excel format.	**YES**	**YES**	**YES**	**YES**	**NO**			**OG**		**YES**	**YES**		**YES**	**YES**	**VEN**: sent to the regional office and delivered during SAM/IG/6 Meeting
Conclusion SAM/IG/5-4 **Implementation of Continuous Descent Operations** That, recognizing the efficiency and	**OG**	**OG**	**OG**	**YES**	**NO**			**OG**		**YES**	**NO**		**YES**	**NO**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
environmental benefits of Continuous Descent operations, and the need to harmonize these operations in the interest of safety, States are encouraged to include the implementation of Continuous Descent operations (CDO) as part of their PBN implementation plans and to implement CDO in accordance with the ICAO CDO Manual.															
Conclusion SAM/IG/5-5 Prediction Program for the FDE Availability That: a) Progress be made in the study and application of the tool AUGUR (EUROCONTROL) by the States of the region. b) Considering that AUGUR tool (EUROCONTROL), incorporates the Airports and Navaids in the SAM, it is suggested that through the Regional Office of ICAO, make contact with EUROCONTROL	**NO**	**NO**	**NO**	**NO**	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**	**YES**	**NO**	**NO**	**NO**	**COL**: Working with the SAPET software and in the process of validating the prediction. It is submitted to consideration whether process is correct for its application in PBN.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
in order to establish the feasibility of extending the validity of calculating prediction made with the AUGUR tool for the different stages of flights, in the SAM Region. c) Through the ICAO Regional Office, establish contact with the FAA, in order to receive guidance on the procedures for approval of a prediction program for the FDE availability and the procedures used by their operators when performing operations such as RNAV based in GNSS out of United States; and															
d) ICAO Regional Office evaluate the possibility to lead a development process for development of an availability forecasting FDE programme for the SAM Region for its use in all flight phases															
Conclusion SAMIG/5-7	**YES**	**YES**	**YES**	**YES**	**YES**	**NO**	**NO**	**NO**	**YES**	**YES**	**YES**	**NO**	**YES**	**YES**	Web

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
ATFM Teleconferences in the SAM Region That SAM States continue to hold weekly ATFM teleconferences between flow management units or flow management positions (FMU / FMP) to improve the exchange of information among participating States.															
Conclusion SAMIG/5-8 Review of the SAM VOR/DME stations line-of-sight coverage database That the SAM States/Territory: a) Review the information in the database delivered during the Meeting containing line-of-sight diagrams of the VOR/DME stations corresponding to their State; b) Send the comments corresponding to the database to the ICAO South American Regional Office no later than 30 June 2010; c) Use the calculated line-	**YES**	**YES**	**YES**	**YES**	**NO**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	Completed

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
of-sight coverage data as an element for the PBN operations feasibility study (RNAV 5, RNAV 1 and RNAV 2).															
Conclusion SAM/IG/5-9 Analysis on the impact of Amendment 1 to the PANS/ATM on the automated systems That the SAM States, through their national committees, take into account the contents of Appendix B, with views that it serve as reference for an initial analysis on the impact it will have on the automated systems involved in the flight plans process, in view of the implementation of the new flight plan format in accordance with Amendment 1 to the PANS/ATM, and that they send the results to the ICAO SAM Regional Office by 30 August 2010, for their presentation at the Seminar/Workshop for the Implementation of Amendment 1 to the	**YES**	**N/A**	**YES**	**YES**	**NO**	**YES**	**--**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
15th Edition of the a PANS/ATM, to be held in Lima from 13 to 15 September 2010.															
Conclusion SAM/IG/6-1 Application of further actions to reduce the risk and risk rate resulting from the SAM ATS routes network optimisation safety plan That States, ATS providers and aircraft operators, take the necessary measures to apply recommendations and further actions in order to reduce the risk and resulting risk rate as shown in Appendix 1 to Chapter 4 of the Safety Plan for the SAM Region ATS routes network, as shown in Appendix A to this part of the report.			**YES**	**O/G**	**NO**					**O/G**	**NO**		**YES**	**YES**	
Conclusion SAM/IG/6-2 Application of subsequent actions to reduce the RNAV5 safety plan risk and the resulting risk rate That States, ATS providers and aircraft users take the			**YES**	**O/G**	**NO**					**O/G**	**O/G**		**YES**	**YES**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
necessary measures to apply further action to reduce the RNAV5 safety plan risk and the resulting risk rate, as shown in Appendix 1 to Chapter 4 of the safety plan for RNAV5 implementation in the SAM Region, shown in Appendix I to this part of the report.															
Conclusion SAM/IG/6-3 Forms CMA F5 and CMS F6 That SAM States take pertinent action in order to apply forms CMA F5 and CMA F6, attached as Appendices A and B to this part of the report, and send them to CARSAMMA as soon as the PBN approval of aircraft and operators is established.			**YES**	**YES**	**YES**					**O/G**	**NO**		**YES**	**YES**	
Conclusion SAM/IG/6-4 ENR 3.3 – Table model of the AIPs That SAM States, in publishing in their AIPs RNAV routes, use the ENR table model shown in Appendix D to this part of the report.			**YES**	**YES**	--					**YES**	**YES**		**YES**	--	**CHI:** As defined in SAM/IG/7

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Conclusion SAM/IG/6-5 Lateral navigation deviation reporting form That SAM States take the corresponding action in order to use the monitoring programme and particularly lateral navigation deviation reporting form attached as Appendix F to this part of the report, and send it to CARSAMMA on the tenth day of each month.			**YES**	**YES**	**NO**					**YES**	**YES**		**YES**	--	
Conclusion SAM/IG/6-6 Publication of an AIC/NOTAM announcing the postponement of the RNAV5 implementation date in the SAM Region That SAM States take the corresponding action in order to publish an AIC/NOTAM announcing the postponement of the RNAV5 implementation date in the SAM Region for 22 September 2011.			**YES**	**YES**	**NO**					**YES**	**YES**		**YES**	----	**CHI:** NOTAM

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Conclusion SAM/IG/6-7 Manual on Collaborative Decision-Making (CDM) for ATFM That SAM States adopt the Manual on Collaborative Decision-Making (CDM) for ATFM shown in Appendix B to this part of the report.			**YES**	**YES**	**NO**					**YES**	**NO**		**O/G**		
Conclusion SAM/IG/6-8 ATFM AIP SUPP/AIC MODEL That the States of the ICAO South American Region, when preparing their national AIC, use as a reference the ATFM AIP SUPP/AIC model shown in Appendix E to this part of the report.			**N/A**	**YES**	**NO**					**YES**	**YES**		**YES**		
Conclusion SAM/IG/6-9 – Actions required for AMHS interconnection That SAM States, in view of the delays in the interconnection of the AMHS, proceed with the following actions:													**YES**		
a) Require from their AMHS providers the necessary support to	**YES**	**N/A**	**YES**	**YES**	**NO**	**N/A**	**N/A**	**YES**	**NO**	**YES**	**YES**	**YES**	**YES**	**YES**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
successfully end the necessary interconnections;															
b) Make necessary arrangements to train personnel in the interconnection tasks, with the aim of minimizing the dependency with their providers;	**YES**	**N/A**	**YES**	**YES**	**NO**	**N/A**	**N/A**	**NO**	**NO**	**YES**	**YES**	**YES**	**YES**	**YES**	
c) Maximize pertinent coordinations; and	**YES**	**N/A**	**YES**	**YES**	**NO**	**N/A**	**N/A**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	
d) States that have not yet done so, complete the drafting and signature of the MoU.	**YES**	**N/A**	**O/G**	**O/G**	**NO**	**N/A**	**N/A**	**O/G**	**O/G**	**YES**	**O/G**	**O/G**	**YES**	**O/G**	
Conclusion SAM/IG/6-10 Review to the study for a new SAM digital network That SAM States analyze the study for the implementation of a new digital network for the SAM Region shown in Appendix B to this part of the Report, and send their comments to the ICAO SAM Regional Office by 31 January 2011.	**YES**	**YES**	**YES**	**YES**	**NO**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**O/G**	**YES**	
Conclusion SAM/IG/6-11 Changes in the AMHS systems and in the FDP for the implementation of	**NO**	**NO**	**OG**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**YES**	**YES**	**NO**	**YES**	**NO**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Amendment 1 to the PANS/ATM That SAM States take into account the contents of Appendix D to this Agenda Item, with the aim that by 1 July 2012 they operate with the NEW flight plan format, in addition to the CURRENT format, States that have identified problems in their AMHS must make the corresponding changes before 31 December 2011. Also, the changes to make in the FDP installed at the various ATS units should be effected by the end of March 2012.															
Conclusion SAM/IG/6-12 Action plan for the implementation of Amendment 1 to Doc. 4444 That SAM States, taking into account the actions indicated in the strategy for the implementation of Amendment 1 to the 15th Edition of the ICAO PANS/ATM (Doc 4444), and using as reference the action plan model presented by	**YES**	**NO**	**YES**	**YES**	**YES**	**NO**	**NO**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**COL:** Training for ATC and FPL has started. There will be a transition period, since the amendment is effective only as of November 2012.

Conclusión/Tarea Conclusion/Task	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**OBSERVACIONES REMARKS**
the Secretariat and the action plan presented by Brazil during the Seminar/Workshop, which appear as Appendices E and F to this part of the report, draft their action plans for the implementation of the Amendment and send it to the ICAO SAM Regional Office no later than 30 November 2010.															

Instrucciones para el llenado del formulario - Instructions to fill in the form

- Cumplida: colocar **Sí** en el casillero correspondiente. / Accomplished: place **YES** in the corresponding box
- En ejecución: colocar **OG** (on going) e indicar en "observaciones" la fecha prevista de término./ In execution: place **OG** (on going) and indicate under "remarks" the estimated deadline
- No cumplida: colocar **NO** en el casillero correspondiente y, de ser el caso, hacer comentarios en columna de observaciones/ Not complied: place **NO** in the corresponding box and if such were the case, make comments in the remarks column

Agenda Item 2: Optimization of the ATS routes

2.1 As stated in the introduction to the ATS route network optimisation programme, at the request of the States and International Organisations, the ICAO regular programme has focused its attention on the optimisation of the ATS route network, among other implementation projects.

2.2 The meeting recalled that during 2009 and 2010, the SAM States met to execute the action plan of the routes optimisation programme, based on the general principle that the ATS route network must serve as the basis for airspace organisation and for air traffic service requirements.

2.3 Likewise, the Region has considered that there is a very close connection between the route network structure and airspace sectoring, and that such connection must be taken into account from the planning phase to ensure the viability of a sectoring that optimises ATC capacity, including the possibility of ATS delegation.

2.4 On the other hand, the meeting considered that in order to ensure the efficiency of the route network with civil/military coordination and coordination was is essential and that the flexible use of airspace (FUA) concept is fundamental to make sure that the requirements of all airspace users are met.

2.5 The meeting analysed the optimisation programme, which establishes as **Phase 1** of the programme, the implementation of RNAV-5, **Phase 2,** Version 011 of the ATS route network, while **Phase 3** would correspond to the implementation of Version 02 of the SAM ATS route network, which entails a complete restructuring of the route network with a view to full integration of ATS routes, control sectors, TMAs, etc., through the implementation of the flexible use of airspace concept.

2.6 The meeting also recalled that **Phase 1** of the programme, concerning the implementation of RNAV-5, had been scheduled for September 2011, but was postponed for **20 October 2011**.

2.7 As regards **Phase 2** of the programme, involving Version 1 of the ATS route network, was satisfactorily concluded by the intended date of March 2011, with the implementation of 15 new RNAV routes, the realignment of 19 routes, and the elimination of 18 conventional and RNAV routes. The meeting highlighted the importance to comply with these dates, by using as mechanism the SAMIG meetings and workshops, as well as the two meetings on the optimisation of the ATS route network (ATSRO) carried out under the auspices of Regional Project RLA/06/901.

2.8 After a fruitful analysis, the Region considered to be ready to begin activities and carry out **Phase 3** involving the implementation of Version 02 of the ATS route network.

2.9 It should be added that, just as in Phase 2, it is expected that ATSRO meetings and workshops will be conducted. The SAM ATSRO/3 meeting/workshop is scheduled for 4-8 July 2011, with the support of Regional Project RLA/06/901.

2.10 The meeting made a full revision of the ATS routes network optimisation programme of the South American Region and carried out the planning of pertinent measures to initiate the implementation of **Phase 3** of the programme and its associated plan, in order to implement **Version 02** of the ATS routes network. The revised action plan is shown in **Appendix A** to this part of the report.

2.11 In view of the above, the Meeting agreed on the following Conclusion:

Conclusion SAM/IG/7-1 ATS routes network optimisation programme of the South American Region, Phase 3, Version 02

That ICAO SAM States take pertinent actions to follow the guidelines and comply with established deadlines to continue with Phase 3, Version 02 of the ATS routes network optimisation programme of the South American Region, shown in **Appendix A** to this part of the report.

RNAV Route Guayaquil-Madrid

2.12 The meeting recalled that the SAMIG/1 meeting held in Lima in April 2008, IATA requested to consider the route Guayaquil-Madrid. This gave rise to coordination activities that were reflected in the final reports of subsequent SAMIG meetings.

2.13 On this matter, the delegate from Venezuela informed the meeting that this implementation is still pending in view of segment in Maiquetía FIR, which involves a restricted airspace and it has not been possible yet to obtain information by the FAV for the crossing of same.

2.14 Under this agenda item, the meeting analysed information provided by Brazil with regard to their experience on conducting of a military operation carried out as international exercise, called CRUSEX V operation.

2.15 The meeting took note that, taking into account the application of the Concept of Flexible Airspace (FUA), which, in order to allow the execution of the exercise and minimise impacts to users, the Centre for Air Navigation Management had planned the activation of a parallel structure within the area of the exercise and of the involved ATC units, in order to furnish a satisfactory ATFM Service.

2.16 Note was taken on the philosophy of civil-military integration applied in Brazil and the planning and execution of military exercise, carried out, the meeting was of the opinion to include as **Appendix B** to this part of the report, the information provided by Brazil, taking into account the importance of this matter in the exchange of experiences about the flexible use of the airspace.

2.17 IATA requested to consider the realignment/implementation of RNAV routes between Aeroparque Jorge Newbery (SABE) and Bahía Blanca (SAZB) airports between GBE VOR and position MOXAN. The Argentinean administration, together with IATA made a preliminary analysis of this domestic route and the feasibility of a uni-directional route in the upper airspace was analysed, pending an analysis of both parts with the Argentinean Coordination Unit of the Flexible Use of the Airspace.

2.18 In parallel, and with regard to the route El Calafate-Ushuaia, the corresponding studies will be carried out between the user and the Argentinean Administration for the feasibility of this route and the same will be made with the Chilean administration, in their airspace.

Reduction of emissions in the South Atlantic (SAIRE)

2.19 On this matter, the meeting took note of the interest of Brazil to encourage an Interoperability Initiative to Reduce Emissions in the South Atlantic (SAIRE) and agreed to present as **Appendix C** to this part of the report the information provided on the possibilities for improvement and benefits related with the reduction of CO2 emissions in the South Atlantic.

Updating of LOAs

2.20 During the meeting, Argentina, Brazil, Paraguay, Suriname, Uruguay and Venezuela analysed the updating of the reference tables, for responsibility in ATS routes, in the appendices to LOAs among the following ACCs:

a) Montevideo ACC/Resistencia ACC
b) Montevideo ACC/Curitiba ACC
c) Resistencia ACC/Curitiba ACC
d) Asunción ACC/Curitiba ACC
e) Maiquetía ACC/Amazónico ACC; and
f) Paramaribo ACC/Amazónico ACC.

Agreement between La Paz ACC with the Curitiba, Brasilia, Amazónico and Resistencia ACCs

2.21 Tables corresponding to Appendices 1 of the LOAs among Curitiba ACC/La Paz ACC, Brasilia ACC/La Paz ACC, Amazónico ACC/La Paz ACC have not been signed in view of the fact that the corresponding Bolivian authority responsible for signature of these LOAs was not present at the meeting.

Agreement between Rochambeau ACC/Amazónico ACC and Georgetown ACC/ Amazónico ACC

2.22 Table corresponding to Appendix 1 of LOAs between Rochambeau ACC/Amazónico ACC and Georgetown ACC/ Amazónico ACC have not been signed yet in view of the fact that the corresponding French Guiana and Guyana were not present at the meeting. The referred LOAs will be sent by the Secretariat to the concerned States, for analysis and further signature.

Predictable estimate for year 2011/12 by IATA IN (13 AIRAC Cycles) on fuel savings and reduction of CO2 in the atmosphere as a result of the implementation of version 01 of the ATS routes optimisation plan in the SAM Region.

2.23 Fuel savings and estimate of savings in CO2 to the atmosphere has been predictably estimated for the period of 13 AIRAC cycles (2011/2012) with a tool used by IATA keeping in mind the last implementation of version 01 of the ATS routes optimisation programme carried out in March 2011. The table with the results of this estimate is shown in **Appendix D** to this part of the Report.

2.24 The IATA tools used were: FWZ Flight Planning Tool, IATA SRS Analyzer, Infrastructure ATM Calculator (Developed by IATA) and third party tools. IATA uses this tool as a means of quantifying the metrics to evaluate the initiatives on the ATM Operational Concept in the SAM Region.

Methodology used

2.25 The traffic data as supplied by the SRS Analyzer or provided by controlling agency is imported to the calculator. The calculator is able to calculate fuel savings for all modern transport category types individually or in generic groups' i.e. Narrow body, Wide body, Wide Tri-Quad and RJ's. The calculator is capable of quantifying savings in kilograms or pounds either using either distance or time savings as a factor. The phase of flight are then selected (Taxi, Climb, Cruise, Decent, Approach Landing). Current global IATA average fuel price is then selected and the calculator provides Cost savings in USD as price per kilo or pound and the CO2 savings associated with the reduced fuel burn are also calculated.

2.26 The meeting took note that the figures provided shown in Appendix D to this part of the report were based in a forecast considering a period of 13 AIRAC cycles. The fuel savings is **U$S 7,638,047** in that period is estimated at a cost of US$ 1.06 per kilogram of fuel. All estimates demonstrated that a reduction in the atmosphere pollution was of **22,697,971 kilos of CO2.** These preliminary figures as a result of the implementation in March 2011, of Version 01 of the ATS routes network optimisation programme were considered very encouraging for the ATM community.

Follow-up of conclusions and decisions adopted by SAMIG meetings

2.27 The meeting reviewed and updated **Appendix A to the Report on Agenda Item 1** of this report and the list of Conclusions and Decisions adopted by SAMIG meetings in the area of implementation and optimisation of ATS routes.

APPENDIX A

Programme for Optimising the ATS Route Network in the South American Region

Version 02

May 2011

1. Introduction

The main objective of the Airspace Organisation and Management (AOM) component of the Global ATM Operational Concept is to maximise efficient airspace use, while maintaining the required level of safety.

Incorporation of the Global ATM Operational Concept into the Global Air Navigation Plan facilitated the planning and implementation of new and innovative methods that make significant improvements in airspace organisation and management possible. The set of Global Planning Initiatives (GPI) directly involved in AOM offer the necessary guidelines for planning and implementing an optimum airspace structure, among the most important of which are:

a) GPI 1 –Flexible Use of Airspace

b) GPI 5 – RNAV and RNP

c) GPI 7 – Dynamic and Flexible ATS Route Management

d) GPI 8 – Collaborative Airspace Design and Management

e) GPI 10 – Terminal Area Design and Management

f) GPI 11 – RNAV and RNP SIDs and STARs

PBN implementation (GPI 5) will facilitate the use of advanced aircraft navigation capabilities, which, combined with the air navigation system infrastructure, will make it possible to optimise the airspace, including the route network. This will favour ATS routing that will meet the needs of airspace users, thereby reducing controller and pilot workloads and the concentration of aircraft in specific portions of the airspace.

Recognising the importance of PBN for AOM, the 36th ICAO Assembly established Resolution 36/23 urging States to implement ATS routes and RNAV and RNP approach procedures, based on the PBN Manual (Doc. 9613). The 36th Assembly also resolved that States and Regional Planning and Implementation Groups (PIRGs) should prepare a PBN implementation plan by 2009.

Before approving the Global ATM Operational Concept and the new Global Air Navigation Plan, CAR/SAM States, Territories, and International Organisations reviewed the ATS route network and implemented new RNAV routes, with the assistance of Project RLA/98/003 through its support for meetings of ATM authorities and planners --ATM (AP/ATM)-- , thereby helping to reduce some paths, leading to a compatible transition between the en-route flight phase and terminal control areas. It also made it possible to develop the CAR/SAM PBN Route Map, approved through GREPECAS/14 Conclusion 14/46.

As a result of the efforts of States with the support of project RLA 98/003, 77 RNAV routes have been implemented, the flight paths of 58 routes have been modified, and 7 routes have been eliminated. The ICAO Council has approved the respective amendments to the CAR/SAM ANP Route Network.

At the request of States and International Organisations, the ICAO regular programme has, among other implementation projects, focused its attention on optimising the ATS route network. In this respect, the meetings of the SAM Implementation Group (SAM/IG) are being held under the auspices of the new RLA 06/901 project. One of the aims of these meetings is to optimise the ATS route network in the South American Region. During its first two meetings, the SAM Implementation Group (SAM/IG/1 and SAM/IG/2) analysed the current state of the route network and confirmed the following:

a) Some routes have not met expectations as to their use by operators, despite the insistence of the latter on their implementation;

b) It was noted that some routes, although duly implemented, are in little use because the operators prefer less direct ATS routes, which result in higher operating costs and, in some cases, less airspace capacity and flexibility;

c) A large number of RNAV routes have not yet been linked through the SID and STAR procedures established in the TMAs, making flight and ATC operation difficult;

d) Airspace complexity is more related to air traffic movement than to airspace design *per se*. As a result, in some cases, routes with low traffic could be maintained so long as the corresponding operational benefits are obtained.

The SAM Region has seen the need to further improve the airspace structure, in order to achieve an inter-functional air traffic management system available to all users during all flight phases, that meets the agreed safety levels, provides cost-effective operations, is environmentally sustainable, and comply with national security requirements.

In order to achieve the above, the SAM/IG/2 meeting deemed it appropriate to conduct a feasibility study to develop an ATS route network that would meet the new aviation requirements and provide for the new performance-based navigation concept.

Considering the diversity of scenarios in the Region, the Meeting felt that this task would be very complicated and should be supported by the Regional Project RLA/06/901, in order to first make a diagnosis of the existing ATS Route Network, develop a strategy for carrying out the task in phases, if appropriate, prepare a list of deliverables, propose a work programme, identify the data needed and the means for their collection, define the necessary support tools to perform the task, specify the reference documentation required, and other aspects deemed relevant for the task, such as the interests of each State, geographic characteristics, etc. In addition to the aforementioned aspects, safety issues and other expectations described in the Global ATM Operational Concept should be taken into account.

Optimising the ATS route network in the South American Region is expected to contribute to the accomplishment of the following Strategic Objectives of ICAO:

A: Safety — *Enhance global civil aviation safety*

C: Environmental protection — *Minimise the adverse effect of global civil aviation on the environment*

D: Efficiency — *Enhance the efficiency of aviation operations*

2. Planning criteria

2.1. General Considerations

This chapter of the programme was based on the EUROCONTROL Manual for Airspace Planning (ASM.ET1.ST03.4000.EAPM.02.02), which can be obtained at the following website address:http://www.eurocontrol.int/airspace/gallery/content/public/EUROCONTROL%20APM%20V2_Ed-2_Released%20Issue_Amendment%202_010606.pdf. Those interested in deepening the analysis contained in this chapter are recommended to refer to that document.

The ATS route network should serve as a basis for airspace organisation and air traffic service requirements. It should be established in such a way as to permit most flights to operate on direct routes, or as close to such routes as possible, in order to unite flight origin/destination areas. This structure must be operationally viable. In order to achieve optimum ATC capacity, it may be necessary to establish non-optimum flight levels and/or paths, but this could reduce the complexity of the airspace structure.

There is a very close relationship between the route network structure and airspace sectorisation. Therefore, that relationship should be considered as of the planning phase, in order to ensure the viability of sectorisation that would make optimum ATC capacity possible, including the possibility of ATS delegation. Definition of the route type (one-way/two-way) and the direction of one-way routes can take into consideration the need for more efficient sectorisation. In more complex airspace structures, validation through ATC simulations may be necessary before implementation.

Civil/military coordination is essential to ensure route network efficiency. The flexible use of airspace (FUA) concept is of key importance for guaranteeing that the requirements of all airspace users are met. FUA application permits the implementation of additional direct routes, as of the moment direct aircraft routing practices are adopted at the ATC tactical level, in cases where temporary special use airspaces (SUA)[1] are not activated. Automatic flight plan reprocessing may facilitate FUA application, permitting flight planning, if information about SUA availability for civil aviation is made viable sufficiently in advance.

Definition of the main traffic flows should include domestic air traffic routes and segments, in order to make the development of an integrated structure possible in the initial planning phase. Efforts should be made to eliminate points of congestion. In that case, special care should be taken to avoid worsening the situation of one area when attempting to resolve problems in another area.

The number of ATS routes should be kept to a minimum, always considering the traffic demand in relation to ATC capacity and the possibility of applying direct routes. Utilisation of a large number of ATS routes improves the possibility of using direct routes. Having a large number of crossing points, however, especially in areas that are already congested, normally reduces ATC capacity, in accordance with growing airspace complexity. Airspace planners should optimise ATC capacity by introducing new routes with the least number of crossing points possible and/or inserting the crossing points as far from the congested areas as possible. In that way, if the implementation of a new route is planned to accommodate a foreseen demand in air traffic that is not confirmed during the implementation phase, its implementation should be reconsidered. Furthermore, redundant ATS routes should be eliminated.

The use of one-way routes should be considered, particularly in areas where the interaction between ascending/descending traffic is a limiting factor, and represents an advantage in improving airspace structure that will lead to increased ATC capacity in ATC sectors. Likewise, in congested areas, aircraft overflights should not, insofar as possible, cross each other or interfere with the arrival and departure flow of the main TMAs, and the duration of possible crossings should be minimised and preferably carried out at 90º angles.

2.2. Use of Performance-Based Navigation

The use of Performance-Based Navigation creates the necessary conditions for optimising the ATS route network, inasmuch as it makes it possible to harmonise aircraft and operator approval criteria for en-route RNAV operations and permits the establishment of appropriate route spacing with the application of the Protected Airspace Concept. With PBN implementation, the airspace can be made less complex through the elimination of conventional routes, reduction of crossing points between flight paths, and orderly arrangement of the airspace as a whole.

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[1] Special Use Airspaces are those provided for in Doc 8126 (AIS Manual), which should be inserted in the ENR part of the AIP of each State, as follows:
ENR 5.1 –Restricted / Prohibited / Dangerous Areas
ENR 5.2 – Areas for Training and Military Exercises / Air Defence Identification Zones (ADIZ)
ENR 5.3 – Other Dangerous Activities and Other Potential Risks

2.3. Regional Routes and Domestic Routes

In airspaces where international operations are responsible for most of the traffic, development of the route network requires coherent coordination among the States involved. In airspaces where most of the air traffic consists of domestic operations, the route network must be harmonised with the adjacent States, in order to optimise the airspace structure.

Isolated State development of domestic ATS routes should be limited to airspaces that serve national purposes only. In addition, such efforts normally have direct and perceptible effects on air traffic beyond the jurisdiction of the State involved.

Development of a harmonised and consistent route network requires active participation by States in the international working groups formed to establish or review the regional route network, considering a top down strategy, based on regional operational requirements for increasing ATC capacity, bearing in mind the following criteria:

a) First, identify the main regional air traffic flows, together with those that extend beyond the Region and have a direct impact on the regional route network, in order to seek out shortcomings in the route network and in ATC sector organisation.

b) Establish and review the ATS route network and support sectorisation in order to accommodate the main air traffic flows, thereby reducing airspace complexity and balancing ATC workload.

c) Integrate the required routes to provide access to the regional route network from/to airports not served by it. It is also necessary to integrate non-permanent routes that are needed to alleviate the air traffic load in the main ATS routes and to ensure flight at the most optimum profile possible.

d) Ensure connectivity between the ATS route network from/to TMA airspace.

e) Establish phased implementation to ensure consistency with State implementation.

2.4. Relationship between ATS Routes and Control Areas (CTA)

Use of Control Areas (CTA) in significant portions of the airspace beyond the ATS routes has the advantage of allowing the controller, when air traffic conditions permit, to authorise a specific flight under his/her control to deviate from an established ATS route without having the aircraft leave the controlled airspace and without losing the ATC benefits.

Within the CTA, however, the protected airspace of ATS Routes is not visible, because, by definition, all airspace around the routes is controlled airspace and this does not facilitate the demarcation of special use airspace (SUA) adjacent to ATS routes. On the other hand, establishing ATS routes in the form of corridors (airways) offers a clear description of the associated protected airspaces, within which controlled flights should remain.

To give flexibility to VFR flights outside airways and TMAs, the lower limits of controlled airspace must be established in order to avoid unnecessarily restricting flights that do not require air traffic control services, while keeping IFR traffic within the controlled airspace during the departure, en-route, arrival and approach phases.

2.5. Flexible Use of Airspace (FUA)

Most ATS routes must be established on a permanent basis. There are cases, however, in which the application of non-permanent routes, in keeping with the existence of temporary special use airspace (SUA), can make it possible to optimise the airspace structure, either reducing the traffic load on the main routes or permitting flights at more convenient profiles.

By way of example, EUROCONTROL has established Conditional Routes (CDRs), according to a specific classification for each operational situation:

a) CDR 1 – Routes that can only be used during specific periods, for example, during weekends or at night. These routes can be used permanently for flight planning purposes during the periods specified in the AIP. Changes in periods specified in the AIP should be published through standard AIS procedures.

b) CDR 2 – Routes that can be used through pre-tactical coordination procedures established by the Airspace Management Control (AMC) units. These routes can be used for flight planning, but not permanently, depending upon AMC coordination. They normally depend upon the capacity for reprocessing flight plans.

c) CDR 3 – Routes that can be used tactically by the ATC unit through direct coordination between the ATC and the user of the special use area. These routes are not used for flight planning purposes.

ATS routes used under the Flexible Use of Airspace concept should be included in the ATS route network, with a clear indication of the limitations imposed by their non-permanent nature. These routes should be reviewed at regular intervals in order to assess their type (1, 2 or 3), whenever fuller use of these routes is needed.

2.6. Protected Airspace – Route Spacing Concept

Item 2.11 of Annex 11 establishes the requirement to provide protected airspace and adequate spacing between adjacent ATS routes. This spacing between the centre lines of parallel runways where PBN is applied depends upon the type of RNAV or RNP specified by each State or on the basis of regional agreements.

In the case of RNAV-5 (B-RNAV) application in Europe, the minimum route spacing was established at between 10 and 15 NM, depending upon whether or not radar was used and ATC intervention capacity.

Route spacing should be assessed as provided for in Doc. 9689, bearing in mind, among other aspects, the available ATS surveillance capacity and air traffic controller workload.

2.7. Harmonisation in route network publication

Doc 8126 (AIS Manual) recommends that part ENR 3 of the AIP contain a list of all ATS routes established within the territory of a State, whether as part of the Regional or of the National Route Network.

As specified in Doc. 8126 (ENR 3 – ATS Routes), a description of the special procedures required in a route or part of a route must be included where applicable.

Under these circumstances, permanent or non-permanent routes should be listed together, inasmuch as a route can contain permanent and non-permanent segments. Special procedures for each route or segment, however, should be published in a specific part of the AIP.

2.8. Planning Principles

The planning principles for developing an ATS route network were established in the Guide for the Implementation of RNAV Routes in the CAR/SAM Regions, approved through Conclusion 12/7 of the GREPECAS/12 meeting. To facilitate reference to those principles, they will be included in this document.

2.8.1. Airspace planners should keep the following planning principles in mind:

a) Air traffic volume in existing and proposed routes;

b) Establishment of the shortest routes possible for most of the flights;

c) Prioritise the planning of areas of greater air traffic volume;

d) Meet the needs of civil and military users;

e) Integration of the route network and support sectorisation at the start of the planning process;

f) Integrate the route network and the TMA arrival and departure flight paths (SIDs and STARs).

2.8.2. **Air traffic volume in existing and proposed routes**

Considering the advantages of RNAV routes and the growing number of users trained in RNAV flight, implementation of an RNAV route normally absorbs most of the air traffic of one or more "conventional" routes. Therefore, the elimination of any of the existing "conventional" routes should be evaluated and accomplished, if necessary, through an analysis of the air traffic volume in each of the routes involved, whether they are RNAV routes or not. It is important to stress that maintaining "conventional" routes for a small number of users not equipped for RNAV flights does not necessarily mean increasing airspace complexity, for that complexity is due to the number of existing flights for each route and not to the additional crossings that would appear on the aeronautical charts.

2.8.3. **Establishment of the shortest routes possible for most of the flights**

Considering the need to serve most users at their optimum flight profiles, the establishment of direct routes as close as possible to the origin/destination paths should be prioritised. Inasmuch as the RNAV route normally absorbs most of the air traffic, implementation of the RNAV route will most likely take preference over the "conventional" route. It is important to emphasise that it may be necessary to maintain routes for users whose aircraft are not RNAV-equipped. Inasmuch as it is not always possible to establish a route between origin and destination, the need should be considered for implementing specific one-way routes for departure from and arrival at a TMA, using specific arrival and departure control sectors. Airspace planning should consider the requirement for establishing new airspace sectorisation when beginning the implementation of a new version of the route network.

2.8.4. **Prioritise the planning of areas of greater air traffic volume**

In order to accomplish the aim of giving most users the shortest routes possible, airspace planning should start in airspace regions with the greatest air traffic volume and proceed to those with the least volume, giving priority to flows with the highest air traffic volume.

2.8.5. **Integration of the RNAV route network and support sectorisation at the start of the planning process**

Adequate airspace sectorisation needs to be guaranteed from the very beginning of the planning process. Furthermore, the planning should not consider FIR boundaries, in order to create a seamless airspace, including, if necessary, the delegation of air traffic services.

2.8.6 **Integration of the route network and TMA arrival and departure paths**

Integration of the RNAV route network and TMA arrival and departure paths should be considered during the initial planning phase for implementation of a new route network, considering the need to reduce pilot and air traffic controller workloads, mainly through more effective use of flight management systems (FMS) and by reducing the ground/air/ground communications load.

2.9. Concepts facilitating route network implementation

Some concepts facilitate consistent and harmonised implementation of a route network.

These concepts are:

a) PBN – as already mentioned in item 2.2

b) FUA – as already mentioned in item 2.5

c) Seamless Airspace – Route network planning and implementation should be accomplished with the application of the seamless concept, without considering FIR boundaries. ATS delegation should be applied as needed to increase ATM capacity and efficiency. This delegation should normally occur:

- When the crossing points are located near the FIR or sector boundaries, to give the controller the necessary information sufficiently in advance to be able to manage the traffic entering the adjacent FIR.
- When the flying time in a given FIR is short, in order to reduce coordination among ATC units responsible for adjacent FIRS, thereby reducing the workload.
- In TMA sectors, to allow the controller to anticipate the regulation/radar vectors for the incoming flow.

d) RVSM – RVSM has permitted the application of additional flight levels that favour the conditions required for distributing aircraft into Flight Level Assignment Systems (FLAS), in order to improve flight safety, thereby minimising the effect on the efficiency of air operations.

2.10 Planning Techniques

2.10.1. Establishment of specialised routes

In high traffic density areas, additional ATC capacity may be obtained by segregating arrival and departure routes and separating them from overflight routes. This increase in capacity is due to the fact that this structure normally avoids conflicts among ascending and descending aircraft and between these and overflying aircraft. As a result, this structure should be applied for the arrival and departure phases. Application of Continuous Descent Approaches (CDAs) depends upon the establishment of specialised arrival paths, through either one-way routes or STARs, with the least possible number of crossings, to allow aircraft to descend without interruption.

2.10.2. Establishment of specialised sectors

Based upon the structure described in item 2.10.1, specialised sectors may be established by grouping routes of a similar nature, like arrival sectors, departure sectors or overflight sectors. These sectors are applied especially in ACC sectors responsible for "feeding" a highly complex TMA, as well as in TMAs themselves.

2.10.3. Crossings as close as possible to the origin of the flights

The route network must be developed in such a way that the essential route crossings used by the main traffic flows are as close as possible to their origin. Considering the complexity of the area of origin, however, it may be appropriate to transfer the crossings to areas with lower traffic/route densities. Crossings should also be executed preferably in areas with ATS surveillance.

3. **Analysis and Diagnosis of the SAM ATS Route Network**

3.1. **General Considerations**

The purpose of this chapter is to make a general analysis and diagnosis of the SAM ATS route network, in light of the planning criteria presented in chapter 2. The items in this chapter correspond to the items in chapter 2, in order to facilitate an understanding of the criteria applied in the analysis and diagnosis of the SAM ATS route network.

Based on material available at the ICAO South American Office, it can be noted that information was already available in 1957 about the development of a route network for the SAM Region and the South Atlantic. It can also be noted in reports of the First and Second CAR/SAM Air Navigation Meetings, held in 1976 and 1989, respectively, that the stability of the route network was always a matter of concern and that there were a prevalence of isolated State initiatives for the development of their own route networks. There were initiatives in the Region for the development of an integrated route network, with the holding of panel meetings starting in 1980, but with limited results, considering the complexity of the subject and the limited time available for the studies. It was only in 1999, during the Third CAR/SAM Air Navigation Meeting (CAR/SAM/3 RAN - Buenos Aires, Argentina, 5-15 October 1999) that the ATS route network was considered stable and fit to be a part of the Regional Air Navigation Plan.

Generally speaking, the development of the route network in the SAM Region was always based on the specific requirements of isolated routes; there was no global analysis that considered broader operational requirements, and in which a functional interrelationship among the various elements of airspace structure were sought, such as: ATS Routes, Control Sectors, Control Areas, TMAs, etc.

As already mentioned, the work performed by the States with the support of Regional Project RLA/98/ resulted in the implementation of 77 RNAV routes, the modification of the paths of 58 routes, and the elimination of only 7 routes. Although this effort has met the operational requirements of airspace users, the addition of RNAV routes to the existing airspace structure ended up, in some cases, by increasing airspace complexity and thus reducing ATC capacity.

3.2. Use of Performance-Based Navigation

RNAV-5 application in the South American Region, foreseen for November 2010, will create the necessary conditions for harmonising aircraft and operator approval criteria for flights in RNAV routes and will provide the necessary elements for establishing adequate spacing between routes.

According to conclusion SAM/IG/2- 3, the assessment of fleet navigation capacity will make it possible to analyse the feasibility of implementing an exclusive RNAV-5 airspace in the SAM Region in a given volume of airspace (for example, between FL 290 and FL 410). This exclusionary airspace would constitute an important element for reducing airspace complexity, with the corresponding increase in airspace capacity.

Another important aspect to be considered is that the maintenance of conventional routes in the SAM Region should take into account the coverage of available radio aids, so that they can be effectively flown by aircraft not equipped for RNAV operations.

3.3. Regional and Domestic Routes

The SAM route network has always been planned and implemented on an isolated basis. International routes are normally analysed in an international forum like the RNAV/RNP Task Force, the ATM/CNS Subgroup, AP/ATM meetings, etc., individually, without any specific concern for an integrated analysis based on the need to assess the impact on ATC capacity. States are responsible for domestic routes, which are implemented without any specific integration into the regional route network. In light of the interrelationship between domestic and regional routes, planning and implementation should be integrated, with a view towards obtaining an optimum structure of the airspace, including ATC control sectors.

SAM ATS routes should be implemented using a top-down strategy, in order to identify the main regional air traffic flows, as well as the shortcomings in the route network and in the sectorisation of the ATC units involved. Based on that identification, it would be possible to conceive an integrated regional/national network that would meet the needs of airspace users and ATS providers. That network should consider the need for sectorisation, integration of the airports it does not serve, the use of non-permanent routes, and connectivity among TMAs.

3.4. Relationship between ATS Routes and Control Areas (CTAs)

According to the information contained in the CAR/SAM Regional Air Navigation Plan (Doc. 8733), six States in the SAM Region have adopted widespread use of CTAs in their airspace above and beyond the ATS routes. Nonetheless, in a significant portion, air traffic control service is not provided to flights that are occasionally made outside the ATS routes. As a result, ATS routes must be established to serve IFR flights, even though the air traffic flow may not be significant, in order to guarantee that they receive air traffic control service.

More widespread adoption of CTAs in the SAM Region could avoid the need for implementing ATS routes in significantly less dense air traffic flows.

3.5. Flexible Use of Airspace (FUA)

In the SAM Region, there is no systematic and harmonised application of a Flexible Use of Airspace, unlike EUROCONTROL. There is a close relationship between FUA application and ATFM, inasmuch as the adoption of non-permanent routes can increase airspace capacity in a given portion of the airspace.

The expansion and systematic application of FUA in the SAM Region is a key element for optimising the route network, in view of its importance for ensuring, at least partially, that aircraft fly their optimum profiles and, in some cases, that airspace complexity is reduced.

Note the need for full development of documentation concerning FUA application, including standards and procedures, as well as the harmonised publication of special procedures applied to non-permanent routes, as provided for in Doc 8126.

3.6. Protected Airspace – Route Spacing Concept

The protected airspace and RNAV route spacing concept envisaged in Annex 11 was not defined in the SAM Region. As a result, spacing between RNAV routes, one of the key elements of airspace planning, has not yet been established, leaving controllers to apply vertical and/or horizontal separation based on ATS Surveillance.

One of the most important factors in optimising the route network would be to establish minimum spacing between RNAV routes, based on the specific characteristics of the SAM Region, such as air traffic volume, air traffic concentration, passing frequency, operational errors, available ATS surveillance, aeronautical communications, and ATC intervention capacity, etc.

Airspace complexity is intrinsically related to the need for controller intervention to provide aircraft separation. The more “natural” the separation between aircraft, ensured by appropriate spacing between ATS routes, the less the need for controller intervention and, consequently, the greater the available ATC capacity.

3.7. Harmonised route network publication

As already mentioned in item 3.5, there is a need to harmonise the way special procedures established for non-permanent routes are published, as required by Doc. 8126. That harmonisation will enable aircraft operators to find out about the operating restrictions on the use of those routes, particularly if they can be used for flight planning and when they can be used for that purpose. Likewise, the restrictions could also establish specific fuel requirements in the event that more appropriate routes were not available.

3.8. Planning Principles

The planning principles should be applied in order to make an objective analysis based on statistical data and the experience of State experts, in order to remedy shortcomings in the route network and in the sectorisation of the ATC units involved.

Collection and analysis of flight data in a significant time sample is key to planning route optimisation, considering that it will be possible through that data to determine the main air traffic flows and, as a result, to prioritise the implementation of routes designed to serve those flows, thereby establishing the most direct routes possible for most flights. Collection of that data has always been limited, thus preventing an in-depth analysis of the main air traffic flows.

Data collection by CARSAMMA, which is limited to the airspace between FL 290 and FL 410 (sample used in RVSM safety assessment), is normally applied, allowing for a preliminary analysis, considering that data are not available for all SAM States. The data obtained from CARSAMMA, processed and analysed in the PBN Implementation Programme for En route Operations, approved by Conclusion SAM/IG/2-1, were inserted in the table. A preliminary analysis of that data reveals that in most of the SAM FIRs, considering the States for which data are available, a small number of ATS routes (up to 14) are used by a large number of flights (85% or more). Table 2, for its part, shows that a small number of city-pairs (up to 16) accounts for most of the air traffic movement (51% or more) in the FIRs.

Air traffic movement between FL 290 and FL 410, by FIR, and percentage of flights on the main ATS Routes Period: 13 to 28 January 2008				
Country	**FIR**	**Amount of air traffic in the sample**	**Percentage of flights on the main ATS routes**	**Number of ATS Routes**
Argentina	Cordoba	1769	92%	13
	Comodoro Rivadavia	713	96%	9
Bolivia	La Paz	684	97%	13
Brazil	Amazonica	4085	67%	13
	Brasilia	11333	50%	12
	Curitiba	10499	44%	13
	Recife	3418	66%	13
	Sao Paulo (TMA)*	1911	100%	4
Chile	Antofagasta	1480	89%	10
	Pascua	164	100%	4
	Puerto Montt	412	94%	6
	Punta Arenas**	281	98%	7
	Santiago	2109	89%	13
Guyana	Georgetown	187	97%	9
Panama	Panama	1389	70%	14
Paraguay	Asuncion	605	90%	14
Peru	Lima	3599	69%	14
Suriname	Paramaribo	369	98%	11
Uruguay	Montevideo***	892	100%	12

* Provides ACC service in the segment between Rio de Janeiro and Sao Paulo. This sample does not cover a significant volume of flights because the aircraft fly below FL 290.
** 91% on ATS UT 100 route
*** A significant volume of flights does not appear in the sample because the aircraft fly below FL 290.

Table 1 – Air Traffic Movement between FL 290 and FL 410, by FIR, and percentage of flights on the main ATS Routes

Air traffic movement between FL 290 and FL 410, by FIR,

and percentage in the main city-pairs Period: 13 to 28 January 2008				
Country	**FIR**	**Amount of air traffic in the sample**	**Percentage of flights of the sample in the main city-pairs**	**Number of city-pairs**
Argentina	Cordoba	1769	51%	14
	Comodoro Rivadavia	713	65%	13
Bolivia	La Paz	684	60%	14
Brazil	Amazonica	4085	27%	14
	Brasilia	11333	28%	17
	Curitiba	10499	28%	16
	Recife	3418	31%	16
	Sao Paulo (TMA)*	1911	76%	15
Chile	Antofagasta	1480	70%	15
	Pascua	164	89%	11
	Puerto Montt	412	94%	10
	Punta Arenas**	281	92%	8
	Santiago	2109	58%	13
Guyana	Georgetown	187	79%	10
Panama	Panama	1389	48%	15
Paraguay	Asuncion	605	53%	13
Peru	Lima	3599	39%	16
Suriname	Paramaribo	369	71%	15
Uruguay	Montevideo**	892	75%	11

* Provides ACC Service in the segment between Rio de Janeiro and Sao Paulo. A significant volume of flights is not covered in the sample because the aircraft fly below FL 290.

** A significant volume of flights is not covered in the sample because the aircarft fly below FL 290

Table 2 – Air Traffic Movement between FL 290 and FL 410, by FIR, and percentage in the main city-pairs

Another important planning phase is the consideration, at the beginning of the work, of airspace sectorisation under ATS unit jurisdiction, inasmuch as the route network has a decisive influence on the sectors and, *vice versa*, the latter can influence the composition of the route network. Route network and ATC planning are not integrated in the SAM Region. In the more complex airspaces, airspace modeling and ATC simulation (in real and/or fast time) tools need to be applied to assess the interrelationship between the route network and airspace sectorisation.

Another analysis that is needed is the integration of the route network and TMA arrival/departure paths (SIDs and STARs), considering that RNAV promotes conditions for the establishment of specific arrival/departure sectors, thereby reducing airspace complexity. It can be noted that most SAM States have not yet implemented the necessary SIDs and STARs to link up departure/arrival paths with the route network. It is important to consider those procedures during the route network planning phase.

3.9. Concepts that facilitate implementation of the Route Network

Of the concepts mentioned in item 2.9, the CAR/SAM Regions have already implemented RVSM in January 2005. RNAV-5 implementation, foreseen for November 2010, will contribute enormously to the optimisation of the SAM route network. As already mentioned in item 3.5, there is a need to systematise FUA application in the Region, as a means for optimising use of the available airspace. In addition, the planning of airspace in general and of the new route network in particular, should consider the seamless concept in order to achieve a better airspace structure. As a result, the conception of a new SAM route network should not consider FIR and sector boundaries for its development.

3.10. Planning Techniques

From the available information, it is not possible to identify whether the planning techniques mentioned in item 2.10 are being applied. Nevertheless, the use of one-way routes can be noted in the following TMAs, indicating the possibility that specialised arrival and departure routes and sectors are being used:

a) Argentina: Ezeiza

b) Brazil: Belo Horizonte, Brasilia, Rio de Janeiro, and Sao Paulo.

c) Chile: Santiago

d) Uruguay: Montevideo.

In optimising the route network, it would be important to assess the specific operational requirements of the main TMAs, in order to identify the need for specialised arrival and departure sectors. Should the TMAs need such, it would be necessary to establish points of entry and departure, in order to allow for the development and integration of the route network into the structure of the main TMAs of the SAM Region. It would also be necessary to evaluate whether that integration would be accomplished by means of the route network or through SIDs/STARs linking the main airports to trunk routes that would serve the main regional flows.

4. <u>Implementation Phases</u>

The SAM route network should be optimised in phases, in order to achieve the corresponding operational benefits as early as possible. The concept of route network versions would be incorporated starting in phase 2, considering that the airspace structure is changing in keeping with the growth in air traffic movement, the shift in air traffic demand from one Region or airport to another, and the available technology, among other aspects. The use of route network versions reflects the need for their periodic comprehensive revision, in order to always guarantee the best possible airspace structure. The implementation phases, with their corresponding activities, are set forth in the Programme for Optimising the ATS Route Network of the South American Region that is presented as Attachment A to this programme. This chapter describes the activities listed in Attachment A.

4.1. **Phase 1 – RNAV-5 Implementation**

It is advisable to consider RNAV-5 implementation as the beginning of the route network optimisation programme, keeping in mind that it is a concept that will facilitate that optimisation. That implementation phase will be carried out in keeping with the SAM PBN Implementation Programme, approved by the SAM/IG/2 meeting and which is based on the PBN Roadmap approved by GREPECAS.

4.2. **Phase 2 – Implementation of Version 1 of the SAM ATS Route Network**

The second phase would correspond to the first version of the SAM ATS route network, within a new integrated development concept. This new version should consist of a broader analysis of the route network, based on statistical data about air traffic movement and fleet navigation capacity, seeking the elimination of unused routes and the exclusion or reduced use of "conventional" routes in a volume of airspace yet to be determined, in which a significant majority of users are equipped for RNAV-5 operations. That phase is directly related to phase 1 and a significant portion of the part relating to the Airspace Concept, envisaged in the RNAV-5 Implementation Programme in the SAM Region, would be detailed during said phase of the Route Network Optimisation Programme. It would be desirable for phases 1 and 2 to be implemented at the same time. Inasmuch as that may not be possible, given the complexity of the route network studies, this programme will maintain two separate phases.

4.2.1. Draft the Feasibility Study for Optimising the SAM Route Network

This activity aimed at assessing the feasibility of optimising the route network, the strategy to be used, and the proposal of a detailed action plan to accomplish said optimisation, is part of the study carried out.

4.2.2. Airspace Concept

The development of the Airspace Concept is the basis for optimising the route network, inasmuch as that concept is fundamental for instituting measurable benefits for airspace users. In that connection, the necessary analyses for the development of that concept should be based on statistical data about air traffic movement and the capacity of the aircraft fleet operating in the SAM Region.

4.2.2.1. Collect traffic data in order to understand airspace traffic flows

Statistical data are essential for shaping an airspace structure that conforms to the airspace planning principles and techniques presented in items 2.8 and 2.10 of this programme, respectively. Traffic data should be collected periodically in order to analyse the evolution of air traffic demand in the Region. According to the discussions held by the SAM/IG meetings, the SAM States should use the form presented in Attachment B, to collect the necessary data for developing version 1 of the SAM route network. It is essential for States to fill in the form according to the instructions given, in order to ensure that the data are consistent and effectively used in the analysis, as well as to facilitate their processing.

4.2.2.2. Analyse the Fleet Navigation Capacity

The Fleet Navigation Capacity is necessary to determine the airspace volume in which it is possible to apply RNAV on an exclusionary basis, in order to optimise aircraft flow and, at the same time, reduce the complexity and the pilot and air traffic controller workload. This task corresponds to task 1.3 of the SAM RNAV-5 Implementation Programme and should be completed in 2009.

4.2.2.3. Determine the gateways of the main TMAs in the SAM Region

States should present their National PBN Implementation Plans, as foreseen in Resolution 36/23 of the 36th ICAO Assembly and in Conclusion 15/38 of GREPECAS/15. States should develop their own airspace concepts for PBN planning and implementation in the TMAs. This will lead them to define the gateways for the main TMAs in the SAM Region. In version 1 of the route network, it will only be possible to have TMA gateways for the States that have already undertaken their PBN implementation process or any other way to restructure airspace in the TMAs. Furthermore, the information available from the States in developing version 1 should also be considered in this phase.

4.2.2.4. Determine and obtain the necessary tools for conducting the study mentioned in item 4.2.2.5 (aeronautical charts, specific software)

The detailed study specified in item 2.2.5 of the Action Plan for Phase 2 calls for specific tools, like aeronautical charts and specific software, to permit an adequate analysis of the SAM route network. Such tools will also be necessary for the workshop envisaged in item 2.2.6 of the same action plan. In this way, Regional Project RLA/06/901, with the support of the SAM/IG/3 meeting, shall determine these tools and seek the means to obtain them. Generally speaking, it will be necessary to have aeronautical charts containing the route network, the main TMAs, the SIDs and STARs and the approach procedures of the main airports in the SAM Region. It would also be advisable to use flight planning software like, for example, FliteStar (Jeppesen), containing the information mentioned in the aeronautical charts, in order to facilitate information management. Furthermore, it would be advisable to use software that would allow for the design of new routes, with the automatic determination of approximate geographic coordinates of significant points.

4.2.2.5. Conduct a detailed study of the SAM ATS route network, with a view to preparing version 1 of the route network

Considering the complexity of the task of developing a new version of the route network for the SAM Region, it will be necessary for a group of experts to be assigned to prepare a preliminary version containing all of the relevant information, permitting experts of each SAM State to evaluate it, for purposes of reviewing and validating the study. The main aim of version 1 of the SAM route network will be to minimise airspace complexity through the elimination of ATS routes not being used, and the elimination of "conventional" routes in an appropriate volume of airspace. The study should also seek to integrate regional and domestic routes, including proposals for the elimination and/or realignment of domestic routes, to be considered by the States involved. It is important to stress that the determination of the interface points between the CAR and SAM Regions will be of key importance for guaranteeing the interoperability of the route networks of the two Regions. It will also be possible in that phase to obtain operational advantages from realigning ATS routes to serve TMA gateways of States that already possess that information.

The study should develop a proposed preliminary amendment to the CAR/SAM Air Navigation Plan. It will also be necessary for the study to establish the required safety assessment methodology, in accordance with the magnitude of the proposed changes and of the need to determine the spacing between RNAV-5 routes in the SAM Region. The SAM/IG/5 Meeting should review the complete study in order to seek a version in keeping with the planning of the States involved.

4.2.2.6. Hold a workshop of SAM experts to review and validate the study referred to in item 4.2.2.5.

The SAM States should review and validate the work described in item 4.2.2.5, including proposals for the elimination and/or realignment of domestic routes. The most rapid and effective way of performing that review and validation would be through a workshop where the responsible experts could present the work done, in the necessary detail for an appropriate evaluation. The State experts could use the same tools used for the study, thereby facilitating its understanding. It is expected that the experts participating in the workshop will have the authority to decide on the implementation of the route network, using the same model applied in the AP/ATM meetings.

4.2.3. Implementation of Version 1 of the SAM ATS Route Network

The SAM Regional Office and the States are responsible for the activities of this item, in terms of processing the proposed amendment to the CAR/SAM Air Navigation Plan and publishing version 1 of the SAM ATS Route Network, respectively. The dates for the implementation activities will be established in keeping with the complexity of the amendments proposed to the study mentioned in 4.2.2.5 and decided in the workshop mentioned in 4.2.2.6.

4.3. Phase 3 – Implementation of Version 2 of the SAM ATS Route Network

The third phase would correspond to version 2 of the SAM ATS route network and should consist of the complete restructuring of the route network in a search for complete integration between ATS routes, control sectors, TMAs, etc., applying the Flexible Use of Airspace concept. This phase would require specific airspace modeling and ATC fast-time simulation tools.

4.3.1. Flexible Use of Airspace

As already mentioned in items 2.9 and 3.5, Flexible Use of Airspace is one of the concepts that facilitates optimisation of the route network and that is not being systematically applied in the SAM Region. Inasmuch as the various implementation projects existing in the Region would not permit this subject to be addressed in version 1 of the SAM route network, an FUA application model would be established for version 2 of the route network.

4.3.1.1. Develop Guidance Material for Application of the Flexible Use of Airspace Concept

FUA application depends upon the development of appropriate guidance material, from which States may obtain, in a harmonised way, all of the procedures applicable at regional level. An example of FUA application is that carried out by EUROCONTROL, which can be obtained from the EUROCONTROL Handbook for Airspace Management (ASM.ET1.ST08.54000.HBK02-00), at its website address: http://www.eurocontrol.int/airspace/gallery/content/public/documents/fua/EUROCONTROL%20ASM%20HBK%20Ed2-A05%20-%20Released%20Issue%20140308.pdf. Other EUROCONTROL guidance documents can be obtained at the following web address: http://www.eurocontrol.int/airspace/public/site_preferences/display_library_list_public.html. This initial guidance material should be limited to basic FUA application, considering the lack of specific tools for airspace management (ASM) in real time. In general terms, that application would be based on the use of routes similar to those used by EUROCONTROL as CDR 1 and CDR 3. The CDR 2s depend upon the cited ASM tools that shall not be available for version 2 of the route network.

The guidance material should include, *inter alia*, the following aspects:

- Model for the use of non-permanent routes, similar to that applied by EUROCONTROL (Conditional Routes – CDR).
- Criteria for defining scenarios in which non-permanent routes are applied.
- Criteria for categorising non-permanent routes.
- Harmonised publication of non-permanent routes.
- Representation of non-permanent routes in aeronautical charts.

4.3.1.2. Establish a Civil-Military Coordination Committee to evaluate application of the Flexible Use of Airspace Concept

To ensure FUA application, each State should create a Civil/Military Coordination Committee to evaluate the opportunities for using the Special Use Airspaces (SUA). It is important to stress that the success of this initiative will depend on the power of the committee to guarantee airspace use to all users, according to their specific needs, while avoiding, inasmuch as possible, the permanent reservation of airspace that would lead to the waste of airspace whenever it is not being used.

4.3.1.3. Develop proposals for route implementation and/or realignment, in keeping with the use of FUA

Based on the flexible use of airspace achieved through the Civil-Military Coordination Committee, State airspace planners should develop route implementation or realignment proposals that would have a significant impact on the development of version 2 of the route network, bearing in mind opportunities for offering users better flight profiles and a possible reduction in airspace complexity.

4.3.2. Airspace Concept

The general methodology used for version 1 and described in item 4.2.2. should be used to develop the airspace concept for version 2 of the route network. The items below will describe only the particular elements to be applied in the development of version 2.

4.3.2.1. Collect traffic data to understand airspace traffic flows

It is important to stress that States should develop a methodology for routine data collection to permit appropriate airspace planning and also the verification of an increase and/or shift in air traffic demand that would require a change in the existing airspace structure.

4.3.2.2. Analyse Fleet Navigation Capacity

In the same way mentioned in item 4.3.2.1 for data collection, States are expected to implement a permanent fleet navigation capacity analysis system to assess the extent of the airspace volume where RNAV-5 would be applied on an exclusionary basis, and to enable the evolution foreseen in the PBN Roadmap for the medium term (RNP-2).

4.3.2.3. Determine the gateways of the main TMAs in the SAM Region

The gateways of the main TMAs in the SAM Region may evolve in accordance with systematic application of FUA and progress in PBN implementation in TMAs and approaches.

4.3.2.4. Determine and obtain the necessary tools for conducting the study mentioned in item 4.3.3.5 (aeronautical charts, specific software)

Continuous evaluation of the tools available for developing the route network is necessary, in order to obtain the most appropriate material to ensure an effective and efficiency work.

4.3.2.5. Make a detailed study of the SAM ATS route network, with a view to developing version 2 of the route network

The development of version 2 of the route network will require a more in-depth analysis, considering that. in addition to the route network itself, the study should also include other aspects, like control sectors, TMA interface, etc. In this sense, and in view of the complexity of version 2, the main objective of the study is to propose scenarios that can be evaluated through the use of airspace modelling and fast-time simulation tools. Such scenarios would be the various options for version 2 of the route network, which would require objective data in order to select the best implementation option, considering the metrics defined in the study, such as fuel consumption, CO^2 emissions, the number of aircraft crossings, etc.

4.3.2.6. Conduct studies of Airspace Modeling and Fast-Time Simulation

Based on the study carried out in 4.3.2.5, Airspace Modeling and Fast-Time Simulation studies should be conducted in order to obtain the necessary data for the analysis to be made by State experts, permitting a decision to be taken regarding the option to be implemented.

4.3.2.7. Hold a workshop among experts from SAM States

Based on the studies mentioned in items 4.3.2.5 and 4.3.2.6, State experts shall review and validate the option of version 2 of the route network to be implemented.

The study should develop a preliminary proposal of amendment to the CAR/SAM Air Navigation Plan. It will still be necessary for the study to establish the required safety assessment methodology, in keeping with extent of the proposed changes and the need to determine RNAV-5 route spacing in the SAM Region. The SAM/IG/9 should review the complete study in order to seek a version that is in line with the planning of the States involved.

4.3.2.8. Implementation of Version 2 of the SAM ATS Route Network

The SAM Regional Office and the States are responsible for the activities under this item, in terms of processing the proposed amendment to the CAR/SAM Air Navigation Plan and publishing version 2 of the SAM ATS Route Network, respectively. The dates for the implementation activities will be established in accordance with the complexity of the modifications proposed in the studies mentioned in 4.3.2.5 and 4.3.2.6 and determined in the workshop mentioned in item 4.3.2.7.

ATTACHMENT 1 (REVISED 3 MAY 2011)

PROGRAMME FOR OPTIMISING THE ATS ROUTE NETWORK IN THE SOUTH AMERICAN REGION (GPIs 1, 5, 7, 8, 10, 11)

Activity	Start	End	Responsible party	Observations
1. **Phase One – RNAV-5 Implementation**				
1.1. RNAV-5 implementation in the SAM Region	**Apr 2008**	**22 Sep 2011**	**Regional Project RLA/06/901**	The implementation will be carried out according to the Implementation Programme approved at the SAM/IG/2 meeting. The implementation of RNAV 5 was postponed to 22 September 2011
2. **Phase Two – Implementation of Version 1 of the SAM ATS Route Network**				
Activity	**Start**	**End**	**Responsible party**	**Observations**
2.1. Conduct a Feasibility Study for Optimising the SAM Route Network	March 2009	Apr 2009	Regional Project RLA/06/901	
2.2. Airspace Concept				
2.2.1 Collect traffic data to understand air traffic flows	June 2008	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901) States	Task 1.2 of the RNAV-5 Implementation Project The Secretariat shall send request to States for data collection using the form contained in Appendix C to the Report on Agenda Item 2, in Excel format.

2.2.2 Analyse the fleet navigation capacity	June 2008	SAM/IG/4	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States IATA	Task 1.3 of the RNAV-5 Implementation Project
2.2.3 Determine the gateways of the main TMAs in the SAM Region	SAM/IG/3	SAM/IG/4	States	
2.2.4 Determine and obtain the necessary tools to make the study mentioned in item 2.2.5 (aeronautical charts, specific software)	SAM/IG/3	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901)	Flight Star.(Verify if the acquisition of another software is necessary)
2.2.5 Make a detailed study of the SAM ATS route network, with a view to preparing version 1 of the route network, including the following: • Indicate the domestic and international ATS routes that should be eliminated, in accordance with their use; • Propose the volume of exclusionary airspace for RNAV-5 application • Indicate the "conventional" RNAV routes that should be eliminated or replaced by RNAV routes in the exclusionary RNAV-5 airspace. • Indicate the RNAV routes that should be realigned, in accordance with the gateways of the main SAM TMAs (see 2.2.3). • Describe in detail the proposed new SAM route network, based on the analysis of the aforementioned items. • Describe in detail the interface between the SAM route network and the CAR route network. • Propose the initial draft Proposal of Amendment to the CAR/SAM ANP	SAM/IG/4	March 2010	SAM/PBN/IG (Project RLA/06/901)	Three persons for a period of 3 weeks. IATA and operators would be invited to select one person to assist in the development of this task.

2.2.6 Prepare safety assessment required, applying a qualitative methodology through the use of SMS	April 2010	May 2010	Project RLA/06/901	One person two weeks
2.2.7 Hold the Workshop of Experts from the SAM States to review and validate the study made under item 2.2.5.	SAM/IG/5	June 2010	SAM/PBN/IG (Project RLA/06/901) States	Further to SAM/IG/5
2.3 Implementation of Version 1 of the SAM ATS Route Network				
2.3.1 Process the proposal of amendment to the CAR/SAM Air Navigation Plan	TBD		SAM Regional Office	Shall depend on the decisions to be adopted by the routes workshop of 2.2.6
2.3.2 Publish version 1 of the SAM ATS Route Network	TBD		States	Shall depend on the decisions adopted in the routes workshop of 2.2.6.
2.3.3 Entry into effect of version 1 of the SAM ATS Route Network	TBD			
3. **Phase Three – Implementation of Version 2 of the SAM ATS Route Network**				
Activity	**Start**	**End**	**Responsible party**	**Observations**
3.1. **Flexible Use of Airspace**				

3.1.1.	Develop guidance material for the application of the Flexible Use of Airspace concept, including: • Model for using non-permanent routes similar to that applied in EUROCONTROL (Conditional Routes – CDR). • Criterion for defining scenarios in which non-permanent routes are applied • Criterion for categorising non-permanent routes • Harmonised publication of non-permanent routes • Representation of non-permanent routes in aeronautical charts	SAM/IG/7	SAM/IG/9	SAM/PBN/IG (Project RLA/06/901)	
3.1.2.	Establish the Civil-Military Coordination Committee to evaluate application of the Flexible Use of Airspace concept mentioned in 3.1.1.	SAM/IG/7	SAM/IG/9	States	The Civil/Military Committees should be implemented in those States which have not done so. Civil/Military Meeting/Workshop to be carried out in Lima from 16 to 19 August 2011.
3.1.3.	Develop proposals for route implementation and/or realignment, in keeping with the utilisation of FUA	SAM/IG/7	SAM/IG/9	States	See 3.1.2
3.2.	**Airspace Concept**				
3.2.1.	Collect traffic data to understand air traffic flows	SAM/IG/7	SAM/IG/9	SAM/PBN/IG (Project RLA/06/901) States	Secretariat will send request to States. Reply date September 2011.
3.2.2.	Analyse the fleet navigation capacity	SAM/IG/7	SAM/IG/9	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States IATA	

3.2.3.	Determine the gateways of the main TMAs in the SAM Region	SAM/IG/7	SAM/IG/9	States	
3.2.4.	Determine the necessary tools for making the study mentioned in item 3.2.5 (aeronautical charts, specific software)	SAM/IG/7	SAM/IG/9	SAM/PBN/IG (Project RLA/06/901)	
3.2.5.	Make a detailed study of the SAM ATS route network with a view to developing version 2 of the route network, including: • Definition of scenarios for the SAM airspace structure, including ATS routes, control sectors, TMA interface, for assessment using airspace modelling and fast-time ATC simulation tools. • Indicate the ATS routes that should be eliminated in accordance with their utilisation; • Propose, if necessary, the extent of exclusionary airspace volume for RNAV-5 application • Indicate, as necessary, the “conventional” ATS routes that should be eliminated or replaced by RNAV routes in accordance with the possible extension of the exclusive RNAV-5 airspace volume. • Indicate the RNAV routes that should be realigned in keeping with possible modifications to the gateways of the main TMAs in the SAM Region. • Detail possible scenarios for version 2 of the SAM route network and of control sectors, based on the analysis of the previous items • Detail the interface between the SAM route network and the CAR route network • Propose the initial draft Proposal of Amendment to the CAR/SAM ANP. • Define the required safety assessment	SAM/IG/7	Mayo 2012	SAM/PBN/IG (Project RLA/06/901)	

	(qualitative or quantitative). • With the air traffic data, consider the possibility to implement RNAV5 parallel routes with adequate separation.				
3.2.6.	Prepare a safety assessment and routes spacing	SAM/IG/8	July 2012	CARSAMMA	Quantitative assessment in order to determine spacing between routes to be applied in item 3.2.5
3.2.7.	Make Airspace Modelling and Fast-Time Simulation studies to assess the scenarios developed in 3.2.5	August 2012	SAM/IG/10		
3.2.8.	Hold the Workshop of Experts from the SAM States to review and validate the studies made in items 3.2.5, 3.2.6, and 3.2.7	SAM/IG/9	Oct 2012	Project RLA/06/901 States	
3.3.	**Implementation of Version 2 of the SAM ATS Route Network**				
3.3.1.	Process the proposal of amendment to the CAR/SAM Air Navigation Plan	TBD		SAM Regional Office	
3.3.2.	Publish version 1 of the SAM ATS Route Network	TBD		States	
3.3.3.	Entry into effect of version 2 of the SAM ATS Route Network	TBD			

APPENDIX B

FLEXIBLE USE OF AIRSPACE (FUA)
OPERATION CRUZEIRO DO SUL (CRUZEX V OPERATION)

1. Background

1.1. CRUZEX V, multinational military air exercise, has assembled Air Force aircraft from Brazil, Chile, U.S., France and Uruguay and simulators from the Army and Navy. The following countries participated as observers: Argentina, Bolivia, Canada, Colombia, Ecuador, Paraguay, United Kingdom and Venezuela. The exercise took place from October 28 to November 19, 2010, in Northeastern Brazil, comprising the states of Ceara, Rio Grande do Norte, Paraiba and Pernambuco. The Natal Air Base received the majority of human and material resources involved in the operation.

1.2. In view of the air scenario of the exercise, close coordination was mandatory between the Air Navigation Management Center (CGNA – ATFM Unit) and the Direction of the Operation (DIREX) in planning and executing stages, to minimize the impacts for the Civil Aviation, such as delays on the landing and departure operations and the en-route deviations. Considering the estimated polygon where the operation was developed, possible impacted air traffic flows were mainly expected to Natal, Recife and Fortaleza airports. The impact on international civil aviation would be minimal, as the air traffic crossings between Europe and South America are concentrated mostly from 23:00 h to 05:00 h.

1.3. Given the need to combine the operations of military and civil aircraft, with the application of the Concept of Flexible Airspace (FUA), allowing the execution of the exercise and reducing impacts to users, the Centre for Air Navigation Management planned the activation of a parallel structure within the area of the exercise and of the involved ATC units, in order to furnish a satisfactory ATFM Service.

2. Analysis

2.1. The evolution of air operations in CRUZEX V consisted of about 100 daily departures from Recife (RBFS) and Natal (SBNT) airports. There were also takeoffs from Fortaleza (SBFZ) airport. From 08:00h to 18:00h, the movement of scheduled flights was about 34 flights on SBNT, 100 on SBRF and 63 on SBFZ. The average number of flights daily within the Recife FIR was approximately 1100 flights.

2.2. The exercise was developed in the area indicated below, from specific areas for refueling operations and air attacks, evolving until FL300, in the western direction of Recife FIR and in the direction to Fortaleza from Natal.

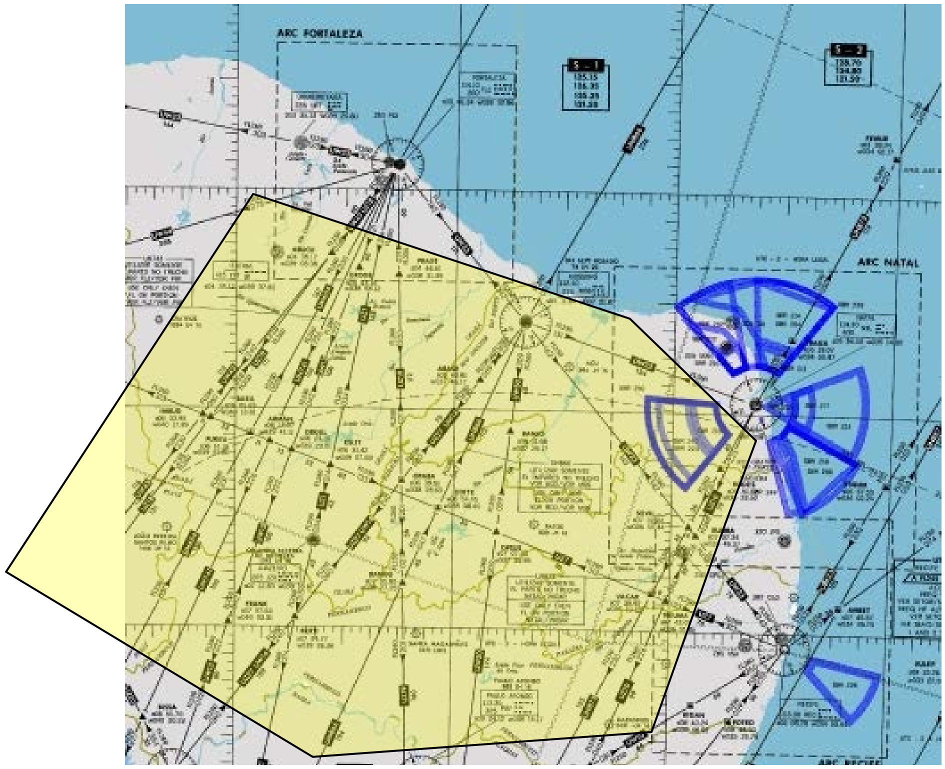
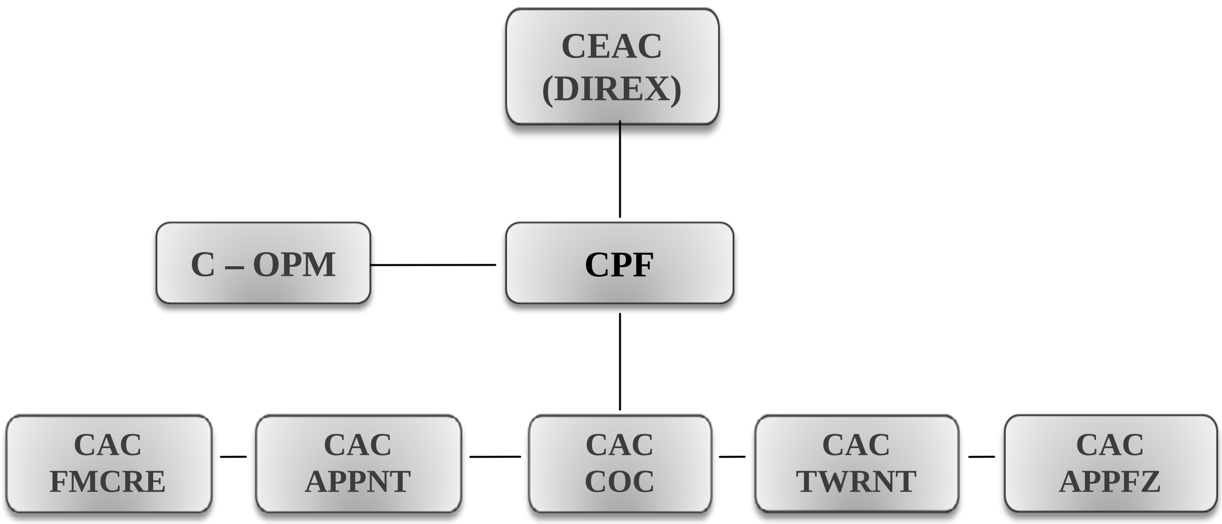


Figure 1 - Area of Air Operations Coverage

2.3. ATFM Support Structure:



Abbreviations:

APPFZ	Fortaleza Approach Control
APPNT	Natal Approach Control
FMCRE	Recife ACC Flow Management Cell
TWRNT	Natal Aerodrome Control Tower
CAC	Current Actions Cell
CEAC	Current Actions Strategic Cell
COC	Current Operations Cell
C - OPM	Military Operations Cell
CPF	Flow Planning Cell

2.3.1. Current Actions Cell

Current Actions Cell is located in the ATC units and in the Current Operations Cell. It is responsible for the tactical actions of the Air Navigation Management Center in military operations, exercises and maneuvers.

2.3.2. Current Actions Strategic Cell

Current Actions Strategic Cell is located in the Direction of the Exercise. It is responsible for planning, organizing, coordinating and controlling all activities of the Air Navigation Management Center in military operations, exercises and maneuvers.

2.3.3. Military Operations Cell

Operational position activated at the Air Navigation Management Center, or remotely, whenever interests the CGNA for coordination of military operations.

2.3.4. Flow Planning Cell

Flow Planning Cell is located in the Air Operations Center. It is responsible for the strategic planning of the Air Navigation Management Center in military operations, exercises and maneuvers.

2.4. ATFM activities

2.4.1. The CEAC, through the Flow Planning Cell, developed strategic worksheets, covering the scheduled and non-scheduled flights and those related to the takeoff and landing flights included in the pack of the operation.

2.4.2. The Flow Planning Cell distributed strategic worksheets to every ATFM support structure CAC and to the C-OPM.

2.4.3. The Flow Planning Cell elaborated tactical worksheets every three hours, including updating the scheduled flights and the flights from the "Coordination Card", in coordination with the DIREX of the Exercise.

2.4.4. Using tactical worksheets, CAC coordinated local actions with ATC units, C-OPM and airlines.

2.4.5. Tactical coordination to allow the Exercise, within the established purposes, and to mitigate the impact to the Civil Aviation, was held between the Current Operations Cell of the Exercise (CAC COC), CEAC, C-OPM and the ATC units CAC in order to make possible the coordination procedures between the Military Air Operations Control Units (OCOAM) and RE-ACC.

2.5. Applied ATFM Measures

2.5.1. Landings at and takeoffs from Natal

2.5.1.1. Natal Airport has concentrated about 80% of all flights of the operation, and the remaining 20% were distributed to Fortaleza and Recife. It must be emphasized that the flights from Natal were shared into four packs throughout the day, or, in other words, two in the morning (takeoff and landing) and two in the afternoon (takeoff and landing). ATFM measures, related to landing and takeoff operations of Civil Aviation, had its focus on the operation of the packs.

2.5.1.2. It was coordinated with DIREX that the departures from the Civil Aviation in Natal, could happen between the departures of the pack, reducing the impact to the takeoff operations. The major concern concentrated on the landings, keeping in mind that the return pack was marked by an aircraft sequencing of the Exercise in specific procedures for military aircraft ("*peel off*"), which initially prevented a mixed sequencing with the Civil Aviation operations. However, despite one of the runways been reduced to 1500m, with the exception of fighter aircraft, the landing of the military aircraft occurred at this runway, facilitating the sequencing of the Civil Aviation aircraft for the main runway. Even with these possibilities, DIREX, at the beginning of activities, updates the Airlines involved, from the C-OPM, on the allocation of the packs, advising that the landings were made in periods outside of the pack, because its duration was around 30 minutes. The minor adjustments were made, through tactical ATFM measures, in coordination with the CAC RE-ACC where the flights could suffer minor delays or advances. It can be stated that when there were delays on the ground or in flight, they were less than 15 minutes on average. In cases of deviations from the route, the coordination was always made to reduce them to a minimum, to prevent the excessive increase in flight time. This was possible only due to the highly collaborative environment that the team from CGNA found on the Direction of the Exercise.

Figures 2 and 3 show clearly the result of work that allowed the shared use of airspace in the Brazilian Northeastern Region during CRUZEX V.

FLEXIBLE USE OF AIRSPACE

Figure 2: Scheduled and Military Aviation sharing the same airspace.

FLEXIBLE USE OF AIRSPACE

Figure 3: Scheduled and Military Aviation sharing the same airspace.

2.5.2. Fortaleza - Natal - Recife Flow

This main Civil Aviation flow was accomplished by the coast, avoiding various areas of exercise, but it is emphasized that, when possible and in coordination with DIREX, OCOAM (Coalition) and COC (Current Operations), direct flights were allowed, overflying the exercise areas.

2.5.3. Fortaleza – BS-FIR Flow

En-route deviations (arrival) and the departures of Civil Aviation were accomplished by the southwestern sector of FZ-TMA, considering that the attacking exercises were taking place within the RE- FIR, south of the FZ-TMA. Close coordination was required sometimes to enable the operation of civil aircraft landing and return of aircraft from the operation to Fortaleza. There were events when the departure of those aircraft from the exercise areas was delayed in order to easy the civil aircraft arrival flow. Such procedure was possible under the close coordination with the Director of the Exercise. Sometimes the evolution of Civil Aviation was coordinated within the flight levels above the areas actually in use by military aircraft, really improving the civil and military operations.

2.5.4. International Crossing Air Traffic

The deviations were significantly reduced considering that the international crossing air traffic, during the period of the day when the exercise was accomplished, is small. The period of greatest demand for international air traffic within the RE-FIR is between 02:00h and 08:00h (UTC).

2.5.5. Monitoring of Delays

Delays in scheduled flights from the BS-FIR and involving Recife, Fortaleza and Natal locations were monitored from the coordination between C-OPM and the Airlines.

2.5.6. Measures Related to General Aviation

A restriction to the General Aviation was established during the accomplishment of the Exercise, given the large number of military aircraft in evolution from 500ft to FL300 in the area of the coverage of the Exercise.

2.5.7. Performance of CAC RE-ACC

Several ATFM measures were implemented by RE-ACC in coordination with the CAC RE-ACC and other positions within the CGNA CRUZEX V (DIREX, COC, CAC NT-TWR, CAC NT- APP and CAC FZ TWR/APP).

2.5.8. A table below shows the results obtained by the Current Actions Cell, located in the Recife Area Control Centre.

Day	**Range of Hours**	**CAG**	**COM**	**CRUZEX 5 Scheduled Departures**	**Departures CAC**	**Holding**	**Monitoring of Delays**	**Deviations**	**Re-router**	**Ground Stop (GS) General Aviation**
09/11	06:00 / 17:00	120	94	54	02	--	--	--	--	--
10/11	06:00 / 17:00	237	97	66	03	--	--	--	--	--
11/11	06:00 / 17:00	223	91	59	05	--	--	--	01	--
12/11	06:00 / 17:00	253	85	45	03	--	--	--	15	12:15/14:30 16:20/19:20
15/11	06:00 / 17:00	287	89	47	02	01	--	--	18	12:50/15:40 16:40/19:00
16/11	06:00 / 17:00	293	91	46	02	01	--	05	15	12:30/14:40 16:30/18:40
17/11	06:00 / 17:00	289	91	54	--	--	--	04	15	12:30/15:00 16:30/19:00
18/11	06:00 / 17:00	293	85	46	03	--	--	01	23	12:30/14:30 16:30/18:50
Total	**06:00 / 17:00**	**1995**	**723**	**417**	**20**	**02**	**--**	**10**	**87**	**--**

Remarks:
Column - CAG: number of civil aviation aircraft in general air flow coordinated by the Current Actions Cell - RE ACC.
Column - COM: number of military aircraft involved with CRUZEX V, coordinated by the Current Action Cell - RE ACC.
Column - GS (Ground Stop - General Aviation): nearly twenty (20) general aviation aircraft were affected by ATFM measures. The survey was conducted by Chiefs and Supervisors from the RE-ACC team. In this column, the hours shown in box are UTC.

2.5.9. Audio Conferences

They were performed daily at 07:30HBV and 17:15 HBV at all parts of the ATFM support structure.

3. Conclusion

3.1. The CGNA participation in CRUZEX V tried to follow up the air operations in real time. DECEA was able to manage the military and civil aviation air traffic flow, being a major objective to share the airspace between civil and military aircraft that took part into the event.

3.2. The philosophy of civil-military integration applied in Brazil has facilitated the planning and execution of military exercise, according to the operational importance of various elements discussed at local, regional and national level and provided the conditions necessary to mitigate possible adverse effects on the Civil Aviation.

3.3. By the results (delays lower than 15 minutes, minimum deviations and shared and flexible use of airspace), we can affirm that the concept of flexible use of airspace can be applied in practice.

- END -

APPENDIX C

IMPLEMENTATION OF THE SOUTH-ATLANTIC INTEROPERABILITY INITITIAVE TO REDUCE EMISSION (SAIRE)

1. INTRODUCTION

1.1 The SESAR Joint Undertaking (Single European Sky ATM Research Joint Undertaking) is an European Community body in charge of all the development activities in Europe to deliver the new generation of Air Traffic Management systems and procedures under the Single European Sky framework. SESAR has set very ambitious goals in the short and medium term - including the reduction of the environmental impact per flight by 10% and the SJU is working decisively with its partners and the ATM community to attain this goal.

1.2 The joint EU/US initiative AIRE (Atlantic Interoperability Initiative to Reduce Emissions) started in 2007 as a programme designed to reduce emissions through the implementation of joint projects and exchange of best practices. Since 2008, the SESAR Joint Undertaking is responsible for its management from a European perspective. The participants include ANSPs, airports, airlines and manufacturers from Europe, Canada, the United States, and Africa. Combined EU/US efforts have resulted in thousands of flight trials to date in real life operations.

1.3 During CAEP/8, February 2010, Spain, on behalf the European CAEP members and the EU already presented the European interest in expanding the experience and benefits from ongoing initiatives such as AIRE to other regions such as the Europe - South America oceanic areas. The initiative was supported and CAEP acknowledged the need for collaboration and establishment of synergies between different countries and authorities to improve aviation efficiency and reduce fuel burn hence CO2 emissions.

1.4 In May 2010, initial discussions took place between the EC and Brazil to improve the mutual technical and operational cooperation on ATM matters. In August 2010, a Letter of Understanding was signed by Brazilian ATM Authority and the SESAR Joint Undertaking, agreeing in particular on the relevance of implementing an AIRE-like partnership focusing on optimizing traffic flows between the Europe - South America (EUR/SAM).

2. Background: AIRE PARTNERSHIP

2.1 AIRE aims to improve energy efficiency and lower aircraft noise through the development and implementation of environmentally friendly procedures for all phases of flight.

2.2 In 2009 under the framework of the European part of AIRE, approximately 1,150 demonstration trials for ‘green’ surface, terminal and oceanic procedures took place in five locations, involving 18 partners. Additionally, two full ‘green’ gate-to-gate flights, from Paris Charles de Gaulle (CDG) to Miami, took place in April 2010, which resulted in substantial gains.

2.3 CO_2 savings per flight ranged from 90 to 1250kg and the accumulated savings during trials equivalent to 400 tons of CO_2. Another positive aspect was the human dimension - the projects boosted crew and controller motivation and enabled cooperative decision making.

2.4 In January 2010, a new call for tender was launched by the SESAR Joint Undertaking to co-finance the expansion of AIRE in 2010 and 2011. AIRE presently comprises on the European side alone 18 projects involving 40 airlines, 5 airport operators, 11 air navigation service providers and around 10 industry partners including the United States, Canada and Morocco. The projects are focused on operational implementation. Technical solutions presently being validated include inter-alia:

a) Lateral, vertical and longitudinal Oceanic optimizations;
b) Shorter flight trajectories through "free route" airspace;
c) Implementation of ADS-B surveillance on North Atlantic operations;
d) Implementation of Reduced Longitudinal Separation minimum in the NAT region based upon an increased position reporting rate and positional accuracy
e) CDOs (CDAs) in Amsterdam, Brussels, Cologne, Madrid, New York, Paris, Gothenburg, Prague, Pointe a Pitre, Toulouse, and Zurich;
f) Development of RNP AR and RNAV procedures in Sweden;
g) Enhanced surface management systems (pre departure sequencing system / Departure Manager);
h) Issue of Target-Off Block time (TOBT), calculation of variable taxi out time and issue of Target-Start-up Arrival Time (TSAT);

2.5 More than 5000 flights are expected to take place, with expected savings on the range of 12.000 tons of CO_2. A great effort will be placed in disseminating the results and experience by dedicated brochures and the organisation of workshops.

3. Current situation: South-Atlantic routes

3.1 Commercial aviation in the South Atlantic (EUR/SAM) airspace is characterized primarily by modern jet passenger and freight aircraft flying distances on average longer than 4000 nautical miles and with durations of eight hours or more.

3.2 The FIRs involved in the EUR/SAM routes are: Canarias, Casablanca, SAL Oceanic, Dakar Oceanic, Santa Maria, Recife, Piarco and Rochambeau. The use of CPDLC (*Controller Pilot Data Link Communications*) and ADS-C (*Automatic Dependant Surveillance*) is not yet available within the whole EUR/SAM corridor.

3.3 Air traffic flow is constricted in the upper airspace to four airways (West to East: UN-741, UN-866, UN-873 and UN- 857) except in an additional RANDOM route 50 NM West of UN-741 currently used on flights between e.g. Madrid and Santiago de Chile.

3.4 Data from Aena (Spanish ATM and Airports organization) show that traffic in the EUR/SAM Corridor increased by 31,8% in the period 2004-2008. Aena also estimated a high increase (over 60%) of traffic in those routes in the mid-term (2010-2015).

4. Possible improvements in South-Atlantic Airspace AND RELATED BENEFITS

4.1 Potential benefits of improving Europe - South America (EUR/SAM) traffic could be identified in all areas (surface, terminal area and en-route/oceanic) and could deliver results in the short term. By means of example, validation projects could be proposed in relation to the following improvement areas/solutions:

a) Oceanic trajectory optimization (horizontal, vertical, longitudinal);
b) Reduced separations for RNP 4 equipped aircrafts (lateral, longitudinal);
c) Optimized Oceanic Entry/Exit transition;
d) Better use of Meteorological information;
e) Continuous Descent Approaches (CDA) procedures;

f) Continuous Climb procedures;
g) Optimized departure routings;
h) Collaborative decision support systems that increase aircraft taxi time predictability allowing airlines to capitalize on use of fuel saving procedures such as reduced engine taxi out.

- END -

APPENDIX D

PREDICTABLE ESTIMATE FOR YEAR 2011/12 BY IATA IN (13 AIRAC CYCLES) ON FUEL SAVINGS AND REDUCTION OF CO2 IN THE ATMOSPHERE AS A RESULT OF THE IMPLEMENTATION OF VERSION 01 OF THE ATS ROUTES OPTIMISATION PLAN IN THE SAM REGION.

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SAM Region, ATC-ATM Efficiencies - Projections 2011

Region	Descriptor	FORECAST 2011								IMPLEMENTED Y T D		
		Domain- Fuel- Kgs (Per Airac cycle)			Savings (13 Airac Cycles)					KGS	USD$ Price Per Kilo	CO2 Kg
		ENROUTE	TMA	GROUND	DIST	TIME	IMP DATE	FUEL	CO2 Kg			
	SAM Region										**$1.06**	
TMA	CCS, VEN. 2 RNAV SIDS		129,988			1	13-Jan-11	1,689,844	5,323,009	**1,689,844**	**$1,791,235**	**5,323,009**
TMA	CCS, VEN. 4 RNAV App. RNAV GNSS 10 Y,Z RNAV GNSS 28, Y,Z		10,372			1	13-Jan-11	134,836	424,733	**134,836**	**$142,926**	**424,733**
TMA	LIMA VOR landing North VOR 33 App.		28,656			7	10-Mar-11	372,528	1,173,463	**372,528**	**$394,880**	**1,173,463**
TMA	BOG SID CACUTA 1B added SOA - EJA				5							
SPECIAL USE AIRSPACE	Palenquero Arrivals BOG REMOL / OUT		256,308		28		15-Dec-11	3,332,004	10,495,813		**$0**	
SPECIAL USE AIRSPACE	Palenquero Arrivals BOG Rio Negro		88,968		3		15-Dec-11	1,156,584	3,643,240		**$0**	
	Maldonado -Beunos Aires, PDP-AEP	46,608			44		15-Dec-11	605,904	1,908,598		**$0**	
	Montevideo-Buenos Aires MVD - AEP	107,712			42		15-Dec-11	1,400,256	4,410,806		**$0**	
	Panama City - Montevideo UM784	7,273			37		15-Dec-11	94,549	297,829	**94,549**	**$100,222**	**297,829**
	Santiago-Sao Paulo, UT650 / UM400	30,224			20		13-Jan-11	392,912	1,237,673	**392,912**	**$416,487**	**1,237,673**
	Sao Paulo- Santiago, UL310 / UM400	20,884			14		13-Jan-11	271,492	855,200	**271,492**	**$287,782**	**855,200**
	Santiago - Rio De JaneiroUM400	2,716			20		13-Jan-11	35,308	111,220	**35,308**	**$37,426**	**111,220**
	Rio De Janeiro - Santiago UL301,UM400	1,904			14		13-Jan-11	24,752	77,969	**24,752**	**$26,237**	**77,969**
	Toluca - Cancun TLC - CUN - TLC	19,680			3,12		15-Dec-11	255,840	805,896		**$0**	
	Toluca - San Jose Del Cabo TLC - SJD	1,512			4		15-Dec-11	19,656	61,916		**$0**	
	RNAV Dir.. MCS-ALDOS, AEP IGR(6) IGR -AEP(6)	19,856			12		15-Dec-11	258,128	813,103		**$0**	
	RNAV Dir.. TOSOR-UMKAL, EZE - SCL	7,844			4		15-Dec-11	101,972	321,212		**$0**	
	RNAV DIR.. BIXIM-ROPON, AEP-NEU (NQN)	3,696			6		15-Dec-11	48,048	151,351		**$0**	
	RNAV Dir.. ALBAL-ASADA, SCL-EZE	5,960			2		15-Dec-11	77,480	244,062		**$0**	

Region	Descriptor	FORECAST 2011								IMPLEMENTED Y T D		
		Domain- Fuel- Kgs (Per Airac cycle)			Savings (13 Airac Cycles)					KGS	USD$ Price Per Kilo	CO2 Kg
		ENROUTE	TMA	GROUND	DIST	TIME	IMP DATE	FUEL	CO2 Kg			
REGIONAL ROUTES	RNAV Dir.. ATOVO-TUC, AEP-TUC(5)AEP-SLA(6)	16,836			11		15-Dec-11	218,868	689,434		$0	
	RNAV Dir..ROSARIO-ASISA, AEP-COR	6,360			2		15-Dec-11	82,680	260,442		$0	
	RNAV Dir.. KAMUV-SNT, MDZ-AEP	4,268			4		15-Dec-11	55,484	174,775		$0	
	RNAV Dir.. LIMAY-ASADA, BRC-AEP	6,804			6		15-Dec-11	88,452	278,624		$0	
	UT653-MJZ-PAMAL, AEP-UAQ	200			1		15-Dec-11	2,600	8,190		$0	
	RNAV Dir.. DIL-RGL, AEP-RGL	9,432			27		15-Dec-11	122,616	386,240		$0	
	RNAV Dir..RGL-DIL, RGL-AEP	3,456			10		15-Dec-11	44,928	141,523		$0	
	RNAV Dir.. DIL-CRV, AEP-CRV	27,128			14		15-Dec-11	352,664	1,110,892		$0	
	Cordoba-Porto Alegre UM418 COR - POA	13,000			69		10-Mar-11	169,000	532,350	169,000	$179,140	532,350
	Rio Branco-Brazilia UM530	26,160			40		10-Mar-11	340,080	1,071,252	340,080	$360,485	1,071,252
	Rosario-Porto Alegre UM534	2,712			24		10-Mar-11	35,256	111,056	35,256	$37,371	111,056
	Lima-Brazilia UM668	22,320			126		10-Mar-11	290,160	914,004	290,160	$307,570	914,004
	Santiago - Lima - Miami US East Coast, UM795	101,656			14		10-Mar-11	1,321,528	4,162,813	1,321,528	$1,400,820	4,162,813
	MIA - SVD (SSA),UZ41	8,060			31		10-Mar-11	104,780	330,057	104,780	$111,067	330,057
	REC-MIA-JFK- AA UM791	10,296			65		10-Mar-11	133,848	421,621	133,848	$141,879	421,621
	SVD-MIA-JFK -AA UZ20				120		10-Mar-11					
	JFK- ATL IAD-EZE, AA UM 402 POS - BVI	127,568			70		10-Mar-11	1,658,384	5,223,910	1,658,384	$1,757,887	5,223,910
	Guayaquil-Madrid, GYE-MAD	22,708			26		15-Dec-11	295,204	929,893		$0	
	Bogota-New york	43,770			45		15-Dec-11	569,010	1,792,382			
	Manaus-Fortaleza UZ12	10,496			25		10-Mar-11	136,448	429,811	136,448	$144,635	429,811
SAM.TOTAL		739,099	514,292	0	915	9		16,294,083	51,326,361	7,205,705	$7,638,047	22,697,971
	TOTAL FORCAST x 13 AIRAC CYCLES	9,608,287	6,685,796	0	915	9		16,294,083	51,326,361	7,205,705	7,638,047	22,697,971

Agenda Item 3: Implementation of performance-based navigation (PBN) in the SAM Region

(RNAV5) En-route PBN Action Plan

3.1 The meeting recalled that the SAM/IG Meetings have been reviewing, as a matter of routine, the PBN Implementation Project - En-route short term (RNAV-5) PBN Action Plan for the SAM Region, and the associated En-route (RNAV-5) PBN Action Plan.

3.2 The meeting also recalled that, in completing the revision of the RNAV5 En-route PBN Action Plan, SAM/IG/6 Meeting was of the opinion that there are still some tasks that had not been completed, and which are essential for such implementation. Taking into account that such tasks would require an effort by SAM States, the users, the ICAO SAM Office, and Regional Project RLA/06/901, the meeting decided to postpone the RNAV5 implementation date in the SAM Region for 22 September 2011.

3.3 In order to avoid a further postponement of the implementation date, the Meeting felt that it was absolutely necessary to establish a mechanism to follow up the activities of the RNAV5 PBN action plan. In this sense, the Meeting deemed it advisable to hold, at least once a month, of a teleconference using the “go to meeting” tool of the SAM Regional Office.

3.4 In view of the above, in reviewing the action plan for RNAV5 implementation, the result of RNAV5 teleconferences was taken into account, as well as the comments provided by States and users present. Following is a summary of the analysis carried out to the tasks pending of execution. **Appendix A** to this part of the report shows the action plan for RNAV5 implementation, duly updated.

Task 1.3 Analyse aircraft fleet navigation capacity

3.5 According to the information gathered during the SAM/IG/4 Meeting, 95% of the SAM fleet would be eligible for RNAV5 approval.

Task 1.4 Analyse ground communication, navigation (VOR, DME) and surveillance means to meet the navigation specifications and the navigation reversal mode

3.6 The meeting noted the work carried out regarding task 1.4 related with the analysis of DME/DME coverage and geometry. Also, it was deemed necessary that States, in addition to the work carried out at a regional level by Regional Project RLA/06/901, should assess VOR/DME coverage taking as a basis the values of 60 NM for conventional VOR/DME and 75 NM for VOR/DME Doppler, for updating purposes navigation systems onboard. In addition, States should use 420 kts as a basis for the estimation of the maximum distance in which IRU may be applied to cover an eventual failure of radio navigation aids in a period of maximum2 hours. This task complements coverage of ground radio navigation aids in support of RNAV5 compliance. This task was completed in March 2011.

Task 2.1 Conduct the safety assessment applying a qualitative methodology using the SMS

3.7 During the SAMIG meetings, the Implementation Group determined that the qualitative methodology shown in ICAO Doc 9859, Safety Management Manual (SMM), would be applied, using a "safety case".

3.8 The meeting recalled Conclusion SAM/IG/6-2, where States are requested that ATS providers and aircraft users take the necessary measures to apply further action to reduce the RNAV5 safety plan risk and the resulting risk rate. RNAV5 teleconferences were carried out during 2011, where the status of application of aforementioned ulterior measures was analysed. The current status of application is shown in **Appendix B** to this part of the report.

Task 3.1 Coordinate the planning and implementation needs with air navigation service providers, regulatory bodies, aircraft operators and military authorities

3.9 It is expected that States permanently coordinate the implementation needs with air navigation service providers, users, aircraft operators and military authorities. This task is still valid.

Task 6.5 Develop an AIP Supplement Model containing the applicable standards and procedures, including the corresponding in-flight contingencies

3.10 The meeting assessed this task, taking into consideration that the same had been completed.

Task 6.6 Develop an amendment to the AIP/AIP Supplement corresponding to ENR 3.3, including limitations as regards applicable sensors and critical radio navigation aids in each route segment

3.11 The meeting noted that, according to Doc 8126 – Manual for aeronautical information services, shows in its Section ENR-3, Routes that air navigation routes (RNAV) should be included, and in view of this and in order to have a standard format for the publication of the corresponding information to be incorporated into section ENR 3.3 – RNAV Routes of the AIP, presented during the SAM/IG/6 meeting a mode, formulating Conclusion SAM/IG/6-4.

3.12 In function of this task, and the corresponding analysis, the meeting agreed that a column should be inserted in Table ENR 3.3 indicating the critical radio-navigation aids for the updating of navigation systems, only in case the loss of this radio navigation aid causes that IRU-based navigation is extended in more than two hours.

Task 6.9 Develop an amendment to the regional documentation, if necessary

3.13 The Secretariat informed the meeting that amendment to Doc 7030, Regional Supplementary Procedures will be approved by the end of June 2011.

Task 8.2 Assess the percentage of RNAV5 approved operations (non-exclusionary airspace)

3.14 Keeping in mind that 95% of the fleet is in condition to be approved for RNAV5 operations and that only approval by operators and aircraft is pending, the meeting considered this task as completed.

Task 8.4 Publish trigger NOTAM

3.15 The list of tasks for RNAV5 implementation The List of Tasks for the Implementation of RNAV 5 in the SAM Region includes the issuance of a **trigger NOTAM** to confirm the date and time of RNAV 5 effectiveness in the corresponding FIRs.

3.16 The meeting analysed the proposed trigger NOTAM for RNAV5 presented by the Secretariat, and which should be published seven days before the foreseen implementation date.

3.17 The meeting, after making the necessary changes, concluded that the following text could be applied by SAM States:

In accordance with AIC #... and or AIP Supplement #...the application of RNAV 5 in RNAV routes in the continental airspace of (name) FIR XX shall commence at 0901 UTC -----.

Task 9.1 Develop a post-implementation monitoring programme for en-route operations

3.18 After the implementation of RNAV5, the SAM Region will enter into a pre-operational phase for a one-year period. At the end of this target date, in case the safety assessment is positive, it will be possible to move to an operational phase.

3.19 In view of the above, and taking into consideration that the tasks of the RNAV5 action plan were completed or are in their way to be completed, the Meeting formulated the following conclusions:

Conclusion SAM/IG/7-2 Implementation of RNAV-5

That SAM States implement RNAV-5 in continental airspace routes, on **20 October 2011,** at 09:01 UTC.

Conclusion SAM/IG/7-3 Documentation to be published for the implementation of RNAV-5

That SAM States publish the following documentation no later than 22 September 2011, effective on 20 October 2011:

a) Amendment to the AIP or AIP Supplement containing the applicable standards and procedures, including the corresponding in-flight contingencies, the model of which appears in **Appendix C** to this part of the report; and

b) The ENR 3.3 Tables that correspond to RNAV routes, using the model shown in **Appendix D** to this part of the report.

Note: **Appendix E** contains 4 examples that may be used as a reference by the States.

Conclusion SAM/IG/7-4 Publication of the trigger NOTAM

That SAM States publish the trigger NOTAM no later than 13 October 2011, using the following model:
In keeping with AIC xx and AIP Supplement xx, RNAV-5 will start to be applied on RNAV routes of the continental airspace in the xx FIR at 09:01 UTC of 20 October 2011.

Analysis of possible difficulties faced by States for RNAV5 implementation

3.20 With regard to this matter, and during RNAV5 teleconferences, the Secretariat was requested to prepare a survey that permitted identification of difficulties that States could face for RNAV5 implementation. In order to comply with this action, a survey was prepared, requesting States to inform on such difficulties. As a follow-up of **Appendix F**, shows the reply of this enquiry.

Review of activities for the implementation of RNAV5 in SAM States

3.21 The PBN implementation group, through the use of teleconferences proposed to know the progress made in the implementation of RNAV-5 in the States of the Region and to check the status of implementation of the tasks of the action plan by the administrations and users.

3.22 Taking into account the foregoing and in order to assess the status of implementation of the tasks that will permit a safe implementation of RNAV-5 on RNAV routes in continental airspace, **Appendix G** to this part of the report presents the latest information provided by the States of the Region on this matter, regarding the tasks to be necessarily carried out.

Summary of teleconferences on RNAV5 implementation

3.23 As a follow-up of the Sixth SAM Implementation Meeting, SAM/IG/6 Meeting, paragraph 3.41), through the GoTo Meeting tool, three TELCONs were held to analyse pending activities for RNAV5 implementation.

3.24 While not all States have been able to participate in the TELCONS, it should be highlighted that they have been successful, and an appropriate and low-cost manner, that enabled the follow-up of pending matters for RNAV5 implementation, expecting to continue with this practice in the future. In this connection, the meeting set a draft schedule regarding the referred virtual meetings:

Tentative schedule for RNAV5 TELCONS:

7JUN11
22JUN11
12JUL11
8AUG11
23AUG11
12SEP11
23SEP11
18OCT11

ICAO recommendations on the publication of instrument procedures

3.25 The meeting took note that Amendment 3 to Doc 8168 Vol. 2, PANS-OPS, effective 18 November 2010, modifies design criteria provisions to address coding issues of the navigation database of instrument flight procedures that appear in the aeronautical information publications (AIPs) of each country.

3.26 It also reviewed the text contained in Vol. 2, Part I, Section 2, Chapter 1, 1.1 states the following: "The introduction of, and growing demand for, RNAV procedures has been such that many pilots normally execute all instrument flight procedures using a guide based on the aircraft navigation database, regardless of whether the procedures are published as RNAV or as conventional procedures. However, not all conventional procedures may be coded in the navigation databases. This is especially true for departure procedures. In order to mitigate this problem and ensure a better capacity for conducting the flight, procedure designers should:

a) Design all procedures as simple as possible;
b) Develop RNAV instead of conventional procedures, whenever possible;
c) Closely coordinate with navigation database providers each time conventional departure procedures are introduced;
d) Ensure continuity between SIDs and the en-route structure, and between the en-route structure and the STARs and approaches, using a common reference and altitudes compatible with the interface;
e) Avoid the use of duplicated segments, that is, a segment declared as part of a STAR and as part of an approach; and;
f) Avoid the use of segments with courses that intercept VOR radials with turns of less than 30°."

3.27 The meeting, taking into consideration that for navigation database users, the aforementioned text contained in Amendment 3 reflects the problems that exist with many conventional procedures. Although the pilot has the duty to always check the procedure charts in paper format, it is also true that an on-board comprehensive and reliable database is the aspiration of every operator, since, in addition to routes and instrument procedures, it provides information on airports, runways, control frequencies, special use airspaces, and much more.

3.28 The meeting noted that existing regulations assign the operator the responsibility of documenting the navigation database validation process for operations based on PBN specifications. This process is essential for conducting a safe flight and is similar to the one carried out by the operator every 28 days to perform the coded conventional procedures in order to determine what procedures can or cannot be performed in an automated way. When performing this task, the operator must always consider that the coding process is very vulnerable and, although strict protocols and processes certified by the FAA and EASA are used, electronic data exchange between ANSPs and database coders is not yet available in the Region.

3.29 During these periodic checks, differences and inconsistencies have been identified by an operator between "paper charts" and the displays on the aircraft primary navigation screen, which, in the most serious cases, may result in confusion amongst the crew with respect to ATC clearances.

3.30 Furthermore, the meeting agreed that the storage capacity of older databases is very small, forcing the operator to select the information he/she wants or can store in it. Consequently, as new procedures and routes are published, the ANSPs must also make an effort to eliminate, in common agreement with the users and the ATC, those procedures no longer used.

3.31 Finally, the meeting felt that problems get worse when instrument procedure charts and ATS route charts do not follow the recommendations of Annex 11 and Doc 8168 on the publication and content of each procedure (SID, STAR and IAC) for proper coding of both conventional and RNAV procedures.

3.32 The meeting agreed that relevant organisations, instrument procedure designers, AIS, airspace planners and those involved in this task are invited to make an effort to adopt and implement ICAO recommendations on this issue. It is most likely that a large percentage of discrepancies that now exist between databases and instrument procedure charts will disappear with this action alone. **Appendix H** to this part of the report presents a compilation of ICAO recommendations. It also provides some examples that will facilitate the identification of problems.

3.33 The meeting encouraged States to establish a joint work with ANSP and operators in order to identify and resolve this and other problems that may arise in relation to the design and publication of instrument procedures, keeping in mind that this effort will be excellent for all stakeholders.

Implementation of RNP APCH and RNP AR APCH

3.34 The Meeting took note that at the 37th ICAO Assembly, held in Montreal, on 28 September to 8 October 2010, Resolution A36-23, “Performance-based navigation global goals”, which urged States to implement ATS routes and RNAV and RNP approach procedures based on the PBN Manual (Doc 9613), was superseded by Resolution A37-11, extending the scope of action of the resolution with respect to the implementation of PBN-based approach procedures.

3.35 The Meeting reviewed the text of the new resolution (**Appendix I** to this part of the report) and recognised that not all airports had the necessary infrastructure to support APV operations and that not all aircraft had the necessary capability for APV operations. It also noted that many States already had the necessary infrastructure and the aircraft capable of conducting direct approaches with lateral guidance (LNAV approaches) based on RNP specifications, and that direct approaches provided proven and significant improvements compared to circling approaches.

3.36 The Meeting took note that ICAO had accordingly included in the aforementioned resolution the need to always indicate the “LNAV-only” minima within the framework of the implementation of approaches with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS) and of direct procedures with LNAV-only minima as an exception, for instrument flight runways at aerodromes that do not have local altimetry facilities available and where aircraft are not properly equipped for APV operations, with a maximum certificated take-off mass of 5.700 kg or more.

3.37 The Meeting considered that the States of the Region were already working hard to publish approach procedures based on PBN, RNP APCH and RNP AR APCH, in order to meet the goals established by ICAO and the Region through the respective PBN implementation plan of each country. In order to assess the status of PBN implementation for TMA and approach to meet the established dates, **Appendix J** to this part of the report contains the latest information provided by the States of the Region regarding the number of procedures already implemented.

3.38 Likewise, the Meeting considered that the information required in order to have a good understanding of an RNP or RNP AR approach procedure is varied and, in some cases, critical for the safe conduction of operations. Information such as the applicable navigation specification, allowable temperatures, design descent angles, the RNP contemplated for each segment, the minimum safe altitude, turn speed restrictions, waypoint type, path terminator defining each segment, *inter alia*, must be included and unequivocally represented in the approach chart.

3.39 The Meeting noted that ICAO documents related to this topic (Doc 8168, Doc 9905, Annex 4) contained many references that are rather disperse but which clarify several aspects related to these procedure charts, and which must be taken into account and applied for an effective and safe publication of the latter.

3.40 **Appendix K** to this part of the report lists the recommendations that are significant from the operational viewpoint, with their respective references, including two chart models that illustrate an RNP and an RNP AR approach, based on the IAC distribution model of one of the States of the Region.

3.41 In this sense, the Meeting urged the States to review the changes introduced to Resolution A36-23 through Resolution A37-11 and analyse their impact on their current plans for the implementation of procedures and publications.

Follow-up of the conclusions and pending tasks of SAMIG Meetings

3.42 The meeting made a revision of conclusions and pending tasks of SAMIG meeting, and the result is shown in Appendix A to the report on agenda item 1. Following are some specific comments on matters of interest:

Task No. 3-5 Conclusion SAM/IG/3-3 – PBN National Implementation Plans

3.43 In reviewing Conclusion SAM/IG/3-3, the meeting was of the opinion that those States that modified their PBN national implementation plan should submit their new plans to the ICAO Regional Office, in order to maintain a data base with current plans. Also, note was taken that PBN national implementation plans from Ecuador, French Guyana, Panama and Suriname were missing, and the Secretariat was requested to communicate again with these States in order to obtain the aforementioned plans.

Task No. 3-15 – Conclusion SAM/IG/5-1 – Training programme and documentation for air traffic controllers and ARO/AIS operators

3.44 Note was taken that during SAM/IG/5 guidelines were prepared of the training programme content. However, this matter was thoroughly analysed in view that many States require assistance for the preparation of the training and documentation to be delivered by ATCOs. Paraguay indicated that their administration is preparing a PBN training manual, and once it is completed, could be submitted for the consideration of States who wish to use it. In this connection, the Secretariat together with Paraguay will coordinate in the forthcoming 30 days the completion of this document and it will be put at the disposal of States of the Region. The meeting thanked Paraguay for this initiative. In view of the above, the meeting considered this task as completed.

Task No. 3-17 – Conclusion SAM/IG/5-4 – implementation of continuous descent operations

3.45 States have already taken note of the conclusion and some of them included this concept in their national implementation plans. Anyway, the meeting considered that the conclusion is still valid.

APPENDIX A

SHORT-TERM EN-ROUTE PBN ACTION PLAN (RNAV-5)
(GPIs 1, 4, 5, 7, 8, 10, 11, 12, 16, 21, 23)

1.	Airspace concept	Start	End	Responsible party	Remarks
1.1	Establish and prioritize strategic objectives (safety, capacity, environment, etc.)	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901)	Completed
1.2	Collect traffic data in order to understand traffic flows in a given airspace	June/2008	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901)	Completed
1.3	Analyze the navigation capacity of the aircraft fleet	June/2008	SAM/IG/7	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States IATA	Completed 95% of the fleet in the SAM Region is candidate for RNAV5 approval. States should continue their efforts to complete the data base (Conclusion SAM/IG/4-3)
1.4	Analyze ground-based means of communication, navigation (VOR, DME) and surveillance to meet navigation specifications and the navigation reversal mode	June/2008	SAM/IG/7	SAM/PBN/IG (Projects RLA/06/901 and RLA/99/901) States	Completed The work was completed through the support of RLA/06/901 who CNS hired experts.
1.5	Optimize airspace structure, reorganizing the network or implementing new routes based on the strategic objectives of the airspace concept, taking into account airspace modelling, ATC simulations (fast time and/or real time), live tests, etc.	SAM/IG/2	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901) States IATA	Transferred. The meeting reviewed this task and decided that it was more appropriate to incorporate to the SAM Region ATS routes network optimization action plan (2.2.5 SAM Region ATS routes network optimization action plan)

2	**Safety assessment**	**Start**	**End**	**Responsible party**	**Remarks**
2.1	Prepare safety assessment execution using a qualitative methodology through the application of SMS	SAM/IG/2	SAM/IG/6	CARSAMMA Project RLA/06/901 Regional Office	**Completed**

3	Establish a collaborative decision-making process (CDM)	Start	End	Responsible party	Remarks
3.1	Coordinate planning and implementation requirements with air navigation service providers, regulators, users, aircraft operators and military authorities	SAM/IG/2	SAM/IG/8	SAM/PBN/IG States	**Valid** Some States have published an initial AIC. Other States have not done so yet. A new AIC is required informing on the change of implementation date.
3.2	Establish the implementation date	SAM/IG/1	SAM/IG/4	SAM/PBN/IG States	**Completed.** 18 November 2009 was established as tentative date. States analysed the feasibility of the tentative date in coordination with domestic operators and military authorities SAM/IG/4 defined as tentative implementation date 18 November 2010. During the SAM/IG/6 Meeting, it was decided to postpone implementation for 22 September 2011 since some tasks had not been executed. Keeping in mind the need for an additional analysis in terms of VOR/DME coverage and DME/DME for the publication of ENR 3.3, SAM/IG/7 Meeting has made a 28 days adjustment in the date of implementation (20 October 2011).
3.3	Establish the documentation format in the SAM PBN website	SAM/IG/1	SAM/IG/2	SAM Regional Office	**Completed**

3	Establish a collaborative decision-making process (CDM)	Start	End	Responsible party	Remarks
3.4	Report planning and implementation progress to the corresponding Regional Office. Conclusion to present national plans at SAM/IG/4	SAM/IG/2	SAM/IG/4	SAM/PBN/IG States	**Completed.** Eight SAM States presented a draft of their national PBN implementation plans and it was agreed that for 31 December 2009, States shall present the final version of the plan. The Secretariat was requested to as States that have not done so yet, submit their respective plans.

4	ATC automated systems	Start	End	Responsible party	Remarks
4.1	Assess PBN implementation in ATC automated systems, taking into account amendment 1 to the PANS/ATM (FPLSG). Note: It is not a requirement for RNAV5 implementation	June/2008	SAM/IG/4	SAM/PBN/IG (Project RLA/06/901)	**Completed** According to the programme presented in ICAO guidelines, it is not a requirement for the RNAV5 implementation. CNS/ATM sub-group will revise this issue.
4.2	Implement necessary changes in automated ATC systems	SAM/IG/2	TBD	States	**Completed**

5	**Aircraft and operator approval**	**Start**	**End**	**Responsible party**	**Remarks**
5.1	Analyze aircraft and operator approval requirements (pilots, dispatchers and maintenance personnel) in keeping with the PBN manual, and develop the necessary documentation.	June/2008	SAM/IG/2	Regional Project RLA/99/901- Regional Safety Oversight Cooperation System	**Completed**
5.2	Publish national regulations for the implementation of the RNAV-5 navigation specification	SAM/IG/2	SAM/IG/7	States	**Completed**
5.3	Approval of aircraft and operators	SAM/IG/3	Permanent	States	**Valid** This is a continuous task that States have initiated and shall continue to carry out upon requirement of operators. Operators should be encouraged to initiate this process.
5.4	Establish and keep up to date a registry of approved aircraft and operators	SAM/IG/3	Permanent	CARSAMMA States Regional Office	**Completed** During SAM/IG/7 meeting, CARSAMMA has received information on approvals of only 71 aircraft and 4 operators from Argentina (19 aircraft and 2 operators) and Colombia (52 aircraft and 2 operators). This is an activity being developed permanently by each one of the States.
5.5	Verify the operation of the continuous monitoring programme (aircraft and procedures)	Sep 2011	Permanent	States	**Completed** This is an activity being developed permanently by each on of the States and is considered in the surveillance plans.

6	Standards and procedures	Start	End	Responsible party	Remarks
6.1	Assess and, if applicable, publish the regulations on the use of GNSS.	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901) States	**Completed**
6.2	Finalize WGS-84 implementation	TBD	TBD	States	**Completed** States which have not done so, should provide the information
6.3	Develop an AIC model to report PBN implementation plans	June/2008	SAM/IG/2	SAM/PBN/IG (Project RLA/06/901)	**Completed**
6.4	Publish the AIC reporting PBN implementation plans	SAM/IG/2	SAM/IG/4	States	**Completed** States should publish on 9 April 2009
6.5	Develop an AIP Supplement model containing applicable standards and procedures, including the corresponding in-flight contingencies	SAM/IG/4	June 2010	SAM/PBN/IG (Project RLA/06/901)	**Completed**
6.6	Develop AIP amendment/AIP Supplement Model that contains in the part corresponding to ENR 3.3, including information related to RNAV5, as well as limitations as regards sensors applicable and critical radio navigation aids of each route segment	SAM/IG/5	SAM/IG/7	SAM/PBN/IG States	**Completed** A new format to publish ENR 3.3 routes was approved (Conclusion SAM/IG/6-4 and Appendix D to the Report on Agenda Item 6. Keeping in mind the results presented in task 1.4, at the SAM/IG/7 meeting made the necessary adjustments in the format to publish RNAV routes ENR 3.3 and formulated Conclusion SAM/IG/7-3
6.7	Publish the AIP Supplement containing applicable standards and procedures, including the corresponding in-flight contingencies	22 September 2011		States	**Valid**
6.8	Review the Procedural Handbook of the ATS units involved	SAM/IG/5	October 2011	States	**Valid**
6.9	Update the letters of agreement between ATS units	SAM/IG/5	October 2011	States	**Valid** Several States have updated their LOAs.

6	Standards and procedures	Start	End	Responsible party	Remarks
					The process is ongoing.
6.10	Develop an amendment to regional documentation, if necessary	SAM/IG/3	June 2011	SAM/PBN/IG (Project RLA/06/901)	**Completed**
6.11	Submit a proposal of amendment to Doc. 7030, if necessary	SAM/IG/5	SAM/IG/6	SAM Regional Office	**Completed**

7. Training	Start	End	Responsible party	Remarks
7.1 Develop a training and documentation programme for operators (pilots, dispatchers and maintenance personnel)	SAM/IG/4	SAM/IG/5	Regional Project RLA/99/901	**Completed** The matters to be incorporated into each one of the training programmes of operators have been included in the corresponding advisory circulars
7.2 Develop a training and documentation programme for air traffic controllers and AIS operators	SAM/IG/4	SAM/IG/5	SAM/PBN/IG (Project RLA/06/901)	**Completed**
7.3 Develop a training programme for regulators (aviation safety inspectors)	SAM/IG/4	SAM/IG/5	RLA/99/901 States	**Completed** The SRVSOP technical committee has proposed a training programme oriented to the authorities
7.4 Conduct training programmes	SAM/IG/5	20 October 2011	States	**Valid** In order to conduct the training programmes, States should consider training programme and documentation for ATCOs and AIS operators Conclusion SAM/IG/5-1 and Appendix A to the Report on Agenda Item 3 (SAM/IG/5).
7.5 Conduct seminars for operators, explaining plans and expected operational and economic benefits	SAM/IG/1	20 October 2011	States	**Valid** States are encouraged to continue with the dissemination of RNAV5 implementation among such users.

8.	Implementation decision	Start	Responsible party	Remarks
8.1	Assess the available operational documentation (ATS, OPS/AIR)	October 2011	States	**Valid**
8.2	Assess the percentage of aircraft and operators (non-exclusionary airspace)	SAM/IG/7	States	**Completed** Keeping in mind that 95% of the fleet is in a condition for RNAV5 operations approval and that only completion of approval process is pending, the meeting has considered this task as completed.
8.3	Analyze the results of the safety assessment	SAM/IG/6	States	**Completed**
8.4	Publish trigger NOTAM	3 October 2011	States	**Valid**

9. Performance monitoring system	**Start**	**End**	**Responsible party**	**Remarks**
9.1 Develop a post-implementation en-route operations monitoring programme	SAM/IG/4	SAM/IG/6	SAM/PBN/IG (Project RLA/06/901)	**Completed**
9.2 Implement a post-implementation en-route operations monitoring programme	October 2011	October 2012	States	**Valid**
Pre-operational implementation date	20 October 2011	20 October 2012		**Valid** SAM/IG/4 defined the tentative implementation date 18 November 2010. It was decided to postpone implementation for 22 September 2011 during SAM/IG/6, since some tasks had not been executed. Keeping in mind the need for an additional analysis VOR/DME and DME/DME for the publication of ENR 3.3, the meeting has made an adjustment of 28 days in the implementation date.
Definitive implementation date	20 October 2012			

APPENDIX B

FOLLOW-UP OF ULTERIOR MEASURES OF RNAV5 SAFETY PLAN TO REDUCE RISKS

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
1. **Non-RNAV5 aircraft flying on RNAV5 routes**															
Inability of the aircraft to maintain RNAV5 route															
1.1 RNAV5 operational approval of aircraft with potential for approval.	NO	YES	YES*	YES	YES	--	--	--	YES	NO	NO	--	NO	YES	**Panama:** the Air Safety Directorate is in charge of approvals and is in final process. **Venezuela:** continuous
1.2 Improve surveillance in the necessary areas (implement VHF, HF, ADS-CPDLC, ADS-B, Radar and other types of communications)	YES	NO	YES	N/A	YES	--	--	--	YES	YES	YES	--	YES	YES	**Panama:** in areas where there is no RADAR VHF coverage, communications are good. **Paraguay:** SSR, COM, AUTO Systems **Perú** in July 2012 wide coverage for the continental upper airspace will be available. **Uruguay**: in bidding process. New VHF AM stations and AMHS moved in addition to SSR Mode S for Montevideo. With the acquisition of 2100 ADS

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															C will be implemented. Digital voice IP recently acquired. **Venezuela**: radar coverage in all territory.
1.3 Direct access of ARO/AIS units to updated database of RNAV5-approved aircraft	NO	NO	YES	YES	YES	--	--	--	NO	NO	NO	--	NO	YES	**Brazil**: data base will be available by the implementation date. **Panama:** does not have any information. **Paraguay:** to be implemented when approvals are initiated. **Uruguay**: both the SIIA and the en-route navigation charts are updated and regularly suffer amendments. No data base for RNAV5 approved aircraft is available. **Venezuela**: in process.
1.4 Training of operators and air navigation service providers	NO	YES	YES*	YES	YES	--	--	--	YES	YES	NO	--	YES	NO	**Brazil:** training of ATCOs and AIS operators will be carried out as near as possible to the implementation date of operators is part of the operational appropriation date. **Chile:** only to air transport operators **Panama:** Both operators as service providers have received information and training on the matter. **Paraguay:** initiates

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															second half of June 2011. **Uruguay**: PLUNA staff was trained specific training was received on acquired equipment (CNS) ATCs August 2011. **Venezuela**: in process.
1.5 Applicable contingency procedures upon identifying a non-RNAV5 aircraft on an RNAV5 route	NO	NO	YES	NO	YES	--	--	--	YES	NO	NO	--	YES	YES	**Brazil**: foreseen in AIP SUP Model prepared for SAM/IG/6. **Panama:** we have published AIC05/10 which has the information. **Uruguay**: AIC August 2011.
1.6 Updating and, if applicable, development of the Operational Manuals of the ANSP, incorporating the appropriate procedures	NO	NO	YES	NO	NO	--	--	--	NO	NO	NO	--	YES	NO	**Brazil:** manuals will be updated up to 30 days before RNAV5 implementation. **Panama:** guidelines have been provided to incorporate information to the manuals. **Paraguay:** to be included in procedures manual. **Uruguay**: 2012
1.7 Designate a responsible party in each State to maintain the database of RNAV5-approved	NO	YES	YES*	YES	YES	--	--	--	YES	YES	NO	--	YES	YES	**Brazil:** responsible body is Safety Superintendent's Office. Colombia: Oswaldo Hernández and Germán Rusinke.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
aircraft															**Panama:** the Air Safety Directorate is responsible. **Venezuela**: safety.
2. **Loss of RNAV5 capacity on board**															
Inability of the aircraft to maintain the RNAV5 route															
2.1 Standardization of operator procedures in case of loss of RNAV5 capability	NO	YES	YES	YES	NO	--	--	--	YES	NO	NO	--	YES	NO	**Brazil:** part of the operational approval process and will be published in the AIP **Panama:** as published in AIC 05/10. **Uruguay**: in view that there is none approved. **Venezuela**: is prepared jointly with Aeronautical Safety.
2.2 Improve surveillance in the necessary areas (implement VHF, HF, ADS-CPDLC, ADS-B, Radar and other types of communications)	YES	NO	YES	N/A	YES	--	--	--	YES	YES	YES	--	YES	YES	**Argentina:** radarisation plan continues. **Paraguay:** SSR, COM, AUTO. **Perú:** in July 2012 wide continental upper airspace will be available. **Uruguay**: in bidding process, new VHF AM moved and AMHS. Recently acquired Voice IP. **Venezuela**: radar coverage in all the territory.

Hazard specific component and ulterior measures	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**REMARKS**
2.3 Applicable contingency procedures upon identifying an aircraft that has lost RNAV5 capability	NO	NO	YES	YES	NO	--	--	--	YES	NO	NO	--	YES	YES	**Brazil**: part of the operational approval process and will be published in the AIP. **Chile**: in AIC Supplement as per the model – template. **Paraguay:** develop and publish. **Uruguay**: 2012 **Venezuela**: in continental flight
2.4 Training of operators, including training of the crew in the application of contingency procedures	NO	NO	YES*	YES	YES	--	--	--	YES	NO	NO	--	YES	YES	**Brazil:** part of the operational approval process and will be published in the AIP. **Panama:** in process by the Air Safety Directorate **Paraguay:** initiates second half of June 2011. **Venezuela**: continuous
2.5 Training of air navigation service providers	NO	NO	YES	NO	YES	--	--	--	YES	NO	NO	--	YES	YES	**Brazil**: ATCOs training and AIS operators will be carried out as close as the implementation date possible. **Paraguay:** initiates second half of June 2011. **Uruguay**: August 2011.
2.6 ATC simulations	NO	NO	N/A	NO	NO	--	--	--	YES	NO	N/A	--	NO	YES	**Brazil**: ATC simulations will not be necessary. **Paraguay**: not necessary. **Uruguay**: will be

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															improved with a simulator acquired by the IAA (aeronautical training centre).
2.7 RNAV system integrity oversight plan	NO	NO	YES*	YES	YES	--	--	--	NO	NO	NO	--	YES	NO	**Brazil:** part of routine operators and aircraft inspection programme. A specific document for PBN operations will be prepared until the implementation date. **Panama:** it has not been established who will maintain surveillance integrity. **Uruguay**: we have a surveillance plan. As approval is achieved, integration to the plan will occur.
3. Lack of GND NAVAID coverage															
Inability of the aircraft to maintain RNAV5 route	--	NO	NO	--	NO	--	--	--	--	NO	--	--	YES	--	**Brazil**: depends on the study to be carried out in order to determine coverage and geometry of radio navigation aids. Will be published as per Conclusion SAM/IG/7-XX. **Panama:** technical report is expected.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
3.1 Publish the areas with **no** GND NAVAIDS RNAV5 (DME/DME) and VOR/DME coverage	YES	NO	YES	YES	NO	--	--	--	NO	NO	NO	--	NO	NO	**Paraguay:** prepare AIC, amend AIP ENR 3.3. **Uruguay:** in process. **Venezuela**: next amendment to AIP
3.2 Ensure an appropriate coverage by:	NO	YES	--	--	--	--	--	--	--	NO	--	--	--	--	
a) Implementing the required GND NAVAIDs; or	YES	NO	N/A	NO	NO	--	--	--	NO	YES	N/A	--	YES	NO	**Brazil**: implementation of new radio navigation aids will not be necessary. **Panama**: new installation of DME is not contemplated. **Paraguay:** VOR/DME for SGME airport, northern area of the country.
b) Establish GNSS and/or INS as requirement to use the route affected.	YES	YES	YES	YES	NO	--	--	--	NO	NO	NO	--	YES	YES	**Panama:** for publication. **Paraguay:** prepare and amend AIP ENR 3.3. **Uruguay**: in bidding process, new VHF AM moved and AMHS. Recently acquired Voice IP
3.3 Improve surveillance in the required areas (implement VHF, HF, ADS-CPDLC, ADS-B, Radar and other types of	YES	NO	N/A*	N/A	YES	--	--	--	YES	YES	YES	--	YES	YES	**Brazil:** implementation of new radio navigation aids will not be necessary. **Paraguay:** SSR, COM, AUTO.**Perú:** in July 2012 wide continental

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
communications)															upper airspace will be available. **Uruguay**: 2012.
3.4 Training of operators and air navigation service providers	NO	NO	NO	YES	YES --	--	--	--	YES	NO	--	--	YES	YES	**Brazil:** training of ATCOs and AIS operators will be carried out as near as possible to the implementation date of operators is part of the operational appropriation date. **Colombia**: training has been provided to operators and ATCOs. **Paraguay:** initiates second half of June 2011. **Uruguay**: August 2011 **Venezuela**: continuous process.
3.5 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating the appropriate procedures		NO	NO	NO	NO	--	--	--	YES	NO	NO	--	YES	YES	**Brazil**: manuals will be updated 30 days before RNAV5 implementation. **Panama**: initiating the process **Paraguay:** to be included in procedural manual. **Uruguay**: 2012.

Hazard specific component and ulterior measures	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**REMARKS**
4. **NAVAID coverage failure**															
Inability of the aircraft to maintain RNAV5 route										NO					
4.1 Standardisation of operator procedures in case the aircraft cannot maintain RNAV5 route	NO	YES	YES*	YES	NO	--	--	--	NO	--	NO	--	YES	NO	**Paraguay:** develop and publish. **Venezuela**: as agreed by box 6 of AIP ENR 3.3 supplement.
4.2 Specific procedures to be applied in case of degradation of RNAV5 navigation capability of the aircraft	NO	NO	YES*	YES	NO --	--	--	--	YES	--	NO	--	YES	YES	**Brazil:** part of operational approval process and will be published in AIP. **Panama:** procedures published in AIC 05/10.
4.3 Compliance with the Maintenance plan for the verification of ground radio aids	YES	NO	YES*	YES	N/A	--	--	--	YES	--	YES	--	YES	YES	**Panama:** maintenance programme established is maintained. **Paraguay**: programme pre-established for each equipment.
4.4 Publish critical GND NAVAIDS for RNAV5 routes	YES	NO	YES	YES	NO	--	--	--	NO	NO	NO	--	YES	NO	**Brazil**: will be published in the AIP. **Panama**: will proceed with information received from technical report. **Paraguay:** prepare AIC, amend AIP ENR 3.3.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
4.5 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating the appropriate procedures	NO	NO	YES	NO	NO	--	--	--	NO	NO	--	NO	NO	YES	**Brazil**: manuals will be updated 30 days before RNAV5 implementation **Panama:** has not been incorporated into the operational manuals. **Paraguay**: to be included in procedural manual.
4.6 Disseminating information about solar storms that might affect the satellite and HF systems	YES	NO	YES	NO	NO	--	--	--	NO	NO	NO	--	YES	NO	**Panama:** we are enquiring. At the time we have not received such information. **Venezuela**: will request to MET on capacity to carry out this measure.
5. **Volcanic eruption**															
Volcanic ash															**Bolivia**: not applicable.
Reduced availability of the route network									NO						**Panama**: we do not have a volcano in activity.
5.1 Re-routing of air traffic	YES	NO	YES	YES	--	--	--	--	NO	YES	NO	--	YES	YES	**Uruguay**: conventional ATS routes.
5.2 Training of operators, including training of the crew on the application of contingency procedures	NO	NO	YES*	NO	NO				NO	YES	NO	--	NO	NO	**Brazil:** part of operational approval process and will be published in AIP. **Paraguay**: AIC, NOTAM, ASHTAM. **Venezuela**: in process
5.3 Determine ATC sector capacity	YES	NO	YES	YES	NO --	--	--	--	NO	YES	YES	--	NO	NO	**Panama:** we must finish before the publication of the new RNAV5 implementation date.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															Venezuela: in process
5.4 ATFM	NO	NO	YES	NO	NO	--	--	--	NO	YES	--	--	NO	NO	**Panama:** we are receiving information from ATFM System provider. **Venezuela**: in process
5.5 Updating of LOAs between MET/ATM services	NO	NO	YES	NO	NO	--	--	--	NO	YES	NO	--	YES	YES	**Uruguay:** in process.
5.6 Develop regional contingency procedures	YES	NO	YES	NO	NO	--	--	--	NO	YES	NO	--	NO	YES	**Venezuela**: LOAs adjacent States.
5.7 Alternate routes	YES	NO	YES	YES	NO	--	--	--	YES	YES	NO	--	YES	YES	**Panama:** conventional alternate routes are maintained. **Venezuela**: agreements among States
5.8 Updating of the operational manuals of the operator	YES	YES	YES*	NO	NO	--	--	--	NO	NO	--	--	NO	NO	**Panama:** operational manuals pending updating.
5.9 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating the procedures foreseen in Chapter 15 (15.8 of Doc 4444)	YES	NO	YES	NO	NO	--	--	--	NO	YES	NO	--	NO	YES	**Panama:** operational manuals pending incorporation.
6. **Adverse meteorological effects**															
Large deviations															
6.1 Updating of	YES	NO	NO	NO	NO	--	--	--	NO	YES	NO	--	YES	YES	**Panama:** not established

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
LOAs between MET/ATM services															
6.2 Alternate routes	YES	NO	NO	YES	NO	--	--	--	NO	YES	NO	--	YES	YES	**Panama:** conventional alternate routes are maintained.
6.3 QMS/MET/AIS	YES	NO	NO	NO	NO	--	--	--	NO	YES	NO	--	YES	YES	**Bolivia**: in process. **Panama:** 80% in progress. **Paraguay**: ISO 9001/2008. **Uruguay**: AIS has presented documentation of the QMS. The same is in an adjustment stage to external pre-audit process.
6.4 Updating of the operational manuals of the operator and the ANSP	YES	NO	YES*	NO	NO	--	--	--	NO	NO	NO	--	YES	YES	**Brazil:** manuals will be updated 30 days before RNAV5 implementation. **Uruguay:** 2012. **Venezuela**: only manuals corresponding to ANSP.
7. **Operational manuals of operators – ANSP not updated**															
Wrong application of procedures				--	--	--	--	--							
7.2 Implement SMS	YES	NO	YES	YES	NO	--	--	--	NO	NO	NO	--	YES	YES	**Panama**: in process of training. **Uruguay**: 2012
8. **Inadequate civil/military coordination**															
Unauthorised entry of civil aircraft in restricted				YES	NO										

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
airspaces															
Unauthorised entry of military aircraft from restricted airspaces into ATS routes															
8.1 Updating of video charts	YES	NO	YES	YES	NO	--	--	--	NO	YES	--	--	YES NO	YES	
8.2 Updating of LOAs and general civil/military ATM procedures	YES	NO	YES	NO	NO	--	--	--	NO	NO	NO	--	YES	YES	**Panama**: not applicable in view that there is no military aviation. **Uruguay**: 2012.
8.3 ATFM	NO	NO	YES	N/A	NO	--	--	--	NO	NO	NO	--	NO	NO	**Panama**: not implemented
8.4 Training of ATCOs and pilots	YES	NO	YES*	NO	NO	--	--	--	YES	YES	NO	--	YES	YES	**Panama**: incorporated to the recurrent ones
8.5 Restructuring of segregated sectors/airspaces	YES	NO	YES*	NO	NO	--	--	--	NO	NO	NO	--	YES	YES	**Panama**: good airspace flexibility
8.6 Optimise or, if applicable, implement a civil/military coordination committee	YES	NO	YES	YES	NO	--	--	--	NO	NO	NO	--	YES	YES	**Panama**: not applicable in view that there is no military aviation, but god coordination is maintained with the national air service.
8.7 Flexible use of airspace	YES	NO	YES	YES	NO	--	--	--	YES	YES	NO	--	YES	NO	**Panama**: good airspace flexibility **Venezuela**: committee in process

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
8.8 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating the procedures foreseen in Chapter 16 (16.1) of Doc 4444 and the standards and recommended practices of Annex 2 and 11	YES	NO	YES	NO	NO	--	--	--	NO	YES	NO	--	YES	YES	**Panama**: not applicable. **Uruguay**: 2012 **Venezuela**: in process
9. Discrepancy of aeronautical information concerning the route network															
Lack of integrity of the data published by the States															
Loss of separation															
9.1 Implement quality management system (QMS) in AIS	NO	NO	YES	YES	NO	--	--	--	NO	YES	NO	--	NO	YES	**Brazil:** in process of implementing. **Panama:** same as MET 80% advanced. **Paraguay**: ISO 9001/2008. **Uruguay:** the AIS has presented the document on QMS. The same is in stage of adjustment to external pre-audit process.
9.2 Comply with AIRAC cycles States ANSPs	YES	YES	YES	YES	YES	--	--	--	YES	YES	NO	--	YES	YES	**Panama:** to date, compliance is carried out with the term.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															Uruguay: the compliance of AIRAC cycles has been carried for more than 10 years.
Outdated airborne navigation database, if used				--	--	--	--	--					-		
Loss of separation															**Uruguay**: the compliance of AIRAC cycles has been carried for more than 10 years.
9.3 Comply with AIRAC cycles	YES	YES	YES	YES	YES	--	--	--	YES	YES	YES	--	YES	YES	**Panama:** complies with the cycle. **Uruguay:** the GIS/TF/1 generated model documents to exchange information among States and with other organizations.
9.4 Improve and/or formalise coordination between States and navigation database providers	YES	NO	YES	YES	NO	--	--	--	NO	NO	NO	--	YES	YES	
9.5 Publish specific navigation database regulations	YES	NO	YES*	YES	NO	--	--	--	NO	YES	NO	--	YES	YES	**Panama:** we are forwarding enquiries to the responsible Directorate. **Uruguay**: DNA has an inspection programme for users. **Venezuela**: complementary regulation to the RAVs.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
9.6 Schedule operator inspections	YES	NO	YES*	YES	NO	--	--	--	YES	YES	NO	--	YES	YES	**Panama**: by the Air Safety Directorate.
9.7 Comply with navigation database regulations established by the States	NO	NO	YES	YES	NO	--	--	--	NO	NO	NO	--	YES	YES	**Panama:** we are enquiring. **Uruguay**: AIS has already presented QMS documentation. The same is in a state of adjustment to external pre-audit process.
9.8 Increased ATCO workload	YES	YES	YES	NO	NO	--	--	--	YES	NO	YES	--	NO	NO	**Panama:** the study revealed that there is now overwork to ATCO. **Paraguay**: further to routes implementation in FIR Asuncion. **Venezuela**: in process
10. Inadequate airspace design															
Analyse sector workload after route optimisation		YES	YES	--	--	--	--	--					YES	NO	**Venezuela**: in process
10.1 Provide a sufficient number of air traffic controllers	YES	YES	YES	YES	NO	--	--	--	YES	NO	YES	--	YES	NO	**Panama:** necessary courses are being carried out to provide the necessary human resources. **Paraguay**: course ends on December 2011. **Uruguay**: is in process of hiring ATCOs. **Venezuela**: in process
10.2 Drafting of the safety plan for	YES	NO	YES	NO	NO	--	--	--	NO	YES	NO	--	NO	NO	**Panama:** because SMS has not been

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
sectors															implemented in ATS **Paraguay**: valid, SMS not applied. **Venezuela**: in process
10.3 ATFM	N/A	NO	YES	NO	NO	--	--	--	NO	YES	NO	--	YES	NO	**Panama:** programmed for 2012. **Venezuela**: in process.
10.4 Updating of ATCO training	YES	NO	YES	YES	NO	--	--	--	YES	YES	NO	--	YES	YES	**Brazil:** training is planned near the date of implementation. **Panama:** the quality management office carries out this job. **Uruguay**: August 2011.
10.5 Analysis of airspace capacity after RNAV5 route optimisation	YES	NO	YES	NO	NO	--	--	--	NO	NO	NO	--	NO	NO	**Brazil:** this analysis will be made after implementation. **Panama**: after implementation. **Paraguay**: further to implementation.
10.6 Airspace redesign applying continuous descent operations (CDO)	YES	NO	N/A	NO	NO	--	--	--	NO	NO	NO	--	NO	NO	**Brazil:** does not have any relationship with RNAV5 implementation. **Panama**: this matter has not been initiated yet. **Paraguay**: not required.
10.7 Implementation of RNAV5 SIDs/STARs	YES	YES	YES	YES	YES	--	--	--	YES	YES	NO	--	NO	YES	**Brazil**: STARs only apply where there is an air traffic volume that justifies its implementation. **Panama**: already in use. **Paraguay**: as per national PBN plan

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															Uruguay: under study.
11. Navigation deviations due to technical errors															
Deviation due to engine failure															**Panama**: we have not received deviation report due to failure in equipment.
Deviation due to a contingency									--						
11.1 Use of the lateral deviation (LD) reporting form	YES	NO	YES	YES	NO	--	--	--	YES	NO	YES	--	YES	YES	**Panama**: when justified. **Venezuela**: if necessary.
11.2 Monthly delivery of LD data to CARSAMMA	YES	NO	YES	YES	NO	--	--	--	YES	NO	YES	--	YES	NO	**Panama**: in the event it occurs
11.3 Training of ATCOs in the completion of the lateral deviation reporting form	YES	NO	YES	YES	NO	--	--	--	YES	NO	YES	--	YES	NO	**Brazil:** will be carried out as near as possible to the implementation date. **Panama**: training in-situ. **Uruguay**: August 2011.
11.4 Use of data available in CARSAMMA for visualising potential technical errors	YES	NO	YES	NO	NO	--	--	--	--	NO	NO	--	YES	NO	
11.5 Operator inspection programmes	YES	NO	YES	YES	YES	--	--	--	YES	YES	NO	--	YES	YES	**Panama**: by Air Safety Directorate.
11.6 Implement ATC system alarms to detect lateral deviations	YES	NO	YES	NO	NO	--	--	--	NO	NO	YES	--	NO	NO	**Brazil:** in implementation process in the new automated systems. **Panama:** has not been

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															considered yet. **Venezuela**: survey on automation
12. Navigation deviations due to operational errors															
NOLack of coordination between ACCs															
12.1 Implement measures to reduce operational errors in the ATC coordination loop between adjacent ACCs (GREPECAS 15/36)	YES	NO	YES	YES	NO	--	--	--	YES	YES	NO	--	YES	YES	**Panama**: obligatorily of information received and conformity with information transmitted.
12.2 Use of the lateral deviation (LD) reporting form	YES	NO	YES	YES	NO	--	--	--	YES	NO	YES	--	YES	NO	**Panama**: when the event occurs.
12.3 Investigation of each LD, taking the necessary risk mitigation measures, and monthly delivery of LD data to CARSAMMA	YES	NO	YES	YES	NO	--	--	--	YES	NO	YES	--	YES	NO	**Panama**: carried out by the investigation unit. **Uruguay**: has not implemented it yet.

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
12.4 Training of ATCOs in the application of procedures to avoid ATC coordination errors and completion of the lateral deviation reporting form	YES	NO	YES	YES	NO	--	--	--	YES	NO	NO	--	YES	NO	**Panama**: as part of the recurrent ones. **Uruguay**: August 2011.
12.5 Use of data available in CARSAMMA to visualise potential errors	YES	NO	YES	YES	NO	--	--	--	NO	NO	NO	--	YES	NO	**Panama:** data has not been used as to date.
12.6 Updating and, if applicable, drafting of the operational manuals of the ANSP, incorporating procedures to reduce operational errors in the ATC coordination loop between adjacent ACCs	YES	NO	NO	YES	NO	--	--	--	NO	NO	NO	--	YES	YES	
12.7 Implement ATC system alarms to detect lateral deviations	YES	NO	YES	NO	NO	--	--	--	NO	NO	YES	--	NO	NO	**Brazil:** in implementation process of new automated systems. **Venezuela**: survey on automation
12.8 Implement	YES	NO	YES	NO	NO	--	--	--	--	NO	NO	--	NO	NO	**Brazil:** in

Hazard specific component and ulterior measures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
AIDC															implementation process of new automated systems.

Instrucciones para el llenado del formulario - Instructions to fill in the form

- Cumplida: colocar **Sí** en el casillero correspondiente. / Accomplished: place **YES** in the corresponding box.
- N/A – No applicable / Not applicable.
- No cumplida: colocar **NO** en el casillero correspondiente y, de ser el caso, hacer comentarios en columna de observaciones/ Not complied.

APPENDIX C

Telephone: Fax: E-mail:	**S T A T E** **AERONAUTICAL INFORMATION** **SERVICE**	ENM AIP/SUPPLEMENT N° N° XX / XX XX XX , 2010

IMPLEMENTATION OF RNAV 5 ROUTES IN CONTINENTAL AIRSPACE OF THE XXXX FIR

1.- PURPOSE

1.1 The purpose of this AIP/Supplement AMD is to provide information about the implementation of RNAV 5 routes and operations in continental airspace of the XXXX FIR as of 18 November 2010, as a way to encourage the participation of stakeholders, specifically:

a) Aircraft operators;

b) Air traffic service providers;

c) Airspace management units;

1.2 The publication of this AIP/Supplement AMD does not preclude other dissemination activities, such as the development of supplements or amendments to the Aeronautical Information Publication (AIP – xxx) or the issuance of specific regulations concerning RNAV 5 implementation.

1.3 This AIP/Supplement AMD supersedes AIC xx / xx dated xx xx xxxx.

2. INTRODUCTION

2.1 The continuous growth of civil aviation increases airspace demand, highlighting the need for an optimum use of available airspace. The enhanced operational efficiency resulting from the application of area navigation (RNAV) techniques has led to the development of navigation applications for all flight phases.

2.2 Navigation application specifications for specific routes or airspaces must be clearly defined in order to ensure that pilots and air traffic controllers (ATCs) are aware of the capabilities of the aircraft RNAV system in order to determine that the performance of the aircraft system is appropriate for airspace requirements.

2.3 RNAV systems have evolved in a way similar to conventional ground-based routes and procedures, in which a specific RNAV system was identified and performance assessed through analysis and in-flight inspection. However, airspace and obstacle clearance criteria were developed based on the performance of the available equipment, even getting to the point of identifying certain equipment models to be used in a given airspace.

2.4 Consequently, *prescriptive* requirement specifications were established, which, in turn, delayed the use of the new RNAV capabilities and generated higher maintenance and certification costs. Within this context, ICAO developed the Performance-Based Navigation (PBN) concept to avoid this type of prescriptive specifications and to enable the definition of aircraft equipment requirements, specifying primarily performance requirements.

2.5 The PBN concept specifies RNAV system performance requirements in terms of the accuracy, integrity, availability, continuity and functionality required for the operations proposed within the framework of a particular airspace concept. In summary, the PBN concept represents a change from system-based navigation to performance-based navigation.

RNAV 5 Standards

2.6 In January 1998, the European Aviation Safety Agency (EASA) published the acceptable means of compliance document 20-4 (AMC 20-4), which replaced transitional guidance material No. 2 (TGL No.2) issued by the former JAA. This AMC contains the acceptable means of compliance concerning airworthiness approval and operational criteria for the use of navigation systems in European airspace designated for basic area navigation operations (basic RNAV or BRNAV).

2.7 Likewise, the United States Federal Aviation Administration (FAA) replaced AC 90-96 of March 1998 with AC 90-96A issued in January 2005. This new circular provides guidance material on airworthiness and operational approval for operators of aircraft registered in the United States that operate in European airspace designated for basic area navigation (B-RNAV) and precision area navigation (P-RNAV).

2.8 The two current documents, AMC 20-4 and AC 90-96A, establish similar operational and functional requirements.

2.9 Within the context of the terminology adopted in the Manual on Performance-Based Navigation (PBN) of the International Civil Aviation Organization (ICAO), B-RNAV requirements are known as RNAV 5.

2.10 The specifications developed by EASA and the FAA are based on the capabilities of RNAV equipment introduced in the early 70's.

2.11 The RNAV 5 navigation specification has been developed by ICAO to be used in en-route operations within the coverage of ground- or space-based navigation aids, or within the capacity limitations of stand-alone aids, or a combination of both.

2.12 The RNAV 5 specification does not require pilot alerting in case of blunder navigation errors, nor two RNAV systems; therefore, the potential loss of RNAV capability requires that the aircraft be provided with an alternate source of navigation.

2.13 The level of performance selected for RNAV 5 operations permits the approval of a broad range of RNAV systems for these operations, including INS inertial systems, with a 2-hour limit after their last position alignment update conducted on the ground in the absence of an automatic aircraft position radio update function.

2.14 Although the RNAV 5 specification does not require in-flight performance control and alert function, the on-board equipment must maintain a lateral and longitudinal navigation precision of + / - 5 NM or more, 95% of the total flight time.

2.15 ICAO Manual on Performance-Based Navigation (Doc. 9613) establishes various navigation specifications that can be applied on a global basis. According to air traffic characteristics in the South American Region, RNAV 5 is the most appropriate for en-route operations, since approval requirements will allow most RNAV-equipped aircraft to meet approval requirements.

2.16 Accordingly, the purpose of RNAV 5 implementation is to optimise the use of aircraft RNAV capability as soon as possible, without the need for most aircraft to make significant changes on airborne equipment.

Benefits of RNAV 5

2.17 RNAV 5 operations provide potential advantages and benefits over conventional ground-based operations. RNAV 5 benefits cover aspects such as safety, ATC and air traffic flow management (ATFM), and economic and environmental considerations, amongst others.

2.18 Airspace capacity can be increased, not only en route but also in terminal areas, through the implementation of more direct routes that do not require flying over radio aids, and through the establishment of parallel routes to address traffic demand. Accordingly, airspace can be used more efficiently through a more flexible structuring of the ATS route network, the establishment of shorter and more direct routes, together with parallel or dual routes, routes designed so that aircraft overfly high-density terminal areas, and alternate or contingency routes to meet the needs of the user community.

2.19 The potential reduction in the tracking required by ATC to ensure that aircraft maintain the course or the assigned levels/altitudes, the reduction of controller/pilot RTF communications, and the increase in the time available for conflict resolution lead to a reduction in the workload of both the controller and the pilot.

2.20 From an economic point of view, shorter and more direct routes reduce fuel consumption, resulting in cost savings. Operators can take advantage of this reduction to increase payload. Furthermore, the implementation of RNAV 5 results in a more efficient management of ground-based radio aids and a better planning of infrastructure. RNAV 5 equipment permits a better maintenance of the course, which leads to reduced fuel consumption and pollution, resulting in a positive environmental impact.

3.- RELATED DOCUMENTS

- ICAO Annex 6 - Operation of Aircraft
- ICAO Document 9613 - Manual on Performance-Based Navigation (PBN)
- ICAO Document 7030 - Regional Supplementary Procedures
- Document 7300 - Convention on International Civil Aviation
- Advisory Circular SRVSOP CA 91-002 (or CAA equivalent)

4.- DEFINITIONS AND ABBREVIATIONS

For purposes of this circular, the definitions and abbreviations contained in ICAO Document 9613, Manual on required-based navigation (PBN), apply.

5.- SCOPE

5.1 RNAV 5 will be applied on all RNAV routes within the continental airspace of the xxx FIR, between flight levels FL xxx and FL xxx.

5.2 Without detriment to that stated in 7.2 and 7.7.5, the DGCA (CAA) will not grant exemptions to the authorisation required to operate on RNAV 5 routes. Consequently, civil aircraft operators are urged to begin the corresponding approval process with the DGCA (CAA) so that they will not be prevented from using such routes as of 18 November 2010.

6.- AIRWORTHINESS AND OPERATIONAL APPROVAL

6.1 For a commercial air transport operator to receive an RNAV 5 authorisation and use RNAV routes in the continental airspace of the xxx FIR, it shall obtain two types of approvals:

a) The airworthiness approval from the State of registry (see Article 31 of the Chicago Convention (ICAO) and paragraphs 5.2.3 and 8.1.1 of Annex 6, Part I); and

b) The operational approval from the State of the operator (see paragraph 4.2.1 and Attachment F to Annex 6, Part I).

6.2 For general aviation operators, the State of registry (see paragraph 2.5.2.2 of Annex 6, Part II) will issue a letter of authorisation (LOA) after determining that the aircraft meets all the applicable requirements of this document for RNAV 5 operations.

6.3 Compliance with airworthiness requirements by itself does not constitute operational approval.

6.4 Advisory circular CA 91-002 “Approval of Aircraft and Operators for RNAV 5 Operations” issued by the ICAO Regional Safety Oversight Cooperation System (SRVSOP) provides acceptable means of compliance (AMC) regarding the approval of aircraft and operators for RNAV 5 operations.

6.5 To supplement the aforementioned advisory circular, the SRVSOP has prepared a Job Aid to provide guidance to the States, operators and inspectors regarding the process to be followed by the operator in order to obtain an RNAV 5 approval. Both documents are posted on the DGCA (CAA) web page, through the link:

www.DGAC/Publicaciones- RNAv 5%

7.- PROCEDURES

7.1 In the xxx FIR, except as stated in 7.2, only aircraft approved for RNAV 5 operations (airworthiness and operations approval) will be able to file flight plans for ATS routes designated as RNAV 5, as specified in the relevant AIP or NOTAM.

7.2 State aircraft, aircraft conducting SAR missions, humanitarian and maintenance or first delivery flights do not require RNAV 5 authorisation. The conditions for filing flight plans are those described in 7.7.5.

7.3 Aircraft operating on RNAV 5 routes will be equipped at least with on-board RNAV equipment that meets an en-route lateral and longitudinal navigation precision of ± 5 NM (± 9,26 KM) 95% of the total flight time.

7.4 Before starting an operation on an RNAV 5 route, the proper operation of the on-board RNAV system will be verified, including:

a) A revision of records and forms, to make sure that maintenance has been performed in order to correct equipment defects;

b) A revision of database validity (current AIRAC cycle), if installed.

c) A revision of the approved flight plan, comparing charts or other applicable resources with the navigation system text display and aircraft display, if applicable. The exclusion of specific navigation aids, if applicable, shall be confirmed.

7.5 When operating on an RNAV 5 route, the proper operation of the on-board RNAV system will be verified, including confirmation:

a) That the equipment required for RNAV 5 operation has not been degraded during the flight;

b) That the route is consistent with the authorisation.

c) Through cross-checks, that the aircraft navigation precision is appropriate for RNAV 5 operation;

d) Other navigation aids shall be selected to permit a cross-check or immediate reversal in case of loss of RNAV capability;

7.6 If the ATC assigns a course that takes the aircraft off the route, the pilot shall not modify the flight plan in the RNAV system until cleared to go back to the route or until the ATC confirms a new authorisation. While the aircraft is not on the designated RNAV route, the specified precision requirement does not apply.

7.7 Flight Planning

7.7.1 An R will be inserted in box 10 (Equipment) of the flight plan to indicate that the aircraft meets the RNAV 5 specification prescribed for the route, and that the operator has obtained an authorisation from the DGCA (CAA) and can meet the conditions of said authorisation. Likewise, a Z will be inserted in box 10 to indicate that box 18 contains a description of the type of RNAV equipment installed on board.

7.7.2 NAV/ will be inserted in box 18 of the flight plan, followed by the corresponding navigation specification code(s), according to the following table:

Code	Navigation Specification		
B1	RNAV 5	-	All sensors permitted
B2	RNAV 5	-	GNSS
B3	RNAV 5	-	DME/DME
B4	RNAV 5	-	VOR/DME
B5	RNAV 5	-	INS or IRS
B6	RNAV 5	-	LORAN C

7.7.3 When an aircraft of an operator with an RNAV 5 approval according to item 6 hereof has a failure or degradation prior to departure that prevents it from complying with the prescribed RNAV functionality and accuracy requirements, the operator will not insert the letter R in box 10 of the flight plan. Consequently, for a flight for which a flight plan has been filed, an appropriate new flight plan will be filed and the old one will be cancelled. For a flight operation based on an RPL, the latter will be cancelled and an appropriate new flight plan will be filed.

7.7.4 State aircraft, aircraft conducting SAR missions, humanitarian, and maintenance or first delivery flights that do not have RNAV approval can file flight plans for operations on RNAV routes. These aircraft must complete box 18 by inserting, RMK/NONRNAV10 and/or RMK/NONRNAV5. These aircraft must fill item 18 including after STS/ the reason for the special treatment; for example STATE, HUM, SAR, MAINT and DELIVERY.

7.7.5 Operators filing repetitive flight plans (RPL) will insert in box Q of the RPL all information concerning navigation equipment and capabilities, in keeping with box 10 of the flight plan. This includes the indicators and designators that describe the level of PBN approval granted to the operator.

7.8 Contingency Procedures

7.8.1 Regarding the in-flight degradation or failure of the RNAV system when the aircraft is on an ATS route designated as RNAV 5:

a) The aircraft will be authorised to fly on the ATS routes defined by VOR/DME; or

b) If these routes are not available, the aircraft will be authorised to fly with conventional navigation aids, that is, VOR/DME; or

c) When the aforementioned procedures are not available, the ATC unit will provide the aircraft, whenever possible, with radar vectoring until the aircraft can resume its own navigation.
Note.- Aircraft authorised to fly according to a) or b) may request, whenever possible, radar tracking by the corresponding ATC unit.

7.8.2 ATC measures with respect to an aircraft that cannot meet RNAV requirements due to failure or degradation of the RNAV system will depend on the nature of the reported failure and general traffic conditions. In many cases, operations may continue according to the current ATC clearance. When this is not possible, a revised clearance can be requested, as specified in 7.8.1, in order to revert to VOR/DME navigation.

7.9 PHRASEOLOGY

RNAV 10 (RNP 10) and RNAV 5

Circumstances	*Fraseología*	*Phraseologies*
Informa the ATC on degrading or RNAVfailure.	*(*distintivo de llamada de aeronave*) IMPOSIBLE RNAV DEBIDO A EQUIPO	*(*aircraft call sign*) UNABLE RNAV DUE EQUIPMENT
Informar the ATC that there is no RNAV capacity.	*(*distintivo de llamada de aeronave*) RNAV NEGATIVO	*(*aircraft call sign*) NEGATIVE RNAV
** Indicating a transmission from pilot.*		

8.- ADDITIONAL INFORMATION

Additional information can be obtained through the following contacts:

- General Director of Civil Aviation
  - For certification issues:
    - Nnnnnnnnnnnnn e-mail - Airworthiness
    - Nnnnnnnnnnnnn e-mail - Operations
  - For airspace issues:
    - Nnnnnnnnnnnnn e-mail
- ICAO Lima

  Mr./Ms. xxx xxx (email: xxxxxx@icao.lima.int)

APÉNDICE/APPENDIX D

ENR 3.3 RUTAS DE NAVEGACIÓN DE ÁREA – AREA NAVIGATION ROUTES

Designador de ruta **(***especificación para la navegación***)** ***Nombre de los puntos significativos Coordenadas*** **Route designator** **(**Navigation specification**)** **Name of significant points Coordinates**	***Derrota Magnética Distancias*** **Magnetic track Distances**	***<u>Límites superiores</u> Límites inferiores Clasificación del Espacio aéreo*** **<u>Upper limits</u> Lower limits Airspace Classification**	***Límites laterales NM*** **Lateral Limits NM**	***Dirección de los niveles De crucero*** **Cruise level direction**		***Observaciones Dependencia de control Frecuencia*** **Remarks Control Unit Frequency**
				Impar **Odd**	***Par*** **Even**	
1	**2**	**3**	**4**	**5**		**6**

1. Columna 1: se insertará la Especificación para la navegación aplicable. *Especificación para la navegación*: Conjunto de requisitos relativos a la aeronave y a la tripulación de vuelo necesarios para dar apoyo a las operaciones de la navegación basada en la performance (PBN) dentro de un espacio definido. Existen dos clases de especificaciones para la navegación:
   - *Especificación RNAV*: Especificación para la navegación basada en la navegación de área que no incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNAV, por ejemplo RNAV 5, RNAV 1.
   - *Especificación RNP*: Especificación para la navegación basada en la navegación de área que incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNP, por ejemplo, RNP 4, RNP APCH

1. Column 1: Applicable navigation specification will be inserted. *Navigation specification*. A set of aircraft and aircrew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specification:
   - *RNAV specification.* A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.
   - *RNP specification.* A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

2. Columna 6: Se insertará informaciones sobre los sensores aplicables (GNSS y/o IRU) en caso de que la cobertura y/o geometría VOR/DME y/o DME/DME no sean suficientes para atender a los requerimientos RNAV5.
   Se insertará la radio-ayuda crítica para la actualización de los sistemas de navegación solo en el caso de que la pérdida de esa radio-ayuda ocasione que la navegación basada en IRU se extienda por más de dos horas.

2 Column 6: Information on the applicable sensors in case of VOR/DME and/or DME/DME coverage and/or geometry are not sufficient to meet RNAV5 requirements.
The critical radio navigation aid for updating of the systems will be inserted only in case the loss of this radio navigation aid causes that the IRU-based navigation is extended for more than two hours.

APÉNDICE/APPENDIX E

Ejemplo Nº1: Aerovía que requiere GNSS o IRU y publicación de radioayuda critica
Example No. 1 Airway requiring GNSS or IRU and publication of critical radio navigation aid

ENR 3.3 RUTAS DE NAVEGACIÓN DE ÁREA – AREA NAVIGATION ROUTES

Designador de ruta *(especificación para la navegación)* ***Nombre de los puntos significativos*** ***Coordenadas*** **Route designator** **(**Navigation specification**)** **Name of significant points** **Coordinates**	***Derrota Magnética Distancias*** **Magnetic track Distances**	***Límites superiores*** ***Límites inferiores*** ***Clasificación del Espacio aéreo*** **Upper limits** **Lower limits** **Airspace Classification**	***Límites laterales NM*** **Lateral Limits NM**	***Dirección de los niveles De crucero*** **Cruise level direction**		***Observaciones Dependencia de control Frecuencia*** **Remarks Control Unit Frequency**
				Impar **Odd**	***Par*** **Even**	
1	2	3	4	5		6
UL 999 **(RNAV 5)**					↓	GNSS o IRU requerido / required
▲ CELSO 425314S-0710601W	280 101	FL 450 FL 245	5	↑		
	1400 NM	A				Entre CELSO y MARIE. En caso de IRU, VOR/DME JFD requerido Between CELSO and MARIE. In case of IRU, VOR/DME JFD required.
▲ MARIE 424223S-0714435W						
	280 101	FL 450 FL 245	5			
▲ JOFER 4235232S-0718435W						
	500 NM	A				ACC Comodoro Rivadavia 125.5 MHz 5547 KHz 11282 kHz

1. Columna 1: se insertará la Especificación para la navegación aplicable. *Especificación para la navegación*: Conjunto de requisitos relativos a la aeronave y a la tripulación de vuelo necesarios para dar apoyo a las operaciones de la navegación basada en la performance (PBN) dentro de un espacio definido. Existen dos clases de especificaciones para la navegación:
   - *Especificación RNAV*: Especificación para la navegación basada en la navegación de área que no incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNAV, por ejemplo RNAV 5, RNAV 1.
   - *Especificación RNP*: Especificación para la navegación basada en la navegación de área que incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNP, por ejemplo, RNP 4, RNP APCH

1. Column 1:Aplicable navigation specification will be inserted. *Navigation specification*. A set of aircraft and aircrew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specification:
   - *RNAV specification.* A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.
   - *RNP specification.* A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

2. Columna 6: Se insertará informaciones sobre los sensores aplicables (GNSS y/o IRU) en caso de que la cobertura y/o geometría VOR/DME y/o DME/DME no sean suficientes para atender a los requerimientos RNAV5.
   Se insertará la radio-ayuda crítica para la actualización de los sistemas de navegación solo en el caso de que la pérdida de esa radio-ayuda ocasione que la navegación basada en IRU se extienda por más de dos horas.

2 Column 6: Information on the applicable sensors in case of VOR/DME and/or DME/DME coverage and/or geometry are not sufficient to meet RNAV5 requirements.
The critical radio navigation aid for updating of the systems will be inserted only in case the loss of this radio navigation aid causes that the IRU-based navigation is extended for more than two hours.

APÉNDICE/APPENDIX E
Ejemplo Nº2: Aerovía que requiere GNSS o IRU / Example No. 2 Airway requiring GNSS or IRU

ENR 3.3 RUTAS DE NAVEGACIÓN DE ÁREA – AREA NAVIGATION ROUTES

Designador de ruta **(***especificación para la navegación***)** ***Nombre de los puntos significativos Coordenadas*** **Route designator** **(**Navigation specification**)** **Name of significant points Coordinates**	***Derrota Magnética Distancias*** **Magnetic track Distances**	***<u>Límites superiores</u> Límites inferiores Clasificación del Espacio aéreo*** **<u>Upper limits</u> Lower limits Airspace Classification**	***Límites laterales NM*** **Lateral Limits NM**	***Dirección de los niveles De crucero*** **Cruise level direction**		***Observaciones Dependencia de control Frecuencia*** **Remarks Control Unit Frequency**
				Impar **Odd**	***Par*** **Even**	
1	**2**	**3**	**4**	**5**		**6**
UL 999 **(RNAV 5)**					↓	GNSS o IRU requerido/ required
▲ CELSO 425314S-0710601W	<u>280</u> 101	<u>FL 450</u> FL 245	5	↑		
	300 NM	A				ACC Comodoro Rivadavia 125.5 MHz 5547 KHz 11282 kHz
▲ MARIE 424223S-0714435W						
	<u>280</u> 101	<u>FL 450</u> FL 245	5			
▲ JOFER 4235232S-0718435W						
	500 NM	A				

1. Columna 1: se insertará la Especificación para la navegación aplicable. *Especificación para la navegación*: Conjunto de requisitos relativos a la aeronave y a la tripulación de vuelo necesarios para dar apoyo a las operaciones de la navegación basada en la performance (PBN) dentro de un espacio definido. Existen dos clases de especificaciones para la navegación:
   - *Especificación RNAV*: Especificación para la navegación basada en la navegación de área que no incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNAV, por ejemplo RNAV 5, RNAV 1.
   - *Especificación RNP*: Especificación para la navegación basada en la navegación de área que incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNP, por ejemplo, RNP 4, RNP APCH

1. Column 1:Aplicable navigation specification will be inserted. *Navigation specification.* A set of aircraft and aircrew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specification:
   - *RNAV specification.* A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.
   - *RNP specification.* A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

2. Columna 6: Se insertará informaciones sobre los sensores aplicables (GNSS y/o IRU) en caso de que la cobertura y/o geometría VOR/DME y/o DME/DME no sean suficientes para atender a los requerimientos RNAV5.
   Se insertará la radio-ayuda crítica para la actualización de los sistemas de navegación solo en el caso de que la pérdida de esa radio-ayuda ocasione que la navegación basada en IRU se extienda por más de dos horas.

2 Column 6: Information on the applicable sensors in case of VOR/DME and/or DME/DME coverage and/or geometry are not sufficient to meet RNAV5 requirements.
The critical radio navigation aid for updating of the systems will be inserted only in case the loss of this radio navigation aid causes that the IRU-based navigation is extended for more than two hours.

APÉNDICE/APPENDIX E
Ejemplo Nº3: Aerovía que requiere GNSS / Example No. 3 Airway requiring GNSS

ENR 3.3 RUTAS DE NAVEGACIÓN DE ÁREA – AREA NAVIGATION ROUTES

Designador de ruta **(***especificación para la navegación***)** ***Nombre de los puntos significativos Coordenadas*** **Route designator (**Navigation specification**) Name of significant points Coordinates**	***Derrota Magnética Distancias*** **Magnetic track Distances**	***Límites superiores Límites inferiores Clasificación del Espacio aéreo*** **Upper limits Lower limits Airspace Classification**	***Límites laterales NM*** **Lateral Limits NM**	***Dirección de los niveles De crucero*** **Cruise level direction**		***Observaciones Dependencia de control Frecuencia*** **Remarks Control Unit Frequency**
				Impar **Odd**	***Par*** **Even**	
1	**2**	**3**	**4**	**5**		**6**
UL 999 (RNAV 5)					↓	GNSS requerido required
▲ CELSO 425314S-0710601W	280 101	FL 450 FL 245	5	↑		
	1300 NM	A				ACC Comodoro Rivadavia 125.5 MHz 5547 KHz 11282 kHz
▲ MARIE 424223S-0714435W						
	280 101	FL 450 FL 245	5			
▲ JOFER 4235232S-0718435W						
	900 NM	A				

1. Columna 1: se insertará la Especificación para la navegación aplicable. *Especificación para la navegación*: Conjunto de requisitos relativos a la aeronave y a la tripulación de vuelo necesarios para dar apoyo a las operaciones de la navegación basada en la performance (PBN) dentro de un espacio definido. Existen dos clases de especificaciones para la navegación:
   - *Especificación RNAV*: Especificación para la navegación basada en la navegación de área que no incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNAV, por ejemplo RNAV 5, RNAV 1.
   - *Especificación RNP*: Especificación para la navegación basada en la navegación de área que incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNP, por ejemplo, RNP 4, RNP APCH

1. Column 1:Aplicable navigation specification will be inserted. *Navigation specification.* A set of aircraft and aircrew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specification:
   - *RNAV specification.* A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.
   - *RNP specification.* A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

2. Columna 6: Se insertará informaciones sobre los sensores aplicables (GNSS y/o IRU) en caso de que la cobertura y/o geometría VOR/DME y/o DME/DME no sean suficientes para atender a los requerimientos RNAV5.
   Se insertará la radio-ayuda crítica para la actualización de los sistemas de navegación solo en el caso de que la pérdida de esa radio-ayuda ocasione que la navegación basada en IRU se extienda por más de dos horas.

2 Column 6: Information on the applicable sensors in case of VOR/DME and/or DME/DME coverage and/or geometry are not sufficient to meet RNAV5 requirements.
The critical radio navigation aid for updating of the systems will be inserted only in case the loss of this radio navigation aid causes that the IRU-based navigation is extended for more than two hours.

APÉNDICE/APPENDIX E
Ejemplo Nº4: Aerovía con suficiente cobertura de radioayudas terrestres
Example No. 4 Airway with sufficient coverage of ground radio aids

ENR 3.3 RUTAS DE NAVEGACIÓN DE ÁREA – AREA NAVIGATION ROUTES

Designador de ruta *(especificación para la navegación)* ***Nombre de los puntos significativos Coordenadas*** **Route designator** (Navigation specification) **Name of significant points Coordinates**	***Derrota Magnética Distancias*** **Magnetic track Distances**	***Límites superiores Límites inferiores Clasificación del Espacio aéreo*** **Upper limits Lower limits Airspace Classification**	***Límites laterales NM*** **Lateral Limits NM**	***Dirección de los niveles De crucero*** **Cruise level direction**		***Observaciones Dependencia de control Frecuencia*** **Remarks Control Unit Frequency**
				Impar **Odd**	***Par*** **Even**	
1	**2**	**3**	**4**	**5**		**6**
UL 999 **(RNAV 5)**					↓	
▲ CELSO 425314S-0710601W	280 / 101	FL 450 / FL 245	5	↑		
	110 NM	A				ACC Comodoro Rivadavia 125.5 MHz 5547 KHz 11282 kHz
▲ MARIE 424223S-0714435W						
	280 / 101	FL 450 / FL 245	5			
▲ JOFER 4235232S-0718435W						
	95 NM	A				

1. Columna 1: se insertará la Especificación para la navegación aplicable. *Especificación para la navegación*: Conjunto de requisitos relativos a la aeronave y a la tripulación de vuelo necesarios para dar apoyo a las operaciones de la navegación basada en la performance (PBN) dentro de un espacio definido. Existen dos clases de especificaciones para la navegación:
   - *Especificación RNAV*: Especificación para la navegación basada en la navegación de área que no incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNAV, por ejemplo RNAV 5, RNAV 1.
   - *Especificación RNP*: Especificación para la navegación basada en la navegación de área que incluye el requisito de vigilancia y alerta de la performance, designada por medio del prefijo RNP, por ejemplo, RNP 4, RNP APCH

1. Column 1:Aplicable navigation specification will be inserted. *Navigation specification.* A set of aircraft and aircrew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specification:
   - *RNAV specification.* A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.
   - *RNP specification.* A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

2. Columna 6: Se insertará informaciones sobre los sensores aplicables (GNSS y/o IRU) en caso de que la cobertura y/o geometría VOR/DME y/o DME/DME no sean suficientes para atender a los requerimientos RNAV5.
   Se insertará la radio-ayuda crítica para la actualización de los sistemas de navegación solo en el caso de que la pérdida de esa radio-ayuda ocasione que la navegación basada en IRU se extienda por más de dos horas.

2 Column 6: Information on the applicable sensors in case of VOR/DME and/or DME/DME coverage and/or geometry are not sufficient to meet RNAV5 requirements.
The critical radio navigation aid for updating of the systems will be inserted only in case the loss of this radio navigation aid causes that the IRU-based navigation is extended for more than two hours.

APPENDIX F

CONSULTATION TO STATES ON RNAV 5 IMPLEMENTATION AND POSSIBLE DIFFICULTIES

Difficulties Identified	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
1. Does your administration foresee difficulties in implementing RNAV 5 on October 2011?	**NO**	**NO**	**NO**	**YES**	**NO**	**NIL**	**NIL**	**NO**	**NO**	**YES**	**NIL**	**NIL**	**YES**	**NO**	**Panama:** Only waiting for the safety area to complete approval of the fleet for RNAV5. **Paraguay:** approval of aircraft and data bank. **Uruguay:** In some areas **Venezuela**: No difficulties foreseen
2. If affirmative, please confirm in which of the following area's) you foresee difficulties: **a) OPS** **b) AIR** **c) ATM** **d) AIS (aeronautical publications)** **e) Others**	**N/A**	**N/A**	**YES**	**YES**	**N/A**	**NIL**	**NIL**	**N/A**	**N/A**	**YES**	**NIL**	**NIL**	**YES**	**N/A**	**Brazil:** AIS **Chile**: AIS **Guyana**: A seminar for ATCO and AIS training is planned. **Panama:** Do not foresee any difficulty in any area, particularly with the safety directorate **Paraguay**: ARO Office. **Uruguay**: AIS/ATM
3. Confirm specifically which are the problems identified	**N/A**	**N/A**	**YES**	**YES**	**N/A**	**NIL**	**NIL**	**NO**	**YES**	**YES**	**NIL**	**NIL**	**NO**	**NO**	**Brazil**: Depending on the information to be published in the AIP, it may be necessary to have more time before the implementation date. **Chile**: Time for publication. AIRAC cycles.

Difficulties Identified	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
															Panama: Specifically the approval of ACFT **Paraguay**: deficient information from the approved aircraft data bank. **Uruguay**: AIS-difficulties to comply with the time for delivery of documentation for publication. ATM-Lack of training manuals, personnel.
4. Do you consider any additional action from ICAO could aid in solving identified inconveniences?	**NO**	**NO**	**NO**	**NO**	**YES**	**NIL**	**NIL**	**NO**	**NO**	**NO**	**NIL**	**NIL**	**NO**	**NO**	**Colombia:** Establish a restriction policy at regional level for operators not certified by 22 September 2011. **Panama:** It should be our responsibility to enforce what is required. **Uruguay**: organize training workshops.

Instrucciones para el llenado del formulario - Instructions to fill in the form

- Cumplida: colocar **Sí** en el casillero correspondiente. / Accomplished: place **YES** in the corresponding box
- En ejecución: colocar **OG** (ongoing) e indicar en "observaciones" la fecha prevista de término./ In execution: place **OG** (ongoing) and indicate under "remarks" the estimated deadline
- No cumplida: colocar **NO** en el casillero correspondiente y, de ser el caso, hacer comentarios en columna de observaciones/ Not complied: place **NO** in the corresponding box and if such were the case, make comments in the remarks column
- No aplica N/A/ Not applicable N/A

APÉNDICE / APPENDIX G

LISTA DE VERIFICACIÓN DE TAREAS PARA LA IMPLANTACIÓN DE RNAV5/TASKS CHECKLIST FOR RNAV5 IMPLEMENTATION

La siguiente Lista de verificación sobre las tareas consideradas críticas para la implantación RNAV5 se ha elaborado tomando como base la información contenida en el plan de acción para la implantación RNAV5 en ruta, las conclusiones y actividades identificadas por el Grupo de Implantación SAM.

Considerando la cantidad y diversidad de los asuntos, actividades y tareas a realizarse y que en esta etapa del proceso de implantación de la RNAV5 ya debe haberse culminado, sino todas, la mayoría de ellas, las preguntas formuladas se refieren a la parte fundamental del tema en cuestión, entendiéndose que una respuesta afirmativa a dicha pregunta indicaría que efectivamente se ha culminado todo el proceso correspondiente y que solamente cuando alguna tarea o actividad específica no se haya finalizado, se explique brevemente en la parte de observaciones.

N/A significa NO APLICABLE

* significa SIN INFORMACIÓN

The following checklist on the tasks considered critical for RNAV5 implementation has been prepared, based on the information contained in the action plan for en-route RNAV5 implementation, the conclusions and activities identified by the SAM Implementation Group.

Taking into consideration the amount and diversity of issues, activities and tasks to be carried out and that in this phase of the implementation process of RNAV5 all or almost all tasks must have been completed. The questions formulated refer to the main part of the referred matter, understanding that an affirmative response to such question would indicate that all the corresponding process has terminated and that only when some specific task or activity has not been finalised, it should be briefly explain in the part corresponding to remarks.

N/A means NOT APPLICABLE
* Means NO INFORMATION PROVIDED

Conclusión/Tarea Conclusion/Task	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**OBSERVACIONES REMARKS**
1.¿Ha publicado una reglamentación nacional para la aprobación RNAV5 de aeronaves y operadores aéreos derivada de la CA91-002? 1. Have you published a national regulation for RNAV5 aircraft and operations approval derived from the CA91-002?	**SI**	**SI**	**NO**	**SI**	**SI**	**NO**	*	*	**SI**	*	**SI**	*	**SÍ**	**SI**	**BRA**: La AC 91-002 está siendo utilizada directamente mientras la reglamentación es desarrollada. **Uru** 91.225, 121.607, 135.165 **VEN**: NC-65-91 **BOL**: RAB91
2. ¿Está el material de orientación para la aprobación RNAV5 disponible para los operadores? 2. Is RNAV5 approval	**SI**	**SI**	**SI**	**SI**	**SI**	*	*	*	**SI**	*	**SI**	*	**SÍ**	**SI**	**BRA**: la AC 91-002 está siendo utilizada directamente, mientras la reglamentación es desarrollada/ AC 91- 002 is directly being used, while the regulation is developed.

Conclusión/Tarea Conclusion/Task	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**OBSERVACIONES REMARKS**
guidance material available to operators?															**ECU**: Mayo/May 2011 **VEN**: www.inac.gob.ve
3. De requerirlo, la AAC ha publicado los antecedentes que deberán presentar los operadores extranjeros que deseen operar en su territorio para que se reconozca la autorización RNAV 5 emitida por su Autoridad? Si es afirmativo indicar el documento o link en donde se puede encontrar. 3. If appropriate the CAA has published the background information to be presented by foreign operators who wish to operate in your territory so that RNAV5 clearance issued by your authority is recognized? If affirmative, indicate the document or link in which it may be found.	**SI**	**SI**	**SÍ**	**NO**	**NO**	*****	*****	*****	**SI**	**NO**	**NO**	*****	**NO**	**NO**	**BRA**: Link: www.anac.gov.br/biblioteca/rbha/rbha129.pdf **BOL**: acepta aprobación RNAV5 del Estado del operador/ Accepts RNAV5 approval from operator. **CHI**: no se requiere/not required **PAN**: Link: www.aeronautica.gob.pa/a **VEN**: no solicita procedimientos administrativos suplementarios./Not requesting supplementary administrative procedures
4. De requerirlo, la AAC ha publicado los antecedentes que deberán presentar los operadores extranjeros que deseen sobrevolar su territorio para que se reconozca la autorización RNAV 5 emitida por su Autoridad? Si es afirmativo indicar el documento o link en dónde se puede encontrar. 4. If appropriate the CAA has published the background information to be presented by foreign operators who wish to over-fly in your territory so that RNAV5 clearance issued by your authority is recognized? If affirmative, indicate the document or		**NO**	**SI**	**NO**	**NO**	*****	*****	*****	**NO**	**NO**	*****	*****	**NO**	**NO**	**BRA**: Link: www.anac.gov.br/biblioteca/iac/iac2216.pdf **Chi :** No se require /not required. **Uruguay** reconoce las autorizaciones emitidas por la AAC de origen. No tenemos requerimientos especiales. / Uruguay recognizes authorizations of origin issued by AAC. We do not have special requirements. **VEN**: La normativa está siendo actualizada para contemplar la RNAV5. Regulation is being updated to observe RNAV5.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
link in which it may be found.															
5. ¿Se ha efectuado una encuesta a los operadores para determinar sus planes para la aprobación RNAV5? 5. Has a survey of operators been conducted to determine RNAV5 plans for RNAV5 approval?	**SI**	**SI**	**SÍ**	**SI**	**SI**	**O/G**	*	*	*	*	**SÍ**	*	**SI**	**NO**	**ECU: Mayo/May 2011**
6. ¿Cuántas aeronaves registradas (elegibles) en el Estado cumplen con los requisitos para la certificación de aeronavegabilidad RNAV5? 6. How many State registered (eligible) aircraft comply with the requirements for RNAV5 airworthiness certification?	*	**4**	**361**	**110**	**NO**	*	*	*	*	*	**14**	*	**17**	**05**	**BRA**: número aproximado, será actualizado oportunamente/ Approximate number, will be duly updated. **ECU**: Mayo/May 2011 **PAN**: se encuentran en proceso de autorización aprox 50 Acft a la fecha. / In process of approval Approc 50 acft to date.
7. ¿Cuántas aeronaves nacionales han recibido aprobación para la aeronavegabilidad RNAV5? 7. How many national aircraft have received RNAV5 airworthiness certification?	*	**4**	**308**	**90**	**NO**	**NO**	*	**N/A**	*	**N/A**	**0**	*	**0**	**0**	**BRA**: número aproximado, será/ Approx number will be **CHI:** Bajo estándares EASA, en proceso armonización con Doc.9613. /under EASA standards, in proces of harmonisation with Doc 9613. **PAN**: en proceso/on going.
8. ¿Cuántos operadores Nacionales han recibido aprobación RNAV5? 8. How many national operators have received RNAV5 approval?	*	**1**	**7**	**3**	**NO**	**NO**	*	**N/A**	*	**N/A**	**0**	*	**0**	**0**	**PAN**: en proceso/ On going
9. ¿Han proporcionado aprobación RNAV5 a aeronaves individuales de aviación general? 9. Have you provided RNAV5 approval to general aviation individual aircraft?	*	**NO**	**NO**	**NO**	**NO**	**NO**	*	*	**NO**	*	**NO**	*	**NO**	**SÍ**	**PAN**: ninguna solicitada/ None requested **Ven**: en la medida de lo posible. If possible.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
10. ¿Están proporcionando a la CARSAMMA información sobre aprobación RNAV5? 10. Are you providing CARSAMMA with RNAV5 approval data?	*****	**NO**	**NO**	**NO**	**NO**	**NO**	*****	*****	**NO**	**NO**	**NO**	*****	**NO**	**NO**	**BRA**: se pretende hacer en conjunto con la publicación del reglamento (2º. Semestre 2011) /intended to be made jointly with publication of regulation (second semester 2011) **CHI:** se informará pronto/will soon inform. **PAN:** se va a iniciar el proceso/ Process will be initiated.
11. ¿Ha completado la Administración las actividades relacionados con la capacitación RNAV5 para los inspectores OPS/AIR? 11. Has the Administration completed all the training activities related with RNAV5 to OPS/AIR inspectors?	**SI**	**SI**	**NO**	**SI**	**SI**	*****	*****	*****	*****	**NO**	**SI**	*****	**SI**	**NO**	**BRA:** faltan los inspectores AIR/ AIR inspectors pending **ECU**: Mayo/May 2011 **PAN**: Se está programando un curso para los inspectores que faltan/ A course is being programmed for inspectors who have not taken it. **PERU** participó en cursos en la oficina SAM. Aun faltan cursos internos en la misma DGAC./ PERÚ participated in courses at the SAM Office. Some internal courses from CAD are missing.
12. ¿Se ha publicado el NOTAM/AIC inicial informando la fecha y el escenario para la implantación RNAV5? 12. Has the initial NOTAM/AIC announcing the RNAV5 implementation date and scenario been published?	**SI**	**SI**	**SI**	**SI**	**SI**	**SI**	*****	*****	**SI**	**SI**	**SI**	*****	**SI**	**SÍ**	**URU**: AIC/04 09 Abril-April 2009
13. ¿Se ha publicado o tiene planes para la publicación del Suplemento al AIP para la implantación PBN? 13. Has the AIP Supplement for PBN implementation been published or do plans exist to publish it?	**SI**	**SI**	**SI**	**SI**	**SI**	**O/G**	*****	*****	**SI**	**SI**	**SI**	*****	**SI**	**SÍ**	**URU**: AIC/04 09 abril 2009. **PER** El 21 de octubre se emite SUP con procedimientos RNP APCH para Piura. En Chiclayo se publica RNP APCH para el próximo ciclo AIRAC/ On 21 October SUP with RNP APCH procedures was published for Piura. For next AIRAC Cycle it will be

Conclusión/Tarea **Conclusion/Task**	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**OBSERVACIONES** **REMARKS**
															published in Chiclayo.
14. ¿Están difundiendo información relacionada con el programa RNAV5? 14. Are you disseminating information about the RNAV5 programme?	**SI**	**SI**	**SI**	**SI**	**SI**	**NO**	*	*	**SI**	*	**SI**	*	**NO**	**SÍ**	**PER** Si se ha diseminado pero no hay respuesta positiva de explotadores. LAN tiene planes para solicitar aprobaciones pero se presume que en el 2011 / PER: ON 21 Oct SUP with RNP APCH Procedures is issued for Piura. In Chiclayo RNP APCH is published for next AIRAC cycle. PER has been disseminated but there is no positive reply from operators. LAN has plans to request approval but assumes in 2011.
15. ¿Ha completado la Administración todas las actividades relacionadas con la capacitación RNAV5 para ATCOs? En caso de que no se haya completado la capacitación, indíquese la fecha prevista de finalización. 15. Has the Administration completed all the training activities related to RNAV 5 for ATCO? In case that training is not completed, indicate the finalization planned date.	**SI**	**SI**	**SÍ**	**SÍ**	**NO**	**NO**	*	*	*	*	**SI**	*	**NO**	**SÍ**	**BRA:** fecha prevista de término: 15/09/2011/ Date foreseen for end: 15/09/2011. **ECU**: Mayo/May 2011 **PAN**: Programa para inicio de noviembre/ **CHI**: se repetirá antes de la implantación./ will repeat before implementation. **PER** Se ha iniciado desde agosto cursos en Lima y el interior./ Courses in Lima and provinces have been initiated since August **URU**: fecha prevista foreseen date 15/11
16. ¿Ha revisado y actualizado el Manual de procedimientos de las unidades ATS involucradas? 16. Has revised and updated the Procedural Manual of ATS units involved?	*	**NO**	**SÍ**	**NO**	**NO**	**NO**	*	*	*	**SI**	**NO**	*	**NO**	**NO**	**BRA**: fecha prevista de término: 30/08/2011/Date foreseen to end: 30/08/2011. **PAN**: en proceso /On going
17. ¿Están proporcionando a CARSAMMA informes mensuales sobre Grandes Desviaciones de Altitud (LHD) y tiene planes para continuar enviando	**SI**	**SI**	**SI**	**SI**	**NO**	**YES**	*	*	**SI**	**SI**	**SI**	*	**SI**	**SÍ**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
además los desvíos laterales (LD)? 17. Are you providing CARSAMMA monthly reports on Large Height Deviations (LHD) and have you plans to continue reporting the lateral deviation (LD)?															
18. ¿Están proporcionando CARSAMMA informes anuales sobre el total de los movimientos IFR en el espacio aéreo superior? 18. Are you providing CARSAMMA annual reports of total IFR movements?	**SI**	**SI**	**SI**	**NO**	**NO**	**SI**	*****	*****	**NO**	**SI**	**NO**	*****	**SI**	**SÍ**	**PAN**: Se tomarán las acciones para cumplir/ actions to comply will be taken
19. ¿Han identificado alguna necesidad de actualización en la automatización o equipos ATC, incluyendo Sistemas de procesamiento de datos de vuelo, Ej. franjas? 19. Have you identified any necessary ATC automation or equipment upgrades, including Flight data processing systems, i.e. stripes?	**SI**	**NO**	**SI**	**SI**	**SI**	**SI**	*****	*****	*****	*****	**SI**	*****	**SI**	**NO**	**PAN**: no se ha considerado/ Has not been considered **PER**: En Julio 2011 estaría operando el centro de control AIRCON 2100 de INDRA/In July 2011 the AIRCON 2100 from INDRA would be operating.
20. ¿En caso de respuesta afirmativa, han iniciado las actualizaciones necesarias en la automatización o equipos ATC? 20. In case of a positive answer, have you initiated the necessary ATC automation or equipment upgrades?	*****	**NO**	**SI**	**NO**	**NO**	*****	*****	*****	*****	*****	**SI**	*****	**NO**	**NO**	**CHI**: Por el momento no es necesario. / At the time it is not necessary. **ECU**: Sólo se ha hecho un diagnóstico/ Only one diagnosis has been made. **PER** En Julio 2011 estaría operando el centro de control AIRCON 2100 de INDRA/ In July 2011 the AIRCON 2100 from INDRA would be operating.
21. ¿Planea adecuar aeronaves sin aprobación	*****	**NO**	**NO**	**NO**	**NO**	**SI**	*****	*****	**NO**	**SI**	**SI**	*****	**NO**	**SÍ**	**PER** Aun no se han determinado las condiciones,

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
RNAV5 que efectúan operaciones domésticas? 21. Do you plan to accommodate non-RNAV5 approved aircraft conducting domestic operations?															pero se espera acomodamiento de estas aeronaves./ No conditions have been determined yet but accommodation of these aircraft is expected.
22. En caso de respuesta anterior afirmativa, ¿ha desarrollado procedimientos para acomodar aeronaves domésticas sin aprobación RNAV5? 22. In case that previous answer was positive, have you developed procedures for accommodating non-RVSM approved domestic aircraft?	**-**	**NO**	**N/A**	**NO**	**N/A**	*****	*****	*****	*****	**SI**	**SI**	*****	**NO**	**NO**	**ECU**: Mayo/May 2011 **PER** Aun no se han determinado las condiciones, pero se espera acomodamiento de estas aeronaves./ No conditions have been determined yet but accommodation of these aircraft is expected.
23. ¿Ha actualizado las LOAs para contemplar la RNAV5? 23. Have you up dated LOAs for RNAV5?	**SI**	**SI**	**SÍ**	**NO**	**SÍ**	**NO**	*****	*****	*****	**SI**	**NO**	*****	**SÍ**	**SÍ**	**BRA**: fecha prevista de término: 30/08/2011/Date foreseen to end: 30/08/2011. **PAN**: se trabaja para obtener los datos./Work is being carried out to obtain data.
24. ¿Está en contacto con las autoridades militares nacionales con relación a las operaciones RNAV5? 24. Are you liaising with State military authorities regarding RNAV5 operations?	**SI**	**SI**	**SI**	**NO**	**SI**	**NO**	*****	*****	**NO**	*****	**NO**	*****	**SI**	**NO**	**PAN**: los militares no tienen esa Capacidad / military aviation does not have that capacity.
25. ¿Se ha publicado o tiene planes para publicar el *Trigger* NOTAM 25. Has the Trigger NOTAM been published or do you have plans to publish it?	**SI**	**SI**	**SÍ**	**SI**	**SI**	**NO**	*****	*****	**SI**	*****	**NO**	*****	**SI**	**NO**	**BRA**: fecha prevista de término: 30/08/2011/Date foreseen to end: 30/08/2011.

Instrucciones para el llenado del formulario - Instructions to fill in the form

- Cumplida: colocar **Sí** en el casillero correspondiente. / Accomplished: place **YES** in the corresponding box
- ***** Sin información / * without information
- No cumplida: colocar **NO** en el casillero correspondiente y, de ser el caso, hacer comentarios en columna de observaciones/ Not complied: place **NO** in the corresponding box and if such were the case, make comments in the remarks column

APPENDIX H

COMPILATION OF ICAO RECOMMENDATIONS ON THE DESIGN AND PUBLICATION OF INSTRUMENT PROCEDURES

1. Annex 11 "Air Traffic Services", Appendix 3 "Principles governing the identification of standard departure and arrival routes and associated procedures"

"2.1.1 The plain language designator of a standard departure or arrival route shall consist of:

a) a basic indicator; followed by
b) a validity indicator; followed by
c) a route indicator, where required; followed by
d) the word "departure" or "arrival"; followed by
e) the word "visual", if the route has been established for use by aircraft operating in accordance with the visual flight rules (VFR).

2.1.2 The basic indicator shall be the name or name-code of the significant point where a standard departure route terminates or a standard arrival route begins.

2.1.3 The validity indicator shall be a number from 1 to 9.

2.1.4 The route indicator shall be one letter of the alphabet. The letters "I" and "O" shall not be used.

3.1 Each route shall be assigned ***a separate designator****.*

3.2 To distinguish between two or more routes that relate to the same significant point (and therefore are assigned the same basic indicator), a separate route indicator as described in 2.1.4 shall be assigned to each route.

4.1 A validity indicator shall be assigned to each route to identify the route that is currently in effect.

4.2 The first validity indicator to be assigned shall be the number "1".

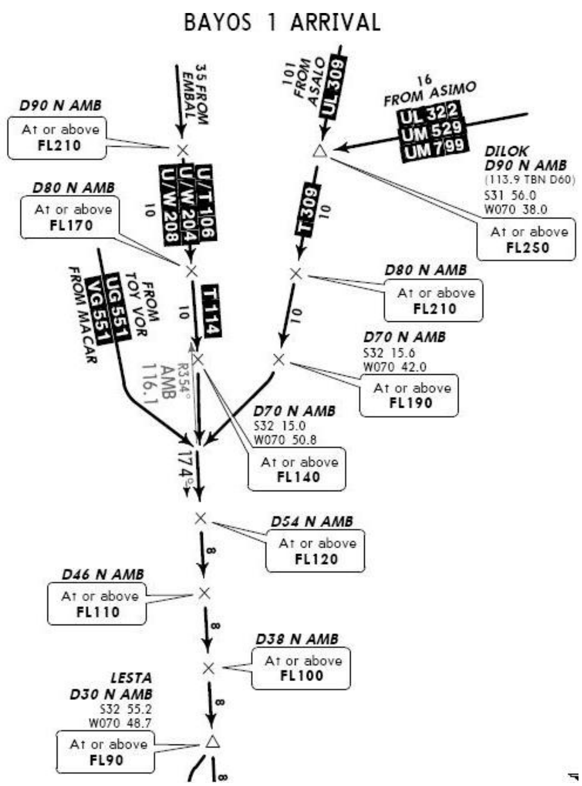
4.3 Whenever a route is amended, a new validity indicator, consisting of the next higher number, shall be assigned. The number "9" shall be followed by the number "1".

Example 1.A: List of STARs in effect at an AD:

VOR/DME RWY 09 PIRA 5-POCOS 9 (STAR)
VOR/DME RWY 09 PIRA 6-POCOS 10 (STAR)
VOR/DME RWY 27 PIRA 7-POCOS 11 (STAR)
RNAV (GNSS) RWY 09 PIRA 8-POCOS 12 (STAR)
RNAV (GNSS) RWY 09 PIRA 9-POCOS 13(STAR)
RNAV (GNSS) RWY 27 PIRA 10-POCOS 14 (STAR)

In order to distinguish the routes that start at the same significant point, in the previous example, a number instead of an alphabet letter has been assigned, and a validity indicator has not been included. This could lead to confusion if the operator does not have a clear understanding of the rules of the State publishing these procedures, who upon reviewing the database, which initially only shows a list of names, might think in a first instance that only the PIRA 10 - POCOS 14 STARs should be included in it, since they seem, because of their number, to be the latest versions (even that conclusion is erroneous because the validity indicator ends in the number 9). Likewise, when the authority introduces a significant change to this route, since there is no validity indicator, the change is not manifest just be seeing the name of the STAR, and the validation work becomes more difficult. The most important thing for States when following ICAO recommendations is that the operator must be able to clearly interpret the publications, regardless of the airspace being used.

Example 1.B: STAR called “BAYOS 1”



The STAR starts on different airways, thus at different points. None of the fixes associated to these airways is called “BAYOS”. In the navigation database, the coder decided to incorporate “transitions” to the STAR. Consequently, what is registered under “BAYOS 1” is only the common part of the STAR (from D54N). Then, the ATC authorises the “BAYOS 1” STAR and the pilot, knowing from what airway the descent is being initiated, will find the correct transition (MACAR, EMBAL or DILOK). This STAR has routes that start at different points and therefore should also have different names. This procedure has three different routes that are clearly identifiable, and which are used under the name “BAYOS 1”. Each route does not receive a separate name.

2. Doc 8168 VOL II, PANS OPS, “Appropriate data to support navigation database coding”

Annex 4 "Aeronautical Charts" indicates: "The appropriate data to **support navigation database coding** will be published on the back of the chart or on a separate sheet, with the appropriate references, according to the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS, Doc 8168), Volume II, Part III, Section 5, Chapter 2, 2.3, for RNAV procedures, and Volume II, Part I, Section 4, Chapter 9, 9.4.1.3, for non-RNAV procedures.

Volume II, Part I, Section 4, Chapter 9, 9.4.1.3 indicates: ***"Aeronautical database requirements****. For* ***non-RNAV*** *approaches, the following data will be published in table format on the back of the ICAO instrument approach chart or on a separate sheet with the appropriate references:*

a) *fixes/final approach points and other fixes/essential points contained in the instrument approach procedure, identified with their* ***geographical coordinates*** *in degrees, minutes, seconds and tenths of a second;*
b) *bearings for determining the fixes for instrument approach procedures, rounded off to the closest hundredth of a degree;*
c) *distance for the determination of fixes for instrument approach procedures, rounded off to the closest hundredth of a nautical mile;*
d) *for non-precision approaches, the final approach angle of descent rounded off to the closest hundredth of a degree."*

Items b), c) and d) above are generally published in the approach charts, but lack the necessary resolution to verify that the approach procedure has been well coded. In the navigation database, each point determined in the conventional way by the procedure designer (based on bearings and distances) becomes a geographical coordinate. Since States do not publish them officially, the database coder makes a calculation that may not be 100% consistent with what the designer intended. The differences that have been identified by no means put the aircraft outside of the corresponding obstacle assessment area, but, once again, verification by the operator is made difficult due to lack of this fundamental piece of information.

Volume II, Part III, Section 5, Chapter 2, 2.3 lists the **requirements for the publication of the aeronautical database for RNAV approach procedures.** The cited text recommends that the data be published as a "table or formal descriptive text" on the back of the chart or on a separate sheet with the appropriate references. Volume II, Part III, Section 5, Chapter 1, 1.5 contains examples of how these tables or texts must be published in order to avoid ambiguities and interpretation errors. Items 2.1 and 2.2 contain the data required for the publication of RNAV SIDs and STARs, respectively.

States need to adopt standard methods for making these publications. Given the growing number of RNAV publications, it is very difficult for database operators and coders to fully understand the publication method used by each particular provider. Just as important as standardising the certification or clearance of RNAV procedures is the standardisation of their publication. In an RNAV procedure, not only geographical coordinates are important for interpreting and implementing the procedure originally assessed by the designer.

Table III-5-1-1 Illustration of the formal and abbreviated description method

Descriptor de trayectoria	*Identificador de puntos de referencia (Nombre de punto de recorrido)*	*Sobrevuelo*	*Rumbo °M (° T)*	*Dirección de viraje*	*Altitud*	*Límite de velocidad*	*Variación magnética*	*Ángulo vertical/ altura de franqueamiento del umbal*	*Performance de navegación*
IF	SUSER	—	—	—	+5 000	250	—	—	RNP 1
TF	CV023	—	258 (256,0)	—	4 000	—	—	—	RNP 0,3
TF	CV024	—	348 (345,8)	—	2 680	150	—	—	RNP 0,3
TF	RW35L	S	348 (345,8)	—	370	—	—	–3,0/50	RNP 0,3
FA	RW35L	—	348 (345,8)	—	+770	—	+2,2	—	RNP 0,3
DF	SUSER	S	—	L	+5 000	—	—	—	RNP 1

Directo a ARDAG a 3 000 ft	→ARDAG[A3000]	DF	N
Hasta PF035 a o por debajo de 2 000 ft	PF035[A2000-]	TF	S
Hasta PF025 a o por debajo de 4 000 ft, continuar con rumbo de la aeronave 265°M y esperar vectores radar	PF025[A4000], [HDG, M265]	TF, VM o FM	N
Hasta OTR en rumbo 090°M a 210 kt	OTR[M090; K210]	CF	N
Hasta DF006 a 2 000 ft como mínimo, 4 000 ft como máximo, velocidad mínima 210 kt	DF006[A2000+; A4000-; K210+]	TF	S
Hasta PD750 a 250 kt, viraje a la derecha con radio de 3,7 NM hasta PD751	PD750[K250]-PD751[R, 3.7, 0543451.2N 0021234.7E]	TF, RF	N, N
Hasta STO en o por encima de FL 100, viraje a la izquierda directo a WW039 en o por encima de FL 070, hasta WW038 a o por encima de 5 000 ft	STO[F100+; L]→WW039[F070+]-WW038[A5000+]	TF, DF, TF	S, N, N

Table III-5-1-2 Illustration of the table description method

3. Doc 8168 VOL II PANS OPS, "Denomination of procedures for arrival and approach charts" (Vol. II, Part I, Section 4, Ch. 9, 9.5)

A summary of the recommendations contained in the aforementioned chapter and that directly affect the way in which the name of the approach procedure is presented to the operator in the navigation database, follows. As stated in the PANS OPS, these recommendations only try to "avoid ambiguities between charts, electronic displays in the cockpit, and ATC clearances":

- The procedure identification must only contain the name describing the type of radio aid that provides **lateral guidance in the final approach.**

- If two radio navigation aids are used as lateral guidance in the final approach, the title shall only include the **last radio navigation aid** used, for example: if an NDB is used as final approach fix and a VOR is used as the last navigation aid during the final approach to runway 06, the procedure will be identified as **VOR RWY 06**. If a VOR is used for the initial approach and then an NDB is used for the final approach to runway 24, the procedure shall be identified as **NDB RWY 24**.

- If additional navigation aids are required for the approach procedure, the corresponding **additional equipment** requirements shall be specified in the chart plan view, not in its title. For example: "ADF required" in a VOR approach, "DME required" in a VOR approach.

- Double identification of procedures. When two or more procedures to the same runway are not distinguishable by the type of radio navigation aid, a one-letter suffix will be used, starting with the letter Z, after the corresponding type of radio navigation aid, for example: ILS Y RWY19, ILS Z RWY 19, VOR Y RWY20, VOR Z RWY20. Since some avionic systems are only capable of containing **one approach for each type of aid in each runway**, States should make sure that they identify the preferred approach with the suffix Z.

When these recommendations are not followed as described above, the navigation database does not show the name as published in the chart, and the system is not capable of containing an approach with the name "LCTR ILS DME RWY 29". Consequently, a new name is generated containing fewer characters and, generally, the navigation aid on which the lateral guidance for final approach is based.

Example:	**Procedure denomination**	**Advanced database**	**Limited database**
	N°1 VOR DME ILS DME RWY 29	ILS29-1	ILS29
	N°2 LCTR ILS DME 29 RWY 29	ILS29-2	Not coded
	N°4 VOR (DME) LO LI RWY 13	VOR13 -4	VOR13 (*)
	Delta 1 RWY 09R VOR/DME	VOR09R1	VOR09R
	Delta 3 RWY 27L VOR	VOR27L3	VOR27L
	Delta 4 RWY 27R VOR	VOR27R4	VOR27R
	Delta 5 RWY 09L VOR/DME	VOR09L5	VOR09L
	ILS Z RWY 27L	ILS27LZ	ILS27L
	CHARLY 7 RWY 27L ILS	ILS27L7	Not coded
	ILS Y RWY 17L	ILS17LY	Not coded
	ILS Z RWY 17L	ILS17LZ	ILS17L

(*) In this procedure, the lateral guidance for the final approach is provided by the NDB, but the coder, when seeing the title on the State chart, designates it as a VOR procedure.

4. Doc 8168 VOL II PANS OPS, "General" (Vol. II, Part I, Section 2, Ch. 1, 1.1.4)

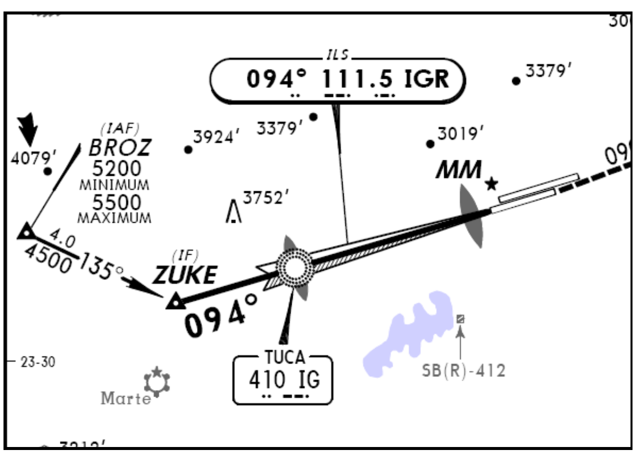
Regarding the recommendations of PANS OPS VOL II on navigation database coding, there are two worth noting, since failure to apply them would result in many procedures being interpreted by the coder, some procedures not being clearly coded, and others simply not being coded. The recommendations are as follows:

"*Ensure the continuity between SIDs and the en-route structure and between the en-route structure and STARs and approaches, using a common reference and consistent altitudes at the interface.*"

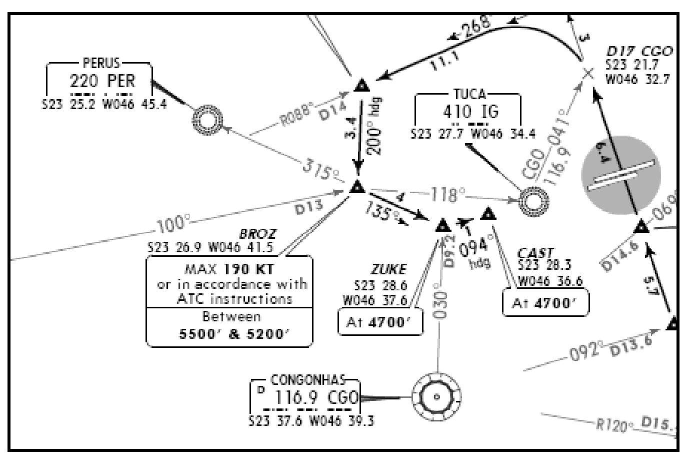
"*Avoid the use of duplicated segments, that is, a segment designated part of a STAR and part of an approach.*"

It is common to find STARs that do not end in the IAF, or SIDs that intercept airways at undefined points, or segments that repeat themselves between a STAR and the approach, even using different altitudes. In order to "understand" the route to be followed, the navigation database must have logical "continuous" data that will allow it, for example, to leave an AWY at a given point and to start a STAR at that point. In that manner, the FMS can properly plan the speeds and points of descent. When there is no continuity between two segments, the pilot must manually intervene in the system, thus wasting on-board planning capabilities, increasing the workload, reducing the possibility of having a consistent flight plan in terms of time and fuel, etc.

Example 4.A:

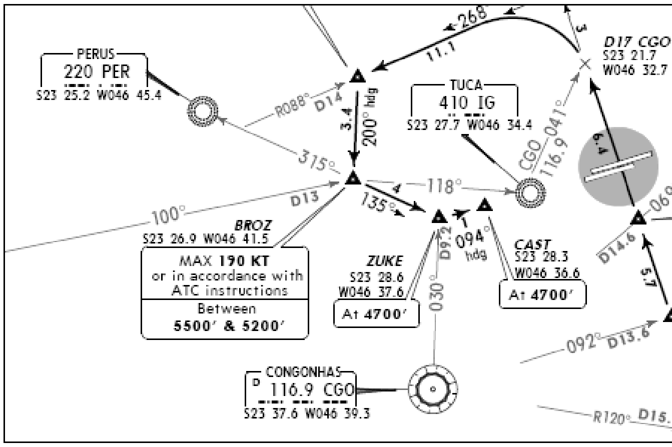


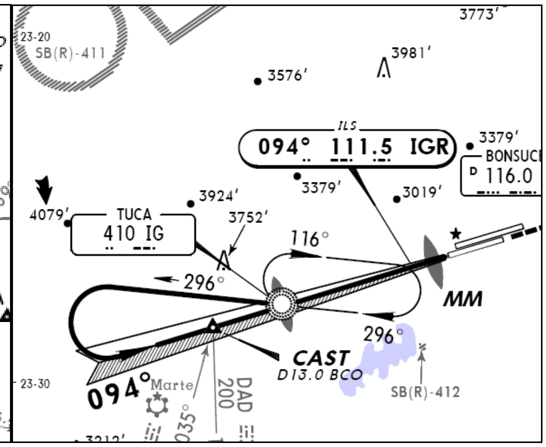
APCH ILS-Z RWY09R



STAR RWY09R

The segment BROZ- ZUKE repeats itself in the STAR and the IAC, but the STAR does not end in BROZ but in CAST, a point that is not described in the approach; the point CAST is described in another approach that does not start in BROZ.



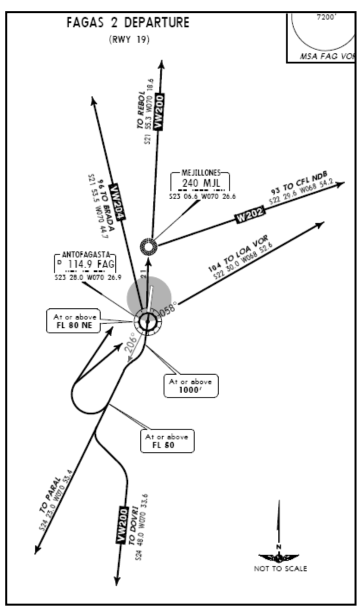


STAR RWY09R IAC RWY09R

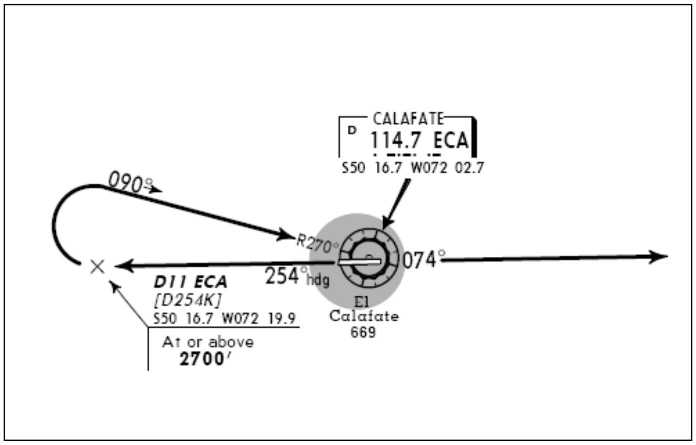
Example 4.B:

This instrument departure, denominated FAGAS 2, indicates in its text: "*Climb on RWY HDG up to 1000FT then turn right to intercept and climb on R206 FAG VOR/DME up to FL50, **then proceed as authorised by the ATC**.*"

The common segment of the SID really ends in FL50, after which there is the possibility of intercepting four different routes towards radio aids or intersections that connect to airways. This cannot be coded in the database, since the interception of each airway is not described and the four different routes to get to them have the same name. Therefore, it is only coded up to FL50. Thus, for the FMS, there is a gap in the information that must be filled manually by the pilot. In summary, this SID is not connected to the AWYs.



Example 4.C: This SID states in its text (for both runways) "climb on R074 to 6600FT" and then turn right or left and intercept any of the airways that converge in the TMA. Since the SID does not end in defined points of a route, there is an information gap in the database, reason why the SID is not coded.



5. **Annex 11 "Air Traffic Services" Appendix 2 "Principles governing the establishment and identification of significant points"**

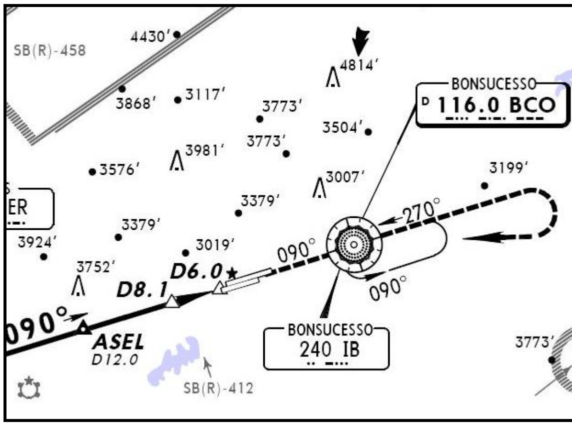
3. "Designators for significant points not marked by the site of a radio navigation aid"

3.1 "Where a significant point is required at a position not marked by the site of a radio navigation aid, and it is used for ATC purposes, the significant point shall be designated by a unique five-letter pronounceable "name-code". This name-code designator then serves as the name as well as the coded designator of the significant point".

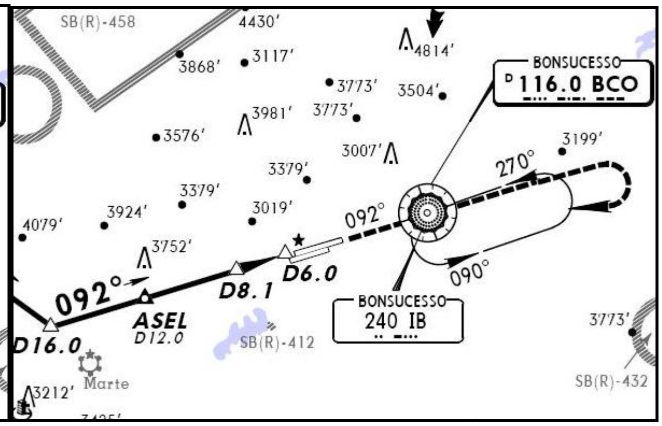
3.4 "The unique five-letter pronounceable name-code designator ***assigned to a significant point shall not be assigned to any other significant point****. Where relocation of a significant point is required, a new name-code designator shall be selected. If the State wants to keep the assignment of specific name-codes to re-use them in a different location, said name-codes will not be used for a period of six months."*

Publications still contain some significant points geographically located in different positions that use the same designator. It is possible to code them in the navigation database by just inserting "some difference" between them to avoid this duplication.

Example 5:



ASEL in VOR09R, R270/D12



ASEL in VOR09L, R272/D12

Point ASEL (FAF) is described in two VOR approaches to parallel runways, using the same radio aid: on R272 to one runway, and on R270 to the other. Since their coordinates are different because their geographical locations are different, they are recorded as ASEL1 and ASEL2 in the navigation database.

* * * * * *

APPENDIX I
(available in Spanish only)

Resolución A37-11: Metas mundiales de navegación basada en la performance

Considerando que el objetivo principal de la OACI es asegurar el funcionamiento operacionalmente seguro y eficiente del sistema mundial de navegación aérea;

Considerando que para mejorar el funcionamiento del sistema de navegación aérea de manera armonizada a escala mundial se requiere la colaboración activa de todos los interesados;

Considerando que la 11ª Conferencia de navegación aérea recomendó que la OACI abordara y avanzara, con carácter urgente, las cuestiones relacionadas con la introducción de la navegación de área (RNAV) y la performance de navegación requerida (RNP);

Considerando que la 11ª Conferencia de navegación aérea recomendó que la OACI elaborara procedimientos RNAV con apoyo del sistema mundial de navegación por satélite (GNSS) para aeronaves de alas fijas, proporcionando gran precisión en el mantenimiento de la derrota y la velocidad para mantener la separación en virajes y permitir alineaciones de aproximación flexibles;

Considerando que la 11ª Conferencia de navegación aérea recomendó que la OACI elaborara procedimientos RNAV con GNSS tanto para las aeronaves de alas fijas como de alas giratorias, a fin de permitir mínimas de operación reducidas en entornos con numerosos obstáculos o con otras limitaciones;

Considerando que en la Resolución A33-16 se pidió al Consejo que formulara un programa para alentar a los Estados a implantar procedimientos de aproximación con guía vertical (APV) utilizando datos como los del GNSS o del equipo radiotelemétrico (DME)/DME, de conformidad con las disposiciones de la OACI;

Reconociendo que no todos los aeropuertos cuentan con la infraestructura necesaria para apoyar las operaciones APV y que no todas las aeronaves tienen actualmente la capacidad necesaria para operaciones APV;

Reconociendo que muchos Estados ya tienen la infraestructura necesaria y las aeronaves capaces de realizar aproximaciones directas con guía lateral (aproximaciones LNAV) basadas en especificaciones RNP y que las aproximaciones directas aportan mejoras demostradas y significativas en comparación con las aproximaciones en circuito;

Reconociendo que en el Plan global para la seguridad operacional de la aviación se han definido Iniciativas de seguridad operacional mundial (GSI) para concentrarse en elaborar una estrategia de seguridad operacional para el futuro que abarque el uso eficaz de tecnología con el objeto de mejorar la seguridad operacional, la adopción congruente de las mejores prácticas de la industria, la armonización de las estrategias de seguridad operacional mundial de la industria y la vigilancia normativa regular;

Reconociendo que en el Plan mundial de navegación aérea se han identificado Iniciativas del Plan mundial (GPI) para concentrarse en la incorporación de capacidades avanzadas de navegación de aeronaves en la infraestructura de sistemas de navegación aérea, la optimización del área de control terminal por medio de mejores técnicas de diseño y gestión, la optimización del área de control terminal a través de la implantación de SID y STAR con RNP y RNAV y la optimización del área de control terminal para ofrecer operaciones de aeronaves más eficientes, en términos de ahorro de combustible, mediante procedimientos de llegada basados en FMS; y

Reconociendo que la preparación permanente de especificaciones de navegación divergentes repercutiría en la seguridad operacional y la eficiencia y perjudicaría a los Estados y la industria;

Tomando nota con satisfacción de que los grupos regionales de planificación y ejecución (PIRG) han completado planes regionales de implantación de la PBN; y

Reconociendo que no todos los Estados han elaborado un plan de implantación de la PBN para la fecha prevista de 2009:

La Asamblea:

1. *Insta* a todos los Estados a implantar rutas de servicios de tránsito aéreo (ATS) y procedimientos de aproximación con RNAV y RNP de conformidad con el concepto PBN de la OACI definido en el *Manual sobre la navegación basada en la performance* (Doc 9613);

2. *Resuelve* que:

a) los Estados completen un plan de implantación de la PBN con carácter urgente a fin de lograr lo siguiente:

 1) implantación de operaciones RNAV y RNP (donde se requiera) para áreas en ruta y terminales de acuerdo con los plazos y los hitos intermedios establecidos;

 2) implantación para 2016 de procedimientos de aproximación con guía vertical (APV) (Baro VNAV y/o GNSS aumentado), incluidos los mínimos para LNAV únicamente, para todos los extremos de pistas de vuelo por instrumentos, ya sea como aproximación principal o como apoyo para aproximaciones de precisión, con los hitos intermedios siguientes: 30% para 2010 y 70% para 2014; y

 3) implantación de procedimientos directos LNAV únicamente, como excepción de 2), para las pistas de vuelo por instrumentos en aeródromos en donde no hay instalaciones de altímetro local disponibles y donde no hay aeronaves adecuadamente equipadas para operaciones APV con una masa máxima certificada de despegue de 5 700 kg o más;

b) la OACI elabore un plan de acción coordinado para asistir a los Estados en la implantación de la PBN y asegurar la preparación y/o el mantenimiento de SARPS, procedimientos para los servicios de navegación (PANS) y textos de orientación armonizados a escala mundial, incluida una metodología mundial armonizada para la evaluación de la seguridad operacional, para que se mantengan a la par de las demandas operacionales;

3. Insta a los Estados a incluir en sus planes de implantación de la PBN previsiones para la implantación de procedimientos de aproximación con guía vertical (APV) para todos los extremos de pistas para aeronaves con una masa máxima certificada de despegue de 5 700 kg o más, de acuerdo con los plazos e hitos intermedios establecidos;

4. Encarga al Consejo que presente un informe sobre el avance en la implantación de la PBN al siguiente período de sesiones ordinario de la Asamblea;

5. *Pide* que los Grupos regionales de planificación y ejecución (PIRG) incluyan en su programa de trabajo la revisión del estado de implantación de la PBN por los Estados de conformidad con los planes de implantación definidos y que rindan informe anualmente a la OACI sobre las deficiencias que puedan observarse; y

6. Declara que esta resolución sustituye a la Resolución A36-23.

APÉNDICE /APPENDIX J

PROCEDIMIENTOS EN AREA TERMINAL Y APROXIMACIÓN PBN IMPLANTADOS
PBN TERMINAL AREA AND APPROACH PROCEDURES IMPLEMENTED

Procedimientos en área terminal y aproximación PBN / PBN Terminal and approach procedures	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**OBSERVACIONES REMARKS**
Procedimientos de aproximación RNP/ RNP Approach procedure -RNP APCH	**NO**	**8**	**240**	**18**	**SI**					**N/A**			**NO**	**11**	**Col:** SKBQ, SKUC, SKBS, SKYP, SKSP, SKCG, SCAS, SKUT. 12 procedimientos RNP APCH / 12 RNP APCH procedures. **Ven**: Para 11 aeropuertos internacionales que corresponden al 100% del requerimiento / For 11 international airports corresponding to 100% of the requirement.
Procedimientos de aproximación RNP/ RNP Approach procedure - Baro-VNAV	**NO**	**--**	**40**	**12**	**NO**					**SÍ**			**NO**	**11**	**Par:** 2 procedimientos SGAS /2 procedures. 2 procedimientos SGES en proceso de publicación /SGES 2 procedures in publication process **Ven**: Para 11 aeropuertos internacionales que corresponden al

Procedimientos en área terminal y aproximación PBN / PBN Terminal and approach procedures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
															100% del requerimiento / For 11 international airports corresponding to 100% of the requirement.
Procedimientos de aproximación RNP/RNP/ Approach procedure -RNP AR APCH	**NO**	**--**	**0**	**3**	**NO**					**N/A**			**NO**	**NO**	
SID NAV 1 o RNP 1 Básico / Basic RNAV 1 or RNP 1 SID	**NO**	**--**	**100**	**4**	**SÍ**					**N/A**			**NO**	**11**	**COL:** SKBQ, SKSP, SKCG, 2 procedimientos SID / 2 SID procedures. **VEN**: Para 11 aeropuertos internacionales que corresponden al 100% del requerimiento / For 11 international airports corresponding to 100% of the requirement.

Procedimientos en área terminal y aproximación PBN / PBN Terminal and approach procedures	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
STAR RNAV 1 o RNP Básico / RNAV1 or Basic-RNP 1 STAR	**SÍ**	**4**	**16**	**28**	**SÍ**					**N/A**			**NO**	**11**	**ARG:** Comodoro Rivadavia, Salta, Mendoza, Bariloche, Ushuaia. **BOL:** en proceso de verificación /in verfication process. **COL**: SKSP, SKCG- 3 procedimientos SID / 3 SID procedures. **VEN**: Para 11 aeropuertos internacionales que corresponden al 100% del requerimiento / For 11 international airports corresponding to 100% of the requirement.

Nota/Note: Los Estados deberán insertar cantidad de procedimientos implantados/
The States should insert the amount of implemented procedures.

APPENDIX K
(available in Spanish only)

Información relevante que debe publicarse desde el punto de vista de la operación de los procedimientos RNP APCH y RNP AR APCH

1. **Identificación de las cartas:**
 - "Las cartas de aproximación RNP en las que se representen procedimientos que se ajusten a los criterios de especificación de navegación RNP APCH contendrán el término RNAV (GNSS) en la identificación" (Ref: Doc.8168 Vol. 2, pág. III-5-1-2).

 - "Las cartas de aproximación RNP que describen los procedimientos que cumplen con los criterios de especificación de navegación RNP AR APCH deben incluir el término RNAV (RNP) en la identificación" (Ref: Doc. 9905, pág. 5-1).

2. **Altitud Mínima de Sector (MSA):**
 "Cuando no se proporcione valores de TAA, se publicará una Altitud Mínima de Sector. Se aplican las disposiciones de la Parte I, Sección 4, Capitulo 8, "Altitudes Mínimas de Sector (MSA)", salvo que en el caso del GNSS se establecerá un sector omnidireccional único. El sector tiene su centro en la longitud y la latitud del punto de referencia del aeródromo" (Ref: Doc.8168 Vol. 2, pág. III-3-2-2)

3. **Temperatura mínima en cartillas RNP APCH con mínimos LNAV/VNAV:**
 Se promulgará "la temperatura mínima para la cual se autorizan las operaciones baro-VNAV" (Ref: Doc.8168 Vol. 2, pág. III-3-4-7). Por su parte la FAA en la Order 8260.54A indica que también se debe publicar la temperatura máxima para el procedimiento (*).

4. **Temperatura mínima y máxima en cartillas RNP AR APCH:**
 En las páginas 4-31 y 4-32 del Doc. 9905 se encuentra descrito el procedimiento y motivos por los que en la cartilla RNP AR deben ser publicadas las temperaturas alta y baja entre las que el procedimiento de aproximación puede ser utilizado (*).

 (*) Respecto de los puntos 3 y 4 anteriores en Doc. 9613 indica en la pág. II-A-8, Adjunto VNAV Barométrica, lo siguiente:

 "Limites de temperatura. Para las aeronaves que usan VNAV barométrica sin compensación de temperatura para realizar la aproximación, los límites de baja temperatura se reflejan en el diseño del procedimiento y se identifican juntamente con los límites de alta temperatura en el procedimiento publicado. Las temperaturas bajas reducen el ángulo real de la trayectoria de planeo, mientras que las temperaturas elevadas aumentan el ángulo real de la trayectoria de planeo. Las aeronaves que usan VNAV barométrica con compensación de temperatura o las aeronaves que usan otro medio alternativo para la guía vertical (ej. SBAS) pueden no tener en cuenta las restricciones de temperatura".

5. **Identificación de Puntos de referencia:**
 "Cuando se establezcan IAF, IF, FAF, MAPt, TP y otros puntos de referencia o puntos esenciales se publicarán en la carta de aproximación" (Ref: Doc.8168 Vol. 2, pág. I-4-9-1).

6. **Punto de aproximación frustrada (MAPt)**
 "El punto de aproximación frustrada (MAPt) se definirá mediante un punto de recorrido de sobrevuelo" (Ref: Doc.8168 Vol. 2, pág. III-3-3-2).

7. Espera RNAV.

"Si bien sobre el mismo punto de recorrido son posibles los dos tipos de circuito de espera RNAV (los que se llevan a cabo manualmente y aquellos con funcionalidad de espera), se publicarán la longitud del tramo de alejamiento y el tiempo o la distancia al punto de recorrido" (Ref: Doc.8168 Vol. 2, pág. III-3-7-5).

"Puede ser que el punto de recorrido de espera no se represente en la carta como un punto de recorrido de sobrevuelo, pero se espera que el piloto y/o el sistema de navegación de la aeronave traten el punto de recorrido como un punto de recorrido de sobrevuelo durante la espera" (Ref: Doc.8168 Vol. 2, pág. III-3-7-6).

8. Circuito de Espera en la frustrada.

"El punto de recorrido del circuito de espera (MAHF) se considera como un punto de recorrido de sobrevuelo" (Ref: Doc.8168 Vol. 2, pág. III-3-7-1).

9. Denominación de puntos de recorrido.

Se utilizará un "nombre clave" único de cinco letras y fácil de pronunciar (5LNC), y no un nombre clave alfanumérico, para puntos de recorrido **con fines ATC** (entre otros) (Ref: Doc.8168 Vol. 2, pág. III-5-1-5, III-5-1-6).

10. Tramos RF.

"Debe incluirse en la carta cualquier requisito RF. La nota del requisito RF puede estar en la carta con el tramo aplicable o como una nota especifica con una referencia al tramo aplicable. Si RF es un requisito habitual en una carta determinada, debe utilizarse una nota general" ("RF requerido") (Ref: Doc.9905, pág. 5-2).

11. Notas especificas para procedimientos RNP AR:

"Para los procedimientos RNP AR APCH con RNP de aproximación frustrada inferior a 1.0 es necesario incluir la siguiente nota: La transición a la RNP de aproximación frustrada para guía lateral no debe iniciarse antes de la posición paralela a la derrota de la DA/H" (Ref: Doc.9905, pág. 5-2).

12. Aproximación final en descenso continuo:

"Cuando la información sobre la distancia esté disponible, para facilitar una aproximación final en descenso continuo (CDFA), debería proporcionarse la información de advertencia sobre el perfil de descenso para la aproximación final a fin de ayudar al piloto a mantener la pendiente de descenso calculada. Esta información debería consistir en una tabla que indique las altitudes/alturas por las cuales la aeronave debería pasar a cada 2Km o 1Nm según corresponda" (Ref: Doc.8168 Vol. 2, pág. I-4-9-2).

13. Publicación de mínimos RNP APCH (IAC RNAV (GNSS))

"La casilla de mínimos en la carta incluirá los valores de OCA/H para operaciones NPA (LNAV) y APV Baro-VNAV (LNAV/VNAV)" (Ref: Doc.8168 Vol. 2, pág. III-3-4-7).

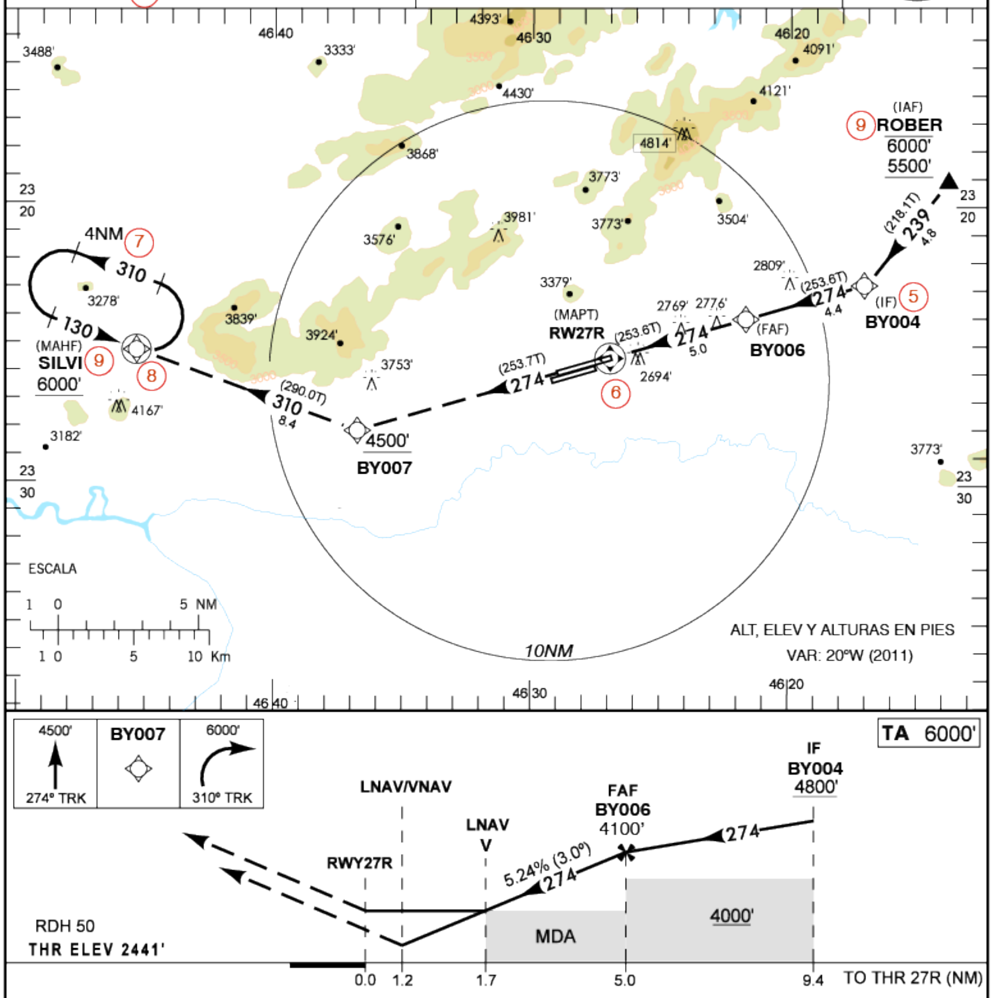
14. Publicación de mínimos RNP AR APCH (IAC RNAV (RNP))

"Debe publicarse una OCA/H o DA/H para RNP0.3 para cada procedimiento de aproximación RNP AR. Se pueden publicar OCA/H o DA/H adicionales para los valores que se encuentren entre RNP 0.1 y 0.3 según corresponda" (Ref: Doc.9905, pág. 5-2).

CARTA DE APROXIMACION
POR INSTRUMENTOS (IAC)

LIMA / OACI - JORGE FERNANDEZ, INTL (SPBY)
1
RNAV (GNSS) Rwy 27R

AD ELEV: 2441'	ATIS 127.5	APP FERNANDEZ 119.8 120.25	TWR FERNANDEZ 118.4 121.35	GNDC FERNANDEZ 121.7 126.90	MSA 25 NM SPBY FL 090 ARP 2
PARA SISTEMAS BARO-VNAV NO CONPENSADOS PROCEDIMIENTO NO AUTORIZADO BAJO -10°C O SOBRE 35°C. 3			**APROXIMACION FRUSTRADA:** ascenso TRK 274 BY007, viraje derecha directo SILVI 6000', ingrese HLDG.		



RWY 27R	1.2	2.0	3.0	4.0	BY006	12
ALT	2876	3127	3446	3764	4090	
(HGT)	435	686	1005	1323	1649	

KT	090	110	130	150	170	190
FPM	500	600	700	800	900	1000
FAF-MAPT	NIL					

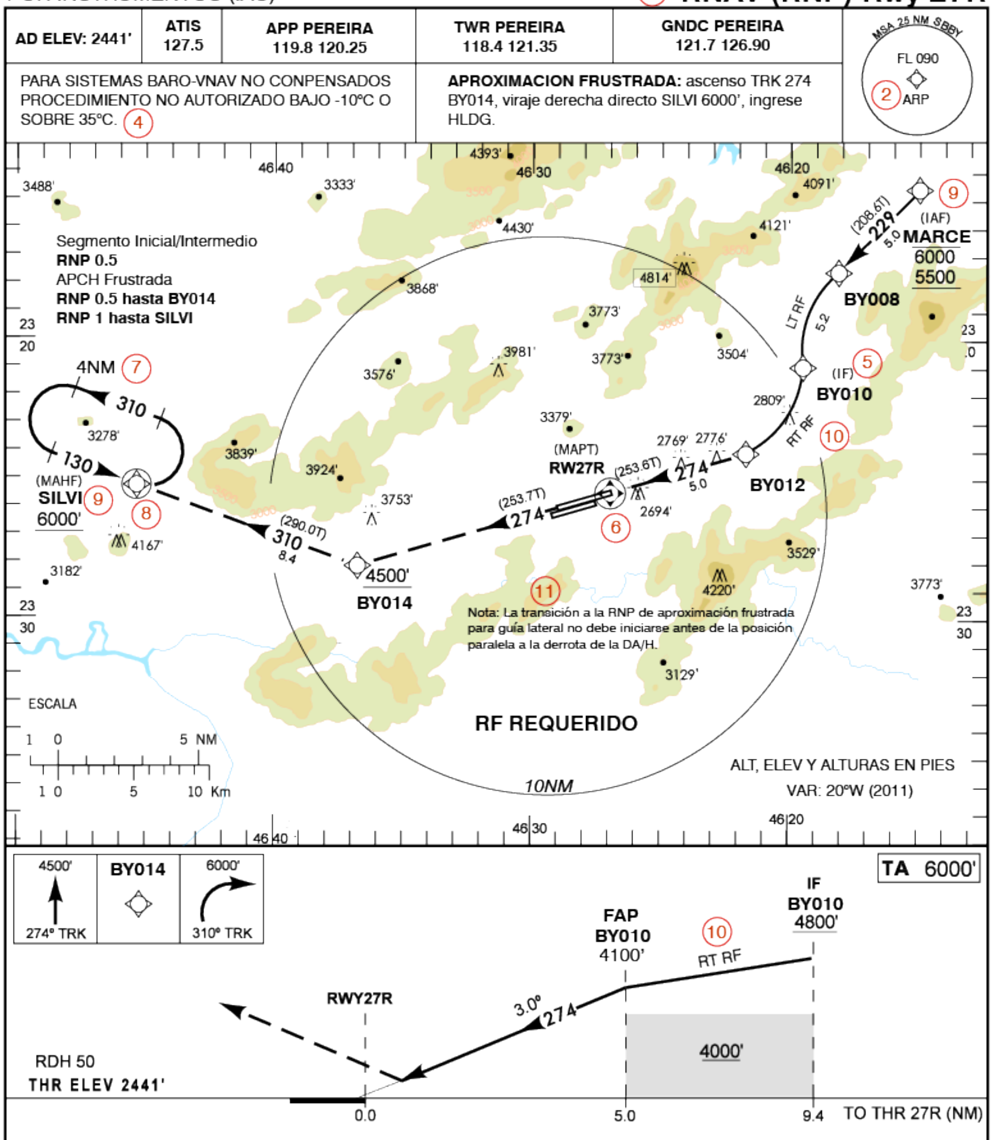
DIRECTO	CAT	A	B	C	D	E
LNAV / VNAV 13	DA/H	2880 / 439				NA
	ALS / NO ALS (m)	1300 / 2000				
LNAV 13	MDA/H	3030 / 585				
	ALS / NO ALS (m)	800 / 1600		2000 / 2700		
CIRCULAR TO CIRCLE	MDA	NA				
	VIS (m)					

06 MAY 10 AIRAC

SPBY **RNAV (GNSS) Rwy 27R**

CARTA DE APROXIMACION
POR INSTRUMENTOS (IAC)

LIMA / OACI - JULIO PEREIRA (SBBY)
1 **RNAV (RNP) Rwy 27R**



SE REQUIERE AUTORIZACION ESPECIAL PARA ACFT Y TRIPULACION

DIRECTO	CAT	A	B	C	D	E
RNP 0.15 14	*DA/H	2700 / 259				NA
	ALS / NO ALS (m)	800 / 1600				
RNP 0.3 14	DA/H	2800 / 359				
	ALS / NO ALS (m)	1600 / 2000				
CIRCULAR TO CIRCLE	MDA VIS (m)	NA				

*MA requiere razón de ascenso de 275FT/NM

06 MAY 10 AIRAC

SBBY **RNAV (RNP) Rwy 27R**

Agenda Item 4: Standards and procedures for the approval of performance-based navigation operations

Review of the status of implementation of the conclusions formulated by SAM/IG meetings and pending activities

4.1 The Meeting reviewed the status of implementation of the conclusions and/or tasks generated by SAM/IG meetings, with the following results:

Task 4.4 Assessment of fleet capacity

4.2 In view of the proximity of the implementation date, the Meeting considered task 4.4 as completed, since it was no longer required.

Task 4.8 RAIM prediction programme

4.3 Regarding task 4.8 concerning the RAIM prediction programme, the Meeting concluded that it would be necessary to continue advancing towards the implementation of a RAIM availability prediction system applicable to the Region. In order to proceed with this task, the Secretariat was requested to contact the AUGUR provider, as was done with VOLPE. Given the experience acquired by Colombia on RAIM prediction, the Meeting requested Colombia to study the possibility of extending its prediction programme to the rest of the SAM Region. It was agreed that the Secretariat would approach the civil aviation authority to submit this request. See additional information in paragraphs 6.29 to 6.32 of Agenda Item 6.

4.4 An update of all pending conclusions and tasks is shown in Appendix A to Agenda Item 1.

En-route PBN Action Plan (RNAV-5)

4.5 The Meeting reviewed the tasks of the en-route PBN action plan, with the following results:

Task 5.2 Publish national regulations for the implementation of the RNAV-5 navigation specification

4.6 The Meeting noted that, with the exception of one State, all those attending the Meeting had already published national regulations for the implementation of the RNAV-5 specification.

Task 5.3 Approval of aircraft and operators

4.7 The Meeting took note that the States had initiated the approval of aircraft and operators for RNAV-5 operations and that it would proceed on an ongoing basis. Thus, the text of the task was modified accordingly.

Task 5.4 Establish and maintain an updated registry of approved aircraft and operators

4.8 Upon reviewing this task, the Meeting took note that only the authorities of Argentina and Colombia had informed about their operators and aircraft approved for RNAV-5 operations. After consulting the representatives of the participating States, the Meeting was apprised that the Administrations of Brazil and Chile had a significant number of aircraft already approved to operate on RNAV-5 routes, although CARSAMMA has not been informed yet through Form F5, awaiting full harmonisation of said approvals with the regulations recently published in the case of Chile and in the process of being published in the case of Brazil.

4.9 In order to make sure that the approval process includes the issuance of Form F5 and its delivery to CARSAMMA, the Meeting urged the States to incorporate this procedure in the work aid of the Operations Inspector Manual.

Approval of Chilean operators to operate on RNAV-5 routes or airspace

4.10 The Meeting took note of the regulations presented by the Administration of Chile, and considered that it was a suitable reference document that could be used, together with Doc 9613 and AC 91-002, by those States that were in the process of drafting their regulations.

Alternate means of compliance with AC 91-002 concerning the RAIM prediction programme

4.11 The Meeting analysed the requirement contained in AC 91-002, par. 10.1, and in Doc 9613, Vol. II, par. 2.3.4.3, concerning the need to have a RAIM prediction programme for the route to be flown, and which must be executed before take-off. In this regard, it was noted that no approved prediction tool applicable to the Region existed in the market. The Meeting also recalled that the original GPS constellation contemplated a total of 24 satellites for global coverage and that the current constellation had 31 satellites.

4.12 Accordingly, the Meeting considered that, as an alternate means of compliance with the requirement contained in the circular, and given the absence of a suitable RAIM prediction tool, an aircraft could be dispatched if the number of satellites in service at the moment of dispatch, taking into account current NOTAMs (NANU), was 24 or more for the period of time in which the flight is to be conducted, and no additional action would be required.

4.13 The information required by dispatchers to apply this alternate means of compliance can be found, *inter alia*, on the following website:

http://www.navcen.uscg.gov/?Do=constellationStatus

Agenda Item 5: Air Traffic Flow Management Implementation (ATFM) in the SAM Region

5.1 The Meeting recalled that the SAM/IG workshops/meetings had analysed, *inter alia*, issues related to ATFM implementation in the South American Region, and related activities.

5.2 Based on the discussions on this topic, the Meeting agreed on the need to review a series of tasks contained in the ATFM action plan, and requested the Secretariat to take steps for their implementation within the framework of Regional Project RLA/06/901, where applicable.

Course for instructors on the calculation of runway and ATC sector capacity

5.3 Amongst the tasks to be carried out, the decision was made to conduct another course on Runway and ATC Sector Capacity to train instructors of SAM States, with a view to spreading training on the calculation of runway and ATC sector capacity to more personnel. Some countries had already done the calculation for a runway at an airport, by way of an exercise, but it needed to be done for the other airports and ATC sectors. The Secretariat is requested to consider the inclusion of a course for instructors on Runway and ATC Sector Capacity in Regional Project RLA/06/901 for the last week of October 201, in Lima.

ATFM Manual and inclusion of ATFM message exchange

5.4 The Meeting took note that the CNS/ATM/1 meeting and then the GREPECAS/16 meeting had approved the consolidated ATFM and CDM Manual for the CAR/SAM Regions.

5.5 It was also recalled that the SAM/IG/6 meeting had decided to postpone the analysis of the relevance of including the exchange of messages in the ATFM Manual until the SAM/IG/7 meeting, following the ATFM Course in Brazil.

5.6 The Group agreed that the inclusion of the exchange of messages in the ATFM Manual should take the form of MOUs between the States, which would be attached to the ATFM Manual.

ATFM teleconferences

5.7 The ATFM Implementation Group had considered that the possibility of holding daily teleconferences between SAM States starting at the SAM/IG/6 meeting should be analysed. The Meeting felt that the States, for various reasons, were not yet prepared to hold such teleconferences on a daily basis, but concluded that weekly ATFM teleconferences should be held between flow management units or flow management positions (FMU/FMP), as established by the SAM/IG/5 meeting, so as to improve the exchange of information between the participating States. In view of communication problems with the line provided by Boeing, it was noted that the States were using SKYPE or e-mail as an alternate means of communication. The Meeting agreed to formalise the use of both means of communication until an appropriate or definitive means was agreed upon. Similarly, the States are requested to provide the user address with which they will sign in SKYPE, before 15 June.

5.8 The Meeting was informed that Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Panama, Paraguay, Peru, Venezuela and Uruguay were keeping in contact by e-mail.

Review and updating of the ATFM Implementation Action Plan

5.9 The participants at the Meeting reviewed the action plan for the implementation of ATFM at airports and the airspace (ATC sectors) of the Region, which included tasks that were entrusted to defined responsible parties and with defined implementation dates. The revised action plan is shown in **Appendix A** to this part of the report.

5.10 The Meeting noted that since 2009, only Bolivia, Brazil, Colombia, Paraguay, Peru and Venezuela had submitted the preliminary exercise for calculating runway and ATC sector capacity. The remaining States are urged to submit their studies at the SAM /IG/8 meeting.

5.11 The Group noted that, to date, no States had reported on item 6 of Appendix A, with the exception of Brazil and Colombia, which were already in the operational phase. Consequently, the Secretariat is requested to send a letter to the corresponding States concerning the following items related to ATFM implementation, to be analysed at the SAM/IG8 meeting:

a) Factors affecting implementation: (lack of personnel, training, automation tools, legislation, etc.
b) Pre-operational implementation phase:
   i) What has been done to date to implement ATFM?
   ii) What is pending?
   iii) Tentative completion date
c) Operational implementation phase: Tentative implementation date

Studies conducted on ATC and runway capacity in Brazil FIRs

5.12 Brazil informed about the results of the studies conducted on ATC and runway capacity in its FIRs. The Meeting considered that the information presented was very valuable and decided to include it as **Appendix B** to this part of the report.

5.13 The Group also felt that the information presented by Venezuela on runway capacity at the Maiquetía airport should be included as **Appendix C** to this part of the report.

Integrated aircraft movement management system (SIGMA)

5.14 The Meeting took note of the new functionalities foreseen in the evolution of the SYNCROMAX system in Brazil, which would change its name to SIGMA (Integrated Aircraft Movement Management System), and of the timetable foreseen for its implementation at the Air Navigation Management Centre (*Centro de Gestión de la Navegación Aérea*).

5.15 The Group considered that this information was useful and thus decided to include it in **Appendix D** to this part of the report.

Action taken by Venezuela for the implementation of ATFM

5.16 During the Meeting, Venezuela informed about the action taken by that State for the implementation of air traffic flow management. This information appears in **Appendix E** to this part of the report.

Review of the work programme for GREPECAS projects

5.17 The Meeting noted that GREPECAS/16 had proposed a new organisation based on programmes and projects, eliminating the existing subgroups, including the CNS/ATM Subgroup. With respect to the projects formulated within the CNS/ATM Subgroup, it was felt that they should be implemented separately: one for the CAR Region and another one for the SAM Region, with a project coordinator for the CAR Region and a project coordinator for the SAM Region.

5.18 For ATFM implementation, an ATFM Programme had been identified, with two associated projects: *Improvement of demand/capacity balancing* and *Flexible use of airspace.* The Meeting reviewed the work programmes with their respective deliverables, and designated Mr. *Marco Vidal* of *Peru* the coordinator for the "*Flexible use of airspace"* project. No coordinator was designated for the "*Improvement of demand/capacity balancing"* project, a position that was left vacant.

5.19 Regarding the above, the Meeting agreed to request the Secretariat to send a letter to the States, highlighting the importance of the participation and continuity of project coordinators in the new work structure of GREPECAS, as well as the need for States to support their expert.

Follow-up of Conclusions and Decisions adopted by the SAMIG meetings

5.20 The meeting reviewed and updated in Appendix A to the Agenda Item 1, the list of Conclusions and Decisions adopted by SAMIG meetings in the ATFM area.

APPENDIX A

ACTION PLAN FOR THE IMPLEMENTATION OF ATFM AT SAM AIRPORTS

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
1. Airport demand/capacity (runway capacity) analysis	**Sep 2008**	**Apr 2010**		
1.1 Prepare ATFM survey	N/A	Aug 2008	Project RLA/06/901 Regional Office	**Completed**
1.2 Send survey to the States of the Region	Aug 2008	SAM/IG/2	Regional Office	**Completed**
1.3 Analyse the methodology presented by Brazil for estimating airport capacity (runway capacity)	June 2008	SAM/IG/2	ATFM/IG	**Completed** and analyzed through WP/08, WP/16.
1.4 Send response to survey	N/A	SAM/IG/2	States	**Completed** Except for French Guyana, Guyana, and Suriname.
1.5 Assess survey results	N/A	SAM/IG/3	ATFM/IG	**Completed**
1.6 Course offered by Brazil on Airport Capacity (runway capacity) Estimate	Mar 2009	Mar 2009	Brazil	**Completed** The course was carried out from 23 – 27 March 2009, as planned
1.7 Development of the Methodology for the Calculation of Airport (runway capacity) and Airspace Capacity in the SAM Region	Nov 2008	Jul 2009	Brazil and USA RLA/06/901	**Completed** Presented at SAM/IG/4

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
1.8 Carry out exercise of Calculation of airport (runway capacity) and ATC sectors Capacity in the SAM Region as per the Course offered by Brazil	Sept 2009	SAM/IG/8	States	**Valid** Through Conclusion SAM/IG/4-5, the guidance material for the application of a common methodology for the calculation of airport and ATC sectors capacity was approved. Bolivia, Brazil, Colombia, Paraguay, Peru and Venezuela presented their preliminary exercise.
1.9 Carry out Calculation of Airport and Airspace Capacity of main airports by States.	Sept 2009	SAM/IG/8	States	**Valid** Brazil, Paraguay and Peru presented the data. Venezuela presented its runway capacity calculation for the Maiquetia airport.
1.10 Identify airports where periods exist where the demand is greater than existing capacity including simulations, if necessary, by States.	Sept/Oct 2009	SAM/IG/8	States	**Valid** Brazil, Paraguay and Peru presented the data.
1.11 Determine operational factors affecting airport demand and capacity to optimise utilisation of existing capacity, including simulations, is necessary.	Sept/Oct 2009	SAM/IG/8	States	**Valid** Brazil, Paraguay and Peru presented the data.
1.12 Present the conclusions on existing airport capacity	**N/A**	SAM/IG/8	States	**Valid** Brazil and Peru presented their conclusions on airport capacity (runway capacity)
2. Coordination with the ATM community				
2.1 Present initial AIC model	SAM/IG/2	SAM/IG/2	ATFM/IG	**Completed**

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
2.2 Publish initial AIC	SAM/IG/2	Next AIRAC date/2009 after SAM/IG/3	States	**Completed**
2.3 Promote seminars to the ATFM community, taking into account the CDM concept for ATFM implementation, and begin the relevant coordination		December 2010	States	**Completed** On 29 to 31 March 2010, the First CDM Workshop was carried out in Rio de Janeiro, Brazil, with the participation of 27 experts. The second ATFM/CDM Workshop will be carried out in Rio de Janeiro during 26 and 27 November 2010
2.4 Inform the GREPECAS CNS/ATM Subgroup	SAM/IG/3	Permanent	N/A	**Completed** The GREPECAS CNS/ATM/SG/1 Meeting (Lima, Peru, 15 to 19 March 2010) was informed on the progress in the ATFM areas carried out to date in the SAM Region (see 5.4) The CNS/ATM/SG/2 Subgroup was also informed on the development achieved to date, and the ATFM and CDM Manuals were presented for its standard application in the CAR and SAM Regions. Both documents condensed in one were approved by GREPECAS/16 Meeting (para. 3.5.4 and Concl. 16/35) for its application in both regions.

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
3. Infrastructure and database		**Aug 2008**		
3.1 Send the results of the survey developed by the hired expert to the Automation Group.		Dec 2008		**Completed**
3.2 Send to the Automation Group the information obtained by the expert hired on the data bases used in the Brazil, United States and Eurocontrol units	Jan 2009	TBD		**Valid**
3.3 Coordinate implementation activities with the Automation Group			ATFM/IG	**Permanent**
4. Policy, standards, and procedures				
4.1 Hiring of an expert to draft the manuals on ATFM measures for airports and FMU and FMP procedures			N/A	**Completed**. Task included in 4.2
4.2 Hiring of an expert for the elaboration of the ATFM Manual		February 2009	Regional Office	**Completed**. Task developed from 6 to 17 July 2009
4.3 Detailed development of ATFM Manual chapters	Dec 2008	SAM/IG/5	Regional Office	**Completed** Approved partial draft, including ATFM concepts for airspace and airports at SAM/IG/2 Meeting. Presented at SAM/IG/4
4.4 Detailed development of the second part of ATFM Manual Chapters.	Dec 2009	Jun 2010	Regional Office (RLA/06/901)	**Completed** The ATFM Manual was analysed from 4-15 October, with the assistance of experts from Colombia and Brazil and some changes were introduced, in order to improve its structure.

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
4.5 Present the model AIC Supplement		SAM/IG/6	ATFM/IG	**Completed** With the assistance of an expert from Peru, an AIP Supplement Model, to be used by States as reference, was prepared and developed (see SAM/IG/6 WP/08).
4.6 Approve the AIC Supplement		SAM/IG/6	ATFM/IG	**Completed** The AIC supplement model was approved by SAM/IG/6
4.7 Publish the AIP Supplements		SAM/IG/7	States	**Valid**
5. Training				
5.1 Draft ATFM training plans and submit them		TBD	States	**Permanent**
5.2 Train the team on decision-making at airports		December 2011	States	**Completed** See 5.1.
5.3 Hiring of an expert to draft Manual on the Introduction to ATFM for the ATM Community		TBD	Regional Office	**Completed** The ATFM Manual was prepared and submitted to CNS/ATM/SG. Guidelines to inform ATM community on ATFM and CDM general concepts. These guides may be provided in courses, seminars or others.

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
5.4 Present and assess the Manual for the Introduction to ATFM for the ATM Community		SAM/IG/6	RLA/06/901	**Completed** Through the hiring of experts, the ATFM manual was developed. GREPECAS/16 Meeting adopted the manual for the CAR and SAM Regions through Conclusion 16/35. It has been planned to develop a second part of such manual.
5.5 Train the members of the ATM community in the CDM and ATFM concepts		TBD	States	**Completed** The ATFM SAM Course was held in Rio de Janeiro, Brazil, from 22 to 26 March, 18 experts participated and the holding of tele-conferences was agreed, same which started on 12 April with excellent results. The First CDM Workshop was held from 29 to 31 March 2010, with the participation of 27 experts. The Second ATFM SAM course was held in Rio de Janeiro, Brazil, from 23 to 25 November 2010, with the participation of 29 experts. On 26 and 27 November 2010, the Second CDM Workshop was held in Rio de Janeiro, Brazil was held, with the participation of 29 experts.

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
				The Second Seminar/Workshop on airport capacity calculation and ATC sectors was held in Rio de Janeiro, Brazil, from 21 to 25 March 2011, with 23 participants.
5.6 Train FMP/FMU staff for application of ATFM measures for airports		TBD	States	**Permanent**
5.7 Monitor the training of the ATM community		SAM/IG/7	States	**Valid**
6. Final implementation decision				
6.1 Identify and review factors that may affect the implementation decision		SAM/IG/8	States	**Valid**
6.2 Declare the pre-operational implementation in the defined area		SAM/IG/8	States	**Valid**
6.3 Declare the final operational implementation in the defined area		SAM/IG/9	States	**Valid**
7. Monitor system performance				
7.1 Draft the ATFM post-implementation follow-up programme at airports	SAM/IG/6	SAM/IG/8	ATFM/IG	**Valid**
7.2 Implement the ATFM post-implementation follow-up programme at airports	SAM/IG/7	SAM/IG/9	States	**Valid**
Tentative pre-operational implementation date		SAM/IG/8	**States**	**Valid**
Tentative definitive implementation date		**SAM/IG/8**	**States**	**Valid**

ACTION PLAN FOR ATFM IMPLEMENTATION IN THE SAM REGION				
B- AIRSPACE (ATC Sector)				
Task description	**Start**	**End**	**Responsible party(designate individual or office in charge)**	**Remarks**
1. Airspace demand and capacity analysis				
1.1 Analyse the methodology to estimate ATC sector airspace capacity presented by Brazil	Jun 2008	SAM/IG/2		**Completed**
1.2 Prepare an airspace demand survey	TBD	TBD		
1.3 Attend the course on Airspace Capacity Estimate **(ATC Sector).**	Mar 2009	States		**Completed**
1.4 Carry out the States estimate airspace ATC sector capacity at the major airports	**Sept. 2009**	**SAM/IG/8**	States	**Valid** States must submit their studies before the SAM/IG/8 Meeting. Brazil has presented their studies.
1.5. Identify airspace sectors where demand sometimes exceeds capacity, including simulations by the States, if necessary	**TBD**	**SAM/IG/8**	States	**Valid** States must submit their studies before the SAM/IG/8 Meeting. Brazil has presented their studies.
1.6 Identify factors affecting airspace demand and capacity in order to optimise the use of existing capacity, including simulations if necessary	**TBD**	**SAM/IG/8**	States	**Valid** States must submit their studies before the SAM/IG/8 Meeting. Brazil has presented their studies.
1.7 Present conclusions on the existing airspace capacity.	**TBD**	**SAM/IG/8**	States	**Valid** States must submit their studies before the SAM/IG/8 Meeting. Brazil has presented their studies.
2. Coordination with the ATM community	**Sep 2008**	**Aug 2009**		

ACTION PLAN FOR ATFM IMPLEMENTATION IN THE SAM REGION				
B- AIRSPACE (ATC Sector)				
Task description	**Start**	**End**	**Responsible party(designate individual or office in charge)**	**Remarks**
2.1Consider by the ATM community the implementation of ATFM in airspace	Sep 2008	**SAM/IG/8**	States	**Valid** States in implementation phase should coordinate with the ATM community the necessary actions for the ATFM implementation process and submit them to the Secretariat before the SAM/IG/8 Meeting.
3. Infrastructure and database	**TBD**	**Dec 2013**		**Valid**
3.1 Send requirements to the Automation Group, as stipulated in Appendix B of the ATFM CONOPS	**TBD**	**TBD**	ATFM/IG	**Valid**
3.2 Coordinate implementation activities with the Automation Group	N/A	Dec 2013	ATFM/IG	**Valid**
4. Policy, standards, and procedures	**TBD**	**Jun 2013**	States	**Valid**
4.1 Develop ATFM policies, taking into account the objectives and principles established in the CAR/SAM ATFM CONOPS	**TBD**	**TBD**	States	**Valid**
4.2 Develop a regional strategy and framework for the implementation of Centralized ATFM units	**2008**	**2014**	Regional Project RLA/06/901	**Valid**
4.3 Develop template/contents for operational agreements between Centralized ATFM units for interregional demand/capacity balancing	**2008**	**2014**	Regional Project RLA/06/901	**Valid**
4.4 Define common elements of situational awareness between FMUs; • common traffic displays, • common weather displays (Internet), • communications (teleconferences, web), and • daily teleconference/messages methodology	**2008**	**2012**	Regional Project RLA/06/901	**Valid** States maintain web conferences for exchange of information.

ACTION PLAN FOR ATFM IMPLEMENTATION IN THE SAM REGION				
B- AIRSPACE (ATC Sector)				
Task description	**Start**	**End**	**Responsible party(designate individual or office in charge)**	**Remarks**
advisories				
4.5 Define common electronic information and minimum databases required to support decision making process and alerting systems for interoperable situational awareness between Centralized ATFM units	**2008**	**2014**	Regional Project RLA/06/901	**Valid**
4.6 Develop a regional strategy to implement the use of a flexible upper airspace (FUA): • evaluate the management processes in the use of the airspace; • improve the current domestic airspace management to adjust dynamic changes to the traffic flows in tactical stages; • introduce improvements to the ground ATS systems and associated procedures for the extension of the FUA with dynamic management processes in the use of the airspace • dynamically implement ATC sectorization with the aim of providing a better balance between demand and capacity that responds in real time to changing situations in the traffic flows and to accommodate in the short-term the users preferred trajectories /	**200/8**	**2015**	Regional Project RLA/06/901	**Valid**

ACTION PLAN FOR ATFM IMPLEMENTATION IN THE SAM REGION				
B- AIRSPACE (ATC Sector)				
Task description	**Start**	**End**	**Responsible party(designate individual or office in charge)**	**Remarks**
5. Training	**TBD**	**May 2013**		
5.1 Train the team on airspace data collection	Jun 2009	March 2011	States	**Completed** A first course was carried out in March 2009. The second course on runway capacity and ATC sector was held in Rio de Janeiro, Brazil, from 21 to 25 March 2011, with 23 participants. The third seminar-workshop, focused to instructors on airport capacity and ATC sectors will be held from 24 to 28 October 2011, in Lima, Peru.
5.2 Air Traffic Flow Management Course	Mar 2010	Nov 2010	Brazil	**Completed** Hosted by RP RLA/06/901. The Second ATFM Course was held in Rio de Janeiro, Brazil, from 22 to 26 March 20101 with 28 experts, and the holding of tele-conferences was agreed, and they have been held as of 12 April 2011, with excellent results. The Second ATFM SAM Course was held in Rio de Janeiro, Brazil, from 23 to 25 November 2010, with 29 Experts. The Third Seminar-workshop on airport capacity and ATC

ACTION PLAN FOR ATFM IMPLEMENTATION IN THE SAM REGION				
B- AIRSPACE (ATC Sector)				
Task description	**Start**	**End**	**Responsible party(designate individual or office in charge)**	**Remarks**
				sectors will be held in Lima, Peru, from 24 to 28 October 2011, addressed to instructors.
5.3 Train personnel in ATFM strategic measures for airspace	**TBD**	**TBD**	States	Permanent An ATFM CDM course was carried out in Brazil in 2010 with the participation of several States
5.4 Prepare plans and ATFM training material	**TBD**	**TBD**	States	**Valid**
5.5 Conduct training of personnel involved.	**TBD**	**TBD**	States	**Valid**
			States	**Valid**
6. Final implementation decision	**N/A**	**Sep 2013**	States	**Valid**
6.1 Analyse factors affecting the implementation decision	**N/A**	**SAM/IG/8**	States	**Valid**
6.2 Declare pre-operational implementation in the area defined	**N/A**	**SAM/IG/8**	States	**Valid**
6.3 Declare definitive operational implementation in the area defined	**N/A**	**SAM/IG/8**	States	**Valid**
7. Monitor system performance	**TBD**	**N/A**	States	**Valid**
7.1 Draft ATFM post-implementation follow-up programme	**TBD**	Aug 2013	Regional Project RLA/06/901	**Valid**
7.2 Implement ATFM post-implementation follow-up programme	Dec 2013	N/A	States	
Tentative pre-operational implementation date	**N/A**	**Jul 2013**	States	**Valid**
Tentative definitive implementation date	**N/A**	**Dec 2013**	States	**Valid**

APPENDIX B

ATC CAPACITY AND RUNWAY CAPACITY

1. Introduction

1.1 The runway capacity saturation for arrivals and departures have is a big problem for domestic and international airports. In order to maintain the air traffic flow near the optimal conditions, avoiding possible overflow in the system, the Brazilian Air Navigation Management Center (CGNA) applies standard procedures for runway capacity calculations and ATC sectors. These procedures help to cope with the variation in the demand/capacity at the airports, giving parameters which support recommendations to the airports of interest in advance and to keep the overall operation in harmony.

1.2 In accordance to the demand evaluation in the airports and in the air space, the capacity calculation should take into account some parameters that could interfere in airport operation and air space operation.

1.3 A lot of factors can influence the Capacity, for example: sector limit, routs disposed and runway configuration. When some of factors suffer a significantly modification, it will be calculated a new capacity. But, it's important that data collection is quite significant, for avoiding deviations and for representing reliable values for the ATC.

ATC Capacity and Runway Capacity values

2.1 Capacity values are used as tools for planning and decision making by the authorities responsible for the calculation of these numbers. Indeed, serve as a reference to maintain the balance between capacity and demand. The CGNA has calculated the ATC Capacity and the Runway Capacity in order to understand the relationship between these values, but also to seek an ideal air traffic flow management.

ATC CAPACITY (APP) AND RUNWAY CAPACITY

º	TMA	Aeroporto	Capacidade: Pista	Capacidade: Setor APP							
1	São Paulo	SBSP	34	APP SP	S1N	S1S	S2	S3N	S3S	FinalGR	
2		SBGR	45		7	8	8	7	5	5	
3		SBMT	32		FinalSP	Final KP	Tubo	S3N/S3S	S2/Final KP		
4		SBKP	26		5	5	10	7	8		
5	Rio de Janeiro	SBRJ	29	APP RJ	S1	S2	S3	S1/S4	S2/S3	S5	S1/2/3/4/5
6		SBGL	40		9	5	7	7	7	10	10
7	Brasília	SBBR	45	APP BR	S1	S2	S1/S2	S1/S2/Final	Final		
					6	11	11	13	7		
8	Belo Horizonte	SBCF	27	APP BH	S1	S2	S3	S2/S3	S1/S2/S3		
9		SBBH	25		6	7	7	7	9		
10	Salvador	SBSV	25	APP SV	S1/2						
					9						
11	Curitiba	SBCT	24	APP CT	S1-Final	S2/3/4-Alimentador	S1/2/3/4				
					4	6	8				
12	Porto Alegre	SBPA	25	APP PA	S3	S4	S2/4	S1/3			
					4	2	5	9			
					S1/2/3	S1/2/4	S1/2/3/4				
					9	9	9				
13	Manaus	SBEG	25	APP MN	S1						
					8						
14	Recife	SBRF	31	APP RF	S1						
					9						
15	Fortaleza	SBFZ	25	APP FZ	S1						
					7						
16	Natal	SBNT	27	APP NT	S1						
					7						

Capacidade: Setor ACC

ACC RECIFE

SETORES DESAGRUPADOS

RE1	RE2	RE3	RE4	RE5	RE6	RE7	RE8
14	15	14	15	14	15	15	16

SETORES AGRUPADOS

RE1/2	RE3/4	RE5/6	RE7/8	RE2/3/4		RE1/2/8	
15	15	15	17	15		17	
RE5/6/7		RE6/7/8		RE1/2/3/4		RE5/6/7/8	
15		15		15		15	
RE3/4/5		RE3/4/8					
15		17					

ACC AMAZÔNICO

SETORES DESAGRUPADOS

AZ1	AZ2	AZ3	AZ4	AZ5	AZ6	AZ7	AZ8
14	14	16	14	18	14	12	12
AZ9	AZ10	AZ11	AZ12	AZ13	AZ14		
14	14	14	14	11	14		

SETORES AGRUPADOS

AZ1/2	AZ1/2/3/4		AZ1/2/5		AZ3/4	AZ6/7/8/9/10	
14	16		18		16	12	
AZ2/3/4		AZ3/4/5		AZ6/7	AZ6/7/8		AZ6/8
13		18		14	14		14
AZ8/9/10		AZ9/10	AZ11/12		AZ13/14		
14		14	14		14		
AZ11/12/13/14		AZ7/9/10		AZ7/8/9/10		AZ1/2/3/4/5	
11		14		14		18	

ACC CURITIBA

SETORES DESAGRUPADOS

CW1	CW2	CW3	CW4	CW5	CW6	CW7	CW8
15	15	14	11	15	15	14	14
CW9	CW10						
14	14						

SETORES AGRUPADOS

CW1/5	CW6/7	CW4/8	CW9/10	CW2/3	CW4/5	CW5/6	CW7/8
15	15	14	14	15	15	15	14
CW1/2/5		CW6/7/8		CW5/6/7		CW4/5/8	
15		15		15		15	
CW5/6/7/8		CW4/6/7/8		CW1/2/3		CW4/7/8	
15		15		15		15	

ACC BRASÍLIA

SETORES DESAGRUPADOS

BS1	BS2	BS3	BS4	BS5	BS6	BS7	BS8
12	12	15	14	14	15	15	14
BS9	BS10	BS11	BS12				
14	14	13	14				

SETORES AGRUPADOS

BS1/2	BS3/4	BS1/4	BS2/3	BS1/2/3/4		BS5/6	BS5/9
12	15	15	14	15		15	14
BS6/7	BS7/8	BS8/9	BS7/8/9		BS5/7/8/9		
15	15	14	15		15		
BS10/11		BS10/12		BS10/11/12			
14		16		16			

Gobierno Bolivariano de Venezuela | Vicepresidencia de la República | Instituto Nacional de Aeronáutica Civil | Servicios a la Navegación Aérea

BICENTENARIO

APÉNDICE C

EJERCICIO DE TOMA DE DATOS
AEROPUERTO INTERNACIONAL "SIMON BOLIVAR" DE – MAIQUETIA.

Metodología Aplicada DECEA – BRASIL.
En el presente ejercicio, se detallan unicamente los pasos determinados en la Metodología de la Capacidad teórica de pista utilizada por el DECEA/BRASIL.

1er PASO.

Recolección de Datos de Aeropuerto:

Los datos fueron tomados en un período de quince dias del mes de mayo del año 2011, en la Torre de Control del Aeropuerto Internacional "Simón Bolívar" de Maiquetìa, por el el equipo de comisión ATFM de la Dirección de Navegación Aérea, en una franja de alta densidad (entre las 12:30 y las 21:00) pista 10.

Error! Not a valid link.

CATEGORÍA	***TOPD***		***TOPP***	
	N° ANV	***TIEMPO***	***N° ANV***	***TIEMPO***
A	***4***	***192***	***6***	***234***
B	***8***	***390***	***14***	***722***
C	***20***	***1134***	***17***	***1005***
D	***8***	***438***	***8***	***515***
E	***0***	***0***	***0***	***0***
total	***40***	***2154***	***45***	***2476***

2do PASO.

Tiempo Medio de Ocupación de Pista (MATOP)

El tiempo de ocupación de pista será calculado por el umbral de la pista,ependiendo de la configuración de la propia.
Luego de la toma de los tiempos de ocupación de pista, el cálculo de la media aritmética del tiempo de ocupación de pista (MATOP) es realizado por categoría de aeronaves.

$$MATOP = \frac{TOPP + TOPD}{2}$$

CATEGORÍA	MATOP
A	43.5
B	50.16
C	57.90
D	59.56
E	0

3er PASO.

Mix de Aeronaves (MIX).

MIX, de aeronaves, es la configuración de la flota en operación en el aeropuerto estudiado. Las aeronaves son subdivididas en cinco categorías, según la velocidad de cruce de umbral de pista, que debe ser 130% del valor de la velocidad de perdida (stall) en la configuración de aterrizaje (full flaps, gear down). De esta manera, las aeronaves son clasificadas de a siguiente y en las siguientes categorias:

CAT"A" – Velocidad menor que 90kt

CAT"B" – Velocidad entre 91/120kt

CAT"C" - Velocidad entre 121/140kt

CAT"D" – Velocidad entre 141/165kt

CAT"E" – Velocidad entre 166/210kt

MIX DE AERONAVES
"MEDIA ARITMÉTICA"

CATEGORÍA	%
A	11.76
B	25.88
C	43.52
D	18.82
E	0.00

4to PASO.

Tiempo Medio Ponderado de Ocupación de Pista (TMOP).

Es la media aritmética ponderada de la media aritmética de los tiempos de ocupación de pista (MATOP), por categoría de aeronaves, tomandose en cuenta el MIX de aeronaves.
El tiempo medio debe ser calculado para cada canecera esxistentes si las hubiera, en el aeródromo, en función de las diferentes configuraciones de pista de taxi para cada cabecera en uso.

$$TMOP = \frac{MIXA \times MATOPA + MIXB \times MATOPB + MIXC \times MATOPC + MIXD \times MATOPD + MIXE \times MATOPE}{\sum MIX}$$

TMOP: 54.50 segundos

5to PASO.

Cálculo de Capacidad Física de la Pista "10".

En el intervalo de una hora, será encontrada por medio de la división del referido intervalo, transormado en segundos (3600seg), por el tiempo medio de ocupación de pista.

$$CFP=3600/TMOP$$

CFP: 66.05

6to PASO.

Porcentual de Utilización de la pista "10"

Indice calculado a partir del movimiento total mensual, obtenido por medio de un muestreo conteniendo datos referentes al periodo de un año.

PU= porcentaje de utilizacion de la pista (Regla de tres)

PU= 85%

7to PASO.

Tiempo de vuelo entre la OM y la TH (T).

Será el tiempo cronometrado entre el marcador externo (5NM), hasta el umbral de la pista.

$$TM = \Sigma\ T\ catX\ /\ N^a\ ANV\ catX$$

TMa= 123.83 ***TMb=123.28*** ***TMc= 118.47*** ***TMd= 116.12***

8to PASO.

Cálculo de Velocidad de Aproximación entre la OM y la TH (V).

Tomando en cuenta las categorias de las aeronaves, es el resultado de la longitud del segmento de aproximación final por el tiempo medio de vuelo entre el marcador externo y el umbral de la pista (TM).

$$VAa = \frac{SAF}{Tma}$$

$$VAb = \frac{SAF}{TMb}$$

$$VAc = \frac{SAF}{TMc}$$

$$VAd = \frac{SAF}{TMd}$$

VAa= 0.0403 NM/seg ***VAb=0.0403 NM/seg*** ***VAc= 0.0422 NM/seg*** ***VAd=0.0430 NM/seg***

9no PASO.

Velocidad Media de Aproximación final (VMP).

Media ponderada tomando en consideración el MIX de aeronaves. la pista (TM).

VMP= 0.0416

<u>10mo PASO.</u>

Determinación de la Separación de Seguridad (SS).

Prevee la posibilidad de ocurrir dos aterrizajes consecutivos, sin herir la separacion minima reglamentaria. Es el resultado de la multiplicacion de la velocidad media en el final y el tiempo medio ponderado de ocupacion de pista.

SS= VMP x TMPO

SS= 2.26 NM

<u>11vo PASO.</u>

Determinación total de la Separación entre dos aterrizajes consecutivos(ST).

Es el resultado entre la sumatoria de la separación de seguridad con la separacion minima reglamentaria.

ST=SS + SMR

ST=7 NM

<u>12Vo PASO.</u>

Tiempo medio ponderado entre dos aterrizajes consecutivos, considerando la separacion total (TMST).

TMST= ST/ VMP

TMST= 168 seg

<u>13mo PASO.</u>

Determinación de numero de aterrizajes posibles (P).

P= 1 hora / TMST

P=21

14vo PASO.

Determinación de numero de despegues posibles (D).

D= P - 1

D=20

15vo PASO.

Determinación de la capacidad teorica de pista (CTP).

Es la sumatoria de despegues y aterrizajes obtenidos.

CTP = A+D

CTP=41

16vo PASO.

Determinación de la CAPACIDAD DECLADRADA DE LA PISTA 10 (CDP).

Se calcula considerando el porcentual anual de utilización de la pista..

$$CDP = \frac{Pua \times CTPA + Pub\ X\ CTPb + ...}{Pua + PUB + Puc......}$$

CDP=34

Elaborado por Especialistas ATFM:
**Maribel Mayora*
**Maruska Yubisay Borges Rodríguez*
**Carlos José Ochoa Martínez*
**Junel Martinez*

APPENDIX D

INTEGRATED SYSTEM FOR AIR MOVEMENT MANAGEMENT (SIGMA)

1. Introduction

1.1 In 1998 there were four centers in the world for Air Traffic Flow Management (ATFM), located in the USA, Europe, Asia and South Africa. At that time, with the continued growth of flights in South America, the need for an ATFM center for the region became apparent, especially for the Brazilian airspace.

1.2 The Directorate of Electronics and Flight Protection (DEPV), current Department of Airspace Control (DECEA), in accordance with the technical and operational information provided by EUROCONTROL (CFMU) and the FAA (ATCSCC), then started the application of traffic flow management techniques in the Brazilian airspace.

1.3 This initiative allowed for meeting the flow management needs which were already outlined, and were later confirmed by the significant increase in Brazilian air traffic demands, which are still present today.

1.4 The supply scope of the initial phase of the ATFM Program considered the need to store information about the actual air traffic demands versus airport capacity, air navigation aids and air traffic control in Brazil, before designing a permanent solution to the problem.

1.5 To this end, during 32 months, the following activities were carried out: Concept of Operations, detailing of the System Requirements Specification, System Design, External Interface Specification, Software Specification, Software Design, Development of ATFM Prototype, Operational Validation (proof of concept), Setup Control and Quality Management and Training.

1.6 From that ATFM prototype, which became known as SYNCROMAX, DECEA acquired sufficient knowledge to specify and contract with Atech, a Brazilian company, the incremental development of an air traffic flow management system for operational use at the Brazilian Air Navigation Management Center (CGNA), operating in São José dos Campos.

1.7 The CGNA, which moved to Rio de Janeiro in 2006, where it could provide better quality service for the users of the Brazilian airspace, now operationally uses SYNCROMAX, the incremental development of which continues in line with the implementation of new CNS/ATM concept in the Contracting States of the International Civil Aviation Organization (JCAO).

1.8 It is noteworthy that SYNCROMAX is a system that fully meets the current flow management system requirements; however, an evolution process is needed for the new features and increased performance, in function of the new technologies developed and the continuing need to increase airspace capacity.

2. Evolution to SIGMA

2.1 Currently in SYNCROMAX, much information is entered manually by Users, generating a very intense workload. Therefore, the Integrated System for Air Movement Management (SIGMA) was designed to represent an evolution from SYNCROMAX, being fully integrated to the systems that provide flow management data.

2.2 SIGMA provides the centralization of flight plan processing and the implementation of new subsystems to CDM (Collaborative Decision), SLOT Center, Capacity Calculation, Ground Delays (GDP) and Air Situation Management (GSA), among others.

2.3 Among the new features to be incorporated with the entry into operation of SIGMA, the following can be highlighted:

- Initial flight plan processing will be centralized;
- Slot Allocation;
- Automation of the acquisition of meteorological data;
- Monitoring of air operations;
- Simulation capabilities for testing alternative scenarios;
- Management of conditioned airspaces (EAC);
- Automatic processing of AIS data; and
- Automatic handling of proposed permits for carrying out regular commercial aviation operations (HOTRAN).

2.4 To maintain CGNA's operability, a backup Center will be created, to be located in São José dos Campos - SP, which will assume the functions of the main Center in case of hindrances that affect its continuous operation, as shown below, which also illustrates SIGMA external subsystems and interfaces.

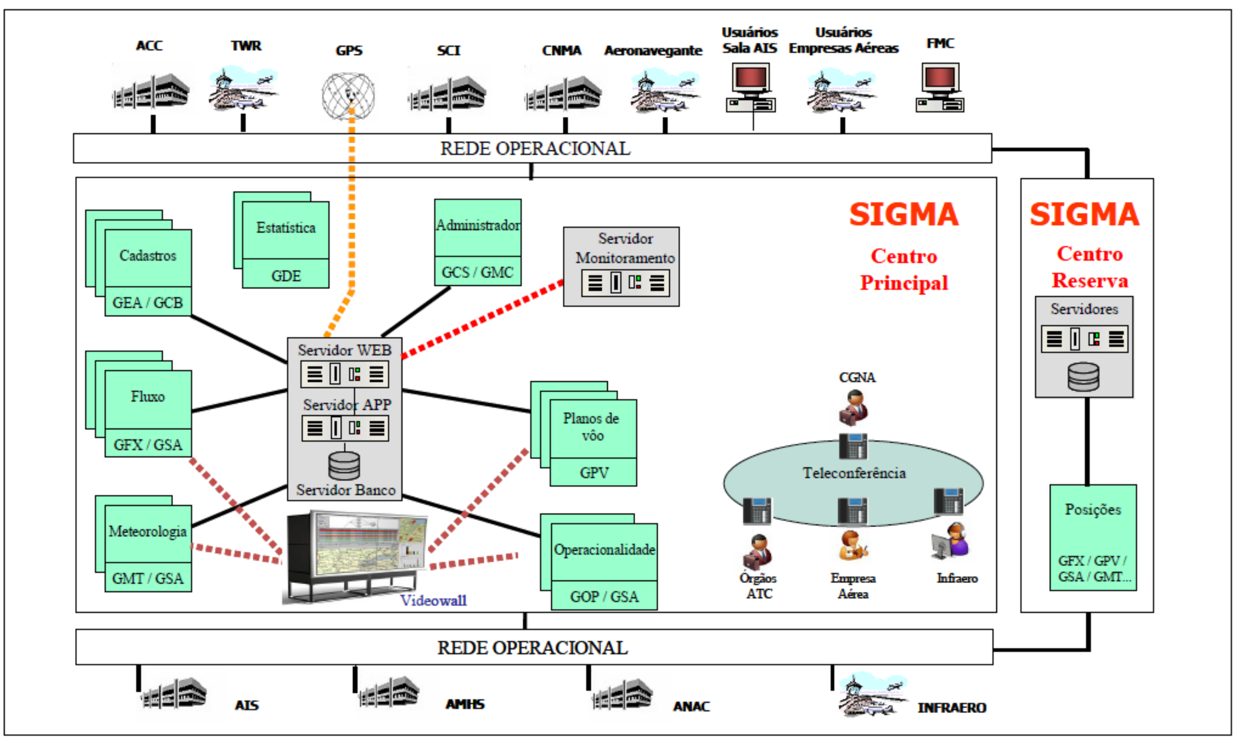


Figure 1 - SIGMA External Subsystems and Interfaces

3. SIGMA Implementation Schedule

3.1 The functionalities related to air traffic flow management activities will be implemented by April 2011.

3.2 Features related to the centralization of flight plan data and complementation of the Main Center will be implemented by February 2012

3.3 The functionalities directed to system contingency (Backup Center), which are related to the flight plan centralization and air traffic flow management will be implemented by July 2012.

4. Conclusion

4.1 The Air Traffic Flow Management System (SYNCROMAX), which was developed from the embryonic ATFM Prototype, meets the current requirements of CGNA's flow management system.

4.2 Due to increased air traffic demand and the new CNS/ATM concepts, DECEA is in an advanced process for deploying a new system entirely developed in Brazil to be called SIGMA (Integrated System for Air Movement Management).

4.3 The expected implementation of SIGMA, with all the new features, is planned for July 2012, and completion of this project will make this System a very important tool for the exercising the air traffic flow management activity in Brazil.

– END –

Agenda Item 6: Assessment of operational requirements in order to determine the implementation of communications and surveillance (CNS) capabilities improvement for en-route and terminal area operations

Assessment of operational requirements to determine the implementation of communication capability improvements

6.1 The Meeting analyzed the activities of the SAM ATN architecture and ATN ground-ground and air-ground applications projects pertaining to the CNS/ATM Subgroup's programme on Ground-ground and air-ground telecommunications infrastructure with the aim of aligning it with the activities for CNS improvements in the SAM Region, in view of GREPECAS Decisions 16/45 and 16/47 approving the new GREPECAS structure and the transforming the Subgroups into programmes and projects for the CAR Region and SAM Region.

6.2 As a result of the review made to the SAM ATN architecture project, the Meeting considered that all the activities taken under consideration therein had been included in the study for a new SAM digital network, and that the Coordinator in charge of the project would be Mr. Athayde Frauche of Brazil.

6.3 The Meeting examined the activities in the ATN ground-ground and air-ground applications project, and considered that its Coordinator be Mr. Omar Gouarnalusse of Argentina. In this regard, the Meeting took note that on 16 June 2011 a via web conference call would be held with all members of the CNS improvement group in order to present, among other aspects, the new schedule of activities for the implementation of the ground ground and air ground activities.

6.4 With regard to the air ground applications, the Meeting took under consideration the need of adding a new task in the project, regarding the development of an implementation strategy for the air ground communications systems in the SAM Region, taking as reference the model navigation and surveillance strategies approved by GREPECAS. The task would be delivered at SAM/IG/8 meeting.

6.5 In addition, consideration was given to add a new task "Development of an Interface control document (ICD) for the SAM Region for data communications between ATS units".

SAM digital network study

6.6 The Meeting recalled that the digital network study had been presented at the SAM/IG/6 meeting and, in this respect, the Meeting considered it convenient that the study were circulated to States for their comments before 31 January 2011, thus formulating Conclusion SAM/IG/6-10 - Review to the study for a new SAM digital network.

6.7 In this respect, the Meeting noted that the digital network study had been sent to SAM States for their comments and, having received replies from Argentina, Brazil, Chile and Panama.

6.8 In addition, the Meeting:

a) noted that the fourteenth meeting of the REDDIG Coordination Committee, held in Lima, Peru, from 16 to 18 March 2011, examined and approved the study shown in **Appendix A** to this Agenda Item; and

b) recalled that, as part of the new digital network study, the fourth coordination committee meeting (RCC/4) of RLA/06/901 project approved the holding of the seminar/workshop on new satellite and ground network technologies, proposed during the SAM/IG/6 meeting.

6.9 Note was taken that for the seminar/workshop, various communications services providers and integrators had been invited, for the exhibition of the different technological solutions available in line with the network's basic requirements. The event is scheduled to be held in Lima, Peru, from 18 to 20 July 2011. The tentative agenda for the seminar/workshop is in **Appendix B** to this Agenda Item.

6.10 The Meeting noted that, after the seminar/workshop and with the possible support of the aeronautical administration of Brazil and RLA/06/901 project, one Brazilian expert and another from Argentina will carry out in August a 15-day mission to Lima, as approved by RCC/4 meeting, for the drafting of the technical specifications for the new SAM digital network.

6.11 Once the technical specifications document is completed, it will be distributed to all SAM States for review and, thereafter, presented at the Twelfth Meeting of Civil Aviation Authorities of the SAM Region (RAAC/12) (Lima, Peru, 3 to 6 October 2011), with the aim of approving the bidding process. In this respect, the Meeting reviewed the action plan for the implementation of the SAM digital network shown in **Appendix C**.

Follow-up to AMHS interconnection

AMHS implementation

6.12 The Meeting was informed that the latest AMHS installed in the Region are those of Guyana and Suriname, which were completed in the first quarter of 2011 and that the State soon to install an AMHS was Bolivia, who has purchased a Thales system and was expected to be nationally in operation by the end of 2011. In addition, the Meeting noted that Ecuador had completed the bidding process for an AMHS, having already selected the winner and estimating its implementation at the beginning of 2012, and that Uruguay was currently in the bidding process phase, estimating the installation and operation by the end of 2012.

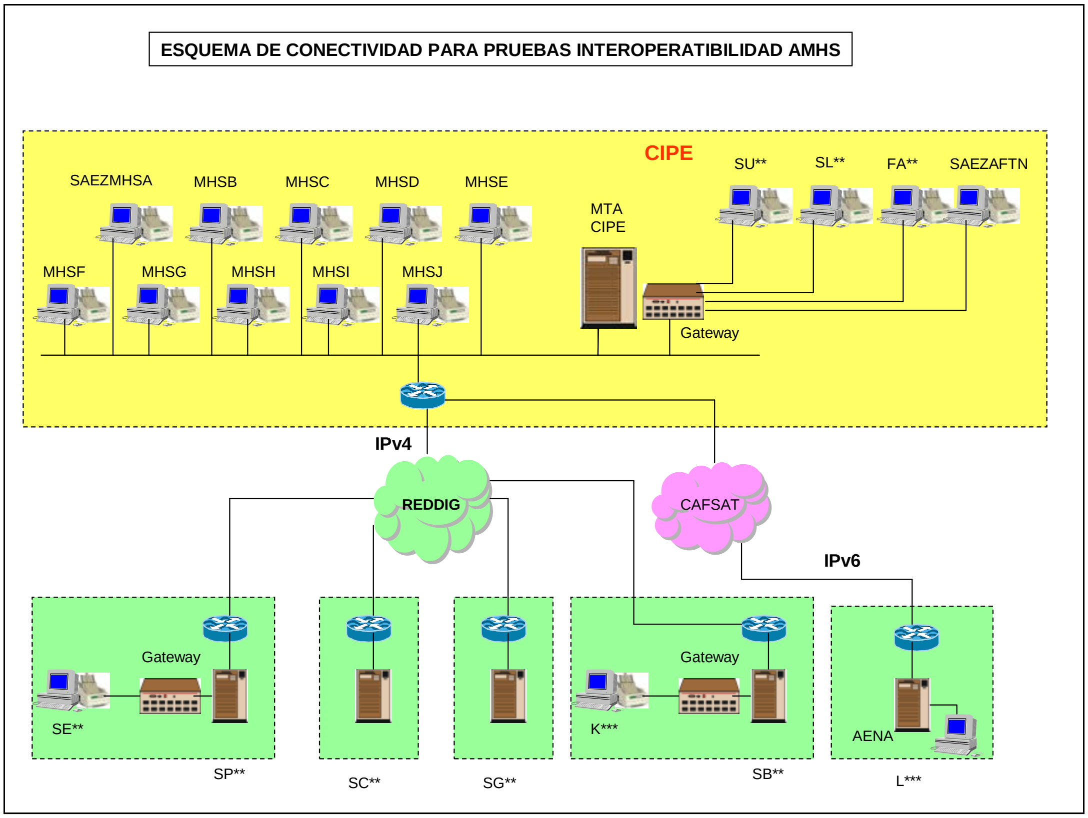
6.13 In this respect, by the end of 2012 all SAM States will have their AMHS implemented and operational, pending only French Guiana (France). **Appendix D** shows a list of AMHS installed in the SAM Region.

AMHS interconnection

6.14 The Meeting took note that in the beginning of 2010 the first AMHS interconnection between Colombia and Peru was implemented in the CAR/SAM Regions, through REDDIG. For the interconnection, the IPv4 addressing scheme approved for implementation in the CAR/SAM Regions through GREPECAS Conclusion 16/37, was used.

6.15 In follow-up to Conclusion SAM/IG/6-9, the following SAM States have the respective MoUs on AMHS interconnection drafted and signed: Argentina–Brazil, Argentina–Chile, Argentina–Paraguay, Argentina–Peru, Brazil-Paraguay, Brazil-Peru and Colombia-Peru.

6.16 Argentina prepared the training system on AMHS installed at the CIPE (Ezeiza) to carry out trials with all States having to date an AMHS, in accordance with the following graphic and data table.



6.17 The shadowed areas in the MTA Name, MTA Password, Server Name and IP Address columns should be completed by the States involved, information which was recently requested.

<table>
<tr><th>State</th><th>MTA</th><th>MTA Name</th><th>MTA Password</th><th>Server Name</th><th>IP Address</th><th>PRMD</th><th>O</th><th>OU</th><th>CN</th><th>CIPE Terminals</th></tr>
<tr><td rowspan="11">Argentina</td><td rowspan="14">CIPE</td><td rowspan="14">MTA-CIPE-1</td><td rowspan="14">radiocom</td><td rowspan="14">nodo-CIPE</td><td rowspan="14">10.0.0.1</td><td rowspan="11">SA</td><td rowspan="10">SAEZ</td><td rowspan="10">SAEZ</td><td>SAEZMHSA</td><td rowspan="10">10 AMHS</td></tr>
<tr><td>SAEZMHSB</td></tr>
<tr><td>SAEZMHSC</td></tr>
<tr><td>SAEZMHSD</td></tr>
<tr><td>SAEZMHSE</td></tr>
<tr><td>SAEZMHSF</td></tr>
<tr><td>SAEZMHSG</td></tr>
<tr><td>SAEZMHSH</td></tr>
<tr><td>SAEZMHSI</td></tr>
<tr><td>SAEZMHSJ</td></tr>
<tr><td>Gateway</td><td></td><td>SAEZFTNA</td><td rowspan="4">4 AFTN</td></tr>
<tr><td>Bolivia</td><td>SL</td><td>Gateway</td><td></td><td>SL******</td></tr>
<tr><td>Uruguay</td><td>SU</td><td>Gateway</td><td></td><td>SU******</td></tr>
<tr><td>South Africa</td><td>FA</td><td>Gateway</td><td></td><td>FA******</td></tr>
<tr><td>Paraguay</td><td>Asunción</td><td></td><td></td><td></td><td></td><td>SG</td><td colspan="3"></td><td></td></tr>
</table>

State	MTA	MTA Name	MTA Password	Server Name	IP Address	PRMD	O	OU	CN	CIPE Terminals
Brazil	Brasilia					SB				
USA						K*	Gateway		K*******	
Perú	Lima					SP				
Ecuador						SE	Gateway		SE******	
Chile	Santiago					SC				
Spain	Madrid					LM				

6.18 In this respect, the Meeting took note that any State wishing to make AMHS interconnection tests had only to send the above indicated information to Argentina and upload the MTA to be interconnected with the ten AMHS terminal addresses indicated in the connectivity scheme. In this manner, manufacturer dependency was avoided, fact which was currently delaying AMHS interconnection. The focal point in Argentina for this test is Mr. Omar Gouarnalusse.

6.19 In view of the configuration installed by Argentina, pre-operational AMHS trials have been coordinated in CIPE to be carried out between Argentina-Brazil and Argentina-Peru during the week of 30 May to 3 June 2011, and tests between Brazil-Peru through the CIPE MTA, during the week of 6 to 10 June 2011.

6.20 Brazil signed the MoU for AMHS interconnection with Colombia. In this regard, the MoU will be sent to Colombia for its signature and later remittance to the SAM Regional Office by 30 June 2011.

6.21 In addition, Chile handed to Peru a revised MoU; Peru informed it would examine and sign the MoUit for its later remittance to Chile. Also, Venezuela coordinated with Brazil and Peru on the drafting of the respective MoUs. With regard to the interconnection between Brazil and Venezuela, the Meeting took note that the MoU would be signed at the SAM/IG/8 meeting.

6.22 In this respect, the regional action plan for AMHS interconnection was amended and is shown in **Appendix E** to this part of the report.

6.23 In addition, the Meeting considered that, in view of the changes in the implementation dates of the AMHS and AIDC systems in the SAM Region, the Secretariat would send FASID Table CNS 1Bb by the end of June 2011 to the States of the SAM Region for its review.

Assessment of operational requirements for determining the implementation of navigation capability improvements

Navigation activities in support of PBN

6.24 The Meeting analyzed the PBN supporting air navigation systems project of the CNS/ATM Subgroup’s PBN Programme with the aim of aligning it with the SAM PBN programme, in view of GREPECAS Decisions 16/45 and 16/47 approving the new GREPECAS structure and transforming the Subgroups into programmes and projects for the CAR Region and SAM Region.

6.25 As a result of the review to the afore indicated project, the Meeting took the following under consideration:

6.25.1 Activity A2.1 - *Feasibility of regional application, technical aspects, operational benefits, associated costs, for an SBAS (WAAS/SACSA) implementation*. Implications for airborne equipment (factory delivered and retrofits) and other relevant aspects, would not taken under consideration in the SAM Region in the short and medium term (2012-2018), since there was no SBAS requirement for PBN implementation. With regard to the studies for SBAS implementation, there is a completed study carried out by RLA/00/009 project (WAAS type SBAS trial), and RLA/03/902 project, is currently carrying out studies for the implementation of a SBAS system.

6.25.2 With regard to Activity A2.2 - *Provide practical guidance for the implementation of GBAS systems*, the Meeting noted the offer made by Brazil to draft practical guidance material for the implementation of GBAS systems in the SAM Region. The guide would be presented at SAM/IG/8 meeting.

6.25.3 As to Activity A2.3 - *Review and update the regional conventional navaids infrastructure Table FASID-AIP and ICAO List 1 and List 2*, the Secretariat would be presenting at next SAM/IG/8 meeting with a new Table CNS 3 model including PBN elements, with the aim that the States of the Region can examine and complete it. In addition, the Secretariat will circulate the ICAO Lists 1 and 2 to all SAM States for their review.

6.25.4 The Meeting considered that in Activity A 2.4 - *Analyse the DME/DME and GNSS infrastructure and coverage supporting PBN implementation*, the deliverable analysis of the DME/ DME and GNSS infrastructure supporting PBN implementation had been completed, as it had been presented and examined during this SAM/IG/7 meeting. The coverage study was carried out through the EMACS tool, and the result delivered was an KMZ file permitting DME DME coverage visualization over a SAM Region geographical map through Google Earth.

6.26 In addition, the Meeting took note of the DME DME coverage verification for each RNAV route segment of the Region (between two fixed), in order that said information serve as support to SAM States for the publication in the AIPs of the DME DME coverage degree at each RNAV route segment (partial, total and no coverage). The result of the verification is shown in **Appendix F** to this Agenda Item.

6.27 In this respect, the Meeting deemed it convenient that the DME DME coverage study in support of RNAV5, as well as the DME DME coverage verification for each route segment, should be examined by the SAM States, by formulating the following conclusion:

Conclusion SAM/IG/7-5 Review of the DME DME coverage in support of RNAV5 in the SAM Region

That the SAM States examine the DME DME coverage study in support of RNAV5 presented as an KMZ file during SAM/IG/7 meeting, as well as the DME DME coverage analysis for each RNAV route segment shown in Appendix F to this part of the report, and send their comments to the ICAO SAM Regional Office no later than 30 June 2011.

6.28 In addition, the Meeting considered that, in order to keep the DME/DME coverage in the SAM Region updated to support RNAV-5 routes, States must keep the ICAO SAM Regional Office informed about any changes in the existing DME facilities. In this respect, the Meeting formulated the following Conclusion:

Conclusion SAM/IG/7-6 Updating of the DME DME study

That SAM States, when making any changes to DME systems, inform the ICAO SAM Regional Office so that it may update and distribute the DME DME coverage study to support RNAV-5.

6.29 With regard to Activity A2.5 - *Development of guidance on use of and available tools required for assessment of GNSS performance and service prediction*, the Meeting took note that for RNAV5, the RAIM availability prediction would be determined by the continuous availability of the 24 GPS constellation satellites. Further information on this topic is found in Agenda Item 4, paras. 4.11 to 4.13.

6.30 The Meeting took note of the referential costs of three options presented by VOLPE for the implementation of a RAIM availability prediction service in the SAM Region, which should be used in support of PBN applications in route, terminal and approach areas. In this respect, the Meeting considered that, in order to complete the cost analysis of the RAIM availability prediction tool, SAM/IG/8 meeting would be presented with RAIM availability prediction quotations from other companies.

6.31 Also, the Meeting noted that Colombia had implemented the RAIM availability prediction service through the EMACS (ElectroMagnetic Airport Control & Survey) application for the support of PBN applications, and that this service could be expanded for all the SAM Region.

6.32 In this respect, Colombia informed the Meeting it would analyze the possibility of widening the RAIM availabilty prediction for the SAM States through the use of the EMACS application, and inform of the results to the ICAO SAM Regional Office by 30 June 2011.

Assessment of operational requirements to determine the implementation of surveillance capability improvements

6.33 The Meeting analyzed the activities of the Improve ATM situational awareness project of the CNS/ATM Subgroup's ATM automation and situational awareness programme with the aim of aligning it with the CNS improvement activities for the SAM Region, in view of GREPECAS Decisions 16/45 and 16/47 approving the new GREPECAS structure and transforming the Subgroups into programmes and projects for the CAR Region and SAM Region.

6.34 The Meeting deemed it convenient that the Coordinator for the SAM Improve ATM situational awareness project be Mr. Paulo Vila of Peru. In this respect, as first a task, the Coordinator will draft a SAM action plan, using the CNS/ATM Subgroup's ATM situational awareness action plan as a base. The initial action plan will be presented at the web conference call of 16 June 2011.

6.35 As deliverables of the action plan on ATM situational awareness, the Meeting considered: to draft an implementation strategy for the implementation of surveillance systems for the SAM Region, taking as a base the CAR/SAM surveillance strategy and the Performance based air navigation system implementation plan for the SAM Region (PBIP); and the guidelines for the operational implementation of ADS B, as well as data exchange (initial steps towards the operational implementation of ADS B), taking into consideration the Surveillance Manual, Doc 9924, and Circular 311.

6.36 The Secretariat would present SAM/IG/8 meeting with the initial results of the ICAO studies developed for the twelfth Air Navigation Conference (AN-CONF/12) on aspects related with the automated systems at the various ATS units.

Miscellaneous

6.37 During the Meeting, with regard to the CNS systems improvements, the following information papers were presented:

a) IP/7 - Introduction to automatic dependent surveillance-broadcast (ADS-B) in Brazilian airspace (presented by Brazil);
b) IP/10 – Activities carried out by Brazil to upgrade the DATA-LINK system (presented by Brazil);
c) IP/12 – OPTIMI (Oceanic Position Tracking Improvement and Monitoring) (presented by Brazil);
d) IP/16 – Flight inspection activities in Brazil (presented by Brazil);
e) IP/17 – Activities undertaken by Brazil for the deployment of GBAS (Ground Based Augmentation System) (presented by Brazil); and
f) IP/19 - Improvement of CNS systems en Argentina (Spanish only) (presented by Argentina).

APPENDIX A

AERONAUTICAL TELECOMMUNICATIONS NETWORK OF THE SAM REGION (SAM ATN)

STUDY FOR THE IMPLEMENTATION OF A NEW DIGITAL NETWORK FOR THE SAM REGION

SAM ATN NETWORK

(REDDIG II)

TABLE OF CONTENTS

REFERENCES

- Final Report of the Fifth Workshop/Meeting of the SAM Implementation Group (SAM/IG/5), Lima, 10-14 May 2010;
- RCC/13 report – Financial Status of Project RLA/03/901;
- Air Navigation Plan for the Caribbean and South American Regions – FASID – Tables CNS1A and CNS1C;
- Table CNS 1Ba – Regional Plan for Routers / SAM Region;
- REDDIG Channelling Plan, V. June 2010, provided by the REDDIG Administrator;
- Manaus AMHS documents – Ezeiza tests;
- Ezeiza AMHS documents – Ezeiza tests;
- Informal quote of *Telefónica SA* for a South American ground network;
- Informal quote of *Empresa Brazileira de Telecomunicaciones* (EMBRATEL) for a South American ground network;
- Informal quote of *Global Crossing Latin America* for a South American ground network;
- Telesat quotes for Brazil; and
- SES quote for the MEVA II – REDDIG interconnection.

GLOSSARY OF TERMS

- ATN Aeronautical Telecommunication Network
- FOB Free on Board, as defined in the INCOTERMS (International Commercial Terms) and published by the ICC (International Chamber of Commerce)
- ISO International Organization for Standardization
- MPLS Multiprotocol Label Switching
- OPEX Operating Expenditure
- OSI Open System Interconnection
- RFC Request for Comments
- SLA Service Level Agreement
- QoS Quality of Service
- VPN Virtual Private Network

INTRODUCTION

1. The Fifth Workshop/Meeting of the SAM Implementation Group (SAM/IG/5), held in Lima on 10-14 May 2010 and sponsored by Regional Project RLA/06/901, considered the conduction of studies on the implementation of a new regional satellite, ground, or mixed (satellite and ground) digital network to serve as the backbone for the SAM Aeronautical Telecommunication Network (SAM ATN), which shall support the current aeronautical fixed voice and data requirements, the exchange of radar and flight plan data, as well as the new ground-ground ATN applications between SAM States/Territories, foreseen to be implemented in the short and medium term.

2. In this regard, *Appendix B to the Report on Agenda Item 6* of the cited workshop clearly describes the Action plan for the implementation of a new digital network in the SAM Region, listing a programme of activities, actions and deliverables.

3. In this regard, the deliverables corresponding to activities 1 to 10, inclusive, are organised according to the following structure:

3.1 *Chapter 1*: Service requirements in support of air navigation in the SAM Region, including those foreseen for the short, medium and long term.

3.2 *Chapter 2*: Interfaces and bandwidth required to support the specified requirements.

3.3 *Chapter 3*: Definition and cost of a satellite REDDIG II structure model.

3.4 *Chapter 4*: Definition and cost of a ground REDDIG II structure model.

3.5 *Chapter 5*: Comparative study of the REDDIG II satellite and ground models and costs.

3.6 *Chapter 6*: Analysis of the mixed model and proposal of a final infrastructure.

4. First of all, some clarifications regarding the *SAM Aeronautical Telecommunication Network (SAM ATN)* are in order to define the work to be carried out subsequently.

5. The SAM ATN will be based on IP. Thus, its core structure will be made up by routers linking the domestic services (either current or future) to the backbone access; that is, to the new digital network.

6. So as not to have a common point of failure, each State will have a dual router. Thus, the basic operating scheme will be that shown at the end of this chapter, in Figure 1.

7. There we can see that, regardless of the technology available in each State, all services are connected to the routers, either directly or through the existing LAN.

8. Some possible options are listed below:

8.1 ATS speech service or teleconference, without PABX or VCS, with the telephone connected directly to the router.

8.2 ATS speech service or teleconference, with PABX or VCS, with interfaces connected directly to the router.

8.3 ATS speech service or teleconference, with PABX or VCS, connected to the LAN.

8.4 AFTN service, with the terminal connected to the corresponding router interface.

8.5 AFTN/AMHS service, with servers and terminals connected to the LAN.

8.6 Automated systems and their terminals, connected to the LAN.

9. Finally, it should be noted that, in order to distinguish the current digital network (REDDIG) from the new digital network, the latter will hereinafter be called as REDDIG II, without this meaning that this should be its definitive name in the future.

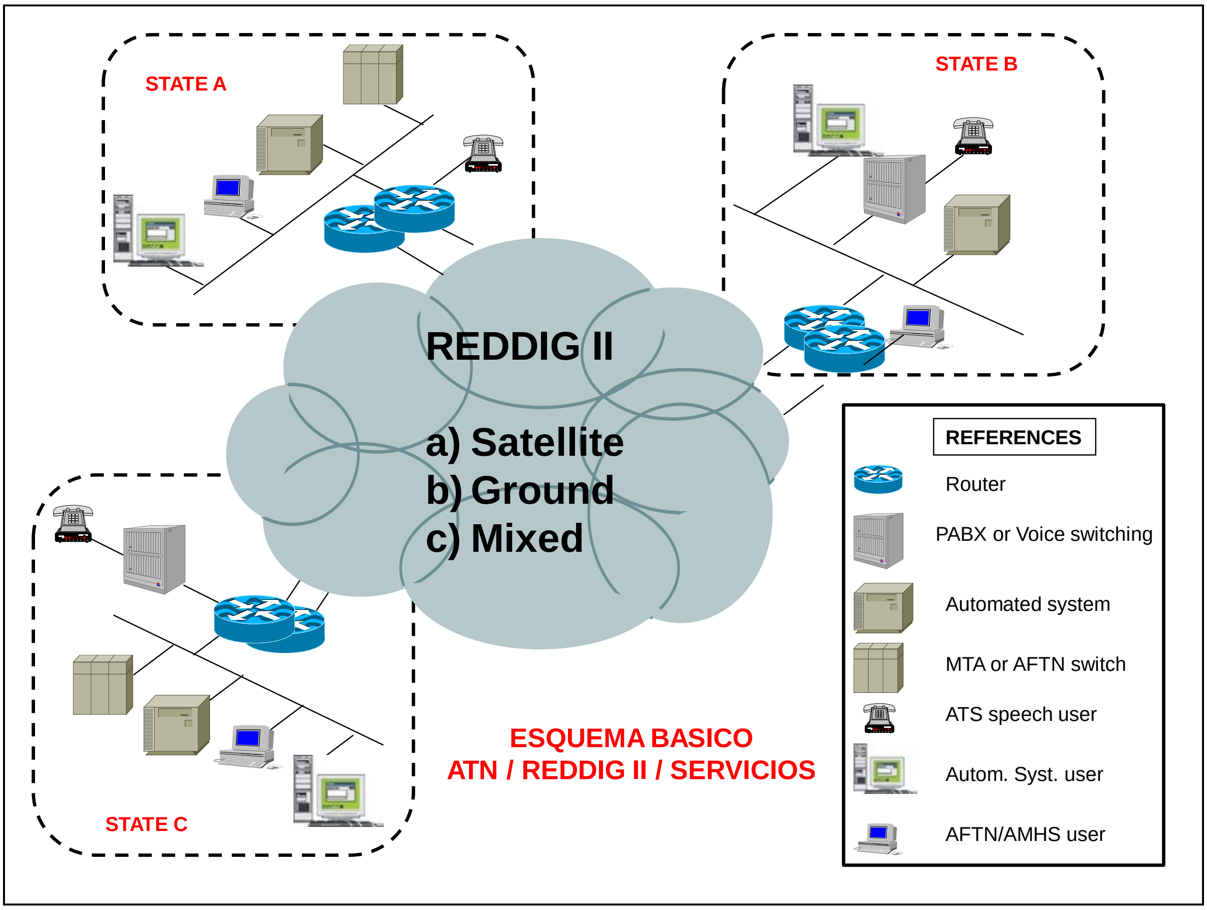


Figure 1: Basic ATN-REDDIG II--Service scheme

Chapter 1 - Service Requirements to Support Air Navigation in the SAM Region, Including those foreseen for the Short, Medium and Long Term

1. The list of services in support of air navigation in the SAM Region, including those foreseen for the short, medium and long term, to be carried by the new digital network include:

1.1 Current services:

1.1.1 Those resulting from the requirements contained in the Air Navigation Plan for the Caribbean and South American Regions, and which are almost fully operational to date, namely:

1.1.1.1 Table CNS1A (AFTN Plan)

1.1.1.2 Table CNS1C (ATS direct speech circuit plan)

1.2 Future services:

1.2.1 Those emerging from the MEVA II – REDDIG interconnection.

1.2.2 The teleconference service for flow management units (FMU) or flow management positions (FMP) to be provided on a daily basis between all units in the Region, initially for twenty users.

1.2.3 The exchange of flight plans and/or radar information, using conventional methods, according to the respective MoUs (Memoranda of Understanding) already signed or to be signed.

1.2.4 AMHS interconnection requirements, gradually replacing the AFTN service, according to the respective MoUs signed or to be signed.

1.2.5 AIDC interconnection requirements, gradually replacing the ATS speech service.

1.2.6 ADS-B data exchange and multilateration between all the ACCs of adjacent FIRs.

1.2.7 The interconnection of automated systems, using Asterix 62 and 63, of all the ACCs of adjacent FIRs.

1.2.8 AIM requirements: to date, there are no concrete requirements.

Chapter 2 – Interfaces and Bandwidths Required to Support the Specified Requirements

1. This Chapter and its Appendices analyse in detail the various services to be maintained (current) or provided (future) by the ATN, which determines the minimum *interfaces* that the routers to be installed in each State should have.

2. The existing interfaces that are needed to maintain the MEVA II – REDDIG interconnection have been included in the respective tables.

3. On the other hand, the interfaces of services that correspond to the AFI (Brasilia – Johannesburg, Brasilia – Dakar – both *via* Recife – and Ezeiza – Johannesburg), EUR (Brasilia - Madrid, Venezuela – Madrid) and ASIA/PAC (Santiago - Brisbane and Santiago – Christchurch (circuits specified in the Plan. In this respect, Chile has informed same would not be implemented)) Regions have been excluded since they use PTT or CAFSAT, and therefore are not related to the problems being addressed.

4. Likewise, an estimate is made of the additional *bandwidth* that will be required from the REDDIG II for the new services, based on the tests conducted and other specified parameters.

5. At the end of this chapter, the following appendices are included:

5.1 *Appendix A*: Interfaces and additional bandwidth for the AFTN.

5.2 *Appendix B*: ATS speech interfaces and additional bandwidth.

5.3 *Appendix C*: Interfaces and additional bandwidth for radar data exchange.

5.4 *Appendix D*: Interfaces and additional bandwidth for teleconferencing.

5.5 *Appendix E*: Interfaces and additional bandwidth for AMHS.

5.6 *Appendix F*: Interfaces and additional bandwidth for AIDC.

5.7 *Appendix G: Interfaces and additional bandwidth for the exchange between automated systems.*

5.8 *Appendix H: Interfaces and additional bandwidth for ADS-B.*

5.9 *Appendix I*: Modification of Table CNS 1Ba – Regional Routers Plan / SAM Region.

6. **Summary of results**

6.1 Based on the individual summaries provided in each of the aforementioned appendices, Tables 2-1 (Interfaces required for routers) and 2-2 (Approximate additional bandwidth) are shown below:

6.1.1 Interfaces

State	Location	Minimum interfaces					
		Universal I/O	Ethernet	Digital	E&M	FXO	FXS
Argentina	Ezeiza	11	1	0	11	0	1
Bolivia	La Paz	4	1	0	4	0	4
Brazil	Curitiba	4	1	0	6	2	1
	Manaus	6	1	0	7	0	5
	Recife	1	1	0	7	0	1
Chile	Santiago	2	1	0	8	0	0
Colombia	Bogota	7	1	1	0	0	0
Ecuador	Guayaquil	3	1	1	0	0	0
French Guiana	Rochambeau	2	1	0	0	0	5
Guyana	Georgetown	4	1	0	0	0	5
Paraguay	Asunción	3	1	0	3	0	3
Peru	Lima	9	1	1	0	0	0
Suriname	Paramaribo	3	1	0	0	0	4
Trinidad and Tobago	Piarco	2	1	0	0	0	6
Uruguay	Montevideo	2	1	0	0	4	5
Venezuela	Maiquetía	10	1	0	7	0	4

Table 2-1: Interfaces required for routers

6.1.1.1 This table may be modified only if:

a) Any of the Administrations decides to change analogue voice interfaces (E&M, FXO and FXS) for digital ones.
b) If the foreseen exchange of radar signals is conducted through Universal I/O (DB25) instead of Ethernet (RJ45).

6.1.2 Additional bandwidth

6.1.2.1 The rules for the preceding calculation are presented in the respective appendices and from their application it may be assumed that the estimate must be used only as guidance.

6.1.2.2 However, it should be noted that what is not used in the AFTN shall be deducted from the cited increases, since the service is either AFTN or AMHS, never in parallel.

6.1.2.3 Therefore, the value obtained from Table 2A-1 is inserted in the final lines of Table 2-2, providing the net value of the required increase in bandwidth.

State	**Location**	**Service (each in Kbps)**			
		AFTN	**Radar**	**AMHS**	**ADS-B**
Argentina	Ezeiza		76.8	28.8	19.2
Bolivia	La Paz		115.2	14.4	19.2
Brazil	Curitiba		76.8	19.2	19.2
	Manaus	9.6	134.4	33.6	19.2
	Recife		0	4.8	19.2
Chile	Santiago		57.6	9.6	19.2
Colombia	Bogota	19.2	76.8	38.4	19.2
Ecuador	Guayaquil		38.4	14.4	19.2
French Guiana	Rochambeau		38.4	9.6	19.2
Guyana	Georgetown		57.6	19.2	19.2
Paraguay	Asunción		57.6	9.6	19.2
Peru	Lima	9.6	96	43.2	19.2
Suriname	Paramaribo		76.8	14.4	19.2
Trinidad and Tobago	Piarco		19.2	9.6	19.2
Uruguay	Montevideo		19.2	9.6	19.2
Venezuela	Maiquetía		76.8	38.4	19.2
Partials (Kbps)		38.4	1017.6	316.8	307.2
Overall partial (Kbps)		1680			
AFTN difference		-103.2			
Net bandwidth increase		**1576.8**			

Table 2-2: Estimated additional bandwidth

6.1.2.4 REDDIG II: 1.576.8 Kbps.

Appendix 2A: Required interfaces and additional bandwidth – AFTN

1. In order to determine the **interfaces** required for the routers, Table 2A-1 shows the AFTN circuits of the SAM Region and of Trinidad and Tobago, member of the REDDIG. Individual values of each circuit have been taken from the parameters established in the REDDIG management.

AFTN TABLE			Rate (Kbps)	Installed interfaces
Argentina	Ezeiza	Bolivia (La Paz) MET	1.2	9
		Paraguay (Asunción) MET	2.4	
		Peru (Lima) MET	1.2	
		Bolivia (La Paz)	2.4	
		Chile (Santiago)	2.4	
		Brazil (Curitiba)	2.4	
		Paraguay (Asunción)	2.4	
		Peru (Lima)	2.4	
		Uruguay (Montevideo)	2.4	
Bolivia	La Paz	Argentina (Ezeiza)	2.4	4
		Argentina (Ezeiza) MET	1.2	
		Brazil (Curitiba)	2.4	
		Peru (Lima)	2.4	
Brazil	Curitiba	Argentina (Ezeiza)	2.4	4
		Uruguay (Montevideo)	2.4	
		Paraguay (Asunción)	2.4	
		Bolivia (La Paz)	2.4	
	Manaus	Colombia (Bogota)	2.4	6
		Colombia (Bogota) - USA	9.6	
		Guyana (Georgetown)	2.4	
		French Guiana (Cayenne)	2.4	
		Peru (Lima)	2.4	
		Suriname (Paramaribo)	2.4	
	Recife	Venezuela (Maiquetía)	2.4	1
Chile	Santiago	Argentina (Ezeiza)	2.4	2
		Peru (Lima)	2.4	
Colombia	Bogota	Ecuador (Guayaquil)	2.4	7
		Brazil (Manaus) - USA	9.6	
		Brazil (Manaus)	2.4	
		Peru (Lima)	9.6	
		Peru (Lima) - USA	2.4	
		Venezuela (Caracas)	2.4	
		Panama (Panama)	2.4	
Ecuador	Guayaquil	Colombia (Bogota)	2.4	3
		Peru (Lima)	2.4	
		Venezuela (Maiquetía)	2.4	

AFTN TABLE			**Rate (Kbps)**	**Installed interfaces**
French Guiana	Cayenne	Venezuela (Maiquetía)	2.4	2
		Brazil (Manaus)	2.4	
Guyana	Georgetown	Brazil (Manaus)	2.4	4
		Suriname (Paramaribo)	2.4	
		Trinidad and Tobago (Piarco)	2.4	
		Venezuela (Caracas)	2.4	
Panama	Panama	Colombia (Bogota)	2.4	1
Paraguay	Asunción	Argentina (Ezeiza)	2.4	3
		Argentina (Ezeiza) MET	2.4	
		Brazil (Curitiba)	2.4	
Peru	Lima	Venezuela (Maiquetía)	2.4	9
		Argentina (Ezeiza)	2.4	
		Argentina (Ezeiza) MET	1.2	
		Bolivia (La Paz)	2.4	
		Brazil (Manaus)	2.4	
		Chile (Santiago)	2.4	
		Colombia (Bogota) - USA	9.6	
		Colombia (Bogota)	2.4	
		Ecuador (Guayaquil	2.4	
Suriname	Paramaribo	Brazil (Manaus)	2.4	3
		Venezuela (Maiquetía)	2.4	
		Guyana (Georgetown)	2.4	
Trinidad and Tobago	Piarco	Venezuela (Maiquetía)	2.4	2
		Guyana (Georgetown)	2.4	
Uruguay	Montevideo	Argentina (Ezeiza)	2.4	2
		Brazil (Brasilia)	2.4	
Venezuela	Maiquetía	Peru (Lima)	2.4	10
		Ecuador (Guayaquil)	2.4	
		Brazil (Recife)	2.4	
		Colombia (Bogota)	2.4	
		Guyana (Georgetown)	2.4	
		Suriname (Paramaribo)	2.4	
		French Guiana (Cayenne)	2.4	
		Curaçao ACC	2.4	
		San Juan ACC	2.4	
		Trinidad and Tobago (Piarco)	2.4	
Current AFTN bandwidth			103.2	

Table 2A-1: AFTN Interfaces

2. Bandwidth: The only two additional requirements of 9.6 Kbps each, with final destination in Atlanta (USA), both *via* Colombia (Bogota), with end points in Brazil (Manaus) and Peru (Lima) have been highlighted in colour. Accordingly, the additional AFTN bandwidth is: 38.4 Kbps.

Appendix 2B: Required interfaces and additional bandwidth - Speech ATS

1. In order to determine the **interfaces** required for the routers, Table 2B-1 shows the ATS speech service requirements of the SAM Region and of Trinidad and Tobago, member of the REDDIG.

2. Likewise, for a better understanding, Table CNS1C (direct and switched) shows both the foreseen circuits as well as those effectively installed in the REDDIG.

ATS TABLE			ATS Req. CNS1C			REDDIG		Installed voice interfaces			
			Direct	Switched		Direct	Switch	E1 Digital	E&M	FXO	FXS
				Partial	Total						
Argentina	Ezeiza	Bolivia (La Paz)		1	14		5	0	11	0	1
		Chile (Santiago)	1	6		1					
		Brazil (Curitiba)		3							
		Paraguay (Asunción)		1							
		Uruguay (Montevideo)	4	3		4					
		Administrative					2				
Bolivia	La Paz	Argentina (Buenos Aires)		1	7		3	0	4	0	4
		Chile (Santiago)		1							
		Brazil (Manaus)		1		1					
		Brazil (Curitiba)		2							
		Paraguay (Asunción)		1							
		Peru (Lima)		1		1					
		Administrative					3				
Brazil	Curitiba	Argentina (Buenos Aires)		3	9		4	0	6	2	1
		Uruguay (Montevideo)		1		1					
		Paraguay (Asunción)		3		1					
		Bolivia (La Paz)		2							
		Administrative					3				
	Manaus	Colombia (Bogota)		1	7	3	3	0	7	0	5
		Guyana (Georgetown)		1							
		French Guiana (Cayenne)		1							
		Bolivia (La Paz)		1		1					
		Venezuela (Maiquetía)		1		1					
		Peru (Lima)		1							
		Suriname (Paramaribo)		1							
		Administrative					4				
	Recife	Uruguay (Montevideo)		1	2		5	0	7	0	1
		French Guiana (Cayenne)		1							
		Administrative					3				
Chile	Santiago	Argentina (Buenos Aires)	1	6	8	1	4	0	8	0	0
		Bolivia (La Paz)		1							
		Peru (Lima)		1		1					
		Administrative					2				

ATS TABLE			ATS Req. CNS1C			REDDIG		Installed voice interfaces			
			Direct	Switched		Direct	Switch	E1 Digital	E&M	FXO	FXS
				Partial	Total						
Colombia	Bogota	Panama (Panama)		5	13	1	7	1	0	0	0
		Cenamer ACC		1							
		Kingston ACC		1							
		Curaçao ACC		1							
		Ecuador (Guayaquil)	2	2		1					
		Brazil (Manaus)		3		3					
		Peru (Lima)		2		1					
		Venezuela (Maiquetía)		1		2					
		Administrative					2				
Ecuador	Guayaquil	Colombia (Bogota)	2	2	3	1	4	1	0	0	0
		Peru (Lima)		1		1					
		Cenamer ACC									
		Administrative					3				
French Guiana	Cayenne	Piarco ACC		1	4	1	2	0	0	0	5
		Brazil (Recife)		1							
		Brazil (Manaus)		1							
		Suriname (Paramaribo)		1							
		Administrative					2				
Guyana	Georgetown	Piarco ACC		1	4	1	3	0	0	0	5
		Brazil (Manaus)		1							
		Suriname (Paramaribo)		1							
		Venezuela (Maiquetía)		1							
		Administrative					1				
Panama	Panama	Colombia (Bogota)	3	2	3	N/A	N/A	N/A	N/A	N/A	N/A
		Kingston ACC		1							
		Cenamer ACC	2								
Paraguay	Asunción	Argentina (Buenos Aires)		1	4		1	0	3	0	3
		Bolivia (La Paz)		1							
		Brazil (Curitiba)	1	2		1					
		Administrative					4				
Peru	Lima	Bolivia (La Paz)		1	6	1	5	2	0	0	0
		Brazil (Manaus)		2							
		Chile (Santiago)		1		1					
		Colombia (Bogota)		1		1					
		Ecuador (Guayaquil		1		1					
		Administrative					3				
Suriname	Paramaribo	Brazil (Manaus)		1	4		2	0	0	0	4
		French Guiana (Cayenne)		1							
		Guyana (Georgetown)		1							
		ACC Piarco		1		1					
		Administrative					1				

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<tr><th>Partial</th><th>Total</th></tr>
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<tr><td>Administrative</td><td></td><td></td><td></td><td></td><td>1</td></tr>
</table>

Table 2B-1: ATS speech service interfaces

3. Additional ATS speech bandwidth: There are no additional requirements for this service.

Appendix 2C: Required interfaces and additional bandwidth - Radar data

1. In order to determine the **interfaces** required for the routers, Table 2C-1 shows the radar data exchange service, listing the circuits going from each State to the adjacent routers. It includes synchronous circuits (through DB25 ports) as well as those transmitted *via* Ethernet interfaces:

Radar exchange to automated centre			**Signal generation**				**Interfaces**	
			Serial		**Ethernet**			
			Tx	**Rx**	**Tx**	**Rx**	**Serial**	**Ether.**
Argentina	Ezeiza	Bolivia (La Paz)	0	TBD	1	TBD	TBD	1
		Chile (Santiago)	TBD	TBD	4	TBD	TBD	
		Brazil (Curitiba)	0	TBD	2	TBD	TBD	
		Paraguay (Asunción)	0	TBD	2	TBD	TBD	
		Uruguay (Montevideo)	1	1	1	TBD	2	
Bolivia	La Paz	Argentina (Buenos Aires)	TBD	TBD	TBD	TBD	0	1
		Chile (Santiago)	TBD	TBD	TBD	TBD	TBD	
		Brazil (Manaus)	TBD	TBD	TBD	TBD	TBD	
		Brazil (Curitiba)	TBD	TBD	TBD	TBD	TBD	
		Paraguay (Asunción)	TBD	TBD	TBD	TBD	TBD	
		Peru (Lima)	TBD	TBD	TBD	TBD	TBD	
Brazil	Curitiba	Argentina (Buenos Aires)	TBD	TBD	TBD	TBD	TBD	1
		Uruguay (Montevideo)	TBD	TBD	TBD	TBD	TBD	
		Paraguay (Asunción)	TBD	TBD	TBD	TBD	TBD	
		Bolivia (La Paz)	TBD	TBD	TBD	TBD	TBD	
	Manaus	Colombia (Bogota)	TBD	TBD	TBD	TBD	TBD	1
		Guyana (Georgetown)	TBD	TBD	TBD	TBD	TBD	
		French Guiana (Cayenne)	TBD	TBD	TBD	TBD	TBD	
		Bolivia (La Paz)	TBD	TBD	TBD	TBD	TBD	
		Peru (Lima)	TBD	TBD	TBD	TBD	TBD	
		Venezuela (Maiquetía)	TBD	TBD	TBD	TBD	TBD	
		Suriname (Paramaribo)	TBD	TBD	TBD	TBD	TBD	
Chile	Santiago	Argentina (Buenos Aires)	TBD	TBD	TBD	TBD	TBD	1
		Bolivia (La Paz)	TBD	TBD	TBD	TBD	TBD	
		Peru (Lima)	TBD	TBD	TBD	TBD	TBD	
Colombia	Bogota	Panama (Panama) (*)	TBD	TBD	TBD	TBD	TBD	1
		Cenamer ACC (*)	TBD	TBD	TBD	TBD	TBD	
		Kingston ACC (*)	TBD	TBD	TBD	TBD	TBD	
		Curaçao ACC (*)	TBD	TBD	TBD	TBD	TBD	
		Ecuador (Guayaquil)	TBD	TBD	TBD	TBD	TBD	
		Brazil (Manaus)	TBD	TBD	TBD	TBD	TBD	
		Peru (Lima)	TBD	TBD	TBD	TBD	TBD	
		Venezuela (Maiquetía)	TBD	TBD	TBD	TBD	TBD	

Radar exchange to automated centre			**Signal generation**				**Interfaces**	
			Serial		**Ethernet**			
			Tx	**Rx**	**Tx**	**Rx**	**Serial**	**Ether.**
Ecuador	Guayaquil	Colombia (Bogota)	TBD	TBD	TBD	TBD	TBD	1
		Peru (Lima)	TBD	TBD	TBD	TBD	TBD	
French Guiana	Cayenne	Brazil (Manaus)	TBD	TBD	TBD	TBD	TBD	1
		Suriname (Paramaribo)	TBD	TBD	TBD	TBD	TBD	
Guyana	Georgetown	Brazil (Manaus)	TBD	TBD	TBD	TBD	TBD	1
		Suriname (Paramaribo)	TBD	TBD	TBD	TBD	TBD	
		Venezuela (Maiquetía)	TBD	TBD	TBD	TBD	TBD	
Panama (*)	Panama (*)	Colombia (Bogota)	N/A	N/A	N/A	N/A	N/A	N/A
		Kingston ACC (*)						
		Cenamer ACC (*)						
Paraguay	Asunción	Argentina (Buenos Aires)	TBD	TBD	TBD	TBD	TBD	1
		Bolivia (La Paz)	TBD	TBD	TBD	TBD	TBD	
		Brazil (Curitiba)	TBD	TBD	TBD	TBD	TBD	
Peru	Lima	Bolivia (La Paz)	TBD	TBD	TBD	TBD	TBD	1
		Brazil (Manaus)	TBD	TBD	TBD	TBD	TBD	
		Chile (Santiago)	TBD	TBD	TBD	TBD	TBD	
		Colombia (Bogota)	TBD	TBD	TBD	TBD	TBD	
		Ecuador (Guayaquil	TBD	TBD	TBD	TBD	TBD	
Suriname	Paramaribo	Brazil (Manaus)	TBD	TBD	TBD	TBD	TBD	1
		French Guiana (Cayenne)	TBD	TBD	TBD	TBD	TBD	
		Guyana (Georgetown)	TBD	TBD	TBD	TBD	TBD	
		ACC Piarco	TBD	TBD	TBD	TBD	TBD	
Trinidad and Tobago	Piarco	ACC San Juan (*)	TBD	TBD	TBD	TBD	TBD	1
		Venezuela (Maiquetía)	TBD	TBD	TBD	TBD	TBD	
Uruguay	Montevideo	Argentina (Buenos Aires)	1	1	TBD	TBD	0	1
		Brazil (Brasilia)	TBD	TBD	TBD	TBD	TBD	
Venezuela	Maiquetía	ACC Piarco (*)	TBD	TBD	TBD	TBD	TBD	1
		ACC Curaçao (*)	TBD	TBD	TBD	TBD	TBD	
		ACC San Juan (*)	TBD	TBD	TBD	TBD	TBD	
		Brazil (Manaus)	TBD	TBD	TBD	TBD	TBD	
		Colombia (Bogota)	TBD	TBD	TBD	TBD	TBD	
		Guyana (Georgetown)	TBD	TBD	TBD	TBD	TBD	

Table 2C-1: Radar data exchange service interfaces

(*): States or ACCs that do not belong to the REDDIG. Consequently, although the interfaces are foreseen, the required bandwidth is be calculated.

TBD: to be developed.

2. Additional bandwidth

2.1 A quick review of the table above clearly shows that the additional bandwidth requirement for the exchange of radar data depends exclusively on the MoUs (Memoranda of Understanding) signed or to be signed by the States.

2.2 In this regard, in order to have an initial calculation, it is estimated that each State will transmit and receive either data from a radar or summarised information from its neighbouring States, giving a total of 106 signals (53 transmitted and 53 received).

2.3 Therefore, consideration should be given to the following bandwidth increases contained in Table 2C – 2:

Radar exchange with automated centre		**Total Tx/RX**	**BW (Kbps)**
Argentina (*)	Ezeiza	8	76.8
Bolivia	La Paz	12	115.2
Brazil	Curitiba	8	76.8
	Manaus	14	134.4
Chile	Santiago	6	57.6
Colombia (+)	Bogota	8	76.8
Ecuador	Guayaquil	4	38.4
French Guiana	Cayenne	4	38.4
Guyana	Georgetown	6	57.6
Paraguay	Asunción	6	57.6
Peru	Lima	10	96
Suriname	Paramaribo	8	76.8
Trinidad and Tobago	Piarco	2	19.2
Uruguay (*)	Montevideo	2	19.2
Venezuela (+)	Maiquetía	8	76.8
Total additional bandwidth			**1017.6**

Table 2C-2: Foreseen bandwidth increases

(*): For Argentina and Uruguay, exchange consumption since 1999 has not been included, since it forms part of the current bandwidth of the REDDIG.

(+): For Colombia and Venezuela, only the links with the REDDIG States have been taken into account.

2.4 Additional bandwidth for the exchange of radar data: 1017.6 Kbps.

Appendix 2D: Required interfaces and additional bandwidths – Teleconferencing

1. Table 2D-1 identifies the **interfaces** required for the routers for the teleconferencing service, listing the flow management units/flow management positions to be interconnected.

Teleconferencing		FMU/ FMP (*)	Interfaces	
			E&M FXS	Digital E1
Argentina	Ezeiza	1	1	
	Mendoza	1		
	Córdoba	1		
	Resistencia	1		
	Comodoro Rivadavia	1		
Bolivia	La Paz	1	1	
Brazil	Curitiba	1	1	
	Manaus	1		
	Atlántico	1		
	Brasilia	1		
	Recife	1		
Chile	Santiago	1	1	
	Puerto Montt	1		
	Punta Arenas	1		
Colombia	Bogota	1		1
	Cali	1		
	Medellín	1		
	Barranquilla	1		
Ecuador	Guayaquil	1		1
French Guiana	Rochambeau	1	1	
Guyana	Georgetown	1	1	
Paraguay	Asunción	1	1	
Peru	Lima	1		1
Suriname	Paramaribo	1	1	
Trinidad and Tobago	Piarco	1	1	
Uruguay	Montevideo	1	1	
Venezuela	Maiquetía	1	1	

Table 2D-1: Required (existing) interfaces for the teleconferencing service

2. **Additional bandwidth for teleconferencing:** For this non-permanent service, it is estimated that the interfaces and remaining bandwidth capacity of the REDDIG are sufficient to absorb the demand, even during peak voice and data traffic. Therefore, **no additional bandwidth is required**.

Appendix 2E: Required interfaces and additional bandwidth – AMHS

1. In order to determine the minimum bandwidth required for the operation between two MTAs, two tests (Test No. 1 and Test No. 2) were conducted in completely different scenarios.

2. **Test No. 1: Ezeiza (CIPE) MTA – Manaus MTA**

2.1 *IP addresses*: Assigned according to the Regional IP Addressing Plan. The following test scheme was used (Figure 2E-1)

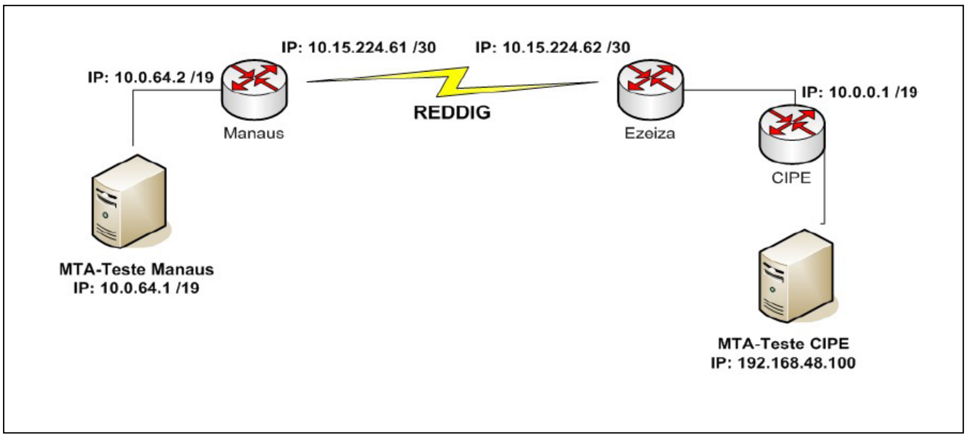


Figure 2E-1: Connectivity scheme

2.2 *Configurations*:

2.2.1 Manaus MTA: PRMD=EG, O=EGGA, OU=EGGA, CN=EGGAXXYY

2.2.2 CIPE MTA: PRMD=SA, O=CIPE, OU=CIPE, CN=CIPE****, (****) ten different terminals.

2.2.3 In this respect, Figure 2E-2 shows the routing configuration in the CIPE MTA.

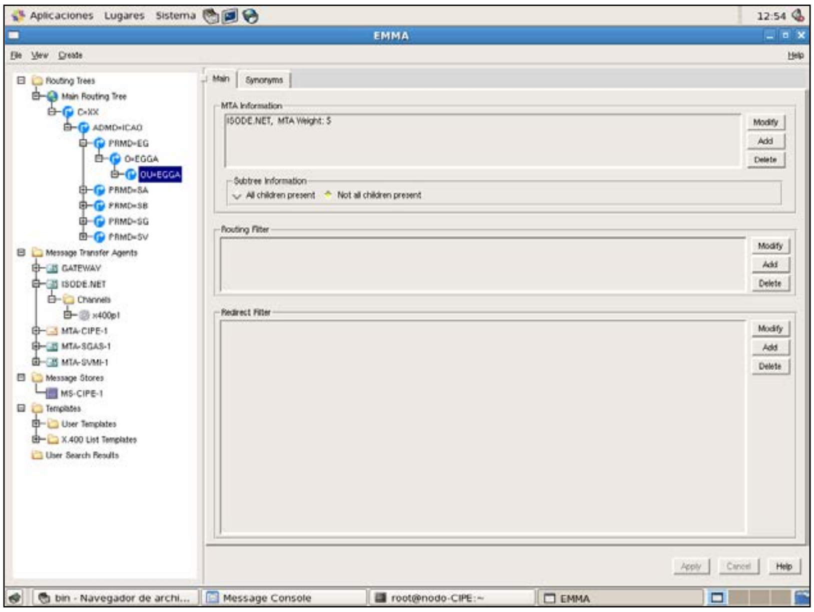


Figure 2E-2: CIPE MTA routing

2.3 *Tests*:

2.3.1 These tests were scheduled with a view to establishing the capacity of the REDDIG for various transmission speeds and message sizes.

2.3.2 In this respect, Table 2E-1 presents a summary of the part of the trials (those conducted with 1-KB messages and configured speeds of 64, 32 and 4,8 kbps).

Test No.	Description	Link rate (Kbits/s)	Total time (hh/mm/ss)	Exchange of messages / hour	Exchange of messages / second	Transit time of each message (seconds)	Remarks
1	Delivery of 5,000 1-KB messages	64	0:59:21	5000	1.39	0.72	
2	Delivery of 5,000 1-KB messages	32	2:18:00	2174	0.6	1.66	
3	Delivery of 25 1-KB messages	4.8	11:42:00 (*)	427	0.12	8.43	To be completed

(*): if the test had been with 5,000 messages

Table 2E-1: Tests and results obtained

(*) A calculation is made of the equivalent time if traffic had been of 5,000 messages

2.4 *Evidence*: Figure 2E-3 presents parts of the CIPE MTA event log, showing the different sizes of the scripts received (different colours), the time used for the transfer, and the transfer rates:

8/ 5 00:00:28 x400p1 07177 (#501) N-MTA_X400-Notice <<< [/PRMD=EG/ADMD=ICAO/C=XX/;isode.net.1841201-100804.191103] message received from cn=x400p1, cn=ISODE.NET, cn=Messaging Configuration,ou=Address Book,c=AR

8/ 5 00:00:28 x400p1 07177 (#501) N-MTA-Notice Transfer Completed (inbound): 6604 bytes in 2.54 seconds (2.53 Kbytes/s)

8/ 5 00:00:29 x400p1 07174 (#501) N-MTA-Notice Recipient 1 '/CN=CIPEZTZX/OU=CIPE/O=CIPE/PRMD=SA/ADMD=ICAO/C=XX/' mta 'MTA-CIPE-1'

8/ 5 00:00:29 x400p1 07174 (#501) N-MTA-Notice Transfer Completed (inbound): 6604 bytes in 1.27 seconds (5.04 Kbytes/s)

8/ 5 00:00:31 x400p1 07177 (#501) N-MTA-Notice Transfer Completed (inbound): 6604 bytes in 2.29 seconds (2.81 Kbytes/s)

8/ 5 00:00:31 x400p1 07174 (#501) N-MTA-Notice Transfer Completed (inbound): 6604 bytes in 1.19 seconds (5.39 Kbytes/s)

8/ 5 00:00:33 x400p1 07174 (#501) N-MTA-Notice Transfer Completed (inbound): 6604 bytes in 1.19 seconds (5.38 Kbytes/s)

8/ 5 00:19:39 x400p1 07737 (#501) N-MTA-Notice Transfer Completed (inbound): 11722 bytes in 2.83 seconds (4.04 Kbytes/s)

8/ 5 00:19:40 x400p1 07740 (#501) N-MTA-Notice Transfer Completed (inbound): 11722 bytes in 1.82 seconds (6.27 Kbytes/s)

Figure 2E-3: CIPE MTA test log Manaus - CIPE

2.5 *Analysis of test results in relation to current traffic*:

2. Buenos Aires – Ezeiza (ARGENTINA)

dir 383 = BUENOS AIRES

Dia	Tráfego Total	Hora de Pico	Tráfego na Hora de Pico
1/7/2009	4.201	11:24 AS 12:24	250
2/7/2009	4.257	16:54 AS 17:55	242
3/7/2009	3.961	11:10 AS 12:10	228
4/7/2009	3.301	16:54 AS 17:54	173
5/7/2009	3.218	16:54 AS 17:54	179
6/7/2009	3.549	22:39 AS 23:39	174
7/7/2009	3.753	18:09 AS 19:09	318
8/7/2009	3.522	10:55 AS 11:54	179
9/7/2009	3.411	16:54 AS 17:54	158
10/7/2009	3.550	10:39 AS 11:40	236
11/7/2009	3.335	10:54 AS 11:54	210
12/7/2009	3.162	11:09 AS 12:09	142
13/7/2009	3.816	16:54 AS 17:54	201
14/7/2009	3.615	12:09 AS 13:09	218
15/7/2009	3.610	22:54 AS 23:57	175
16/7/2009	3.653	10:39 AS 11:39	186
17/7/2009	3.763	10:09 AS 11:09	246
18/7/2009	3.302	10:54 AS 11:54	189
19/7/2009	2.988	16:24 AS 17:24	170
20/7/2009	3.442	14:39 AS 15:39	176
21/7/2009	3.832	10:39 AS 11:39	214
22/7/2009	3.839	10:39 AS 11:39	233
23/7/2009	3.796	10:54 AS 11:54	216
24/7/2009	3.514	23:24 AS 00:24	151
25/7/2009	3.228	16:54 AS 17:54	162
26/7/2009	3.258	11:24 AS 12:25	166
27/7/2009	3.593	16:39 AS 17:39	179
28/7/2009	3.748	16:54 AS 17:54	198
29/7/2009	3.844	10:39 AS 11:39	203
30/7/2009	3.748	04:54 AS 05:54	167
31/7/2009	3.825	10:54 AS 11:54	190
Total geral	111.634		

Table 2E-2: SBBR-SAEZ AFTN peak hour traffic

2.5.1 Table 2E-2 presents the monthly traffic of messages between Brazil and Argentina whose average numbers repeat themselves in the last 12 months.

2.5.2 An analysis of the maximum number of messages during peak hour (7/7/2009), which was **318 messages**, leads to the conclusion that a bandwidth of 4,8 kbit/s is reasonable for the configuration of the AMHS circuit between Brazil and Argentina. Since the transmission between the two countries currently accounts for the highest bandwidth utilisation for said application in the REDDIG, it may be concluded that the rate of 4,8 kbit/s or 2,4 kbit/s could be used for all cases in the SAM States.

2.5.3 However, Table 2E-3 summarises AFTN peak hour traffic between Brazil and Atlanta, which has a maximum number of messages during peak hour (2/7/2009) of **1745 messages**. For that circuit, a rate of 9,6 kbit/s may be enough, but must be checked with continued testing of the 16-kbit/s and 9,6-kbit/s rates.

1. Atlanta (EUA)

dir 94 = ATLANTA

Dia	Tráfego Total	Hora de Pico	Tráfego na Hora de Pico
1/7/2009	17.337	11:40 AS 12:39	940
2/7/2009	19.728	18:25 AS 19:25	1.745
3/7/2009	19.794	10:54 AS 11:54	1.668
4/7/2009	17.145	16:39 AS 17:40	1.075
5/7/2009	17.684	16:09 AS 17:09	914
6/7/2009	17.486	16:39 AS 17:39	1.201
7/7/2009	17.661	18:09 AS 19:09	1.090
8/7/2009	18.596	15:54 AS 16:54	1.184
9/7/2009	17.044	06:24 AS 07:25	1.200
10/7/2009	17.606	22:39 AS 23:39	939
11/7/2009	13.803	00:00 AS 00:54	717
12/7/2009	13.071	12:09 AS 13:09	741
13/7/2009	15.186	19:10 AS 20:09	824
14/7/2009	13.159	21:09 AS 22:09	763
15/7/2009	12.682	21:54 AS 22:54	687
16/7/2009	12.473	21:09 AS 22:09	710
17/7/2009	12.816	15:39 AS 16:39	598
18/7/2009	11.722	03:54 AS 04:54	779
19/7/2009	9.418	12:24 AS 13:24	621
20/7/2009	12.863	18:54 AS 19:54	986
21/7/2009	13.310	23:09 AS 00:09	955
22/7/2009	12.822	20:39 AS 21:39	651
23/7/2009	12.337	20:24 AS 21:24	736
24/7/2009	9.958	19:54 AS 20:54	369
25/7/2009	11.208	21:24 AS 22:24	593
26/7/2009	10.661	20:24 AS 21:24	678
27/7/2009	13.051	11:54 AS 12:54	661
28/7/2009	13.139	21:39 AS 22:39	755
29/7/2009	13.171	17:09 AS 18:09	995
30/7/2009	13.177	18:54 AS 19:54	682
31/7/2009	11.776	20:09 AS 21:09	658
Total geral	441.884		

Table 2E-3: SBBR-Atlanta AFTN traffic during peak hour

3. **Test No. 2: MTA Ezeiza (CIPE) –XX MTA** (XX: test, simulating another country, Ethiopia in this case)

3.1 *IP addresses*: according to the following test scheme (Figures 2E-3 and 2E-4):

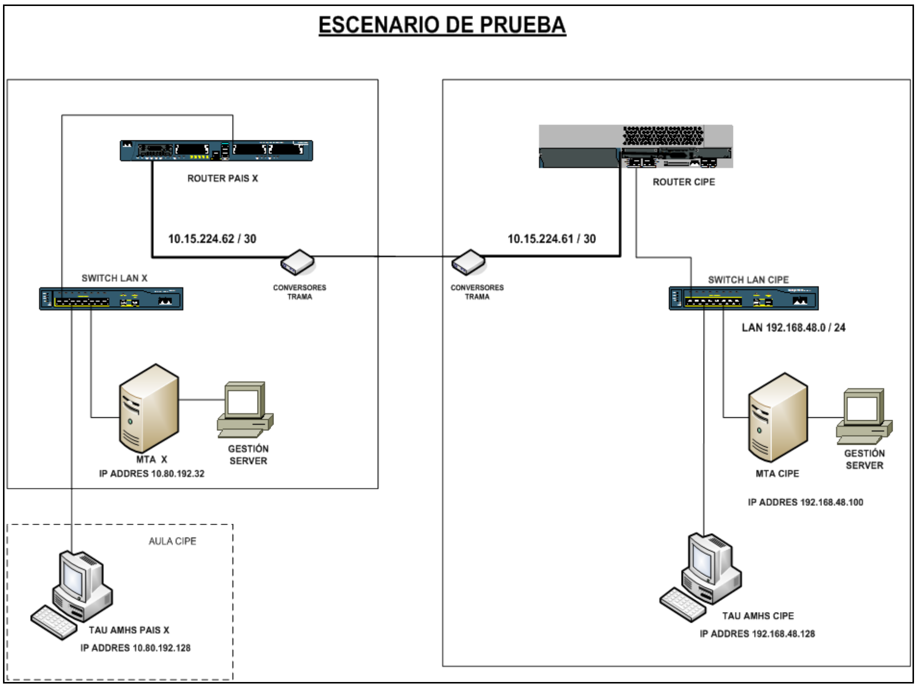


Figure 2E-3: CIPE MTA / XX MTA connectivity scheme

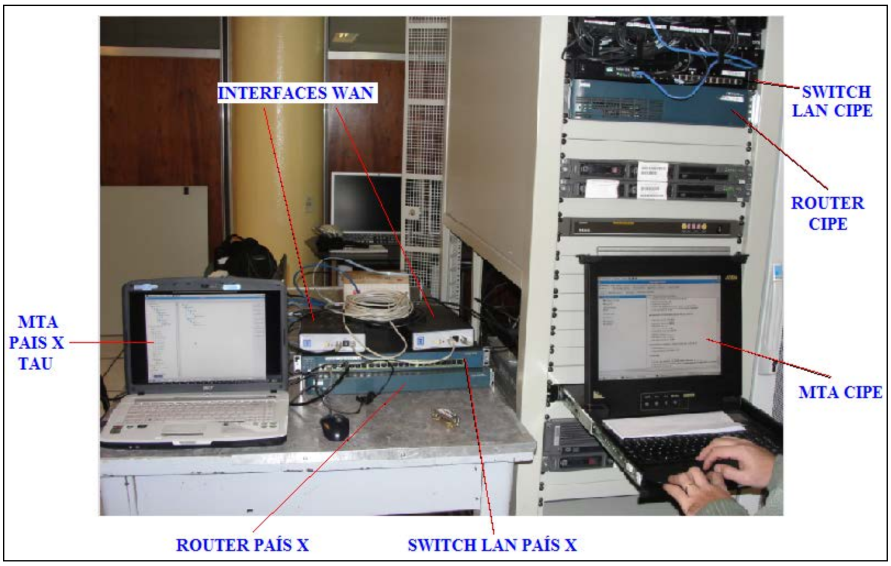


Figure 2E-4: Image of the test scenario

3.2 *Configurations*:

3.2.1 XX MTA: PRMD=HA, O=HAAB, OU=HAAB, CN=HAABYFYX

3.2.2 CIPE MTA: PRMD=SA, O=CIPE, OU=CIPE, CN=CIPE****, where **** are ten different terminals.

3.2.3 Next, Figure 2E-5 shows a print screen (in CIPE) of the connectivity test with the other MTA:

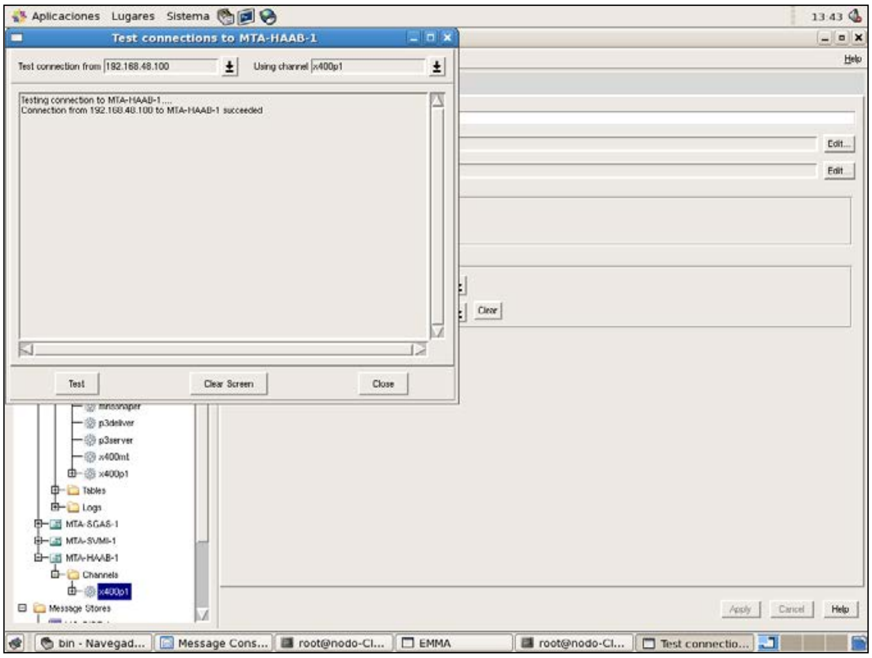


Figure 2 E-5: Certifying the connectivity with the other MTA

3.3 *Tests*

3.3.1 Two-way delivery of 500-message packages, checking the delivery rate at the terminal of the opposite MTA, varying the link rate by modifying the parameters of the associated routers.

3.3.2 Next, Figure 2E-6 presents part of the event log of the XX MTA, showing the size of the messages, transfer time, and incoming and outgoing transfer rates:

Examples of messages received at the XX MTA (MTA Event)

8/11 13:42:00 x400p1 20693 (#501) N-MTA_X400-Notice <<< [/PRMD=HA/ADMD=ICAO/C=XX/; localhost..0309501-100806.121319] message received from cn=x400p1,cn=MTA-HAAB-1, cn=Messaging Configuration,ou=Address Book,c=AR
8/11 13:42:00 x400p1 20693 (#501) N-MTA-Notice Transfer Completed (inbound): 674 bytes in 0.01 seconds (47.01 Kbytes/s)
8/11 13:42:00 x400p1 20692 (#501) N-MTA_X400-Notice <<< [/PRMD=HA/ADMD=ICAO/C=XX/; localhost..0302901-100806.120935] message received from cn=x400p1,cn=MTA-HAAB-1, cn=Messaging Configuration,ou=Address Book,c=AR
8/11 13:42:00 x400p1 20692 (#501) N-MTA-Notice Transfer Completed (inbound): 672 bytes in 0.01 seconds (54.69 Kbytes/s)
8/11 13:58:02 x400p1 20773 (#501) N-MTA_X400-Notice <<< [/PRMD=HA/ADMD=ICAO/C=XX/;localhost..0465701-100806.123120] DR received from cn=x400p1,cn=MTA-HAAB-1,cn=Messaging Configuration,ou=Address Book,c=AR
8/11 13:58:02 x400p1 20773 (#501) N-MTA-Notice Transfer Completed (inbound): 464 bytes in 0.00 seconds (90.62 Kbytes/s)
8/11 14:05:21 x400p1 20811 (#501) N-MTA_X400-Notice <<< [/PRMD=HA/ADMD=ICAO/C=XX/; localhost..2943401-100806.123839] DR received from cn=x400p1,cn=MTA-HAAB-1,cn=Messaging Configuration,ou=Address Book,c=AR
8/11 14:05:21 x400p1 20811 (#501) N-MTA-Notice Transfer Completed (inbound): 464 bytes in 0.00 seconds (113.28 Kbytes/s)

Examples of messages sent by the XX MTA (MTA Event)

8/11 14:09:30 pp.qmgr2 20287 (pp) N-IOevent-ConnectionClosed Normal Connection Closure
8/11 14:09:30 x400p1 20848 (pp) N-MTA-Notice Transfer Completed (outbound):
663 bytes in 0.10 seconds (6.29 Kbytes/s)
8/11 14:09:30 x400p1 20848 (pp) N-MTA_X400-Notice >>> Message [/PRMD=SA/ADMD=ICAO/C=XX/; localhost..2083107-100811.170928] transfered to <cn=x400p1,cn=MTA-HAAB-1, cn=Messaging Configuration,ou=Address Book, c=AR>
8/11 14:09:30 x400p1 20848 (pp) N-MTA-Notice Transfer Completed (outbound):
665 bytes in 0.03 seconds (17.55 Kbytes/s) 8/11 14:09:30 x400p1 20848 (pp) N-MTA_X400-Notice >>> Message [/PRMD=SA/ADMD=ICAO/C=XX/; localhost..2083108-100811.170928] transfered to <cn=x400p1,cn=MTA-HAAB-1,cn=Messaging Configuration,ou=Address Book,c=AR>
8/11 14:09:30 x400p1 20848 (pp) N-MTA-Notice Transfer Completed (outbound):
665 bytes in 0.01 seconds (34.18 Kbytes/s)

Figure 2E-6: MTA Log

3.4 *II test results*:

3.4.1 Delivery times practically did not vary, regardless of router configuration (the transfer rate was high in all cases), since the physical connection medium did not change. Therefore, it was not possible to determine the minimum link rate under message stress conditions.

3.4.2 Consequently, these tests did not add any important additional information to the tests conducted between Manaus and Ezeiza.

4. Additional bandwidth

4.1 Next, Table 2E-4 presents the conventional **AMHS connectivity** in the SAM Region and in Trinidad and Tobago.

4.2 Likewise, for the purpose of calculating the additional bandwidth, the primary conclusions of the tests conducted between Manaus and Ezeiza have been adopted. This involves assigning 4.8 Kbps between each pair of States, with the exception of messages from (or switched by) Brazil and Peru to USA (Atlanta), and which will travel between each of the cited States and Colombia (Bogota), to enter the MEVA II at this location to continue to its final destination, *via* Miami, for which 9.6 Kbps were assigned, in addition to the 4.8 Kbps assigned to the traffic between each pair of States.

4.3 Consequently, between Brazil (Manaus) – Colombia (Bogota) and Peru (Lima) – Colombia (Bogota), the width assigned is 14.4 Kbps (9.6 Kbps + 4.8 Kbps). The cited values are shown in column BW (Kbps).

AMHS TABLE			BW (Kbps)
Argentina	Ezeiza	Bolivia (La Paz)	4.8
		Chile (Santiago)	4.8
		Brazil (Curitiba)	4.8
		Paraguay (Asunción)	4.8
		Peru (Lima)	4.8
		Uruguay (Montevideo)	4.8
Bolivia	La Paz	Argentina (Ezeiza)	4.8
		Brazil (Curitiba)	4.8
		Peru (Lima)	4.8
Brazil	Curitiba	Argentina (Ezeiza)	4.8
		Uruguay (Montevideo)	4.8
		Paraguay (Asunción)	4.8
		Bolivia (La Paz)	4.8
	Manaus	Colombia (Bogota) (*)	14.4
		Guyana (Georgetown)	4.8
		French Guiana (Cayenne)	4.8
		Peru (Lima)	4.8
		Suriname (Paramaribo)	4.8
	Recife	Venezuela (Maiquetía)	4.8
Chile	Santiago	Argentina (Ezeiza)	4.8
		Peru (Lima)	4.8
Colombia	Bogota	Ecuador (Guayaquil)	4.8
		Brazil (Manaus) (*)	14.4
		Peru (Lima) (*)	14.4
		Venezuela (Caracas)	4.8
Ecuador	Guayaquil	Colombia (Bogota)	4.8
		Peru (Lima)	4.8
		Venezuela (Maiquetía)	4.8
French Guiana	Cayenne	Venezuela (Maiquetía)	4.8
		Brazil (Manaus)	4.8
Guyana	Georgetown	Brazil (Manaus)	4.8
		Suriname (Paramaribo)	4.8
		Trinidad and Tobago (Piarco)	4.8
		Venezuela (Caracas)	4.8
Paraguay	Asunción	Argentina (Ezeiza)	4.8

AMHS TABLE			BW (Kbps)
Peru	Lima	Venezuela (Maiquetía)	4.8
		Argentina (Ezeiza)	4.8
		Bolivia (La Paz)	4.8
		Brazil (Manaus)	4.8
		Chile(Santiago)	4.8
		Colombia (Bogota) (*)	14.4
		Ecuador (Guayaquil	4.8
Suriname	Paramaribo	Brazil (Manaus)	4.8
		Venezuela (Maiquetía)	4.8
		Guyana (Georgetown)	4.8
Trinidad and Tobago	Piarco	Venezuela (Maiquetía)	4.8
		Guyana (Georgetown)	4.8
Uruguay	Montevideo	Argentina (Ezeiza)	4.8
		Brazil (Brasilia)	4.8
Venezuela	Maiquetía	Peru (Lima)	4.8
		Ecuador (Guayaquil)	4.8
		Brazil (Recife)	4.8
		Colombia (Bogota)	4.8
		Guyana (Georgetown)	4.8
		Suriname (Paramaribo)	4.8
		French Guiana (Cayenne)	4.8
		Trinidad and Tobago (Piarco)	4.8
			316.8

Table 2E-4: AMHS connectivity and bandwidth calculation

(*): As already stated, the combined traffic between each pair of States (Brazil – Colombia and Peru – Colombia) and the one originating in Peru and Brazil, but which continues to Miami/Atlanta *via* MEVA II, are added.

4.4 **Estimated additional AMHS bandwidth**: 316.8 Kbps.

Appendix 2F: Required interfaces and additional bandwidth – AIDC

1. Interfaces

1.1 Table 2F-1 below shows the future AIDC service in the SAM Region and in Trinidad and Tobago.

1.2 It includes all the services that should go from each State to the adjacent routers, either for ACC/ACC, ACC/APP or APP/TWR communications.

<table>
<tr><th colspan="3">AIDC TABLE</th><th>Number</th><th>Total</th><th>Ethernet Interfaces</th></tr>
<tr><td rowspan="5">Argentina</td><td rowspan="5">Buenos Aires</td><td>Bolivia (La Paz)</td><td>1</td><td rowspan="5">5</td><td rowspan="5">1</td></tr>
<tr><td>Chile (Santiago)</td><td>7</td></tr>
<tr><td>Brazil (Curitiba)</td><td>3</td></tr>
<tr><td>Paraguay (Asunción)</td><td>1</td></tr>
<tr><td>Uruguay (Montevideo)</td><td>7</td></tr>
<tr><td rowspan="6">Bolivia</td><td rowspan="6">La Paz</td><td>Argentina (Buenos Aires)</td><td>1</td><td rowspan="6">6</td><td rowspan="6">1</td></tr>
<tr><td>Chile (Santiago)</td><td>1</td></tr>
<tr><td>Brazil (Manaus)</td><td>1</td></tr>
<tr><td>Brazil (Curitiba)</td><td>2</td></tr>
<tr><td>Paraguay (Asunción)</td><td>1</td></tr>
<tr><td>Peru (Lima)</td><td>1</td></tr>
<tr><td rowspan="13">Brazil</td><td rowspan="4">Curitiba</td><td>Argentina (Buenos Aires)</td><td>3</td><td rowspan="4">4</td><td rowspan="4">1</td></tr>
<tr><td>Uruguay (Montevideo)</td><td>1</td></tr>
<tr><td>Paraguay (Asunción)</td><td>3</td></tr>
<tr><td>Bolivia (La Paz)</td><td>2</td></tr>
<tr><td rowspan="7">Manaus</td><td>Colombia (Bogota)</td><td>1</td><td rowspan="7">7</td><td rowspan="7">1</td></tr>
<tr><td>Guyana (Georgetown)</td><td>1</td></tr>
<tr><td>French Guiana (Rochambeau)</td><td>1</td></tr>
<tr><td>Bolivia (La Paz)</td><td>1</td></tr>
<tr><td>Venezuela (Maiquetía)</td><td>1</td></tr>
<tr><td>Peru (Lima)</td><td>1</td></tr>
<tr><td>Suriname (Paramaribo)</td><td>1</td></tr>
<tr><td rowspan="2">Recife</td><td>Uruguay (Montevideo)</td><td>1</td><td rowspan="2">2</td><td rowspan="2">1</td></tr>
<tr><td>French Guiana (Rochambeau)</td><td>1</td></tr>
<tr><td rowspan="3">Chile</td><td rowspan="3">Santiago</td><td>Argentina (Buenos Aires)</td><td>7</td><td rowspan="3">3</td><td rowspan="3">1</td></tr>
<tr><td>Bolivia (La Paz)</td><td>1</td></tr>
<tr><td>Peru (Lima)</td><td>1</td></tr>
<tr><td rowspan="5">Colombia</td><td rowspan="5">Bogota</td><td>Panama (Panama)</td><td>5</td><td rowspan="5">5</td><td rowspan="5">1</td></tr>
<tr><td>Ecuador (Guayaquil)</td><td>4</td></tr>
<tr><td>Brazil (Manaus)</td><td>3</td></tr>
<tr><td>Peru (Lima)</td><td>2</td></tr>
<tr><td>Venezuela (Maiquetía)</td><td>1</td></tr>
<tr><td rowspan="2">Ecuador</td><td rowspan="2">Guayaquil</td><td>Colombia (Bogota)</td><td>4</td><td rowspan="2">2</td><td rowspan="2">1</td></tr>
<tr><td>Peru (Lima)</td><td>1</td></tr>
</table>

AIDC TABLE			Number	Total	Ethernet Interfaces
French Guiana	Rochambeau	ACC Piarco	1	4	1
		Brazil (Recife)	1		
		Brazil (Manaus)	1		
		Suriname (Paramaribo)	1		
Guyana	Georgetown	ACC Piarco	1	4	1
		Brazil (Manaus)	1		
		Suriname (Paramaribo)	1		
		Venezuela (Maiquetía)	1		
Paraguay	Asunción	Argentina (Buenos Aires)	1	3	1
		Bolivia (La Paz)	1		
		Brazil (Curitiba)	3		
Peru	Lima	Bolivia (La Paz)	1	5	1
		Brazil (Manaus)	2		
		Chile(Santiago)	1		
		Colombia (Bogota)	1		
		Ecuador (Guayaquil	1		
Suriname	Panamaribo	Brazil (Manaus)	1	4	1
		French Guiana (Rochambeau)	1		
		Guyana (Georgetown)	1		
		ACC Piarco	1		
Trinidad and Tobago	Piarco	Guyana (Georgetown)	1	4	1
		Venezuela (Maiquetía)	1		
		Suriname (Paramaribo)	1		
		French Guiana (Cayenne)	1		
Uruguay	Montevideo	Argentina (Buenos Aires)	7	3	1
		Brazil (Recife)	1		
		Brazil (Curitiba)	1		
Venezuela	Maiquetía	ACC Piarco	1	4	1
		Brazil (Manaus)	1		
		Colombia (Bogota)	5		
		Guyana (Georgetown)	1		

Table 2F-1: AIDC Service

2. **Bandwidth**

2.1 Regarding this service, there are 3 operational exchange modalities:

2.1.1 *Via* AFTN

2.1.2 *Via* AMHS

2.1.3 Directly between automated systems, *via* ATN over IP.

2.2 For the *first two cases*, these are AFTN messages generated/received by the automated systems and that travel through the respective AFTN or AMHS systems (or a combination of the two). Therefore, the increase in information will be reflected only as an increase in the number of AFTN messages circulating over the ATN.

2.3 Since ATS traffic historically accounts for only 15% of the total AFTN traffic, a hypothetical 300% increase in ATS messages will only be reflected in a 30% increase of AFTN traffic.

2.4 For the *third case*, each centre will send the information to the corresponding adjacent centre, and the increase in bandwidth will depend on the number of control messages that each switched centre will generate, which obviously will depend on the surrounding air traffic.

2.5 Furthermore:

2.5.1 As the service is installed in the various States, the need for greater bandwidth for this service will gradually and slightly increase.

2.5.2 A greater bandwidth will be required once this service has been operationally disseminated throughout the Region, while voice handover of flights continues to be *temporarily* mandatory.

2.5.3 Once this phase is completed and voice communications gradually are deactivated, bandwidth consumption drops until there is no longer the need to continue using speech circuits.

2.6 At that moment, the net bandwidth (increase through AIDC – reduction of ATS speech) will be negative, that is, there will be a reduction of bandwidth requirement.

3. **Additional bandwidth for AIDC**

3.1 No additional bandwidth is required for this service.

Appendix 2G: Required interfaces and additional bandwidth - Exchange between automated systems

1. Interfaces

1.1 Table 2G-1 below shows the data exchange service using Asterix 62 and 63 between automated systems in the SAM Region and in Trinidad and Tobago.

Automated system interconnection table			Number	Total	Ethernet
Argentina	Ezeiza	Bolivia (La Paz)	1	6	1
		Chile (Santiago)	1		
		Brazil (Curitiba)	1		
		Paraguay (Asunción)	1		
		Uruguay (Montevideo)	1		
Bolivia	La Paz	Argentina (Buenos Aires)	1	6	1
		Chile (Santiago)	1		
		Brazil (Manaus)	1		
		Brazil (Curitiba)	1		
		Paraguay (Asunción)	1		
		Peru (Lima)	1		
Brazil	Curitiba	Argentina (Buenos Aires)	1	4	1
		Uruguay (Montevideo)	1		
		Paraguay (Asunción)	1		
		Bolivia (La Paz)	1		
	Manaus	Colombia (Bogota)	1	8	1
		Guyana (Georgetown)	1		
		French Guiana (Cayenne)	1		
		Argentina (Buenos Aires)	1		
		Bolivia (La Paz)	1		
		Peru (Lima)	1		
		Venezuela (Maiquetía)	1		
		Suriname (Paramaribo)	1		
Chile	Santiago	Argentina (Buenos Aires)	1	3	1
		Bolivia (La Paz)	1		
		Peru (Lima)	1		
		Panama (Panama)	1		1
		Ecuador (Guayaquil)	1		
		Brazil (Manaus)	1		
		Peru (Lima)	1		
		Venezuela (Maiquetía)	1		
Ecuador	Guayaquil	Colombia (Bogota)	1	2	1
		Peru (Lima)	1		
French Guiana	Rochambeau	ACC Piarco	1	3	1
		Brazil (Manaus)	1		
		Suriname (Paramaribo)	1		

Automated system interconnection table			**Number**	**Total**	**Ethernet**
Guyana	Georgetown	ACC Piarco	1	4	1
		Brazil (Manaus)	1		
		Suriname (Paramaribo)	1		
		Venezuela (Maiquetía)	1		
Paraguay	Asunción	Argentina (Buenos Aires)	1	3	1
		Bolivia (La Paz)	1		
		Brazil (Curitiba)	1		
Peru	Lima	Bolivia (La Paz)	1	5	1
		Brazil (Manaus)	1		
		Chile (Santiago)	1		
		Colombia (Bogota)	1		
		Ecuador (Guayaquil	1		
Suriname	Paramaribo	Brazil (Manaus)	1	4	1
		French Guiana (Rochambeau)	1		
		Guyana (Georgetown)	1		
		ACC Piarco	1		
Trinidad and Tobago	Piarco	Venezuela (Maiquetía)	1	1	1
Uruguay	Montevideo	Argentina (Buenos Aires)	1	2	1
		Brazil (Brasilia)	1		
Venezuela	Maiquetía	ACC Piarco	1	4	1
		Brazil (Manaus)	1		
		Colombia (Bogota)	1		
		Guyana (Georgetown)	1		

Table 2G-1: Exchange of data between automated centres

2. **Bandwidth**The evolution of the new system utilisation/required bandwidth ratio follows the same analogy as the AIDC service, that is:

2.1.1 As the service is installed in the various States, the need for greater bandwidth for this service will gradually and slightly increase.

2.1.2 A greater bandwidth will be required once this service has been operationally disseminated throughout the Region, while “radar to automated centre” transmissions continue to be *temporarily* mandatory.

2.1.3 Once this phase is completed, the net bandwidth (increase due to exchange between centres - traditional reduction) will be negative, that is, the bandwidth requirement will be reduced or, at least, will remain the same.

3. **Conclusion**

3.1 **Additional bandwidth for the exchange between automated centres:** No additional bandwidth is required for this service.

Appendix 2H: Required interfaces and additional bandwidth - ADS-B

1. Interfaces

1.1 There should be no major *interface* requirements, since the market currently offers data output over IP. Since this offering is expected to grow, only ATN access switch free ports shall be used.

1.2 This service will replace or supplement radar information transmission in two stages, in a similar way as for radar exchange, that is:

1.2.1 *¨ADS-B sensor-to-automated centre¨ modality*: As the service is installed in the various States, the need for greater bandwidth for this service will gradually increase. The corresponding calculation is done at the end of this Appendix.

1.2.2 *¨Radar information exchange between automated centres¨ modality*: A greater bandwidth will be required once this service has been operationally disseminated throughout the Region, while "ADS-B sensor-to-automated centre¨ transmissions continue to be *temporarily* mandatory.

1.2.3 Once this phase is completed, the net bandwidth (increase due to exchange between centres - traditional reduction) will be negative, that is, the bandwidth requirement will be reduced or, at least, will remain the same.

2. Bandwidth

2.1 In this case, it is assumed that each State will exchange information of one (1) ADS-B sensor with one (1) adjacent State, that is two (2) signals are calculated per State, each of 9.6 Kbps (identical to data radar).

2.2 Accordingly, Table 2H-1 shows the additional bandwidth increase for the service:

Data exchange with an automated centre		**Total Tx/RX**	**BW (Kbps)**
Argentina	Ezeiza	2	19.2
Bolivia	La Paz	2	19.2
Brazil	Curitiba	2	19.2
	Manaus	2	19.2
	Manaus	2	19.2
Chile	Santiago	2	19.2
Colombia	Bogota	2	19.2
Ecuador	Guayaquil	2	19.2
French Guiana	Cayenne	2	19.2
Guyana	Georgetown	2	19.2
Paraguay	Asunción	2	19.2
Peru	Lima	2	19.2
Suriname	Paramaribo	2	19.2

Data exchange with an automated centre		**Total Tx/RX**	**BW (Kbps)**
Trinidad and Tobago	Piarco	2	19.2
Uruguay (*)	Montevideo	2	19.2
Venezuela	Maiquetía	2	19.2
Total (Kbps)			**307.2**

Table 2H-1: Additional bandwidth for ADS-B

3. Conclusion

3.1 **Additional bandwidth requirement for ADS-B**: 307.2 Kbps

Appendix 2I - Table CNS1b - Plan of Routers for the SAM Region

1. The REDDIG II shall be based on IP and the boundary elements will be the routers. Therefore, all the services listed in Activity 1 (and described in detail in the previous Appendices) shall be based on them.

2. In this case, Table CNS 1Ba – Regional Router Plan/SAM Region**,** should be thoroughly reviewed to make sure that voice communications follow the direct path between the routers of two adjacent ACCs (avoiding double hop, in the case of a satellite solution).

3. Furthermore, it was deemed important, without modifying the original structure, to subdivide the columns of said Table in order to accommodate aggregate parameters to quickly visualize the already established links and services, the initial bandwidth, the backbone technology currently supporting them, the protocols used or to be used, etc.

Appendix 2I - Table CNS1b - Routers Plan of the SAM Region

Administration and location		Type of router	Type of interconnection	Connected router	Link rate		Link Protocol						*Via*		Target date	Remarks	
							Physical layer - link		IP version		Routing protocol						
Admin.	Location				Current	Future	Current	Future	Current	Future	Current	Future	Current	Future		Current	Future
1		2	3	4	5		6							7	8	9	
Argentina	Ezeiza	IP	Inter Regional	AFI (Johannesburg)	N/A	TBD	FDMA FR	TBD	N/A	IPv6	N/A	TBD	CAFSAT	CAFSAT	TBD	B	E
				EUR (Canary Is.)	19.2	TBD			IPv6	IPv6	BGP	TBD			2010	D	D
		IP	Intra Regional	Bolivia (La Paz)	N/A	TBD	TDMA FR - ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2012	B	F
				Chile (Santiago)	N/A				N/A		N/A				2011	B	F
				Brazil (Curitiba)	N/A				N/A		N/A				2011	B	F
				Brazil (Manaus)	64k				IPv4		Static				2010	D	N/A
				Paraguay (Asunción)	64K				IPv4		Static				2009	B	F
				Uruguay (Montevideo)	64k				IPv4		Static				2010	C	F
Bolivia	La Paz	IP	Intra Regional	Argentina (Ezeiza)	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2012	B	F
				Chile (Santiago)	N/A				N/A		N/A				2012	B	F
				Brazil (Manaus)	N/A				N/A		N/A				2012	B	F
				Brazil (Curitiba)	N/A				N/A		N/A					B	F
				Paraguay (Asunción)	N/A				N/A		N/A					B	F
				Peru (Lima)	N/A				N/A		N/A				2012	B	F

A	AFTN
B	AFTN + ATS speech
C	AFTN + ATS speech + radar
D	AMHS
E	AMHS + AIDC + teleconference
F	AMHS + AIDC + teleconference + radar

Administration and location		Type of router	Type of interconnection	Connected router	Link rate		Link Protocol						Via		Target date	Remarks	
							Physical layer - link		IP version		Routing protocol						
Admin.	Location				Current	Future	Current	Future	Current	Future	Current	Future	Current	Future		Current	Future
1		2	3	4	5		6							7	8	9	
Brazil	Curitiba	IP	Intra Regional	Argentina (Ezeiza)	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2010	B	F
				Uruguay (Montevideo)	N/A				N/A		N/A				2012	B	F
				Paraguay (Asunción)	N/A				N/A		N/A				2012	B	F
				Bolivia (La Paz)	N/A				N/A		N/A				2010	B	F
			Intra Regional	Colombia (Bogota)	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2010	B	F
				Guyana (Georgetown)	N/A				N/A		N/A				2012	B	F
				French Guiana (Cayenne)	N/A				N/A		N/A				2012	B	F
				Argentina (Ezeiza)	64k				IPv4		Static				2010	D	D
				Bolivia (La Paz)	N/A				N/A		N/A				2012	B	F
				Venezuela (Caracas)	N/A				N/A		N/A					C	F
				Peru (Lima)	N/A				N/A		N/A				2010	B	F
				Suriname (Paramaribo)	N/A				N/A		N/A				2011	B	F
	Recife	IP	Intra Regional	French Guiana (Cayenne)	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II		B	E
				Uruguay (Montevideo)	N/A				N/A		N/A					B	F
			Inter Regional	AFI (Dakar)	N/A	TBD	FDMA FR	TBD	N/A	IPv6	N/A	TBD	CAFSAT	CAFSAT	TBD	B	E
				EUR (Canarias)												A	D

A	AFTN
B	AFTN + ATS speech
C	AFTN + ATS speech + radar
D	AMHS
E	AMHS + AIDC + teleconference
F	AMHS + AIDC + teleconference + radar

Administration and location		**Type of router**	**Type of interconnection**	**Connected router**	**Link rate**		**Link Protocol**						**Via**		**Target date**	**Remarks**	
							Physical layer - link		**IP version**		**Routing protocol**						
Admin.	**Location**				**Current**	**Future**	**Current**	**Future**	**Current**	**Future**	**Current**	**Future**	**Current**	**Future**		**Current**	**Future**
1		2	3	4	5		6							7	8	9	
Chile	Santiago	IP	Inter Regional	PAC (Christchurch)	N/A	TBD	N/A	N/A	N/A	IPv6	N/A	BGP4	PTT	PTT	TBD	A	D
			Intra Regional	Argentina (Ezeiza)	N/A		TDMA FR + ISDN	TBD	N/A	IPv4	N/A		REDDIG	REDDIG II	2010	B	F
				Bolivia (La Paz)	N/A				N/A		N/A					B	F
				Peru (Lima)	N/A				N/A		N/A				2010	B	F
Colombia	Bogota	IP	Inter Regional	NAM (Atlanta)	N/A	TBD	TDMA FR	TBD	N/A	IPv4	N/A	TBD	MEVA II	MEVA II	2010	A	D
				ACC Kigston	N/A				N/A		N/A					B	F
				ACC Curacao	N/A				N/A		N/A					B	F
				ACC Cenamer	N/A				N/A		N/A					B	F
				Panama (Panama)	N/A				N/A		N/A					B	F
		IP	Intra Regional	Ecuador (Guayaquil)	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2011	B	F
				Brazil (Manaus)	N/A				N/A		N/A				2010	B	F
				Peru (Lima)	N/A				N/A		N/A				2010	B	F
				Venezuela (Caracas)	N/A				N/A		N/A				2011	B	F
Ecuador	Guayaquil	IP	Intra Regional	Colombia (Bogota)	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2011	B	F
				Peru (Lima)	N/A				N/A		N/A				2011	B	F
			Inter Regional	ACC Cenamer	N/A	TBD	TDMA FR	TBD	N/A	IPv4	N/A	TBD	MEVA II	MEVA II		B	F

A	AFTN
B	AFTN + ATS speech
C	AFTN + ATS speech + radar
D	AMHS
E	AMHS + AIDC + teleconference
F	AMHS + AIDC + teleconference + radar

Administration and location		Type of router	Type of interconnection	Connected router	Link rate		Link Protocol						Via		Target date	Remarks	
							Physical layer - link		IP version		Routing protocol						
Admin.	Location				Current	Future	Current	Future	Current	Future	Current	Future	Current	Future		Current	Future
1		2	3	4	5		6							7	8	9	
French Guiana	Cayenne	IP	Inter Regional	ACC Dakar	N/A	TBD	TBD	TBD	N/A	IPv6	N/A	TBD	TBD	TBD		B	F
				ACC Piarco	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II		B	F
			Intra Regional	Brazil (Recife)	N/A				N/A	IPv4	N/A					B	F
				Brazil (Manaus)	N/A				N/A		N/A				2012	B	F
				Suriname (Paramaribo)	N/A				N/A		N/A				2012	B	F
Guyana	Georgetown	IP	Inter Regional	ACC Piarco	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	TBD	MEVA II	REDDIG II	2012	B	F
		IP	Intra Regional	Brazil (Manaus)	N/A	TBD		TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2012	B	F
				Suriname (Paramaribo)	N/A				N/A	IPv4	N/A				2012	B	F
				Venezuela (Caracas)	N/A				N/A	IPv4	N/A				2012	B	F
Panama	Panama	IP	Intra Regional	Colombia (Bogota)	N/A	TBD	TDMA FR	TBD	N/A	IPv4	N/A	TBD	MEVA II	MEVA II		B	F
			Inter Regional	ACC Cenamer	N/A				N/A		N/A					B	F
				ACC Kigston	N/A				N/A		N/A					B	F
Paraguay	Asunción	IP	Intra Regional	Argentina (Ezeiza)	64K	TBD	TDMA FR + ISDN	TBD	IPv4	IPv4	Static	BGP4	REDDIG	REDDIG II	2009	B	F
				Bolivia (La Paz)	N/A				N/A		N/A					B	F
				Brazil (Curitiba)	N/A				N/A		N/A				2010	B	F

A	AFTN
B	AFTN + ATS speech
C	AFTN + ATS speech + radar
D	AMHS
E	AMHS + AIDC + teleconference
F	AMHS + AIDC + teleconference + radar

Administration and location		Type of router	Type of interconnection	Connected router	Link rate		Link Protocol						Via		Target date	Remarks	
							Physical layer - link		IP version		Routing protocol						
Admin.	Location				Current	Future	Current	Future	Current	Future	Current	Future	Current	Future		Current	Future
1		2	3	4	5		6							7	8	9	
Peru	Lima	IP	Intra Regional	Bolivia (La Paz)	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2012	B	F
				Brazil (Manaus)	N/A				N/A	IPv4	N/A				2010	B	F
				Chile (Santiago)	N/A				N/A	IPv4	N/A				2010	B	F
				Colombia (Bogota)	N/A				N/A	IPv4	N/A				2010	B	F
				Ecuador (Guayaquil	N/A				N/A	IPv4	N/A				2011	B	F
Suriname	Paramaribo	IP	Intra Regional	Brazil (Manaus)	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II	2012	B	F
				French Guiana (Cayenne)	N/A				N/A		N/A					B	F
				Guyana (Georgetown)	N/A				N/A		N/A					B	F
			Inter Regional	ACC Piarco	N/A	TBD	TDMA FR	TBD	N/A	IPv6	N/A	TBD	MEVA II	MEVA II		B	F
Trinidad and Tobago	Piarco	IP	Intra Regional	French Guiana (Cayenne)	N/A	TBD	TDMA FR + ISDN		N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II		B	F
				Guyana (Georgetown)	N/A				N/A		N/A					B	F
				Venezuela (Caracas)	N/A				N/A		N/A					B	F
				Suriname (Paramaribo)	N/A				N/A		N/A					B	F
			Inter Regional	ACC San Juan	N/A	TBD	TDMA FR		N/A	IPv4	N/A	TBD	MEVA II	MEVA II		B	F

A	AFTN
B	AFTN + ATS speech
C	AFTN + ATS speech + radar
D	AMHS
E	AMHS + AIDC + teleconference
F	AMHS + AIDC + teleconference + radar

Administration and location		**Type of router**	**Type of interconnection**	**Connected router**	**Link rate**		**Link Protocol**						**Via**		**Target date**	**Remarks**	
							Physical layer - link		**IP version**		**Routing protocol**						
Admin.	**Location**				**Current**	**Future**	**Current**	**Future**	**Current**	**Future**	**Current**	**Future**	**Current**	**Future**		**Current**	**Future**
1		2	3	4	5		6							7	8	9	
Uruguay	Montevideo	IP	Intra Regional	Argentina (Ezeiza)	64K	TBD	TDMA FR + ISDN	TBD	IPv4	IPv4	Static	BGP4	REDDIG	REDDIG II	2011	C	F
				Brazil (Recife)	N/A				N/A		N/A					B	E
				Brazil (Brasilia)	N/A				N/A		N/A				2012	B	F
Venezuela	Maiquetía	IP	Inter Regional	EUR (Madrid)	N/A	TBD	TBD	TBD	N/A	IPv6	N/A	TBD	PTT	PTT	TBD	A	D
				ACC San Juan	N/A	TBD	TDMA FR	TBD	N/A	IPv4	N/A	TBD	MEVA II	MEVA II		B	F
				ACC Curacao	N/A				N/A		N/A					B	F
				ACC Piarco	N/A	TBD	TDMA FR + ISDN	TBD	N/A	IPv4	N/A	BGP4	REDDIG	REDDIG II		B	F
			Intra Regional	Brazil (Manaus)	N/A				N/A		N/A				2011	C	F
				Colombia (Bogota)	N/A				N/A		N/A				2011	B	F
				Guyana (Georgetown)	N/A				N/A		N/A				2012	B	F

A	AFTN
B	AFTN + ATS speech
C	AFTN + ATS speech + radar
D	AMHS
E	AMHS + AIDC + teleconference
F	AMHS + AIDC + teleconference + radar

Chapter 3 – Definition and Cost of a REDDIG II Satellite Structure Model

1. General

1.1 Satellite communications are the ideal solution for the interconnection of geographically distant sites. Currently, the market offers many technological solutions for these communications, with equipment developed by different manufacturers for different applications.

1.2 It is important to note that, in terms of satellite transmission, the main problem is recurrent monthly costs (OPEX). Also important are matters related to coding and compression, modulation used, and the medium access technique, such as: Time-division multiple access (TDMA), frequency-division multiple access (FDMA) or code-division multiple access (CDMA).

1.3 The REDDIG is a VSAT network made up by sixteen nodes in fourteen countries, with a space segment leased to INTELSAT. The network operates full-meshed, with two management and control centres, the main one being installed in Manaus (Brazil) and the alternate in Ezeiza (Argentina).

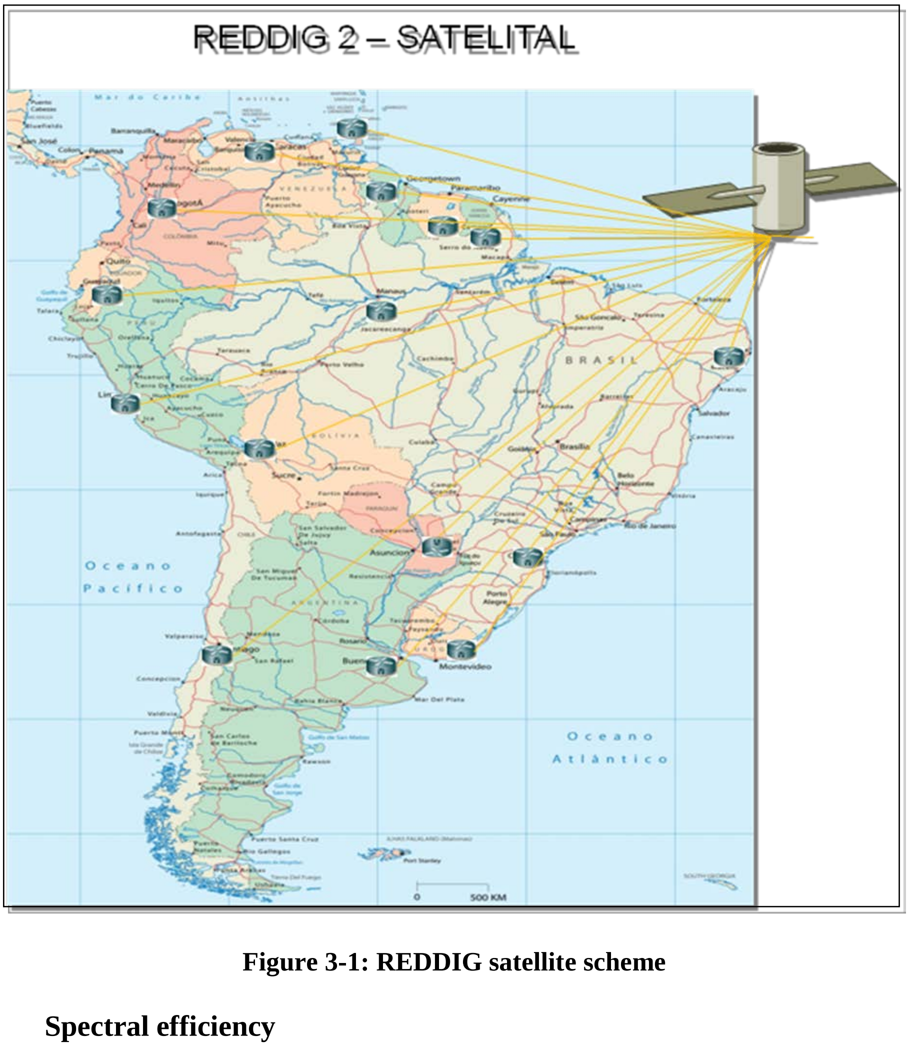


Figure 3-1: REDDIG satellite scheme

2. Spectral efficiency

2.1 The REDDIG uses the TDMA medium access method and the Frame Relay layer 2 protocol. It uses two 1,25 Msym/s-carriers, which means a space segment occupation of 1,75 MHz for each, and a smaller one of 0,625 Msym/s, consuming 0,875 MHz. Thus, total utilisation of the space segment is 4,38 MHz.

2.2 Another very important aspect is that the modulation used by the REDDIG is QPSK; which means that it transmits *two bits of information for each symbol*.

2.3 Since the transmission channel can distort and cause information errors, an Error Correction Code is applied, which, in the case of the REDDIG is VITERBI ½, which means that, of every 2 bits transmitted, only *one corresponds to information and the other is used as redundancy for error detection and correction*.

2.4 The 8-PSK is currently used in modern modulation techniques for satellite transmission, which means that 3 bits are sent for each symbol. Likewise, error correction techniques have evolved and modern systems use Turbo-Coding 7/8, where *one redundancy bit is used for every seven bits of useful information*. Therefore, it is felt that a change in the REDDIG satellite platform will significantly improve spectral efficiency.

3. **Medium access technology**

3.1 Regarding the medium access technology to be used, the experience of the Brazilian Administration indicates that it should not be restricted to a specific medium access technology, modulation, error correction code, etc.; the focus should be on the services instead of selecting a specific platform, as long as the basic principle illustrated in the ¨*Introduction Chapter, Figure 1: Basic ATN-REDDIG II Scheme* - *Services*¨ is followed.

4. **Cost**

4.1 The required services can be obtained in different ways, which are analysed below:

4.1.1 <u>Option 1 (current): Leasing of the space segment and management by States, with/without participation of the ICAO Technical Cooperation</u>

4.1.1.1 In terms of investment for the acquisition of the satellite equipment, the FOB costs quoted by various manufacturers to the Brazilian Administration for replacing the TELESAT satellite platform were used as a reference.

4.1.1.2 The most reliable figures suggest an average investment of USD 130,000.00 for each Brazilian TELESAT node. However, the values consider that the Brazilian satellite system is redundant with the land medium, which is the main medium. Thus, the equipment does not have fully duplicated chains.

4.1.1.3 The investment for the REDDIG (which provides an availability of 99,998%) is estimated in *USD 250,000.00 per node*, which is equivalent to a total cost of USD 4,000,000.00 for the sixteen REDDIG nodes. This value includes the two routers required by State. Of course, the values for the REDDIG II will need to be quoted subsequently in the preliminary phase of the project.

4.1.1.4 Table 3-1 summarises the estimated costs for the implementation of the REDDIG II, where both recurrent and non-recurrent charges are considered, with updated partial values:

Satelital			
NRC (Non Recurring Charges)	Valor (USD)	ARC (Annual Recurring Charges)	Valor (USD)
Estaciones Terrenas Completas	4.000.000,00	Repuestos	50.000,00
		Segmento Espacial	227.500,00
		Administrador de la REDDIG	240.000,00
Total	4.000.000,00		517.500,00

Table 3-1: Summary of satellite implementation costs

4.1.1.5 It should be noted that the value for ground stations includes the two routes required by State (USD 20,000.00 each, USD 40,000.00 per earth station).

4.1.2 Option 2: Service contract

4.1.2.1 Another way of providing satellite services is through a service contract, as is the case of the SES service provider for the members of MEVA II, which is the communication network of the CAR Region, which uses the same technology as the REDDIG.

4.1.2.2 Table 3-2 shows the costs of a hypothetical contract with the service provider (SES) for the REDDIG. These costs were derived from the values presented by the company in 2006, based on a cost comparison between the REDDIG (under Regional Cooperation Project RLA 03/901) and the budget submitted by the US company for the services being provided at the time when the interconnection of the two communication networks (MEVA II and REDDIG) was agreed upon.

4.1.2.3 The values are expressed in US dollars and the company proposed to aggregate the REDDIG to MEVA II; prices are considered to be reasonable by comparison. SES charges by number and types of circuits charged, based on which the REDDIG requirements (current circuits) were quantified and quoted.

Nó	PAMA	DAMA	AFTN	RADAR	GNSS	GERÊNCIA	PAMA	DAMA	AFTN	RADAR	GNSS	GERÊNCIA	TOTAL	ANUAL
SAEZ	5	7	9	2	1	1	540,00	826,00	2.205,00	490,00	245,00	1.080,48	5.386,48	64.637,76
SBCT	3	7	4	0	1	1	324,00	826,00	980,00	0,00	245,00	1.080,48	3.455,48	41.465,76
SBMN	5	7	5	1	0	1	540,00	826,00	1.225,00	245,00	0,00	1.080,48	3.916,48	46.997,76
SBRF	0	8	1	0	0	1	0,00	944,00	245,00	0,00	0,00	1.080,48	2.269,48	27.233,76
SCEL	2	6	2	0	1	1	216,00	708,00	490,00	0,00	245,00	1.080,48	2.739,48	32.873,76
SEGU	2	10	3	0	0	1	216,00	1.180,00	735,00	0,00	0,00	1.080,48	3.211,48	38.537,76
SGAS	1	5	4	0	0	1	108,00	590,00	980,00	0,00	0,00	1.080,48	2.758,48	33.101,76
SKED	8	9	10	0	0	1	864,00	1.062,00	2.450,00	0,00	0,00	1.080,48	5.456,48	65.477,76
SLLP	2	6	5	0	0	1	216,00	708,00	1.225,00	0,00	0,00	1.080,48	3.229,48	38.753,76
SMPM	1	5	3	0	0	1	108,00	590,00	735,00	0,00	0,00	1.080,48	2.513,48	30.161,76
SOCA	1	4	2	0	0	1	108,00	472,00	490,00	0,00	0,00	1.080,48	2.150,48	25.805,76
SPIM	4	8	9	0	0	1	432,00	944,00	2.205,00	0,00	0,00	1.080,48	4.661,48	55.937,76
SUMU	5	5	2	3	0	1	540,00	590,00	490,00	735,00	0,00	1.080,48	3.435,48	41.225,76
SVMI	7	4	11	0	0	1	756,00	472,00	2.695,00	0,00	0,00	1.080,48	5.003,48	60.041,76
SYGC	1	5	4	0	0	1	108,00	590,00	980,00	0,00	0,00	1.080,48	2.758,48	33.101,76
TTZP	4	2	2	0	0	1	432,00	236,00	490,00	0,00	0,00	1.080,48	2.238,48	26.861,76
TOTAL	**51**	**98**	**76**	**6**	**3**	**16**	**5.508,00**	**11.564,00**	**18.620,00**	**1.470,00**	**735,00**	**17.287,68**	**55.184,68**	**662.216,16**

Table 3-2: SES costs for the REDDIG

4.1.3 Comparison of Options 1 and 2

4.1.3.1 For comparison purposes, the provision of satellite services takes into account the number and type of circuits charged.

4.1.3.2 *It is also assumed that, in both modalities, the States are responsible for purchasing the equipment for earth stations*. That is, the quote of USD 250,000.00 of SES for a station with duplicated chains is the same as for the REDDIG.

4.1.3.3 Table 3-3 shows a summary of REDDIG costs obtained from the final report of the RCC/13 meeting. Column 2009 shows the cost charged to all nodes, a total of *USD 676,000.00*.

4.1.3.4 It should be noted that this total value includes a significant growth in spare parts due to obsolescence and discontinuation of the main equipment of the REDDIG.

4.1.3.5 A simple analysis leads to the initial conclusion that hiring services is more advantageous than managing and controlling the REDDIG, as is done today.

4.1.3.6 However, the REDDIG uses 73,5% of the hired space segment. In case of a 100% utilisation, the value of USD 662,216.16 presented by SES would increase to an average value of **USD 837,000.00.**

Cuadro 2

Desglose detallado de gastos al 31 de diciembre de 2009

Rubro	2003	2004	2005	2006	2007	2008	2009	TOTAL
BL 11 Expertos								
Administrador REDDIG	22.359	87.650	101.296	157.561	197.784	177.449	207.289	951.388
Experto CNS						1.504		1.504
BL 13 Apoyo Adm.								0
13-01 Secretaría	354	12.185	12.551	0	15.718	18.988	14.069	73.865
13-02 Técnico REDDIG		12.000	12.108	712	250		2.080	27.150
BL 15 Viajes Oficiales		321	925	499				1.745
BL 16 Misiones	3.504	4.110	16.733	18.642	18.357	25.718	11.789	98.853
BL 20 Sub-Contratos								0
21-01 PanAmSat (1 Oct -31 Dic 2003) P.O. 30473	62.727							62.727
21-01 PanAmSat (2004) P.O. 40670		168.849	231.264	231.264	231.264	231.264	231.264	1.325.169
21-98 Seguro Responsabilidad Profesional		845	1.156	3.469			1.156	6.626
BL 39 Capacitación		3.014	53.862	30.553	34.044	32.852	31.084	185.409
BL 40 Equipo								0
45-01 Repuestos		-12.752	59.542	36.312	71.637	34.758	122.925	312.422
45-02 Equipo para Oficina	82		2.083	-30	0			2.135
45.03 Operación y mantenimiento de equipo		1.716	1.781		0			3.497
45.04 Traslado del NCC de SPIM a SBMN								0
PO 40694 VIASAT		8.250						8.250
PO 40687 MEMOTEC		4.250						4.250
45.05 PO 40489 Extensión contrato SEEE		50.000						50.000
45.06 PO 40090 Red de Back-up SEEE		24.820						24.820
45.98 Seguro de responsabilidad profesional(PLI)		444	284	246			1.092	2.066
BL 53.01 Tel., Gastos Bancarios, courier, etc.	643	4.726	4.475	1.150	8.688	5.918	3.016	28.616
BL 53.02 Gastos por Servicios del PNUD		118	505	337	0			960
55.01 Costos Administrativos AOSC	6.439	28.795	35.817	34.695	34.601	33.188	50.897	224.432
TOTAL	96.108	399.341	534.382	515.410	612.343	561.639	676.661	**3.395.884**

Table 3-3: Annual costs of the REDDIG

4.1.3.7 On the other hand, for a proper comparison, the values for spare parts and training for the maintenance of the REDDIG nodes must be eliminated from column 2009 of Table 3-1, giving a corrected value of **USD 522,652.00** for Option 1. The resulting annual difference, **USD 314.348**, *is in favour of the current mode*.

4.1.3.8 *Accordingly, the current operational option is clearly more advantageous.*

4.1.4 <u>Option 3: Leasing of earth stations and hiring of services</u>

4.1.4.1 SES offers another way of providing satellite services to its customers, through hired services and the leasing of earth stations. Even in the absence of a direct quote from the provider of said stations, 2006 values were considered for the equipment and the cards that would need to be installed in the REDDIG and MEVA II nodes involved in the interconnection.

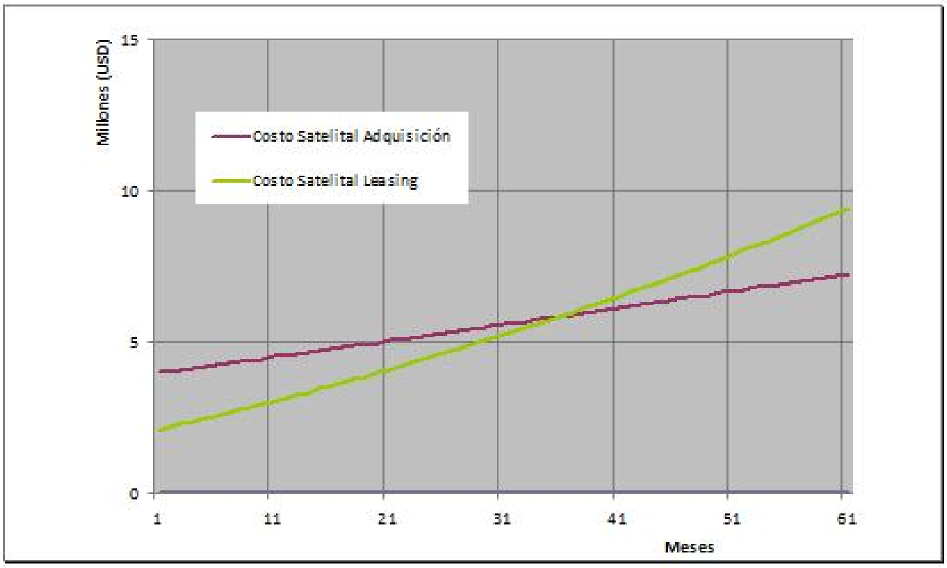
4.1.4.2 The SES quote assumed that the State would be able to purchase the equipment after a period of 5 years of contract, at the symbolic price of USD 1.00. However, it was noted that all the offers included an interest rate of 1.6% per month for *half the total value of the equipment*, since the leasing contract presupposed *a payment of 50% of the total value on the first month*.

4.1.4.3 Accordingly, the *application* of the model to the acquisition of earth stations through a leasing contract results in the costs shown in Table 3.4.

Red Satelital Leasing			
NRC (Non Recurring Charges)	Valor	ARC (Annual Recurring Charges)	Valor
Estaciones Terrenas Complestas	2.000.000,00	Servicios	662.216,16
		Leasing	400.000,00
Total	2.000.000,00		1.062.216,16

Table 3.4: Cost of a satellite network with leased earth station services

4.1.4.4 Another way of comparing costs is shown in Graph 3-1, which reflects the cost of hiring services under the equipment leasing modality, compared to the current REDDIG model, with the purchase of new equipment and the hiring of the space segment. Since the States have the possibility of buying the equipment after 5 years, the comparative time space is limited to 60 months.



Graph 3.1: Satellite network with leased services - Current REDDIG model

5. Conclusion

5.1 Studies show that the current method of managing and controlling the satellite network and hiring the space segment represents a clear advantage for SAM States, compared to the modality of hiring the services from a provider, either through leasing or through the purchase of the ground equipment.

Chapter 4 – Definition and Cost of a REDDIG Ground Structure Model

1. Original requirement

1.1 During the thirteenth Technical Cooperation Meeting of the REDDIG (RCC/13), held at the ICAO Regional Office in Lima-Peru, on 9-10 March 2010, an *ad-hoc* group was established with the participation of delegates of Argentina, Brazil and Peru with the purpose of beginning studies for changing the REDDIG platform. The results are shown in Appendix D to Agenda Item 2, which are transcribed as Table 4-1 below:

ESTUDIOS PRELIMINARES A REALIZAR PARA EL CAMBIO DE LA PLATAFORMA TECNOLOGICA DE LA REDDIG

(Información elaborada por el Grupo ad Hoc conformado por Argentina, Brasil y Perú)

1.1 Para el estudio se tuvieron en cuenta los siguientes criterios:

1.1.1. Disponibilidad.
1.1.2. BER
1.1.3. Ancho de Banda (BW).
1.1.4. Tecnología actual (equipamiento instalado).
1.1.5. Tipos de servicios a ser implementados.
1.1.6. Proveedor de telecomunicaciones único.

1.2 Considerando los criterios determinados anteriormente se propone:

1.2.1. Caso 1:

1.2.1.1. Analizar una red terrestre principal para las aplicaciones actuales y ATN y los anchos de bandas necesarios.
1.2.1.2. Analizar una red satelital de backup para casos de contingencia.

1.2.2. Caso 2:

1.2.2.1. Analizar una red satelital principal para las aplicaciones actuales y ATN y los anchos de bandas necesarios.
1.2.2.2. Analizar una red de backup para casos de contingencia.

1.2.3. Determinar el equipamiento apropiado.

1.2.4. Realizar estudios de costo beneficio para cada una de las soluciones propuestas.

1.2.5. La solución definitiva (cambio progresivo o completo) será analizada luego de disponer de los costos asociados para poder estudiar el impacto en cada una de ellas.

Table 4-1: Document of the *ad-hoc* Group

1.2 Initially, the idea was to follow the criteria listed in item 1.1. Based on a simple analysis of criteria, it may be concluded that the quotes for ground circuits would be requested for “clear channel” circuits, that is, those that are dedicated and seamless to the protocol.

1.3 It was assumed that this type of circuit isolated the user completely from the ground provider, and ensured that the hired bandwidth was at its full disposal.

1.4 Furthermore, the States would purchase the terminal equipment for multiplexing and routing the services provided by the service provider and entering the equipment of the physical layer (layer 1). Likewise, it was noted that services would be offered by a single company to facilitate maintenance (to avoid proliferation of problems when a complaint must be filed regarding the failure or degradation in the quality of the services).

2. Market offerings

2.1 For this activity, the proposals and quotes submitted by *Telefónica S.A*, *Global Crossing Latin America* and *Empresa Brazileira de Telecomunicaciones* (EMBRATEL) were taken into account. It should be noted that the Administration of Argentina provided the *Telefónica* quote, while the Brazilian Administration provided the other two.

2.2 All of the companies submitted their proposals with circuit availability variations, mentioning the services covered, such as network management and control, and the speed associated to the communication channels. However, *the three companies presented the IP/MPLS* solution as the most feasible for implementation, taking into account network coverage, which many times has the last mile provided by third parties under contract.

2.3 In this sense, other matters should be taken into account for the adoption of the proposed solution, which differs from that stated in paragraph 1.1 of the study conducted by the RCC-13 *ad-hoc* group. Consequently, some important aspects related to MPLS are presented below.

3. MPLS technology

3.1 MPLS is a label-based packet routing technology that, in essence, works with the addition of labels by given routers of the network. The MPLS is indifferent to the types of data transmitted, which can be traffic using the IP (Internet Protocol) or other types of protocol at the entrance of the backbone. From there on, all the routing is based on those added labels.

3.2 Compared with IP routing, MPLS is more efficient since the routing tables for all network assets no longer need to be consulted. Furthermore, its flexibility permits the transmission of messages independently from the stack of protocols used in the upper layers.

3.3 MPLS permits the creation of VPN (Virtual Private Networks), ensuring full isolation of traffic through the creation of label tables that are exclusive for each VPN. It is also possible to do QoS (quality of service) prioritising critical applications, giving differential treatment to traffic between the various points of the VPN. The QoS creates the necessary conditions for a better use of network resources, also enabling the traffic of voice and video applications and other continuous applications in real time.

3.4 Figure 4-1 illustrates packet transmission in a traditional IP network.

3.5 As may be noted in this figure, the routing table is consulted in all the routers, which consumes processing resources and causes a greater delay in the transmission of information.

3.6 This is due to the fact that headers are deleted in each router up to level 3 of the ISO (*International Organization for Standardization*) OSI (*Open Systems Interconnection*) layer.

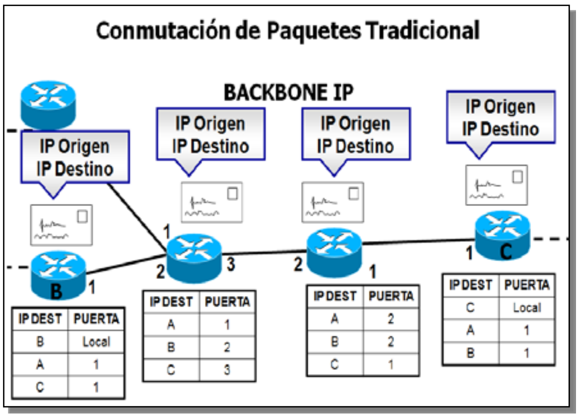


Figure 4-1: IP Switching

3.7 Figure 4-2 shows that packet routing using MPLS is accomplished through a label table, thus eliminating the need to delete packet headers up to OSI level 3. MPLS operates in an intermediate layer in relation to the traditional definitions of layer 2 (link) and layer 3 (network), reason why it was called layer 2.5 protocol.

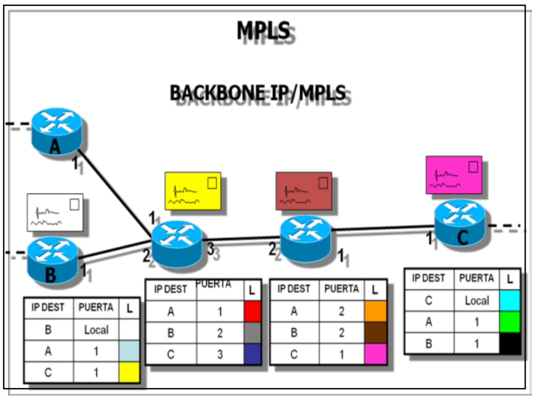


Figure 4-2: MPLS Switching

3.8 In order to achieve complete success in MPLS contracts, it is necessary to establish characteristics in the SLAs *(Service Level Agreements)* to ensure the creation of the VPN using the MPLS, in keeping with RFC 2547 and RFC 3031, and enable QoS configuration over MPLS/VPN, as provided for in RFC 3270 and RFC 2938.

3.9 According to the required SLA priorities and levels, the various types of packets that will circulate through the network will be classified in at least five types of service, following thRFC 2474 and 2475 (*DiffServ*) patterns, supplemented by RFC 2597 (*Assured Forwarding PHB*) and RFC 2598 (*Expedited Forwarding*).

3.10 An example of classification that might be used for QoS configuration follows. *Real time:* Delay- and jitter-sensitive applications, which require packet prioritising and band reservation.

3.10.2 *Critical mission*: Critical interactive applications for the transmission of critical operational information that requires guaranteed delivery and priority treatment.

3.10.3 *Management*: Network management applications using ICMP, SNMP, Telnet, and other protocols.

3.10.4 *Non-critical:* Applications with messages of varying size that do not require immediate attention by users. Even if the contents may be important, these applications may wait until network resources are available.

3.10.5 *Standard*: All the traffic that is not explicitly assigned to the aforementioned classes will be classified as standard or ¨*best-effort*¨. This type of traffic may be transmitted if network resources are available, but should not have a negative impact on the other classes.

4. **Proposed MPLS network topology**

4.1 Figure 4-3 shows a map illustrating an IP/MPLS network topology in each of the existing REDDIG nodes.

Figure 4-3: Ground Network Model

5. **Cost of the MPLS service for the REDDIG II**

5.1 With respect to comparative costs of the three aforementioned telecommunication providers, it may be stated that the most advantageous offer in terms of cost-benefit ratio is the one from *Telefónica*. The presence of *Telefónica* in the SAM States is illustrated in Figure 4-4 below, which shows its penetration in most of South America.

Figure 4-4: Current Presence of *Telefónica* in South America

5.2 The main points of the offer from *Telefónica* are listed below:

5.2.1 Availability/link: 99,5% in average.

5.2.2 Transmission rate: 256 kbps.

5.2.3 Monthly cost of each link (average): USD 2,941.00.

5.2.4 Installation of equipment: USD 54.080 (total).

5.3 However, in order to make a proper assessment of the costs of *Telefónica* (with respect to REDDIG expenditure), an availability of 99,998% is required, which is equal to that expected with the existing satellite platform.

5.4 The study contemplated the installation of a second link per node, resulting in an availability increase to 99,9975%. It should be noted that the cost of the backup link normally tends to be higher, since the provider will have to establish another communication medium for the establishment of the last mile, or hire it from a third party.

5.5 Furthermore, the quote did not consider the cost of the routes in each node. Thus, considering an average cost of USD 20,000.00 per router for equipment redundancy, the investment is in the order of USD 40,000.00 for each REDDIG node.

5.6 Table 4-2 contains a summary of the prices of *Telefónica*, in US dollars:

5.6.1 Routers: USD (20,000.00 x 2 x 16), that is, two routers in each of the 16 nodes.

5.6.2 Installation: as proposed by *Telefónica*.

5.6.3 Spare parts: 10% per year of the cost of the routers (0.1 x 640,000.00).

5.6.4 Cost of MPLS: USD (2,941.00 x 2 x 16 x 12), that is, the unit monthly payment x 2 accesses x the number of nodes x 12 months.

Red Terrestre			
NRC (Non Recurring Charges)	Valor (USD)	ARC (Annual Recurring Charges)	Valor (USD)
Costo de Enrutadores	640.000,00	Repuestos	64.000,00
Instalación de Equipos Proveedor	54.080,00	Costo de MPLS (32 accesos)	1.129.344,00
Total	694.080,00		1.193.344,00

Table 4-2: Prices of the Ground Network

Chapter 5 - Comparative Study of Satellite and Ground REDDIG II Models and Costs

1. General

1.1 In the current structure of the REDDIG, the space segment is hired and said segment is managed and controlled by the REDDIG Administration. There is also a backup network made up by ISDN BRI circuits, whose technology is being discontinued by the service providers.

1.2 It is also a fact that the amount of space segment required is directly related to the technology used in earth stations and to the services supported, as stated above.

1.3 However, it should be noted that in the space segment hired, payment is based on the amount of bandwidth hired, whether or not the available capacity is used. Likewise, as already stated, the OPEX is a major problem in satellite communications.

1.4 Furthermore, when hiring ground services based on IP/MPLS, payment is made for the link between the client and the point of presence (PP) of the provider, and for the use of network (cloud) resources involving the QoS configuration of the applications. If network demand is sized consistently, services may be readily added to the hired network.

2. Availability and logistics

2.1 The concept of *availability* is very important in telecommunication networks. Two factors are involved when talking of availability: Mean Time Between Fail (MTBF) and Maximum Time to Repair (MTTR).

2.1.1 MTBF is more related to the quality of the equipment--which is directly related to the manufacturer--and to the health of the facilities (quality of electric power and grounding).

2.1.2 MTTR is related to the logistics available for maintenance and how fast the team in each State conducts such maintenance. Statistically, in case of failure, the shorter the time of unprotected operation of the redundant module while the main equipment is being maintained, the less likely it will be for the system to remain inoperative.

2.2 It should be noted that the REDDIG technicians have received (and continue to receive) proper training through a cyclic training programme, which provides for excellence in the services rendered.

2.3 Meantime, logistics *is a weak point in the process*. This is because the REDDIG lacks expeditious customs procedures for receiving and returning the parts to the ICAO Regional Office in Lima, where spare parts are kept for Project RLA03/901.

2.4 The RCC/9 meeting formulated Conclusion RCC 9/03 “Alternatives for improving spare part logistics for the REDDIG”, which contemplated a study for the creation of a REDDIG spare part warehouse under the free-zone modality, which in the end, did not occur. The practical result, as reflected in the RCC/10 report, is that the equipment import/export times are not as desired, in some cases, taking as much as *12 months*.

2.5 A solution might be the creation of the South American Air Navigation and Safety Organisation, one of whose functions would be to manage the REDDIG. An organisation in which all the States of the SAM Region participate *may* succeed in the development of mechanisms to facilitate and expedite the management of spare parts.

2.6 It may be concluded that the current availability of the REDDIG *could be seriously compromised* because of spare part logistics, and there seems to be no solution until the future regional organisation is created (without concrete implementation times).

3. Comparative costs

3.1 The costs associated to the ground and satellite modalities are compared in Tables 5-1 and 5-2, extracted from the respective chapters.

Red Terrestre			
NRC (Non Recurring Charges)	Valor (USD)	ARC (Annual Recurring Charges)	Valor (USD)
Costo de Enrutadores	640.000,00	Repuestos	64.000,00
Instalación de Equipos Proveedor	54.080,00	Costo de MPLS (32 accesos)	1.129.344,00
Total	694.080,00		1.193.344,00

Table 5-1: Cost of the ground solution

3.2 It should be noted that, for the satellite solution, the REDDIG will use more efficient equipment in terms of modulation and error correction codes, resulting in bandwidth optimisation in the order of 30%, as shown in Table 5-2.

Satelital			
NRC (Non Recurring Charges)	Valor (USD)	ARC (Annual Recurring Charges)	Valor (USD)
Estaciones Terrenas Completas	4.000.000,00	Repuestos	50.000,00
		Segmento Espacial	227.500,00
		Administrador de la REDDIG	240.000,00
Total	4.000.000,00		517.500,00

Table 5-2: Cost of the satellite solution

3.3 This comparison should be done through time, since recurrent and non-recurrent charges differ, as shown in Table 5-3:

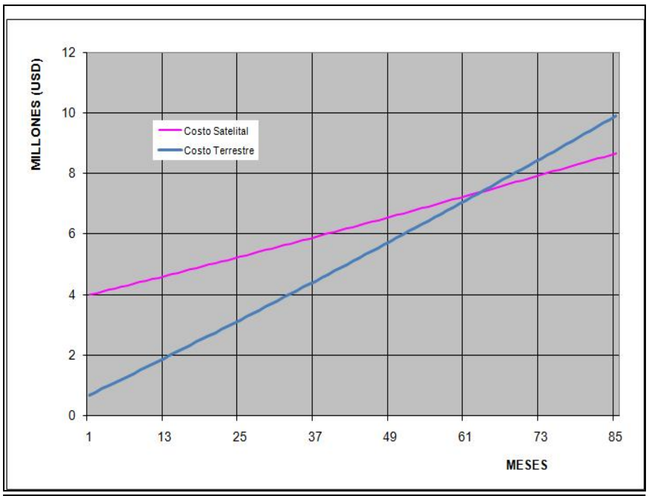


Table 5-3: Comparison of satellite and ground costs through time

3.4 For comparison purposes in the table, a period of seven (7) years was considered--the estimated period currently contemplated for technological changes--, since the old ten-year rule is now obsolete given the fast pace of technological change. An interest rate of 0.2% per month was considered, which represents an annual rate of 2.4% (which reflects the FED in the last 8 years).

3.5 As may be seen in the table, *after five years, ground costs are higher than satellite costs*.

4. **Conclusions**

4.1 From the *economic* point of view, the final costs at the end of seven years favour the *satellite* solution.

4.2 From the *technical-operational* point of view, it must be recognised that all States have skilled personnel to support their respective stations; thus, the *satellite* solution seems to be the most logical one.

4.3 As to the *availability associated to logistics*, it is felt that the *ground* solution is the most appropriate due to the uncertainty (or potential hazard) involved in the satellite solution.

Chapter 6 - Analysis of the Mixed Model and Proposal of a Final Infrastructure

1. Mixed model

1.1 From the economic and technical-operational point of view, the satellite structure is advantageous to SAM States compared to a purely ground network. On the other hand, the hiring of a parallel ground network guarantees availability (in the first place) and offers a natural increase of such availability. Accordingly, a mixed network configuration, as shown below, could be applied until the South American Air Navigation and Safety Organisation is created.

2. Infrastructure

2.1 The infrastructure is based on the scheme shown in Figure 6-1:

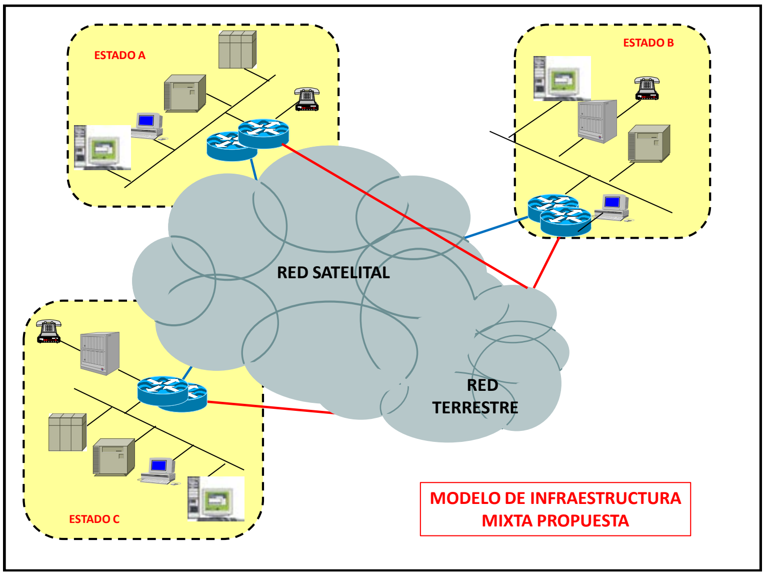


Figure 6-1 – Proposed infrastructure scheme

2.2 The aforementioned network would be a combination of a *main satellite network and a ground network*, which would increase network capacity, for the transmission of new ATN applications and, as already stated, to increase system availability.

2.3 To that end:

2.3.1 The satellite part would have duplicated chains to ensure high availability.

2.3.2 The ground part would have a chain, with the practical availability provided by most ground networks.

3. Availability

3.1 Table 6-1 shows the theoretical availability of the two systems, ground and satellite, in parallel, considering, for calculation purposes, an 8-year average MTBF and a 30-day MTTR. The table shows the significant improvement obtained in this aspect.

Disponibilidad Satélite				Disponibilidad Terrestre			
D1	D2	Dparalelo	Descrição	D1	D2	Dparalelo	Descrição
99,900000%	99,900000%	99,999900%	Disponibilidad FRAD		99,500000%	99,500000%	Equipo de Capa 1
99,900000%	99,900000%	99,999900%	Disponibilidad MODEM				
99,900000%	99,900000%	99,999900%	Disponibilidad SSPA				
	99,990000%	99,990000%	Disponibilidad Seg. espacial/año				
Dsistema:		99,989700%		Dsistema:		99,500000%	
Disponibilidad de dos sistemas e paralelo:				99,9999485002%			
Indisponibilidad en minutos por mes:				0,02			

Table 6-1: Availability

3.2 It is important to highlight that, under the present circumstances, *there is the potential for the REDDIG availability to be seriously compromised*, as already discussed extensively in the previous chapter. This single reason would warrant a mixed system.

4. Cost

4.1 For the adoption of the mixed solution, consideration has been given to a main satellite network with duplicated chains, and a parallel ground backup network, the associated cost of which appear in Table 6-2.

4.2 Another form of mixed network includes a satellite network with a simple chain, which reduces the investment in equipment, as shown in Table 6.3.

4.3 In the proposed model, the cost difference between the mixed and the satellite network will be smaller the sooner the South American Air Navigation and Safety Organisation is created.

Red Mixta			
NRC (Non Recurrin Charges)	Valor	ARC (Annual Recurring Charges)	Valor
Estaciones Terrenas Completas	4.000.000,00	Segmento Espacial	227.500,00
Instalación Equipos Proveedor	54.080,00	Administrador de la REDDIG	240.000,00
		MPLS (16 accesos)	564.672,00
		Repuestos	50.000,00
Total	4.054.080,00		1.082.172,00

Table 6-2: Cost of the mixed network with duplicated satellite chain

Red Mixta (Cadena Satelital Simple)			
NRC (Non Recurrin Charges)	Valor	ARC (Annual Recurring Charges)	Valor
Estaciones Terrenas Completas	2.000.000,00	Segmento Espacial	227.500,00
Instalación Equipos Proveedor	54.080,00	Administrador de la REDDIG	240.000,00
		MPLS (16 accesos)	564.672,00
		Repuestos	25.000,00
Total	2.054.080,00		1.057.172,00

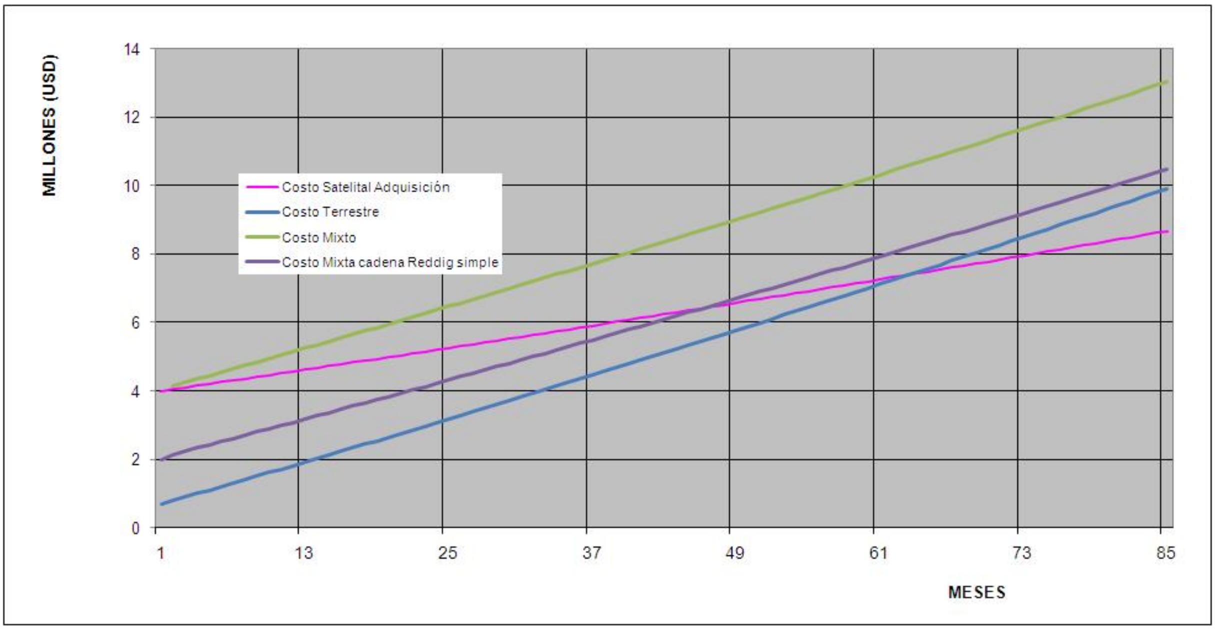
Table 6-2: Cost of the mixed network with duplicated satellite chain

4.4 The quote for the ground proposal assumed that all services would revolve around it, which resulted in a 256K access, with the indicated costs.

4.5 However, used as a redundant system, only critical services (those currently in operation) would have access and only half of the access bandwidth (128K) would be used, thus reducing recurrent costs by at least 2/3 of the indicated value (USD 376,448.00 per year, instead of USD 564,672.00). Thus, at the end of the seven years analysed, there would be a reduction of USD 1,317,568.00.

5. **Comparison of the satellite, ground and mixed models**

5.1 Graph 6-1 shows the associated costs of the four types of networks under study: satellite, ground, mixed (duplicated satellite chain) and mixed (single satellite chain).



Graph 6-1: Comparison of satellite, ground and mixed costs

5.2 It is obvious that the mixed solution with duplicated satellite chain is more expensive. However, it should be noted that:

5.2.1 The required availability is guaranteed, although the potential satellite availability risk will persist until a regional mechanism that ensures the normal mobilisation of spare parts is found.

5.2.2 The States may chose to have access to the redundant network, or stay linked only to the satellite network.

5.2.3 The leasing of 128K of ground access is considered sufficient *prima facie*, thus reducing total cost.

5.2.4 If the South American Air Navigation and Safety Organisation is created prior to the implementation of the mixed solution, it will not be necessary to hire the ground network. Likewise, the ground network service contract may be terminated if said Organisation is not created before implementing the mixed solution.

5.3 Table 6-3 contains a summary of all the numbers presented so far:

Partial cost of the mixed solution after seven years			
Item	**Satellite**	**Ground 1 (256K)**	**Ground 2 (256K)**
Earth stations	4,000,000.00		
Installation		54,080.00	54,080.00
Space segment	1,592,500.00		
REDDIG administration	1,680,000.00		
MPLS		3,952,704.00	2,635,136.00
Spare parts	350,000.00		
Total cost of the mixed solution after seven years			
Pure satellite	7,622,500.00		
Mixed 1 (Satellite + ground 1)		11,629,284.00	
Mixed 2 (Satellite + ground 2)			10,311,716.00
Differences	**Net**	**Percent**	
Mixed 1 - satellite	4,006,784.00	52.57%	
Mixed 2 - satellite	2,689,216.00	35.28%	

Table 6-3: Summary of costs

6. Implementation of services

6.1 A mixed network allows for a wide variety of configuration options. For example, Table 6-4 shows the applications that could be initially used in the ground portion of the mixed network, with the corresponding bandwidth consumption. In this case, *half* of the essential services of each node have been considered, which, for current applications, correspond to AFTN/AMHS, radar data and non-switched speech communications.

State	Location	AFTN			Hot line			Radar			Partial
		Circ.	Vel.	BW	Circ.	Vel.	BW	Circ.	Vel.	BW	
Argentina	Ezeiza	4	2.4	9.6	3	10.0	30.0	2	9.6	19.2	58.8
Bolivia	La Paz	2	2.4	4.8	1	10.0	10.0	0	9.6	0.0	14.8
Brazil	Curitiba	2	2.4	4.8	1	10.0	10.0	0	9.6	0.0	14.8
	Manaus	3	2.4	7.2	3	10.0	30.0	0	9.6	0.0	37.2
	Recife	1	2.4	2.4	0	10.0	0.0	0	9.6	0.0	2.4
Chile	Santiago	1	2.4	2.4	1	10.0	10.0	0	9.6	0.0	12.4
Colombia	Bogota	4	2.4	9.6	4	10.0	40.0	0	9.6	0.0	49.6
Ecuador	Guayaquil	2	2.4	4.8	1	10.0	10.0	0	9.6	0.0	14.8
French Guiana	Rochambeau	1	2.4	2.4	1	10.0	10.0	0	9.6	0.0	12.4
Guyana	Georgetown	2	2.4	4.8	1	10.0	10.0	0	9.6	0.0	14.8
Paraguay	Asunción	1	2.4	2.4	1	10.0	10.0	0	9.6	0.0	12.4
Peru	Lima	4	2.4	9.6	2	10.0	20.0	0	9.6	0.0	29.6

State	Location	AFTN			Hot line			Radar			Partial
		Circ.	**Vel.**	**BW**	**Circ.**	**Vel.**	**BW**	**Circ.**	**Vel.**	**BW**	
Surinam	Paramaribo	2	2.4	4.8	1	10.0	10.0	0	9.6	0.0	14.8
Trinidad y Tobago	Piarco	1	2.4	2.4	2	10.0	20.0	0	9.6	0.0	22.4
Uruguay	Montevideo	1	2.4	2.4	3	10.0	30.0	2	9.6	19.2	51.6
Venezuela	Maiquetía	5	2.4	12.0	2	10.0	20.0	0	9.6	0.0	32.0
Total bandwidth of the ground medium											**394.8**

Table 6-2: Example of ground applications of the mixed network

APPENDIX B

SEMINAR/WORKSHOP ON NEW SATELLITE AND GROUND NETWORKS TECHNOLOGY

(Lima, Peru, 18 to 20 July 2011)

DRAFT AGENDA

Agenda Item1: **REDDIG II digital network study** *(presented by SAM communications experts, REDDIG Administration and ICAO)*

a) Study on services requirements in support of air navigation in the short, médium and long term
b) Study on band width requirements for the implementation of new services in REDDIG II
c) Study of the ground and mixed (satellite & ground) satellite communications networks models for REDDIG II

Agenda Item 2: **New satellite communications networks trends** *(presented by the industry and communications services providers)*

a) New modulation and multiplexing techniques in satellite digital link protocols
b) New multiple satellite Access techniques
c) New coding techniques and error correction in digital links

Agenda Item 3: **New ground digital communications networks trends** *(presented by the industry and communications services providers)*

New modulation and multiplexing techniques in ground digital link protocols

Agenda Item 4: **Solutions proposed by the industry to the REDDIG II satellite digital network model** *(presented by the industry and communications services providers)*

Presentation of solution proposals by the industry and communications services providers to the REDDIG II digital network study

APPENDIX C

ACTION PLAN FOR THE IMPLEMENTATION OF A NEW DIGITAL NETWORK FOR THE SAM REGION (SAM ATN NETWORK)

ACTIVITIES	ACTION TO BE TAKEN BY	DELIVERABLE	TARGET DATE	REMARKS
1	**2**	**3**	**4**	**5**
1 Identify current voice and data services requirements, as well as those scheduled to be implemented in the short, medium and long term in the SAM Region, in support of air navigation	SAM/IG Group for the implementation of CNS improvements	List of services requirements in support of air navigation for the SAM Region, including those scheduled for the short, medium and long term	SAM/IG/6	Completed. Identified in the study
2 Analysis of band width required for the services identified in Activity 1	SAM/IG Group for the implementation of CNS improvements	Amount of band width required to support the requirements specified in Activity 1	SAM/IG/6	Completed. Identified in the study
3 Determination of costs for the band width increase in REDDIG	SAM/IG Group for the implementation of CNS improvements	Implementation costs of new REDDIG services	SAM/IG/6	Completed. Identified in the study
4 Study of the new REDDIG technological platform and determination of its cost	SAM/IG Group for the implementation of CNS improvements	Definition of the REDDIG technological platform	SAM/IG/6	Completed. Identified in the study
5 Study of a ground SAM IP structure supporting the services required and defined in Activity 1, as well as of the band width requirements defined in Activity 2	SAM/IG Group for the implementation of CNS improvements	Definition of a SAM ground IP network model structure	SAM/IG/6	Completed. Identified in the study
6 Determination of costs for the implementation of Activity 5	SAM/IG Group for the implementation of CNS improvements	Implementation costs of SAM ground IP network structure	SAM/IG/6	Completed. Identified in the study

ACTIVITIES	ACTION TO BE TAKEN BY	DELIVERABLE	TARGET DATE	REMARKS
1	**2**	**3**	**4**	**5**
7 Study on the structure of a mixed (ground and satellite) SAM digital network structure	SAM/IG Group for the implementation of CNS improvements	Model definition	SAM/IG/6	Completed. Identified in the study
8 Determination of the costs for the implementation of Activity 7	SAM/IG Group for the implementation of CNS improvements	Implementation costs of a mixed (ground and satellite) digital network structure	SAM/IG/6	Completed. Identified in the study
9 Comparisons between the network infrastructure models specified in Activities 4, 5 and 7	SAM/IG Group for the implementation of CNS improvements	Comparative study between the ground IP and mixed (satellite and ground) satellite network models	SAM/IG/6	Completed. Identified in the study
10 Determination of SAM network infrastructure model, on the basis of results of Activity 9	SAM/IG Group for the implementation of CNS improvements	Definition of a SAM network infrastructure model	SAM/IG/7	The study for the new SAM digital network was distributed to all SAM States for comments, which were received from Argentina, Brazil, Chile and Panama. SAM/IG/7 meeting defined the model SAM network infrastructure.
11 Holding of a seminar/workshop on new satellite and ground networks technology	Secretariat	Technological solutions for the new network configuration in the SAM Region	Lima, Peru, 18-20 July 2011	During this seminar, the communications services providers, integrators and manufacturers will present initial implementation proposals on the new SAM digital network
12 Acceptance process for the implementation of the network infrastructure model determined by Activity 10, through a public bidding process	SAM/IG Group for the implementation of CNS improvements	Acceptance of the public bidding process for the implementation of a SAM network infrastructure	SAM/IG/7	SAM/IG/7 meeting approved the network infrastructure model for the SAM Region

ACTIVITIES	ACTION TO BE TAKEN BY	DELIVERABLE	TARGET DATE	REMARKS
1	**2**	**3**	**4**	**5**
13 Preparation of technical specifications for the implementation of the SAM network infrastructure specified in Activity 10	SAM/IG Group for the implementation of CNS improvements	Technical specifications for the implementation of a SAM network infrastructure	Aug 2011	Experts will be hired for a 15-day period to draft the definite technical specifications. RLA/06/901 RCC/4 meeting approved the activity
14 Circulation to States of the technical specifications for the implementation of the SAM network infrastructure	States of the Region	Approval of technical specifications for the implementation of the SAM network infrastructure	Sep 2011	
15 Presentation of REDDIG network study and technical specifications to RAAC/12 meeting	Secretariat	Go ahead for the public bidding process through ICAO	Oct 2011	
16 Evaluation of offers presented	SAM/IG Group for the implementation of CNS improvements	Assessment of offers	Mar 2012	
17 Determination of winning bidder	SAM/IG Group for the implementation of CNS improvements	Designation of winning bidder for the network implementation	Jun 2012	

APPENDIX D / APENDICE D

STATUS OF IMPLEMENTATIONOF AMHS IN THE SAM REGION
ESTADO DE IMPLANTACION DE LOS SISTEMAS AMHS EN LA REGION SAM

STATE/ ESTADO	MANUFACTURER/ FABRICANTE	YEAR OF INSTALLATION/ AÑO DE INSTALACION	REMARKS/ OBSERVACIONES
ARGENTINA	RADIOCOM	2005	Three MTAs installed: Ezeiza, Cordoba and Comodoro Rivadavia Se tienen instalados tres MTA: Ezeiza; Córdoba; y Comodoro Rivadavia
BOLIVIA	THALES	2011	Equipment in the country and national installation scheduled for the end of 2011 Todo el equipamiento ya se encuentra en el país y su instalación a nivel nacional está previsto para finales del 2011
BRASIL	RADIOCOM	2009	Two MTAs installed: Brasilia; and Manaos Se tienen instalados dos MTA: Brasilia; y Manaos
CHILE	THALES	2010	
COLOMBIA	COMSOFT	2009	AMHS interconnected with Peru. Only interconnection in the Region. Está interconectado en AMHS con Perú. Única interconexión en la Región
ECUADOR	RADIOCOM	2007	AMHS installed only in Guayaquil and operates only there, consists of an MTA and some terminals. Ecuador has purchased a new AMHS to become operational nationally in the beginning of 2012 El sistema AMHS está instalado únicamente en Guayaquil y funciona solamente en esa localidad consiste de un MTA y algunos terminales. Ecuador ha adquirido un nuevo sistema AMHS que estará en operación a nivel nacional a principio de 2012
GUYANA	SKYCOM	2011	Operational at the end of May 2011 Finales de mayo 2011 puesta en operación
FRENCH GUIANA (FRANCE)			No information available regarding AMHS implementation plans No se tiene información de planes para la implantación de un sistema AMHS
PANAMA	COCESNA	2009	
PARAGUAY	RADIOCOM	2007	
PERU	COMSOFT	2009	
SURINAME	SKYCOM	2011	Operational since the start of 2011 En operación desde inicios de 2011
URUGUAY			Currently in the purchasing process Se encuentra en el proceso de adquisición
VENEZUELA	RADIOCOM	2010	

APPENDIX E

ACTION PLAN FOR THE INTERCONNECTION OF AMHS SYSTEMS IN THE SAM REGION

ITEM	ACTIVITY	RESPONSIBLE	EXPECTED RESULT	STATUS	FINALIZATION DATE
1	2	3	4	5	6
1	Review of the ATN Regional Plan as regards AMHS implementation	Secretariat	Revised ATN ground ground applications plan (Table CNS 1Bb)	Completed	Jun 2009
2	Review and assignment of intra-regional routers IP addressing	Secretariat	Assignment of IP addressing	Completed	Jun 2009
3	Review of CAAAS addressing plan	SAM States	Revised CAAS addressing Plan	Completed	Jun 2009
4	Prepare interconnection protocol tests to determine bandwidth required for transmission of AMHS messages between MTAs through REDDIG	RLA/06/901 project CNS Expert	Protocol interconnection tests. A guide for the operational interconnection of AMHS systems was drafted	Completed	Dec 2009
5	Preparation of Guide for the Operational Interconnection of AMHS Systems in the SAM Region	RLA/06/901 project CNS Expert	Guide for the operational interconnection of AMHS systems in the SAM Region	Completed	Oct 2009
6	Drafting of a model MoU for the interconnection of AMHS	Argentina	Model MoU for the interconnection of AMHS	Completed	Oct 2009
7	MoU for the interconnection of AMHS currently implemented in the SAM Region: a) Argentina-Brazil b) Argentina-Chile c) Argentina-Peru d) Argentina-Paraguay e) Brazil-Colombia f) Brazil-Paraguay g) Brazil-Peru h) Chile-Peru i) Colombia-Perú j) Colombia-Panama k) Colombia-Venezuela l) Peru-Venezuela m) Brazil-Suriname n) Guyana-Venezuela o) Suriname-Venezuela p) Brazil-Guyana q) Guyana-Suriname r) Brazil-Venezuela The AMHS interconnection MoU in Bolivia, Ecuador, French Guiana (France) and Uruguay should be drafted once AMHS installation is completed at national level.	SAM States involved	MoU for interconnection of AMHS systems between SAM States having AMHS implemented.	Valid a), b) c), d), f), g) & i) completed	e) Jul 2011 h) Oct 2011 j) Jul 2012 k) Oct 2011 l) Oct 2011 m) Oct 2011 n) Oct 2011 o) Oct 2011 p) Oct 2011 q) Oct 2011 r) Oct 2011

ITEM	ACTIVITY	RESPONSIBLE	EXPECTED RESULT	STATUS	FINALIZATION DATE
1	2	3	4	5	6
8	Phase I Interconnection trials between MTAs of: a) Argentina-Brazil b) Argentina-Paraguay c) Brazil-Paraguay d) Colombia-Peru e) Argentina-Chile f) Argentina-Peru g) Brazil-Peru Types of tests to carry out: Network transportation; Network connectivity; Message exchange; Preparatory phase. **Note**: Inclusion has been made of only the AMHS interconnected between States having implemented and signed the MoU.	Argentina, Brazil, Chile, Colombia, Paraguay, Peru and REDDIG Administration	Interconnection trials between Argentina, Brazil, Chile and Paraguay MTAs	Valid a) network transportation and connectivity trials carried out with the Manaos node. MoU was updated, since Brazilian entrance node will be Curitiba. Network connectivity, and transport and exchange of messages tests will be repeated b) network transportation and connectivity, and message exchanges trials carried out. c) MoU was updated, as entrance node to Brazil will be Curitiba, and the network connectivity, and transport and exchange of messages tests will be carried out. d) Operational interconnection trials completed. e), f) and g) No tests carried out	a) Jun 2011 b) Jul 2011 c) Jul 2011 e) Jul 2011 f) Jun 2011 g) Jun 2011
9	Operational interconnection implementation at the following MTAs: a) Argentina-Paraguay b) Argentina-Brazil c) Argentina-Chile d) Argentina-Peru e) Brazil-Paraguay f) Brazil-Peru g) Colombia-Peru **Note**: Inclusion has been made of only the AMHS interconnected between States having implemented and signed the MoU.	Argentina, Brazil, Chile, Colombia, Paraguay and Peru	Operational implementation of AMHS systems	g) Colombia and Peru completed and operating	a) Oct 2011 b)Oct 2011 c) Oct2011 d)Oct 2011 e)Oct 2011 f) Oct 2011

APPENDIX F / APENDICE F

RNAV ROUTES SAM REGION / RUTAS RNAV REGION SAM

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL201			
	MITU CO VOR/DME (MTU)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BOGOTA
	ABIDE		
	ABIDE	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	AMAZONICA
	CLOTI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	MINIB	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	BUMBA		
	EGLER	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	PERSA		
	OBEBA		
	IRUMI		
	BARGE		
	RONEN		
	ARPAR		
	KUGMA		
	CANON		
	CANON	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA
	ILMOK		
	EQUAL	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ANGOL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	GRACE		
	MABMA		
	ABUSE		
	TESEK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ISIRO		
	ASTOB	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	HASTE		
	PIRASSUNUNGA VOR/DME (PIR)		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL206			
	VITORIA VOR/DME (VTR)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	CALVO		
	CALVO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	RECIFE
	ABROLHOS NBAV		
	PAMOX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	DEMON		
	ILKOX		
	GIANT		
	FLUTE		
	NEMOL		
	BUGAT		
	REGIS		
	ARUNU	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO
	BUTAP		
	KODOS		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL211			
	LA PLATA VOR (PTA) ESLAN GATOS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZEIZA
	PAGAD REKUL	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	GUXOR ANKOK KILOS KAKIN KETIS MORSI MUNES	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
UL216			
	FOZ VOR/DME(FOZ)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	BITUR	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	ASUNCION
	BITUR SOSMO EGELU ARVOP	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	ARVOP ESDER SIDAK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	SIDAK POSPA ARMUK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LA PAZ
	ARMUK UBSIM ESBUL DOTKI EVOLO ILSOV PORTO VELHO VOR/DME (PVH) NELIT MAZAR RITMO MEDLE NAFTA BUMBA AKSUK GABRIEL VOR/DME (SGC) ZORRO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	ZORRO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	LOKES	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	MAIQUETIA
	LOKES PUERTO AYACUCHO VOR/DME (PAY) EKUNA SAN FERNANDO VOR/DME (SFD) DAVEX SAN SEBASTIAN NDB (SSB) ALTOS VOR/DMEMAIQUETIA/MIQ	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UL224			
	MARICA VDMRC VULGO ROKAD	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	CIDER	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL300			
	BOGOTA "BOG" VOR/DME-NDB ROLUS	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	ROLUS IQUITOS VOR/DME (IQT) OSORA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA
	OSORA TEMOR (FIR AMAZONICA) SELVA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	AMAZONICA
	SELVA ETEBA TOMIX OPKUL OLGAS ARICA VOR/DME (ARI)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	LIMA
	ARICA VOR/DME (ARI) TIVIL INT TUNIN INT BAGRE INT ALDER INT TONGOY VOR/DME TOY	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	ANTOFAGASTA SANTIAGO

UL301			
	ASUNCION VOR/DME(VAS) KEVUR BITUR BOLIR	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ASUNCION
	BOLIR VENUS TILKI RABAN MINOT GALES FLORI DIONI ANDOR CONGONHAS VOR/DME (CGO)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	

UL302			
	LIMA DVOR/DME (LIM) ARPON ILMAR IREMI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA
	IREMI INT ASEPU INT ELASA INT ATEDA INT TONGOY VOR/DME (TOY)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	ANTOFAGASTA SANTIAGO

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL304			
	BONSUCESSO VOR/DME (BCO) OPRAM POCOS NDB (PCL) ZANET EDOLA CORVO PAGUE ROMIX PAMEO GOIANIA VOR/DME (GOI) KOMGA OPLIK OPORA OPRUX	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	OPRUX TEREX LITUK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	DADOT MULUV MUMSA DARLO ITAITUBA NDB (YUB) ILTAN ESLEX TEPIM PUERA KAKIL ILNOV DAPSA BOA VISTA VOR/DME (BVI)		AMAZONICA
	BOA VISTA VOR/DME (BVI) BUVKU	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	BUVTU ISANI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	ISANI CANAIMA VE VOR/DME (CMA)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	MAIQUETIA
	LODIR RONER ERIPA CABO CODERA VOR/DME (CBC) AKNUR BEGAB OPSEN EDGEL GAVA ILKIT	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL305			
	BARRANQUILLA VOR/DME /BAQ) MAGANGUE VOR/DME (MGN) BAGRE	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BARRANQUILLA
	BAGRE OTU VOR/DME (OTU) MARIQUITA VOR/DME (MQU)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BOGOTA
	GIRARDOT VOR/DME (GIR)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	DIKUN PULTU	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	PULTU TERAS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	GUAYAQUIL
	TERAS OSUBU VUKOK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA
	TARAPOTO VOR/DME (TAP)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ENPAP	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	AMVEX LIMA DVOR/DME (LIM)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL306			
	LIMA DVOR/DME (LIM) KADEL	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**LIMA**
	KADEL SELVA	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**LIMA**
	SELVA BOBAS PANOL VERDE PALIO ARTIK INTER LANCE RITMO JOUST EGLER SALSA ESBUV EGBIB CHECK ASUMI MANAUS VOR/DME (MNS) TEPEM DADEG DOMGA PUERA INPUT LODOK ROGIN LONAS AKNIB ANSOX SIROS	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**AMAZONICA**
	SIROS DIMAS DORLI DABRA CAYENNE VOR/DME (CYR)	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	
UL308			
	UGADI ANPAL	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**GUAYAQIL**
	ANPAL ITALU UGEMA	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**LIMA**
	UGEMA ISREN SALINAS VOR/DME (SLS) LIMA DVOR/DME (LIM)	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**LIMA**
UL309			
	GABRIEL VOR/DME (SGC) IODAD CLOTI MULIP PRIMA JURIS INTER GEDOX BRANCO VOR/ME (RBC)	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**AMAZONICA**
	BRANCO VOR/ME (RBC) GRAFO	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**AMAZONICA**

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	GRAFO ELANI AKSES LA PAZ VOR/DME (LPZ)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	LA PAZ
	IRONO EMPEX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LA PAZ
	EMPEX CALAMA VOR/DME (LOA) CEPAM PABOS	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ANTOFAGASTA
	ASALO DILOK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	ANTOFAGASTA
	TABON DVOR/DME (TBN)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	ANTOFAGASTA

UL310			
	CONGONHAS VOR/DME (CGO) DORMI ORANA PAGIN	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CURITIBA
	SERGI PUNTO ATARI EDMAR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
		SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	SIGAS	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	ERVAS ARULA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CURITIBA

UL312			
	LOGAL ANGES ERIZO OSAKI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	GUAYAQUIL
	OSAKI AKSER	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	LIMA
	SALINAS VOR/DME (SLS)	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA

UL318			
	ESMERALDAS VOR/DME VAMOS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	GUAYAQUIL
	VAMOS BOLDO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA

UL322			
	GEORGETOWN VOR/DME (TIM) BUVIP	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	GEORGETOWN
	BUVIP ILNOV ISOSU KIGOM ISUNU ISIVA MANAUS VOR/DME (MNS) CHAMP POLEN DOKBU AROPI PAKEM BARGE SIMON ILTAR REDON ILTEG	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	ESBUL MUDAB ILRES		
	ILRES VAROM NILSO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LA PAZ
	NILSO SEDMA VIRU-VIRU (VIR) GAXOK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	GAXOK SALTA VOR/DME SAL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	SALTA VOR/DME SAL ALGAR	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	ALGAR BUSLO EGIKA ILSUR ASIMO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	ASIMO DILOK TABON VOR/DME TBN	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	SANTIAGO

UL324			
	FOZ VOR/DME (FOZ) CATARATAS DEL IGUAZU VOR/DME (IGU) ALDOS LUCIA ILPEP ELAMO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	RESISTENCIA
	ELAMO CUARA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	CUARA GUTIL DAYMA ANPON PALOL TORON KUKEN	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO
	KUKEN EZEIZA VOR/DME (EZE)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZEIZA

UL327			
	PORTO VOR/DME (PCX) KIGUV PANAS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	PANAS VITORIA VOR/DME (VTR)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	VITORIA VOR/DME (VTR) LIVAM	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	LIVAM PORGA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	PORGA GUSOD ONSEK VADAD ETIMO ASANU SERIM	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO

UL330			
	VITORIA VDVTR MINIG POLVO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	POLVO DESEX EMTUP BILUX UDIGA EGUPA ASDOK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL335			
	VITORIA VDVTR KIKAT	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	KIKAT GARUP	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BRASILIA
	GARUP VODSA TURAB MELEM ISUPA DAGAM AKRAN	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO
UL337			
	VUDAL ALDIT DABAM EDMAX GUTIM ILMET ARMUR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	MAIQUETIA
UL340			
	PORTO VOR/DME (PCX) KIGOL LOBIK TENIG	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	TENIG EKALO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
UL344			
	ARTOM PUPES LOLIN AMERO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	AMERO VALEM	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	VALEM ANKOR	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	ANKOR EVRID SALINAS VOR/DME (SLS) LIMA DVOR/DME (LIM)	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
UL348			
	DOMINGO VOR/DME DGO MORSA INT	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	SANTIAGO
	MORSA INT ROBIK INT MAKRA INT CARPA INT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	SANTIAGO
	TACAS INT GAMBA INT OSTRA INT VINAP INT ISLA DE PASCUA VOR IPA HANPI INT SAKOB INT SAURI INT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL375			
	UKEDI EGIMI DIKEB OBKUT ORARO BODAK NOISE PUGSA DIGOR ARUNU UDIGA ETIMO ISUPA LOKIM SISET	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**ATLANTICO**
UL401			
	VENTANAS VOR/DME VTN ANPUK	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**SANTIAGO**
	ANPUK JURAK ESDIN INT	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**ANTOFAGASTA**
	ESDIN ILVOS KARAZ	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**LIMA**
	KARAZ OSELO	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**GUAYAQUIL**
UL404			
	CERES VOR /DME ERE MEVUR UBRIX BOKEN MARIA	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**CORDOBA**
	MARIA VIRU VIRU VOR/DME (VIR)	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**LA PAZ**
UL417			
	EGAPO ISATO ALGUK	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**BARRANQUILLA**
	MIBEN UGOTA IROTI	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	IROTI PUKEN LONAX	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**BOGOTA**
	BUTAN PABON	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	PABON ARUXA DOGLO TENUG ARTIK ESBUK	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**AMAZONICA**
	BRANCO VOR/DME (RBC) ISARA	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	ISARA APARE KIMUR PUBUM	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**LA PAZ**
	PUBUM IMBER UBRIX MEVUR CERES VOR/DME (ERE)	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**CORDOBA**

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL423			
	ISEBA	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**PANMA**
	OPKOL	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	ILTUR		
	ILTUR	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**BOGOTA**
	AMBALEMA VOR/DME (ABL)		
UL465			
	TABOGA DVOR/DME (TBG)	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**PANAMA**
	ARNAL		
UL474			
	TABOGA DVOR/DME (TBG)	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**PANAMA**
	MANBO		
	FRANK		
	ROKIN		
	ROKIN	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**BARRANQUILLA**
	TOMEK		
UL540			
	NADIR	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**AMAZONICA**
	PABID		
	MOLRI		
	ISULO		
	RIXOM		
	ILNES		
	IMPERATRIZ VOR/DME (YTZ)	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	KEVOS		
	ESNER	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	KOLGI	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	
	ESLUR		
	UGUTO		
	ISKAX		
	ORAVU		
	DADOT		
	ISTAR	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	PADAK		
	GERTU		
	UVBIL		
	ESKES		
	VUDAM	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	
	DADEL		
	ILMOK		
	ESLEK		
	KUMIR		
	OGTUR		
	UREVI		
	ISUNO		
	ISIVU		
	KOGMO		
	ERVEL		
	ERVEL	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**LA PAZ**
	KIVIL		
	VIRU VIRU VOR/DME (VIR)		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL550			
	LIMA DVOR/DME (LIM) ASIA VOR/DME (ASI) PISCO VOR/DME (SCO) ESGOL DORKA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA
	DORKA SAREG CALAMA VOR/DME(LOA)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	ANTOFAGASTA
	CALAMA VOR/DME(LOA) KONRI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	KONRI ALGAR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CORDOVA
	ALGAR TUCUMAN VOR/DME (TOC)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	TUCUMAN VOR/DME (TOC) PUBER PORKA OPTIR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	OPTIR DOPRI ROKER	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	ROSARIO VOR/DME (ROS)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZIZA
UL650			
	ATACAMA VOR/DME DAT PABOS INT GEKAL INT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ANTOFAGASTA
	GEKAL INT BUSLO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CORDOVA
	BUSLO CATAMARCA VOR/DME (CAT)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
UL655			
	EGODI ASIBO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	PANAMA
	ASIBO ASEPI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	ASEPI ESARO DABAX SIMAT	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	SIMAT IRUVA PABON ASAPA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	ASAPA AKTOR JURIS LANCE MASON OGLAM BOGUR DIKAL REDON TELIR ISOSA MARIN CRONE UREVI ISENA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	ISENA ISEKI ISUDU DIMER ANGAS ESTER EGIMO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	EGIMO LIVER KALER SILOR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	DAKEM BAURU NDB (BRU)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UL695			
	ARUSI EGIMI DIKEB OBKUT ORARO BODAK NOISE PUGSA DIGOR BUTAP EGUPA ASANU DAGAM FHAW	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO
UL775			
	PUERTO MONTT VOR/DME GUTIN PABAL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PUERTO MONTT
	PABAL ESQUEL VOR/DME ESQ	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	COMODORO RIVADAVIA
UL776			
	KAISO IBERT UTGIN ROLIG NEKOB	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	GEORGETOWN
	NEKOB TIRIOS NDB (TIR)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	PARAMARIBO
	TIRIOS NDB (TIR) AKNIB AMVER MOMVI PADIL GAVUX ISKAX MEVOS	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	MEVOS RONAL DOLVI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA
	BRASILIA VOR/DME (BSI)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UL780			
	DAGUD BUXOS	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PANAMA
	BUXOS UGUPI	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	UGUPI GUAYAQUIL VOR/DME VAKUD	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	GUAYAQUIL
	VAKUD TRUJILLO VOR/DME (TRU)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	LIMA
	ISREN	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	MOXES	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	SORTA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	SORTA INT ISPEL INT LIVOR INT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ANTOFGASTA
	SULNA INT VENTANAS VOR/DME VTN	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	SANTIAGO

UL793			
	PAGAK ALGOK KAKER IMBAT GATUG EDPAL DAVEX BIVAP LOGON SIMUR	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MAIQUETIA
	SIMUR LOGIR UGAGA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	UGAGA AKNOV	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	AKNOV TEFE VOR/DME (TFE)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	TEFE VOR/DME (TFE) EGLER GLINT MUPEG ISOLU EGELO DIKAL EVOLO KUGOL ALBOM UDIDI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	VALLE KIBIL OMERO ZOZOG CAMBA ORUMU ORUMU	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LA PAZ
	ORUMU MOROS EGEXO KUBIR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ASUNCION
	KUBIR AKPEL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	RESISTENCIA
	AKPEL RESISTENCIA VOR/DME SIS DAMIS KILIP TODES	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	TODES IMBAK DALAB GUALEGUAYCHU VOR/DME GUA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZEIZA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UL795			
	ESIPO OPTAS LOKUR DOLPO ATIGA DANVO TOMAX SUBMA EKUNA LOGON	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MAIQUETIA
	VUMPI	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	VUMPI BIVUT BINAS LUCRE ASUMI REPIL FERAL CHAMP	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	IRUMO UGEMU ALTA FLORESTA VOR/DME (ATF) UVBIL RONIL	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	RONIL KOGPA SAMAR GARCAS VORDME (BAG) NILON	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA
	NEFAR ATONI MIKAN PASTE QUILT	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	RUTLE PIRASSUNUNGA VOR/DME (PIR)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UL797			
	IQUIQUE NDB UCU AKNUV INT TOKOL INT ILPEM INT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ANTOFAGASTA
UM400			
	CORDOBA VOR/DME (CBA) GEMOP OPTIR ROMUR SIKOB	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CORDOBA
	SIKOB KILIP PULEN ARULA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	RESISTENCIA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	ARULA ERVAS		CURITIBA
	ERVAS REKIR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	REKIR ISOVI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	ISOVI VUPIT PERNA TIGDA PADIR TENUD GEDEL PAKOV	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	PAKOV SIDOX RONUT IMBEK KOLBI ROPAS BITAK VULGO ALDEIA VOR/DME (ADA)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM402			
	ISIGI SIDAM	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MAIQUETIA
	SIDAM TELUR KUMIX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	GEORGETOWN
	KUMIX UDUSA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	MAIQUETIA
	UDUSA ILNER KOKPO BOA VISTA VOR/DME (BVI) ANBIX NILBU ILSUB KIGUX MANAUS VOR/DME (MNS) KOKPA IRUMO OPLIM DEMIT SIPAK ARPAR PARDO ISUGO NABAL CRONE ABATE ISIVU NIBMI UBKAB	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	UBKAB SIDAK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	AMAZONICA
	SIDAK REMEK LOBAX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ASUNCION
	LOBAX ASUNCION VOR/DME (VAS) UPOVA KONTO SIMOR	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	ASUNCION
	SIMOR BOKIL KIMIK	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	RESISTENCIA
	KIMIK SEKLO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	SEKLO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	MUKIB		
	MIGOT		
	ILSIM		
	ETEXU	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO
	OGLAP		
	ANDAN		
	VUKAS		
	CARRASCO VOR/DME (CRR)		
UM403			
	BRASILIA VOR/DME (BSI)		
	SIREM		
	PAMEO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	KETUL		
	EGONI		BRASILIA
	ATONI		
	TESEK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	VAMIK		
	PUKIL		
	PUKIL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	POXET		
	KALER		
	BUTNA		
	SIRIS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	ORBAM		
	DUNCE		
	KABEG	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	REBOX		
	REBOX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	SOSMO		ASUNCION
	NILKI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	ASUNCION VOR/DME (VAS)		
UM409			
	PORTO VDPCX	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	ABSAL		
	BARBACENA NDB (BBC)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	BELIA		
	DEJAN		
	EKUBA		
	AKSUG		
	TRIVI		
	MOPDA		
	REINA		
	FLAND		
	PROVE	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	DOMGI		
	FORMOSA VDFRM		
	ILSUL		
	DOMLI		
	DOTKA		
	BRAZE		
	DOLVI		
	EGBAV	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	POLAN		
	DOTLA		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	DADOT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	DOMDA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	EPKOK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	ESMAR		
	GAXIM	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	MAMGI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	SIGEP		
	KUBID		
	MALPU		
	TEPEM		
	ISUNU		
	ILSUB		
	GEDIX		
	PABUX		
	DOGTO		
	LITUX		
	BIVUT		
	VUMPI		
	VUMPI	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	MAIQUETIA
	SIMUR		
	PUERTO AYACUCHO VOR/DME (PAY)		
	PUERTO AYACUCHO VOR/DME (PAY)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	AMAYA		
	AMAYA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MAIQUETIA
	EDRIN		
	BARINAS VOR/DME (BNS)		
	ISAGA		
	BUTOL		
	IROSA		
	SIGAB		
	MARACAIBO VOR/DME (MAR)		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM414			
	NDBELORZA/EZA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MAIQUETIA
	OPRUS		
	OPRUS	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	GELER		
	ILTEN	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	ILMUX		
	ILMUX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA
	IQUITOS VOR/DME (IQT)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	BORLA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	TINGO MARIA NDB (TGM)		
	AMVEX	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	LIMA DVOR/DME (LIM)		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM415			
	LIMA DVOR/DME (LIM)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	LIMA
	ASIA VOR/DME (ASI)		
	MEXUR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	LITOT		
	OPKUL		
	JULIACA VOR/DME (JUL)		
	DOBNI		
	DOBNI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	LA PAZ
	VIRU VIRU VOR/DME (VIR)	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	SIDAK		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	SIDAK DARIO ESPIN MUCUS DUNCE	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	PRUDENTE VOR/DME (PRR) NERVO KNAVE GROVE ORDEA EGITO SOROCABA VOR/DME (SCB)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UM417			
	VOR/DMEMAIQUETIA / MIQ KOTOM TUY VOR/DME (TUY) MUDAG	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MAIQUETIA
	UGRUL VAGAN	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	VAGAN AKSUM ISODI ILNIG NILBU KIGOM ISOBA DADEG LUTVI NISLA ESDAS	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	MAVBA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ESMAR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	LUVTA TAROP	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
UM418			
	CORDOBA VOR/DME CBA MAVBI DOPRI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CORDOBA
	UMSAR IMBAK	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZEIZA
	RODOV RODOV SASKU MUKIB ARTOX UBLAM	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO
	UBLAM	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	SIDUL EKOGA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	MUNOR MUMIL ISOGU PORTO ALEGRE VDPOR	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UM419			
	TABOGA DVOR/DME (TBG) AROVI ANSON	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	PANAMA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM423			
	GUAYANA VOR (GNA) PAKON	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	MAIQUETIA
	PAKON DIVRA BOA VISTA VOR/DME (BVI)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	AMAZONICA
	KIGOX ISOSU NAXIT DOMGA DOLTI ESMED EVNUL ESLAX NAXUM MUPIR EPKOK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	TAROP PADAK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	MORMA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	MORMA MUMBU MALMI OBGES DIMUB MOXOB MOSNA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA
	MUPET NAXIV NEBAL EGONI RORAG PASTE	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
UM424			
	SANTIAGO DVOR/DME AMB LINER INT SUPRA INT ALBAL INT	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	SANTIAGO
	ALBAL SAN RAFAEL VOR/DME SRA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MENDOZA
	RODIK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	RODIK EDNOR LOGAM	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	EZEIZA
	PABAS ASADA EZEIZA VOR/DME EZE	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UM525			
	TABOGA DVOR/DME (TBG) SIROT	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	PANAM
	BITIX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	BITIX AMBIL BUTES	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BARRANQUILLA
	BUTUM ANDUR ALGUK EDMOL	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	SELAN	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM527			
	LIMA DVOR/DME (LIM)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	LIMA
	GAVIL		
	MUMAT	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	SIGOB		
	SIGOB	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	AMAZONICA
	TEMOR		
	SIGIX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	MINUT		
	TEMID		
	VUKEB		
	TENUG		
	AKTOR		
	MULIP		
	MINIB		
	AKSUK		
	AKNOV		
	DIMUK		
	ARVIX		
	BIVUT		
	ARVOT		
	AKSUM		
	BUVKU	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	DIVRA		
	DOBDA		
	DOBDA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	GEORGETOWN
	TIM		
	UTGIN		
	DAGTO		
	UMREM		
	UMREM	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PARAMARIBO
	TRAPP		
UM529			
	RESISTENCIS VOR/DME SIS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	RESISTENCIA
	TIKLA		
	PORKA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CORDOBA
	KUGIN		
	BURMI		
	SAN JUAN VOR/DME JUA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	MENDOZA
	ASIMO		
	ASIMO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	SANTIAGO
	DILOK		
	TABO VOR/DME (TBN)		
UM530			
	BRASILIA VDBSI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	KOGDI		
	OPLIK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	MOSNA		
	ISOPA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	SAMAR		
	MIPAD	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ILSOT		
	LUVTI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	EQUAL		
	KOGDU		
	ESLEK		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	MUGEP ISUGO ISOSA KODPI KOGLA ILTEG DOTKI KUGOL KOGLU BUVKI	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	BUVKI DADED	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	LA PAZ
	DADED BRANCO VDRBC	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	AMAZONICA
UM532			
	BRASILIA VDBSI KUKOL ROMIK ILPAV RORAG	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	MIKAN	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ISIRO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	MUGOT SILOR VULTO LONEG PRUDENTE VDPRR SIRED RODUS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	TILKI DIDOM TELIX NEDOK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	LODUR SIGAS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	REKIR CUARA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
UM534			
	ROSARIO VOR/DME ROS ANRAL DALAB SUGRA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZEIZA
	SIGRA ENSAS LOLIL ILSIM PORLI URURI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO
	URURI LOBOR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	ISOBU NEBID OBLAD PORTO ALEGRE VDPOR	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UM538			
	TABOGA DVOR/DME (TBG) LODAX DABOR PUDAK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PANAMA
	PUDAK ITATA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BOGOTA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM540			
	CARRASCO VOR/DME (CRR) MOLBI AKPOD	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO
	AKPOD AROMA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	AROMA CALVE PORTO ALEGRE VOR/DME (POR)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	PORTO ALEGRE VOR/DME (POR) JUICE	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	JUICE NANDU	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	NANDU PONCA OSAMU	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
UM542			
	PUDAK ITATA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	ITATA MIBAR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	GUAYAQUIL
	MIBAR ATIPU ATENO ARNEL	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UM544			
	ASUNCION VOR/DME (VAS)VAS PADOT	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	ASUNCION
	PADOT EGELU	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	EGELU AKSUL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	AKSUL ESPIN CAMPO GRANDE VDCGR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CURITIBA
UM548			
	VAS ROLOK FOZ VOR/DME (FOZ)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	ASUNCION
	FOZ VOR/DME (FOZ) DOGTI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	DOGTI TELIX ILBEK	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ILBEK PUNTO DADUS VERBO CURITIBA VDCTB PARANAGUA NBPNG RONUT	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UM654			
	EZEIZA VOR/DME EZE KUKEN	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZEIZA
	KUKEN TILDA PUMIL ETEXU PORLI GAMOT	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	GAMOT SIDUL BRICK VUPIT ATARI ILBEK	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**CURITIBA**
	AULIC RABAN NETOS KNAVE BAURU NDB (BRU) PERAU	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	PERAU FOSSE HASTE	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**BRASILIA**
	GAUZE	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	ABAFT	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	
	EDOLA	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	BACON CROWD DEPTI FLAND PRUMO AFTER NIDNA 1HATCH	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	NEFAS	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	NEFAS MALBA OLEAR	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**RECIFE**
	PACAS AUGUR BIRTI	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	KODMI NEFRO GAXEX PUREU	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	
	ILNER	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	FORTALEZA VDFLZ	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	

UM656			
	SOROCABA VOR/DME (SCB) BETEL MINCE BAURU NDB (BRU) EQUIV MUGOT MEVIL PUKIL	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**CURITIBA**
	PUKIL KOXIS MAMGU	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**BRASILIA**
	MALMU KODMU ANGOL LUVTI	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	RAPAT	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	RAPAT DADEL ESDAG KIGUL DEMIT DOKBU EGBEM EKOXU ESBUV ESDAX EPKIR MONIC DIMUK BUVKA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	BUVKA LOGIR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	MAIQUETIA
	LOKES RELUN USEKO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	SILIK BARINAS VOR/DME (BNS)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
UM659			
	LESIR OGLUT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PANAM
	OGLUT ANRAX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BOGOTA
	ANRAX GUAYAQUIL VOR/DME	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	GUAYAQUIL
UM661			
	CARRASCO VO/DME (CRR) KILIUM TODAX DAKIS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO
	DAKIS	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	OPTUR TOSAD	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	DIDAB IREKI ARVOR MILUG NEPEV	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ROKAD LOBIK TOMID SIREL	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	ESDAV KIKAT LIVAM MINIG MUDSA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	OPROP PAMOX SAMTI TEMUP KOGRI KULEP MOXIP NILKI VUKIR PUGSA ERETU	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**ATLANTICO**
UM664			
	ARICA VOR/DME ARI	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**ANTOFAGASTA**
	DANKI LOLES	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**LIMA**
	LOLES VAGUR	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**ANTOFAGASTA**
UM665			
	GUAYAQUIL VOR/DME PUNAS CUENCA VOR/DME KORBO	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**GUAYAQUIL**
	KORBO OSUBU IQUITOS VOR/DME (IQT)	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**LIMA**
UM668			
	LIMA DVOR/DME (LIM) GATUK	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**LIMA**
	GEBAG AKREL CUSCO VOR/DME (ZCO) URCOS VOR/DME (URC)	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	OPTOP OBLIR	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	
	OBLIR ANKIS BOKAP	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	OBKUL PAPEK KADOX TRINIDAD–VOR (TRI)	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	NILSO TEPUG LOBON POSPA GEDUS	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	GEDUS KOGMO NIBMI ISUDU CUIABA VOR/DME (CIA) LISAN KODMU GRACE MOLPA NILON	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	NAXIV ILTAS GOIANIA VOR/DME (GOI)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	KOGMA BRASILIA VOR/DME (BSI)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	

UM671			
	MELO VOR (MLO) AKNEN	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO
	AKNEN OBLAD	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	ISOGU	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	COVER DO SUL VDCXS	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	NADAR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	GLOVE OSAMU	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	RONUT ANISE	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	

UM674			
	TABOGA DVOR/DME (TBG) MILAT TOKUT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PANAMA
	TOKUT TUMACO VOR/DME (TCO)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	TUMACO VOR/DME (TCO) ENSOL INTAG CONDORCOCHA VOR/DME PAKOK EKUMO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	GUAYAQUIL
	EKUMO ROBIG VUKID BOBUG ATOGO GALGO LIMA DVOR/DME (LIM)	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA

UM776			
	CONDORCOCHA VOR/DME	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	GUAYAQUIL
	PUMTA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	GELAR TERAS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	TERAS IQUITOS VOR/DME (IQT)	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM778			
	ELORZA NDB (EZA*)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	MAIQUETIA
	PALIR		
	PALIR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	ATATU	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	SAO GABRIEL "SGC" VOR/DME-NDB		
UM782			
	ARNAL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PANAMA
	LONET		
	AGUJA		
	AGUJA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BARRANQUILLA
	XOGEN		
	XOGEN	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BOGOTA
	BARRANCABERMEJA "EJA" VOR/DME		
	LONAX	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	MITU VOR/DME (MTU)		
	MITU VOR/DME (MTU)	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	ABIDE		
	MULIP		
	ROUSE		
	MEDLE		
	JOUDT		
	GLINT		
	PINUP		
	SIMON		
	ISOKI		
	SIDUM		
	PARDO		
	MUGEP		
	KUMIR		
	ANPOS	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA
	CUIABA VOR/DME (CIA)		
	SIRIA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	TOMBO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	ALBEX		
	POXET		
	MEVIL		
UM784			
	LIMPO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	AMAZONICA
	MINUT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	PANOL	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	KILEV		
	KILEV	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	LA PAZ
	ALBEG		
	OBKUL		
	DIBUG		
	LOKOX		
	GUVAS		
	SAVRA		
	PALIV	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	BOLET		
	PILCO		
	PILCO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	RESISTENCIA
	GETRA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	RESISTENCIA VOR/DME (SIS)		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM787			
	CORO VOR/DME (CRO) LOKUR REBIM	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MAIQUETIA
	REBIM ROPOL	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BARRANQUILLA
	ROPOL NELUR KIKOL TELAX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PANAM
UM788			
	CONGONHAS VOR/DME (CGO) CURSE PARANAGUA NDB (PNG) PAKOV	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	PAKOV DELAY	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	DELAY NAFIL MOVER PENSO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	PENSO ASDEK BAKER MUNOR ISOBU BAGE V0R (BGE)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
UM789			
	IQUIQUE NDB UCU TARKA CALAMA VOR/DME LOA KADAT	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ANTOFAGASTA
	KADAT JUJUY VOR/DME (JUJ)	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CORDOVA
	JUJUY VOR/DME (JUJ) MIMEX IMBER BOKEN	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	BOKEN VINOS	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	VINOS AKPEL KALOM	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	RESISTENCIA
	KALOM ASUNCION VOR/DME (VAS)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	ASUNCION
UM791			
	KOGMU KOGNA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO
	KOGNA KIGUG KOGDO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	KOGNO		
	KOGNU	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	
	ISUPI		
	ESDAB		
	ISUBA		
	ABUCU		
	ILNER		
	SALNU		
	ESMEM		**RECIFE**
	KIKAD		
	ISUGI		
	ABASE	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	KIGUK		
	KODSO		
	EPKIM		
	CAMPINA GRANDNBCPG		
	ISUKU		
	RECIFE VDREC		
UM792			
	CONGONHAS VDCGO		
	CURSE	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	PARANAGUA NBPNG		
	PAKOV		
	DELAY	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	
	NAFIL		
	MOVER	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**CURITIBA**
	PENSO		
	ASDEK		
	EAGLE		
	MUMIL	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	NEBID		
	AKNEN		
	AKNEN		
	MELO VOR (MLO)		
	AROMO	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	**MONTEVIDEO**
	TELAK		
	CARRASCO VO/DME (CRR)		
UM793			
	LIMA DVOR/DME (LIM)		
	ASIA VOR/DME (ASI)	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	ALAMO	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	LAKUN	**SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME**	**LIMA**
	AREQUIPA VOR/DME (EQU)		
	OLGAS	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	
	KOMPA		
	KOMPA		
	LA PAZ-VOR (PAZ)		
	DAKOG	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	TEDOK		
	COCHABAMBA-VOR (CBA)	**SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL**	**LA PAZ**
	VAREB		
	SANSO	**SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME**	
	VIRU VIRU–VOR (VIR)		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UM795			
	COLBY ENPAN OGRUL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	PANAMA
	OGRUL LA PALMA VOR/DME (PML) ILTUR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	PANAMA
	ILTUR BOKAN	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	BOGOTA
	BOKAN PUMTA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	GUAYAQUIL
	PUMTA LOBOT	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	GUAYAQUIL
	LOBOT KUSKU PUPMI RELOR GAXIX	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	LIMA
	GAXIX MULAM LIMA DVOR/DME (LIM)	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	LIMA
UM796			
	MENE MAUROA VOR/DME (MAU) MARACAIBO VOR/DME (MAR) AKNIL	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MAIQUETIA
	AKNIL ISIMO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BARRANQUILLA
	ISIMO PAKOP ALGEN PADUR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	PANAMA
UM799			
	TABON VOR/DME (TBN) DILOK ASIMO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	SANTIAGO
	ASIMO SIBOX LA RIOJA VOR (LAR) KAKAN CATAMARCA VOR/DME(CAT)	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CORDOBA
	CATAMARCA VOR/DME(CAT) PUBER MUDUL GAVEX UBRIX	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CORDOBA
	UBRIX VINOS	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CORDOBA
	VINOS GETRA AKNEL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	RESISTENCIA
	AKNEL EGEXO ILPUR REMEK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ASUNCION
	REMEK ESDER	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CURITIBA
	ESDER DARIO ARGOS	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	ARGOS CANOP	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	CURITIBA
	CANOP TOSAR	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	TOSAR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA
	ESTER	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	SIRIA		
	ISUKA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	LISAN		
	ANGOL		
	SAMAR		
	DIMUB		
	KOGTU		
	EGOLA		
	TERES		
	POLAN		
	BERNA		
	ELDOR		
	RONAL		
	ZELAN		
	ALVAR		
	ALVAR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	AMAZONICA
	TEREB		
	ISOBI		
	GEDOG		
	GIRAL		
	URUGU	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	INTEL		
	RICAR		
	BELIS		
	GEDIR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	KOGNI		
	VUKER		
	EPKOL		
	ISKAB		
	ISIXU		
	ILSUD		
	NADIR		
	ESLEB		
	BUVMU		
	KOGNO		
	MASVA		
	ESLEL		
	EGBIR		
	EGIMI		
	MOVGA		

UN741			
	NANIK	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO
	DIKEB		
	PUGSU		
	JOBER		
	JOBER	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	RECIFE
	FORTALEZA VOR/DME (FLZ)		
	SALNU		
	ARMAN	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	NEBIV		
	BISSA		
	DALMA		
	ILNOS	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ILPUR		
	HAMBU	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	CARDO		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	CARDO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA
	GOLFO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	DOLTU	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	LISBO		
	TRES MARIAS VOR (TRM)		
	REINA		
	UNIDO		
	GAXEV		
	VERME		
	ZANET		
	PIRASSUNUNGA VOR/DME (PIR)		
	GRADE		
	OROKA		
	OROKA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	CURITIBA
	BETEL		
	EGITO		
	GERAL		
	FLORI		
	DARCI		
	MADRI	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	SERGI		
	VERBO		
	PERNA		
	NOBEL		
	EKOGA		
	LOBOR		
	BAGE VOR (BGE)		
	ISALA		
	ISALA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	MONTEVIDEO
	OGLAP	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	DURAZNO VOR/DME (DUR)		
	PONPA		
	PAPIX	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZEIZA
	PAPIX		
	EZEIZA VOR/DME (EZE)		

UN857			
	EZEIZA VOR/DME EZE	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	EZEIZA
	LA PLATA VOR PTA		
	DORVO		
	DORVO	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	MONTEVIDEO
	PABOT		
	LOMID		
	ANDAN		
	MELO VOR (MLO)		
	OGRUN		
	OGRUN	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	ABELA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	TORON		
	PORTO ALEGRE VOR/DME (POR)		
	JUICE	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	EGBIP		
	EKUBI	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	DEUCA		
	FEITO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	AKNUB	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	BITAK		
	KOGBA		
	MARICA VDMRC		
	KIGOL		

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
	ISOLI KOKPI KIGUV DOGSU	CON COBERTURA DME/DME	
	DOGSU SASBU	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	SASBU DAGEL	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	DAGEL PORTO SEGURO NBSGR BIDEV EKUGO ESLIB MEDIT RUBEN AMBET FERNANDO VDFNO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	RECIFE
	FERNANDO VDFNO NEURA	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	NEURA PUGUN NOISE ERETU	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO

UN866			
	BONSUCESSO VOR/DME (BCO) SORAI TRIVI VISTA KIKAX KODMO KIGUB KODNU PENTE QUARU	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	BRASILIA
	QUARU RUBIC	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	RUBIC SPINO	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	RECIFE
	SPINO MANPI TROVA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	TROVA ADEMI BANGU EDITE	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	
	EDITE KIGUK MOSSORO VDMSS MAGNO	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	MAGNO OBKUT DEKON	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO

ROUTE/ RUTA	WP	DME/DME COVERAGE ANALYSES RESULTS / RESULTADOS DE ANALISIS DE COBERTURA DME/DME	FIR
UN873			
	TASIL ORARO INTOL	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	ATLANTICO
	INTOL FEMUR	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	RECIFE
	IBAGA NATAL VDNTL SEVIL EPKIM VACAR EVPAB	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	AVILA TOMAS	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	ADOLF BORBA IRUMO KODSA DEDOR ELEFA	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	
	GONZA BUXER	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	
	BUXER FERMA MORGA EVPAD GAVUP	SEGMENT WITH NO DME/DME COVERAGE / TRAMO SIN COBERTURA DME/DME	BRASILIA
	GAVUP MEDIA	SEGMENT WITH PARTIAL DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME PARCIAL	CURITIBA
	BARBACENA NDB (BBC)	SEGMENT WITH DME/DME COVERAGE / TRAMO CON COBERTURA DME/DME	

Agenda Item 7: Operational implementation of new ATM automated systems and integration of the existing ones

7.1 The Meeting examined WP/11 – *Support to projects on the operational implementation of ATM automation and the improvement of situational awareness in the SAM* Region, WP/17 – *Follow up on the interconnection of automated system*, presented by the Secretariat, and IP/9 – *Advanced air traffic management system and reports of operational interest* – SAGITARIO, presented by Brazil.

Support to projects on the operational implementation of ATM automation in the SAM Region

7.2 Pursuant to GREPECAS Decisions 16/45 and 16/47 approving the modification to the new GREPECAS structure, transforming the subgroups into programmes and projects for the CAR and for the SAM Regions, the Meeting reviewed the activities of the Project on *ATM Automation* under the *ATM Automation and ATM Situation Awareness* programme in order to align them with the activities of the automation programme of the SAM Region.

7.3 The Meeting considered that the coordination of the ATM Automation project would be entrusted to Mr. Alessander Santoro (Brazil), taking into account that he was the coordinator of the same project in the CNS/ATM Subgroup.

7.4 In order to examine the tasks of the GREPECAS ATM automation project and ensure their alignment with automation activities in the SAM Region, an *ad-hoc* group was established, made up by representatives of Argentina, Brazil, Peru, Uruguay and Venezuela.

7.5 The Meeting identified the need for the coordinator of the ATM Automation project to review the System and Subsystem Specification Document (SSS Document) for automated systems, based on the information contained in WP/25 presented at the SAM/IG/6 meeting. The updated document will be presented to the SAM/IG/8 meeting.

7.6 The Meeting also considered that the Secretariat should submit information on advanced automation tools (ETMS, A-SMGC, etc.) for analysis by the SAM/IG/8 meeting, pursuant to the ICAO vision (CNS Roadmap).

Follow up to the interconnection of automated systems

7.7 The Meeting reviewed the progress made in the interconnection of automated systems in the SAM Region as a follow up on the regional action plan prepared by the SAM/IG and in keeping with the activities specified in the Memoranda of Understanding (MoUs) drafted and signed to date.

Interconnection of automated systems between Argentina and Uruguay

7.8 The Meeting took note that the Durazno (Uruguay) radar data were available in Ezeiza (Argentina) since the end of March 2011, thus completing the implementation of the exchange of radar data using the IP protocol between Argentina and Uruguay, since the Quilmes (Argentina) radar data were already available in Montevideo. What remains pending is the operational use of available data through the establishment of operational agreements. In this regard, the Meeting urged the operational side to make use of the radar exchange in the respective ACCs.

7.9 The Meeting noted that, since the updating of the automated system of Uruguay had not been completed, the AIDC service between Argentina and Uruguay would be available in 2012.

Interconnection of the automated systems between Argentina and Brazil

7.10 The Meeting was apprised that the MoU signed between the Administrations of Argentina and Brazil established the interconnection of automated systems of the Resistencia and Curitiba ACCs, taking the information from the secondary radar of Resistencia to the Curitiba ACC and from the Santiago and Foz de Iguaçu radars to the Resistencia ACC. The date foreseen for the interconnection of radar data and the automatic handoff of flight plans is October 2011.

7.11 In this regard, Argentina informed that the Resistencia radar would be replaced with the Corrientes radar for the delivery of data. Brazil reported that, given the delay in the implementation of the SAGITARIO automated system in the Curitiba ACC, OLDI and AIDC would not be available before April 2012.

Interconnection of automated systems between Brazil and Uruguay

7.12 The Meeting took note that the MoU signed between the Administrations of Brazil ad Uruguay established the interconnection of automated systems between the Curitiba ACC and the Montevideo ACC, taking information from the secondary radar of Durazno to Curitiba, and from the Santiago and Canguçu radars to the Montevideo ACC. Coordination activities for the exchange of radar data were under way and were scheduled for completion in October 2011.

7.13 Taking into account the updating of the automated system of Uruguay and the implementation of the SAGITARIO system in Curitiba, the Meeting observed that the OLDI and the AIDC would only be available for automatic hand-off of flight plans as of April 2012.

Interconnection of automated systems between Argentina and Chile

7.14 The Meeting took note that Argentina and Chile signed an MoU for the exchange of radar data and flight plans between the Santiago ACC (Chile) and the Ezeiza, Córdoba and Comodoro-Rivadavia ACCs (Argentina) operationally effective in November 2011. The radars involved in Chile would be Iquique, Antofagasta, Chañaral, La Serena, Santiago, Temuco, Puerto Montt, Balmaceda and Punta Arenas. The radars involved in Argentina would be Mendoza, Santa Rosa, Neuquén, Córdoba, San Luis, Tucumán, Salta, La Rioja and Bariloche.

Interconnection of automated systems between Brazil and Venezuela

7.15 The Meeting recalled that, at the SAM/IG/6 meeting, the MoU between Brazil and Venezuela was signed for the exchange of radar data and flight plans between the Amazónico (Brazil) and the Maiquetía (Venezuela) ACCs. The radars involved would be Boa Vista and Sao Gabriel da Cachoeira (Brazil) and Santa Elena de Uairen (Venezuela).

7.16 The Meeting took note that the configuration of the Maiquetía and Manaos ACCs and the REDDIG was being completed for the interconnection to be completed in July 2011. ATECH is providing support for the configuration of the ACCs involved.

Interconnection of automated systems between Brazil and Peru

7.17 During the Meeting, Peru asked about the possibility of establishing an MoU with Brazil for the exchange of radar data and flight plans. In this regard, Brazil informed that such MoU could be signed at the SAM/IG/8 meeting, in view of the various tasks foreseen to attain the interconnection.

Interconnection of automated systems between Chile and Peru

7.18 During the Meeting, Chile presented to Peru with the MoU for the interconnection of automated systems between the Santiago ACC and the Lima ACC, for review by the Aeronautical Administration of Peru and its subsequent signing. In this regard, it is expected that the MoU could be reviewed by the two parties and signed by October 2011.

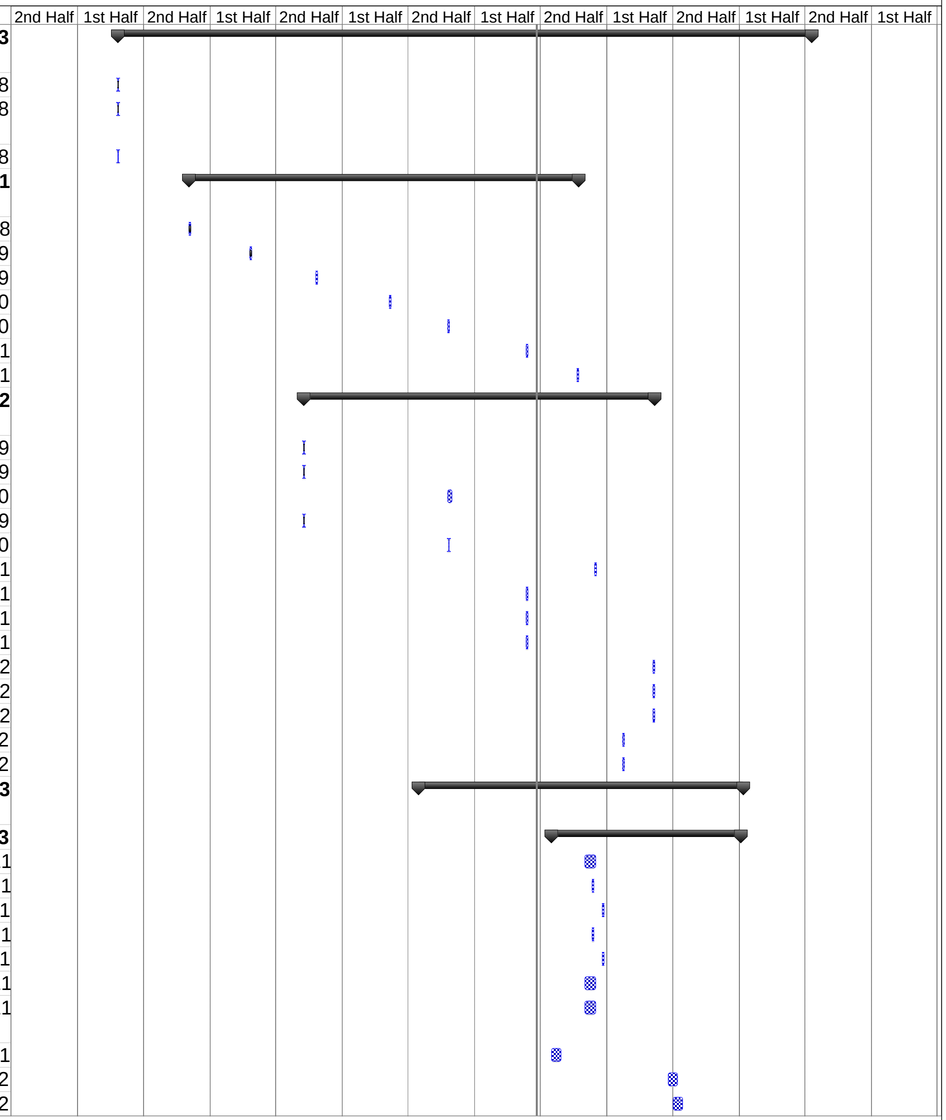
Review of the Regional Action Plan for the interconnection of automated systems

7.19 Based on the information provided during the Meeting, the Group reviewed the action plan contained in the **Appendix A** to this part of the report.

Appendix A to the Report on Agenda Item 7
Apéndice A al Informe sobre la Cuestión 7 del Orden del Día

APPENDIX A / APENDICE A

ID	Nome da tarefa	Duration	Start	Finish
1	**SAM Region Interconnection Plan / Plan de Interconexión Región SAM**	**1370 days**	**Mon 21/04/08**	**Fri 19/07/13**
2	Plan approval / Aprobación del Plan	1 day	Mon 21/04/08	Mon 21/04/08
3	Establishment of management team / Creación del equipo de gestión	1 day	Mon 21/04/08	Mon 21/04/08
4	Execution / Ejecución	1 day	Mon 21/04/08	Mon 21/04/08
5	**Coordination meetings / Reuniones de coordinación**	**770 days**	**Mon 03/11/08**	**Fri 14/10/11**
6	SAM/IG/2	5 days	Mon 03/11/08	Fri 07/11/08
7	SAM/IG/3	5 days	Mon 20/04/09	Fri 24/04/09
8	SAM/IG/4	5 days	Mon 19/10/09	Fri 23/10/09
9	SAM/IG/5	5 days	Mon 10/05/10	Fri 14/05/10
10	SAM/IG/6	5 days	Mon 18/10/10	Fri 22/10/10
11	SAMIG/7	5 days	Mon 23/05/11	Fri 27/05/11
12	SAMIG/8	5 days	Mon 10/10/11	Fri 14/10/11
13	**MoU establishment / Establecimiento de MoU**	**693 days**	**Wed 16/09/09**	**Fri 11/05/12**
14	Argentina - Uruguay	1 day	Wed 16/09/09	Wed 16/09/09
15	Argentina - Brasil	1 day	Wed 16/09/09	Wed 16/09/09
16	Argentina - Chile	10 days	Mon 18/10/10	Fri 29/10/10
17	Brasil - Uruguay	1 day	Wed 16/09/09	Wed 16/09/09
18	Brasil -Venezuela	1 day	Thu 21/10/10	Thu 21/10/10
19	Brasil Colombia	5 days	Mon 28/11/11	Fri 02/12/11
20	Colombia- Ecuador	5 days	Mon 23/05/11	Fri 27/05/11
21	Colombia=Panama	5 days	Mon 23/05/11	Fri 27/05/11
22	Colombia Venezuela	5 days	Mon 23/05/11	Fri 27/05/11
23	Peru Chile	5 days	Mon 07/05/12	Fri 11/05/12
24	Peru Colombia	5 days	Mon 07/05/12	Fri 11/05/12
25	Peru Ecuador	5 days	Mon 07/05/12	Fri 11/05/12
26	Paraguay Argentina	5 days	Mon 13/02/12	Fri 17/02/12
27	Paraguay Brasil	5 days	Mon 13/02/12	Fri 17/02/12
28	**Flight plan interconnection / Interconexión de plan de vuelo**	**641 days**	**Fri 30/07/10**	**Fri 11/01/13**
29	**OLDI**	**375 days**	**Mon 01/08/11**	**Fri 04/01/13**
30	EZEIZA-SANTIAGO	22 days	Tue 01/11/11	Wed 30/11/11
31	BOGOTA - GUAYAQUIL	5 days	Mon 21/11/11	Fri 25/11/11
32	BOGOTA - PANAMA	5 days	Mon 19/12/11	Fri 23/12/11
33	BOGOTA - BARRANQUILLA	5 days	Mon 21/11/11	Fri 25/11/11
34	BARRANQUILLA - PANAMA	5 days	Mon 19/12/11	Fri 23/12/11
35	SANTIAGO - CORDOBA	22 days	Tue 01/11/11	Wed 30/11/11
36	SANTIAGO - COMODORO RIVADÁVIA	22 days	Tue 01/11/11	Wed 30/11/11
37	AMAZÓNICO-BOGOTÁ	20 days	Mon 01/08/11	Fri 26/08/11
38	LIMA - SANTIAGO	20 days	Mon 18/06/12	Fri 13/07/12
39	LIMA - GUAYAQUIL	20 days	Mon 02/07/12	Fri 27/07/12

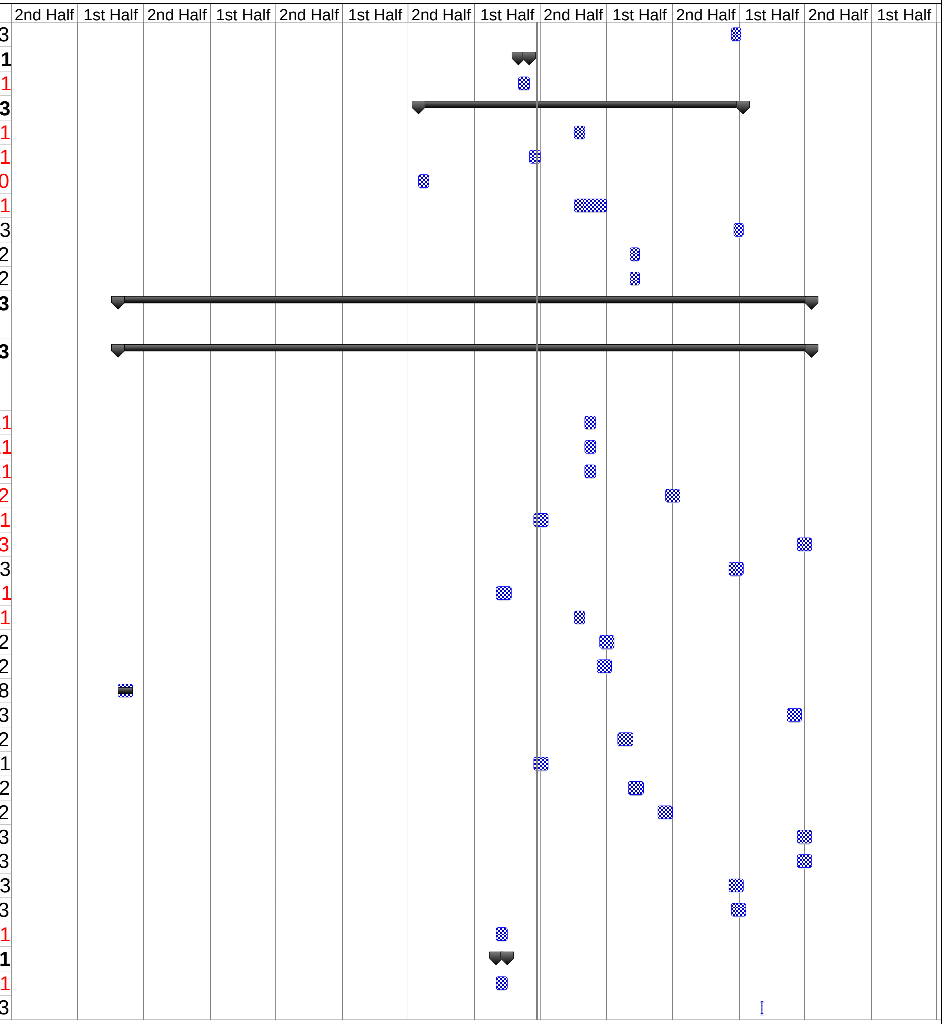


Projeto: PLAN ACCIÓN INTERCONEXIÓN SISEMAS AUTOMATIZADOS
Data: Wed 22/06/11

Tarefa
Divisão
Etapa
Resumo
Resumo do projeto
Tarefas externas
Etapa Tarefa
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Andamento
Divisão

APPENDIX A / APENDICE A

ID	Nome da tarefa	Duration	Start	Finish
40	LIMA - BOGOTA	20 days	Mon 10/12/12	Fri 04/01/13
41	**DOC 44444**	**22 days**	**Mon 02/05/11**	**Tue 31/05/11**
42	AMAZONICO - MAIQUETIA	22 days	Mon 02/05/11	Tue 31/05/11
43	**AIDC**	**641 days**	**Fri 30/07/10**	**Fri 11/01/13**
44	CURITIBA-RESISTENCIA	21 days	Mon 03/10/11	Mon 31/10/11
45	CURITIBA - MONTEVIDEO	22 days	Wed 01/06/11	Thu 30/06/11
46	EZEIZA-CORDOBA	20 days	Fri 30/07/10	Thu 26/08/10
47	EZEIZA - MONTEVIDEO	65 days	Mon 03/10/11	Fri 30/12/11
48	LIMA - AMAZONICO	20 days	Mon 17/12/12	Fri 11/01/13
49	ASUNCIÓN - CURITIBA	20 days	Mon 05/03/12	Fri 30/03/12
50	ASUNCIÓN - EZEIZA	20 days	Mon 05/03/12	Fri 30/03/12
51	**Radar data exchange / Intercambio de datos radar**	**1370 days**	**Mon 21/04/08**	**Fri 19/07/13**
52	**Direct connection to centre - ASTERIX / Conexión Directa al Centro - ASTERIX**	**1370 days**	**Mon 21/04/08**	**Fri 19/07/13**
53	CORDOBA – SANTIAGO	22 days	Tue 01/11/11	Wed 30/11/11
54	EZEIZA - SANTIAGO	22 days	Tue 01/11/11	Wed 30/11/11
55	SANTIAGO - C. RIVADÁVIA	22 days	Tue 01/11/11	Wed 30/11/11
56	MENDOZA – SANTIAGO	30 days	Mon 11/06/12	Fri 20/07/12
57	EZEIZA – PUERTO MONTT	30 days	Mon 13/06/11	Fri 22/07/11
58	PUNTA ARENAS – C. RIVADAVIA	30 days	Mon 10/06/13	Fri 19/07/13
59	AMAZONICO – BOGOTA	30 days	Mon 03/12/12	Fri 11/01/13
60	CURITIBA – MONTEVIDEO	30 days	Tue 01/03/11	Mon 11/04/11
61	CURITIBA - RESISTENCIA	21 days	Mon 03/10/11	Mon 31/10/11
62	BOGOTA – GUAYAQUIL	30 days	Mon 12/12/11	Fri 20/01/12
63	BOGOTA – PANAMA	30 days	Mon 05/12/11	Fri 13/01/12
64	BOGOTA – BARRANQUILLA	30 days	Mon 21/04/08	Fri 30/05/08
65	BOGOTA – LIMA	30 days	Mon 13/05/13	Fri 21/06/13
66	BOGOTA – MAIQUETÍA	30 days	Tue 31/01/12	Mon 12/03/12
67	BARRANQUILLA – PANAMA	30 days	Mon 13/06/11	Fri 22/07/11
68	BARRANQUILLA – MAIQUETÍA	30 days	Wed 29/02/12	Tue 10/04/12
69	LIMA – SANTIAGO	30 days	Mon 21/05/12	Fri 29/06/12
70	LIMA – GUAYAQUIL	30 days	Mon 10/06/13	Fri 19/07/13
71	LIMA – AMAZONICO	30 days	Mon 10/06/13	Fri 19/07/13
72	ASUNCIÓN – CURITIBA	30 days	Mon 03/12/12	Fri 11/01/13
73	ASUNCIÓN – EZEIZA	30 days	Mon 10/12/12	Fri 18/01/13
74	MONTEVIDEO-EZEIZA	23 days	Tue 01/03/11	Thu 31/03/11
75	**ICD owner / ICD propietario**	**23 days**	**Tue 01/03/11**	**Thu 31/03/11**
76	AMAZONICO - MAIQUETIA	23 days	Tue 01/03/11	Thu 31/03/11
77	Inter-Centro ASTERIX 62,63 (TBD)	1 day	Mon 04/03/13	Mon 04/03/13



Projeto: PLAN ACCIÓN INTERCONEXIÓN SISEMAS AUTOMATIZADOS
Data: Wed 22/06/11

Tarefa		Tarefas externas		Manual Task		Finish-only	
Divisão		Etapa Tarefa		Duration-only		Andamento	
Etapa		Inactive Task		Manual Summary Rollup		Divisão	
Resumo		Inactive Milestone		Manual Summary			
Resumo do projeto		Inactive Summary		Start-only			

Agenda Item 8: Implementation of the new flight plan format

Implementation of the new flight plan format in the SAM Region

8.1 The Meeting took note of the information presented in WP/2 and in Appendices A and B, with the purpose of assessing the tasks and their status of implementation with respect to Amendment 1 to the PANS/ATM.

8.2 In this regard, the Meeting considered that Conclusion SAM/IG/6-12 superseded Conclusion SAM/IG/4-11.

8.3 The Meeting took note of the information presented in WP/15 and WP/35. In this regard, it reviewed the Action Plan for the Implementation of the New Flight Plan Format – Amendment 1 to the 15th Edition of ICAO Doc 4444 (PANS/ATM) in the SAM Region, incorporating the project activities formulated by the CNS/ATM Subgroup. The results of this review are shown in **Appendix A** to this part of the report. The Meeting also took note of the information presented in IP/14, IP/18, IP/20 and IP/23.

Focal Points

8.4 The Meeting reviewed the list of focal points. The updated information on all the focal points of the SAM Region is shown in **Appendix B** to this part of the report. In this regard, the Meeting stressed the importance for States to keep focal point information up to date, in view of the need for focal points of the States to coordinate the implementation of Amendment 1 to the 15th Edition of the ICAO PANS ATM (Doc 4444).

8.5 Likewise, in order to follow up on the activities for the implementation of the new flight plan format, the Meeting saw the need to establish a mechanism to follow up on the activities of the regional plan, *via* web conference with State focal points at least once a month, starting in June 2011, using the "Go to Meeting" tool of the SAM Regional Office.

National action plans for the implementation of the new flight plan format

8.6 The Meeting analysed the status of State action plans for the implementation of Amendment 1, as a follow up to Conclusion SAM/IG/6-12, and proposed that the Secretariat send a reminder to the States that had not submitted them yet to draft their Action Plan and send it to the ICAO SAM Regional Office. For the drafting of the plan, the action plan presented by Brazil could be considered, which had been adopted by most SAM States, in order to successfully and harmoniously carry out the implementation of the new format, taking into account the importance of this task for a successful and harmonised implementation in the Region.

Seminar/workshop on the implementation of the new flight plan format

8.7 The Meeting took note of the results of the Seminar/Workshop on the Implementation of the New Flight Plan Format in the SAM Region, which was attended by delegates of 9 States--Argentina, Bolivia, Brazil, Chile, Panama, Paraguay, Peru, Suriname and Uruguay--, 1 airline representative--LAN Peru--, and 4 industry vendors--Atech, Indra, Comsoft and Thales, giving a total of 36 participants.

8.8 The seminar/workshop showed the progress made in the implementation of the new flight plan format in SAM States and in other Regions of the world. The Executive Summary of the seminar/workshop appears in **Appendix C** to this part of the report.

8.9 The presentations and other material produced during the second seminar/workshop on the flight plan are posted on the ICAO Regional Office website:
http://www.lima.icao.int/MeetProg/mt_MeetingDocumentation.asp?wShortTitle=FLIGTPLAN&wLanguage=S&wYear=2011

8.10 In this regard, it was noted that most SAM States had prepared their national action plan for the implementation of the new flight plan format, taking as a reference the Action Plan of Brazil, and that the implementation strategy focused on the updating of all the national documentation, the safety assurance assessment, the analysis and implementation of changes to automated systems, and the training programme, in line with the four modules (Legislation, Safety Assessment, Automated Systems, and Training).

Legislation

8.11 This part of the plan contains the actions related to the review and updating of all the national documentation, in light of the modifications contained in Amendment 1 to the 15th Edition of the ICAO PANS-ATM (Doc 4444). In this regard, the Meeting formulated the following conclusion:

Conclusion SAM/IG/7-7 Publication of an AIC for a broad dissemination of Amendment 1 to the 15th Edition of ICAO PANS ATM (Doc 4444)

> That SAM States, taking into account the regional strategy for the implementation of Amendment 1 to the 15th Edition of ICAO PANS ATM (Doc 4444), take the corresponding measures to publish an AIC announcing the implementation, and disseminating the content, of Amendment 1 to the PANS-ATM, including the main dates agreed upon, **no later than 1 August 2011**.

Safety assessment

8.12 This part of the plan deals with the activities related to the safety assessment, taking into account the possible impact of the changes to be made on the operation and the risks associated to such changes, which might require mitigating measures and contingency plans contained in the Safety Plan.

8.13 In this sense, the Meeting recognised the importance that States designate individuals involved in the implementation of Amendment 1 to the 15th Edition of the PANS/ATM to attend the seminar/workshop for assessing the risks associated to the implementation of Amendment 1 to the PANS/ATM, to be held in Lima on 5-9 September 2011, as one of the activities in the SAM Region for the implementation of the new flight plan format.

8.14 The risk assessment for the implementation of Amendment 1 to the PANS/ATM will permit compliance with ICAO Annex 11 (par. 2.27). In this sense, the Meeting formulated the following conclusion:

Conclusion SAM/IG/7-8 Safety assessment for the implementation of Amendment 1 to the 15th Edition of ICAO PANS ATM (Doc 4444)

> That SAM States, taking into account the regional strategy for the implementation of Amendment 1 to the 15th Edition of ICAO PANS ATM (Doc 4444), adopt the corresponding measures to conduct a safety assessment for the implementation of Amendment 1 to the PANS-ATM, and send it to the ICAO SAM Regional Office **no later than 30 November 2011**.

Automated systems

8.15 This part of the plan addresses the activities related to the updating of automated systems, including impact studies to identify the effort required to adapt the systems affected by the changes specified in the aforementioned Amendment and to develop system updating requirements.

8.16 In this regard, the States of the Region were reminded of Conclusion SAM/IG/6-11, which stated that the changes identified at the level of AMHS or AFTN systems should be introduced by 31 December 2011, and changes to flight plan processors by the end of March 2012.

Training

8.17 This part of the plan contemplates actions related to the drafting of the training plan for the personnel that needs to be familiar with, and know how to apply, the modified concepts, especially air traffic controllers and ARO/AIS operators.

8.18 The progress being made in the activities involved in the updating of State documentation, the safety assurance analysis, and the analysis and implementation of changes to automated systems is providing the necessary information for the development of the training programme. In this sense, the Meeting formulated the following conclusion:

Conclusion SAM/IG/7-9 Development of the training programme for the implementation of Amendment 1 to the 15th Edition of ICAO PANS ATM (Doc 4444)

That SAM States, taking into account the regional strategy for the implementation of Amendment 1 to the 15th Edition of ICAO PANS ATM (Doc 4444), adopt the corresponding measures to draft a training programme for the personnel that needs to be familiar with, and know how to apply, the modified concepts, especially air traffic controllers and ARO/AIS operators, for the implementation of Amendment 1 to the PANS-ATM, and send it to the ICAO SAM Regional Office **no later than 31 October 2011**.

APPENDIX A

ACTION PLAN FOR THE IMPLEMENTATION OF THE NEW FLIGHT PLAN FORMAT – AMENDMENT 1 TO THE 15th EDITION OF ICAO DOCUMENT 4444 (PANS/ATM)

ACTIVITIES	ACTION BY	DELIVERABLE	TARGET DATE	REMARKS
1	**2**	**3**	**4**	**5**
Approval of Amendment 1 to the 15th Edition of PANS/ATM – Doc 4444 – (*Procedures for air navigation services – air traffic management)* (ICAO State letter 13/2.1-08/50 of 25 June 2008)	SAM States	Take note of the Amendment	December2008	Completed
Guidelines for the inclusion of the flight plan information as per Amendment 1 to the 15th Edition of PANS/ATM-Doc 4444 (ICAO State letter AN 13/2.1-09/9 of 6 February 2009	SAM States	Take note of the ICAO guidelines	June 2009	Completed
Draft a regional strategy for the implementation of Amendment 1 to the PANS/ATM	RLA/06/901 project	Regional strategy for the implementation of Amendment 1 to the 15th Edition of the ICAO PANS-ATM - Doc 4444	October 2009	Completed. The strategy approved by SAM/IG/4 meeting for its adoption in the SAM Region was approved for the CAR/SAM Regions at the meeting of the CNS/ATM Subgroup (March 2010)
Draft a national plan for the implementation of Amendment 1 to the PANS/ATM	SAM States	National plan for the for the implementation of Amendment 1 to the 15th Edition of the ICAO PANS-ATM - Doc 4444	End of April 2010 – Extension to 30 November 2010, for adjustments in accordance with models presented	The following States have not yet presented their action plans: Bolivia, Colombia, Ecuador, French Guiana (France).

ACTIVITIES	ACTION BY	DELIVERABLE	TARGET DATE	REMARKS
1	2	3	4	5
Nomination of focal points for the coordination between ICAO and States in the implementation of Amendment 1 to the PANS/ATM	SAM States	SAM States focal points for the coordination between ICAO and States in the implementation of Amendment 1 to the PANS/ATM	7 May 2010	Completed. Updated in SAM/IG/7. See Appendix B to this Agenda Item.
Analyze the checklist of systems involved in the flight plan process to evaluate the impact of the implementation of the new flight plan format in the automated systems	SAM/IG meeting	Checklist of systems involved in the flight plan process and its impact on the new flight plan format	SAM/IG/5	Completed. Systems affected: flight plan format templates of AMHS terminals and flight plan processors (FDP).
Carry out an analysis on the impact of the implementation of the new flight plan format in the SAM States automated systems	SAM States	Impact of the implementation of the amendment in the automated systems	End of August 2010	Carried out to following States: Argentina, Brazil, Chile, Colombia, Ecuador, Guyana, Panama, Peru, Suriname, Uruguay and Venezuela
Preparation of a SAM seminar/workshop for the implementation of Amendment to the PANS/ATM	ICAO Secretariat	Seminar/Workshop for the Implementation of Amendment 1 to the PANS/ATM	Lima, Peru, 13 to 15 September 2010	Carried out with the participation of 41 delegates from 10 States (Argentina, Bolivia, Brazil, Chile, Panamá, Paraguay, Perú, Suriname, Uruguay and Venezuela; 1 international organization (IATA), 5 providers (Adacel Inc., Atech, Indra, Ineco-Tifsa and Radiocom Inc.)
Hold national meetings between providers and users when implementing Amendment 1 to the PANS/ATM	SAM States	Establishment of a national schedule of meetings for the implementation of Amendment 1 to the PANS/ATM	Necessary national meetings for 2010-2012	The number of national meetings would be determined by the States
Prepare user and service provider personnel on the implementation of Amendment 1 to the PANS/ATM	SAM States	Service provider and user personnel trained on Amendment 1 to the PANS/OPS, under a national training programme	October 2010-November 2012	

ACTIVITIES	ACTION BY	DELIVERABLE	TARGET DATE	REMARKS
1	**2**	**3**	**4**	**5**
Hold second seminar/workshop for the SAM Region on the implementation of Amendment 1 to the PANS/ATM	ICAO Secretariat	second seminar/workshop for the SAM Region on the implementation of Amendment 1 to the PANS/ATM	Lima, Peru, 19-20 May 2011	Held with participation of 8 SAM States (Argentina, Bolivia, Brazil, Chile, Panama, Paraguay, Peru, Suriname and Uruguay), one air line representative (LAN Peru), industry representatives (Atech, Comsoft, Indra and ICAO representatives, totalling 36 participants
Conduct trials between systems with new flight plan processing capability	SAM States		End of June 2012	Trials should be held between 18 July 2011 until end of June 2012
Hold a seminar/workshop for the evaluation of risk as consequence of the implementation of Amendment 1 to the PANS/ATM	RLA/06/901 project	Study with the safety assessment before the implementation of the new flight plan format	Lima, Peru, 5-9 September 2011	
Study the implementation of the transition to the new flight plan format (operation taking under consideration the current and new format) including contingency measures	RLA/06/901 project	Study the implementation of Amendment 1 to the PANS/ATM, during the transition phase with the contingency measures	SAM/IG/8	
Publishing of transition actions, trials and other publications for users and interested parties	SAM States	Publishing of transition actions, trials and other publications for users and interested parties	End of March 2012	
Implementation of the new flight plan format in accordance with the strategy on the implementation of Amendment 1 to the 15th Edition of the PANS/ATM-Doc 4444	SAM States	Systems involved in the FPL process with capability to operate the new FPL format	End of March 2012	Conclusion SAM/IG/6-11 (AMHS until 31/12/2011 and FDP until 31/03/2012)

ACTIVITIES	ACTION BY	DELIVERABLE	TARGET DATE	REMARKS
1	**2**	**3**	**4**	**5**
Implementation of activities permitting systems involved in the FPL to operate with the current and new FPL	SAM States	Systems involved in the FPL process with capability to act upon the current and new flight plan during the transition period	End of 2012	If the new plan is implemented before June 2012, same will be only used on a trial basis (national, intra- and inter-regional), continuing to operate with the current flight plan format. In addition, during this period, pre-operational trials can be carried out (national, intra- and inter-regional)
Keep the Regional Office informed on the progress of activities, as well as on date changes in the action plans	SAM States	Updated information of the action plan	Continuous process until 15/12/2012	
Implementation of operational phase with the current and new flight plan	SAM States	Systems involved in the FPL process operating with the current and new format	1 July 2012 to 15 November 2012	The new FPL format should not become operational before 1 July 2012

APPENDIX B / APENDICE B

PUNTOS FOCALES PARA LA COORDINACIÓN DEL FORMATO DE PLAN DE VUELO / FOCAL POINTS FOR THE COORDINATION OF THE FLIGHT PLAN FORMAT

Estado/State Organization	Autoridad / Authority		E-mail	T / F
	Area	Nombre y título / Name and Title		
1	2	3	5	6
Argentina		Omar GouarnalusseDepartamento CNS de la Dirección Nacional de Servicio de Navegación Aérea y Aeródromo, ANAC	ogouarna@faa.mil.ar	T: + 54 11 4317 6667
Bolivia		Daniel Cassio Bustamante Leyton Inspector ATM/SAR, DGAC	dbustamante@dgac.gob.bo	T: +591 4 459 3101
Brasil	ATM/ PBN	Jorge Wilson de Avila F. Penna Departamento de Control del Espacio Aéreo, DECEA	adjpln@decea.gov.br	T: +5521 94997635 +5521 21016477
Chile		Marcial Vidal Arriagada Controlador de Tránsito Aéreo, DGAC	mvidal@dgac.cl	T: +56 2 290 4709
Colombia	PBN	Gladys Mercedes Roa de la Cruz AIS, UAEAC	gladis.roa@aerocivil.gov.co	T: +571 266 3693 +571 266 2514
Ecuador		Ivan Guillermo Sala Garzon Jefe Departamento Radar	ivan_salas@dgac.gov.ec	T: +5932 222 8309
French Guiana		Jean Jacques Deschamps Head, Technical Department for the ANSP in French Antilles and Guyana, DIRAC	jean-jacques.deschamps@aviation-civile.gouv.fr	
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		Rickford Samaroo Manager ATS Operations, CAD	satcori@hotmail.com	T: +592 261 2564 F: +592 261 2279
Panamá		Arístides Villareal Jefe del Departamento de Telecomunicaciones, AAC	avillareal@aeronautica.gob.pa	T: +507 501 9825/501 9826 F: +507 501 9848
Paraguay		Liz Rocío Portillo Castellanos Sección Normas y Reglamentos, DINAC	nyrlrpc@dinac.gov.py lizroportillo@gmail.com	T: +595 21 205 365
		David Ricardo Torres Sección Terminales AMHS/GTE, DINAC	dr.torres33@gmail.com	T: +595 21 645707/08 +595 21 205365 F: +595 21 645598
Perú		Paulo Vila Inspector CNS, DGAC	pvila@mtc.gob.pe	T: +511 615 7880 F: +511 615 7881
Suriname		Lunette Rinelda Edam AIS/Maps and Charts and Communication	ais@cadsur.sr; edamlunette@hotmail.com	T: +597 498-898 F:+ 597 498-901
		Doris Kranenburg AIS/Maps and Charts and Communication	ais@cadsur.sr; do12burg@hotmail.com	Tel.: +597 498-898 Fax:+ 597 498-901

Estado/State Organization	Autoridad / Authority		E-mail	T / F
	Area	Nombre y título / Name and Title		
1	2	3	5	6
Uruguay		Rosanna Barú Banchieri Encargada Departamento de Servicios Aeronáuticos, DINACIA	navegacionaerea@dinacia.gub.uy rocbb17@gmail.com	T: +5982 604 0408 – Ext. 4461
Venezuela		Kender Ferrer Jefe OPS ACC MIQ, INAC	k.ferrer@inac.gob.ve	T: +58 212 580 4444 F: +58 426 3317 687
		Vicente Fiore Jefe de MMTO Radar Maiquetía, INAC	v.fiore@inac.gob.ve	T: +58 416 6235 643
		Benjamín Uquillas Jefe Subcentro Comunicaciones Maiquetía, INAC	buquillas@gmail.com	T: +58 412 721 5068

APPENDIX C

SECOND SEMINAR/WORKSHOP ON THE IMPLEMENTATION OF THE NEW FLIGHT PLAN FORMAT – AMENDMENT 1 TO THE 15TH EDITION OF DOC 4444 PANS/ATM

(Lima, Peru, 19-20 May 2011)

EXECUTIVE SUMMARY

SESION 1 - Detailed implementation plans of the new flight plan format

In this session, a summary on the progress made globally and regionally in the implementation of the new flight plan format was presented. In addition, each participating State informed on the activities carried out to date, as well as the schedule until the complete implementation of the new flight plan format.

Current situation in SAM States

Argentina
Argentina has developed an action plan for the implementation of the amendment, which has not yet been approved by the aeronautical authorities. It should have been approved in March 2011, but it was delayed because the aeronautical authority is being transferred from the military to the civil area. Regarding the revision of documentation related to ATS operations, the updating of the AIP has not started yet. As to automated system improvements, they are under way. Coordination activities have been carried out with the providers of AMHS and ACC automation systems (INDRA) for the implementation of the new flight plan format. With respect to training plans for ATS and technical personnel and for users, they is being coordinated with the Civil Aviation Training Centre (CIPE).

Bolivia
Bolivia informed it had not yet drafted its action plan, since it had no automated systems implemented at its ATS units. In addition, it informed that they would be installing an AMHS system by the end of 2011. The Bolivian delegation informed it would be sending their national action plan before the end of June 2011.

Brazil
Brazil has developed an action plan that has already been approved by the aeronautical authorities. Pursuant to the action plan, the national documents that regulate ATC operations have been amended; an AIC on the contents of Amendment 1 to the 15th edition of Doc 4444 has been sent to CISCEAB users; the safety assessment has been made to identify hazards, assess the relevant risks and the required mitigation actions. It is anticipated that this process will be completed by late August 2011. Likewise, the changes required in automated systems as a result of the implementation of the new flight plan format are being introduced with the support of ATECH. In reference to the training of the internal operational and technical personnel of the administration, and of external personnel, such as airspace users, internal and public seminars being scheduled throughout 2011. For purposes of coordination and implementation of the activities envisaged in the amendment, a multidisciplinary group has been established, made up by the aeronautical authorities, aeronautical service providers, users and the company responsible for the installation of the automated systems.

Chile

The action plan for the implementation of the new flight plan format was approved in mid January 2011; it was since November 2010 but its approval was delayed due to changes in the aeronautical authorities. A national working group, approved by the aeronautical authority, has been established to coordinate the activities for the implementation of the new format, made up by aeronautical service providers and airspace users. Regarding the amendments to the national documents that regulate ATC operations, these are under study and the whole documentation is expected to be ready by February 2012. With respect to the safety assessment, the group has identified the hazards and assessed the risks, and expects to complete the whole safety assessment process by mid September 2011. As to the impact of the implementation of the new flight plan format on automated systems, they have identified the affected systems, and are awaiting a technical-economic proposal from the manufacturer (Thales). Thales was present at the event and informed that it would be sending its proposal in early June 2011. National trials of the processing of the new flight plan format are foreseen for late March 2012. Regarding training, there are plans to use the e-learning methodology. The initial duration of courses on the new flight plan format will be one week. Training is foreseen for the operational and technical personnel responsible for the provision of ATS services and for users throughout 2011 until June 2012.

Panama

The aeronautical authorities have approved the national plan for the implementation of the new flight plan format, and have created a national working group made up by the aeronautical administration personnel responsible for providing navigations services, and the users.

The identification of ATC operational documents that need to be amended has started, together with the safety assessment process to identify hazards and assess risks. The equipment affected by the new flight plan format in the Panama ACC has been identified. In this regard, it was informed that the ACC would be moved to a new location because work will start in the current premises to build a subway. The installation of the new ACC will entail the acquisition of a new AMHS system and a new automated system for the Panama ACC.

The implementation of the new ACC and of the new equipment is foreseen for 2012. Given the magnitude of the construction work and the equipment to be installed, works could extend beyond 15 November 2012. Consequently, it was recommended that alternate measures be considered in order to comply with the plan. Regarding training, it has been foreseen for the navigation service provider personnel and the users.

Paraguay

A national action plan was developed and then approved by the aeronautical authority in February 2011. Likewise, a national group has been created, made up by air navigation service providers and airspace users. It is expected that all activities related to national regulations and the publication and harmonisation of the AIP be completed in 2011. The safety assessment is foreseen for completion by June 2012. Regarding automated equipment, coordination activities have been carried out with INDRA, which recently installed the new automated system in the ACC, and also with RADIOCOM, the AMHS provider. These changes are scheduled for late 2011. Training has been foreseen for the personnel responsible for providing air navigation services and for the users. The training process will take place from June 2011 through August 2012.

Peru
A national action plan has been approved and a multidisciplinary group has been established for the implementation of the amendment (aeronautical authorities, service provider, and user). Regarding the national documentation for ATC operations, the supplementary technical regulation related to ICAO Doc 4444 is currently being reviewed, and the AIC to inform about the amendment at national level is to be published in late May 2011. The safety assessment is to be completed by late July 2011. Regarding the assessment of automated systems, agreements have been signed with COMSOFT for updating the AMHS starting in late May 2011. Likewise, coordination activities have been carried out with INDRA to make the necessary changes to automated systems, taking into account they are currently being installed. Training is foreseen for the personnel that provide air navigation services and users, in coordination with the Civil Aviation Training Centre (*Centro de Instrucción de Aviación Civil* - CIAC).

Suriname
A national action plan has been approved and a multidisciplinary group has been established (aeronautical authorities, service provider, and user) for the implementation of the amendment. The revision of national regulations for ATC operations is in its initial phase. Since the AMHS and the automated systems of the Paramaribo ACC have been recently installed, arrangements have been made with the manufacturers to make the necessary changes for accepting the new flight plan format. Training is foreseen for the personnel that provide air navigation services and users throughout 2011 and 2012.

Uruguay
A national resolution issued in October 2010 created a committee for the implementation of Amendment 1 to the 15th edition of the PANS-ATM (Doc 4444), made up by the aeronautical authority, service providers and users. This committee drafted an action plan for the implementation of the amendment. In compliance with the activities of the action plan, national documents for ATC operations will be reviewed, and a safety assessment will be conducted. Regarding automated systems, an AMHS is to be installed in 2012. Likewise, INDRA has submitted a technical and economic proposal for updating the automated system of the Montevideo ACC.

As to training, coordination activities have been carried out with the Aeronautical Training Institute (*Instituto de Adiestramiento Aeronáutico* - IAA) and the appropriate group with a view to scheduling internal seminars and planning their dissemination, especially for the ATM, AIS and COM areas.

SESSION 2 - Detailed transition plans for the new flight plan format

With regard to this topic, explanation was given on the need that each State identify all intra and interregional communications requirements (AFTN, AMHS, OLDI, AIDC) during the transition phase, with the aim that the transmission tests and operation of the new flight plan format can be carried out during this phase. **Attachment A** to this Appendix E shows a chart with a recommended order for the testing and operation of the new intra and interregional flight plan format. The order suggested for the tests and operation is to, first, make interregional oceanic communications, then interregional continental, then OLDI or AIDC interregional and, last of all, the AFTN or AMHS interregional communications.

SESSION 3 - Testing for the implementation of the new flight plan format

This session highlighted the importance of making all necessary trials to all new or modified equipment, as well as to any new or modified software application in the systems bearing impact on the new flight plan format (AFTN, AMHS, FDP, RDP, etc.). These trials are to be carried out with the manufacturer in order to obtain acceptance. The final acceptance of the equipment and software is to be achieved once not only local trials are finished, but also with States and users at intra and interregional level. Local equipment tests are to be completed before **1 April 2011**. Tests with adjacent States having implemented the flight plan format during this time should also be carried out in this period. The remainder of the intra and interregional tests with States should be carried out until **30 June 2011**. Tests and operation with users should be made during the period between **1 July and 15 November 2011**. **Attachment B** to this Appendix shows a list of activities to be taken under consideration upon carrying out the tests.

In this respect, SAM States were reminded of Conclusion SAM/IG/6-11 indicating that the changes identified at the AMHS or AFTN systems should be made by 31 December 2011, and the changes in the flight plan processors, at the end of March 2012.

SESSION 4 - Industry and stakeholder

COMSOFT
COMSOFT described some aspects to be taken into account for the implementation of a flight plan convertor during the transition phase, where the current and new flight plan formats would coexist. In this regard, it stated that the conversion should be at the network level and that the conversion process should be from the new to the current format, and *viceversa*. ICAO does not contemplate the latter. In this respect, COMSOFT informed that this solution was optional, since they also had applications for converting from the new to the current format only. The recommendation was to take into account ICAO recommendations on the conversion of the format.

INDRA
INDRA noted that it responds to all the requests in the Region, including Argentina, Paraguay and Peru this year, and Colombia next year. For the implementation of the new format, INDRA has solutions for its new systems and also for the existing ones. Since the existing equipment was installed in the Region on different dates and involved different models, the solution varied for each system; thus, a regional solution was not viable. The automated system of INDRA is already prepared to process the new and the current format, in keeping with ICAO specifications.

Thales
Thales informed that the new automated systems (FDP, RDP) that date back to 2010 are already prepared to accept both the new and current flight plan formats. Systems installed prior to 2010 require updates, and Thales informed that updates are already underway in some countries worldwide. The Thales system includes conversion from the new to the current flight plan format during the transition phase.

SESION 5 - Documentation to be updated

Note was taken that States had this activity included in their national action plans. Some States had already completed the updating of documents on operational procedures, as well as their AIP, and had started publishing aeronautical information circulars to indicate all users on the new flight plan format. With the aim that States can identify the publications that might be affected by the new flight plan format, **Attachment C** to this appendix indicates all possible documentation to be reviewed: training documents, regional documents (Doc 7030), national documents (AIP, letters of agreement, etc.) and other documents.

SESION 6 - Safety assurance

SAM States have taken this activity under consideration in their action plans; it is important that before the operation of any activity, this is carried out in support of the new flight plan format. Brazil presented an analysis procedure for safety assurance, which has been considered as a model to be applied by the remaining States of the Region. It was deemed convenient that the safety assessment be carried out before **31 December 2011**.

SESION 7 - Training template

The States of the SAM Region have considered internal training (controller, operational, management and technical personnel) for an air navigation service provider, and external training for users (flight crew and dispatchers). In accordance with information provided by States, this training would be carried out in 2011 and part of 2012.

SESION 8 - Spreading the message

During the seminar/workshop, a poster and a brochure on the new flight plan format implementation calendar were handed out, showing all activities to be carried out during the various new flight plan format implementation phases. Copy of the poster is shown in **Attachment D** to this Appendix. Participants were invited to hang the poster in strategic areas within their aeronautical units with the aim that all can take note of all actions required for the new plan to be implemented by **15 November 2012**. In addition, the assistants were reminded of the importance on accessing the ICAO FITS web page to look at all information, documentation, progress in the global implementation of the new flight plan format, and difficulties encountered. It is important that States inform of all progress and changes to the ICAO SAM Regional Office, with the aim of keeping the FITS updated. The web page is http://www2.icao.int/en/FITS/Pages/home.aspx.

SESION 9 – Finance

During the event, States were informed that all changes, as well as equipment, software, training, documentation and other activities required for the implementation of the new flight plan format, are to be borne by each aeronautical administration’s funds. **Attachment E** shows the various finance sources for the implementation of the new flight plan format.

SESION 10 - Strategic support teams

During this sesión, the air navigation services provider (ANSP) micro-management, regional membership, tool kit and contingencies, were discussed upon. **Appendix F** presents a summary of the aspects related with strategic support teams.

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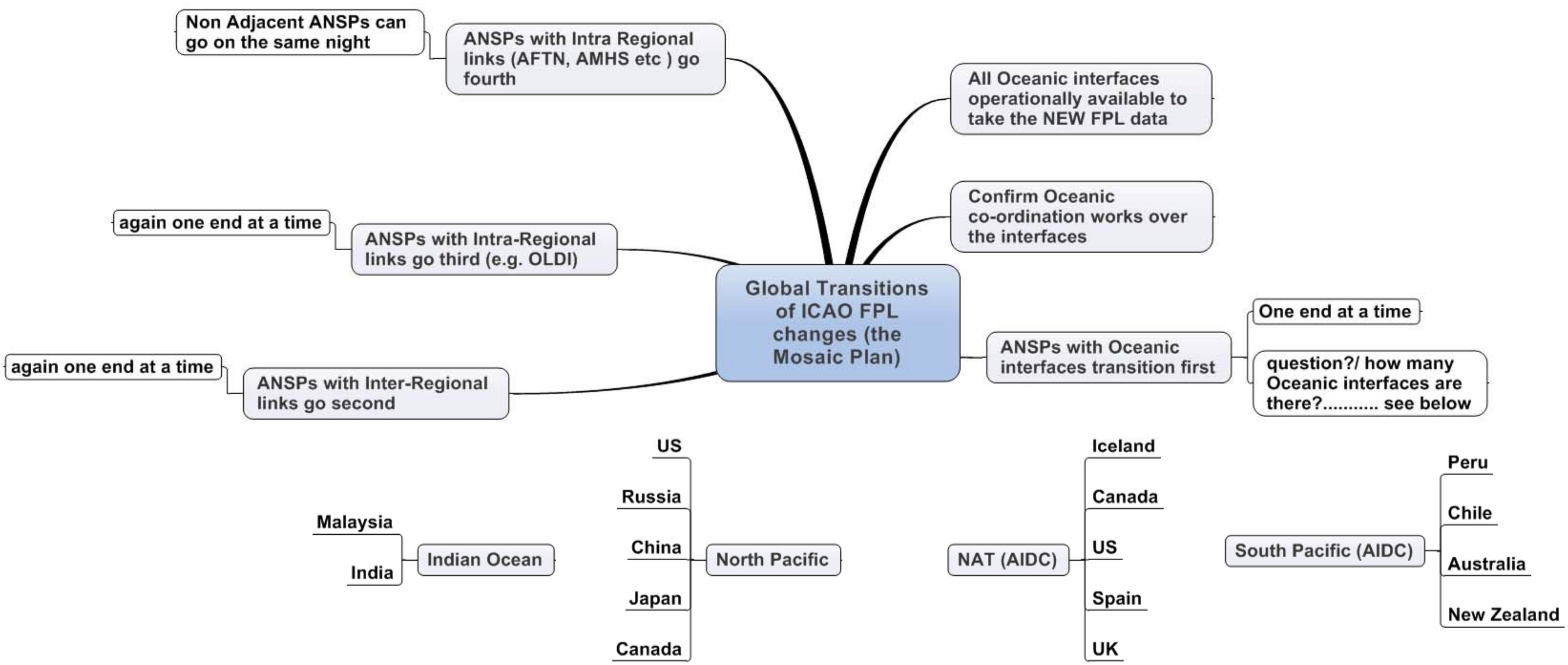
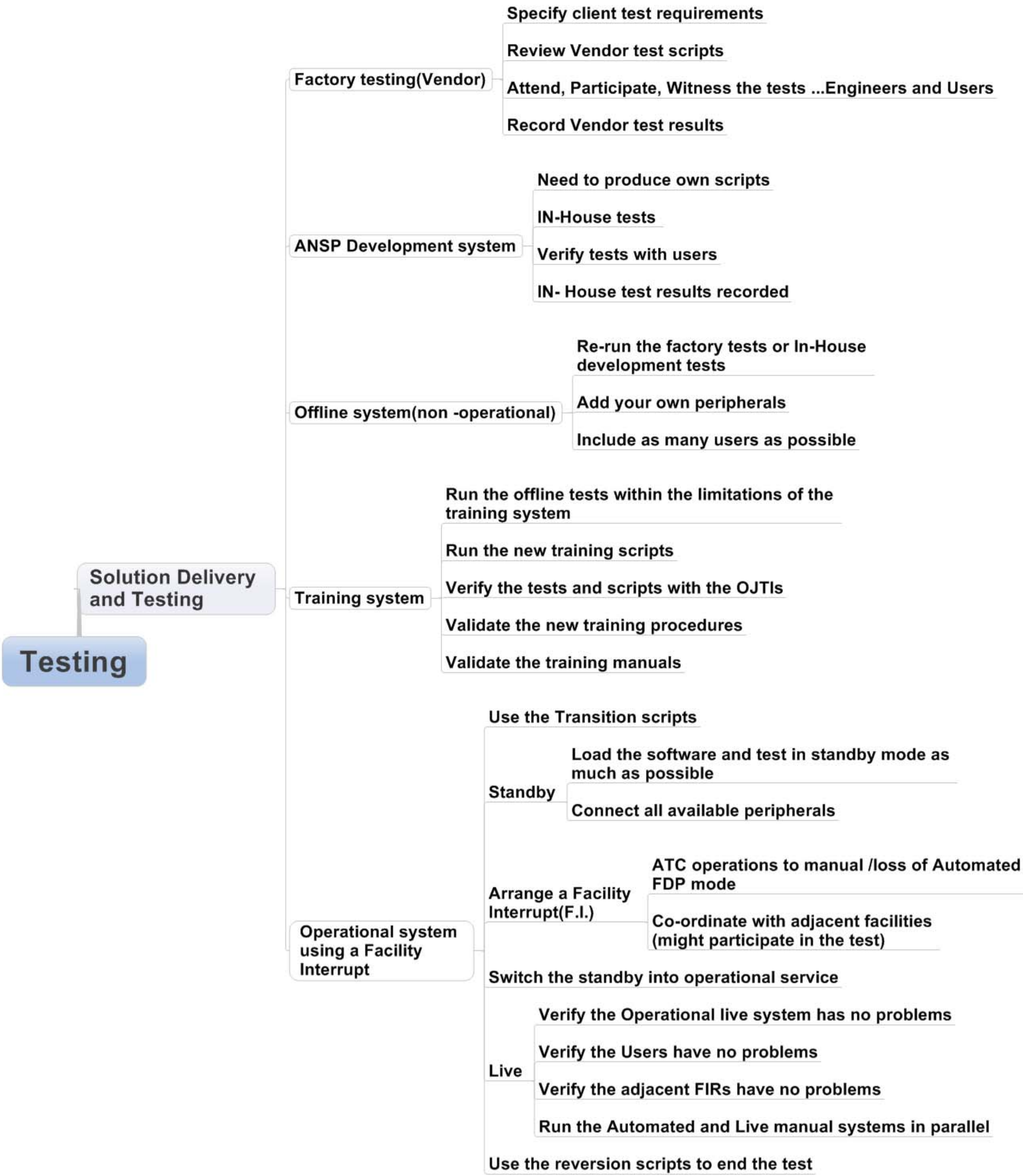
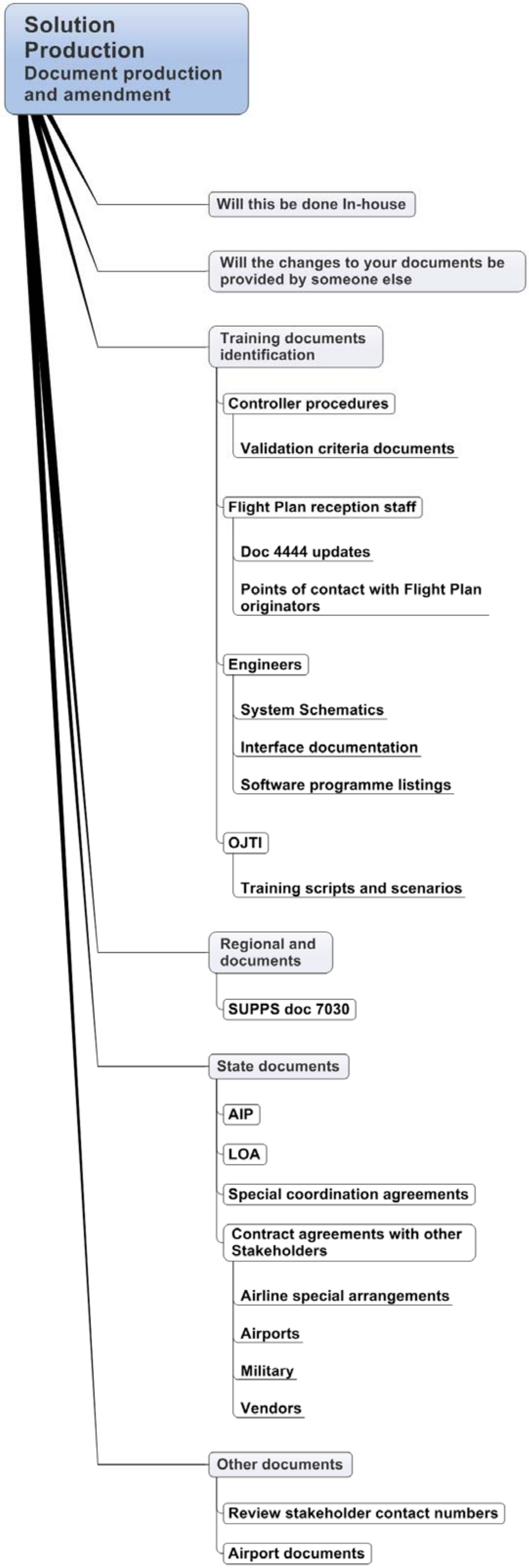

Global Transitions of ICAO FPL changes (the Mosaic Plan)
ANSPs with Intra Regional links (AFTN, AMHS etc) go fourth
Non Adjacent ANSPs can go on the same night
ANSPs with Intra-Regional links go third (e.g. OLDI)
again one end at a time
ANSPs with Inter-Regional links go second
again one end at a time
All Oceanic interfaces operationally available to take the NEW FPL data
Confirm Oceanic co-ordination works over the interfaces
ANSPs with Oceanic interfaces transition first
One end at a time
question?/ how many Oceanic interfaces are there?........... see below
Indian Ocean
Malaysia
India
North Pacific
US
Russia
China
Japan
Canada
NAT (AIDC)
Iceland
Canada
US
Spain
UK
South Pacific (AIDC)
Peru
Chile
Australia
New Zealand

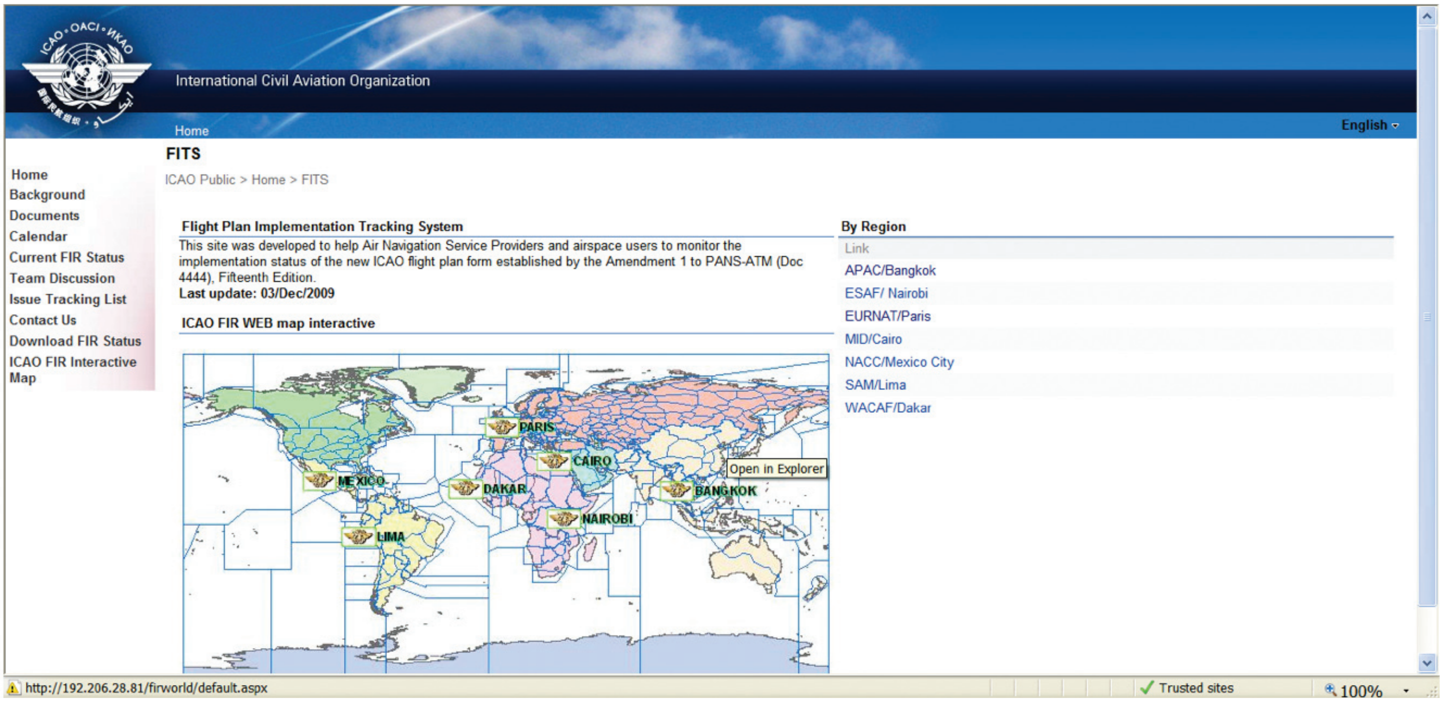

Testing
Solution Delivery and Testing
Factory testing(Vendor)
Specify client test requirements
Review Vendor test scripts
Attend, Participate, Witness the tests ...Engineers and Users
Record Vendor test results
ANSP Development system
Need to produce own scripts
IN-House tests
Verify tests with users
IN- House test results recorded
Offline system(non -operational)
Re-run the factory tests or In-House development tests
Add your own peripherals
Include as many users as possible
Training system
Run the offline tests within the limitations of the training system
Run the new training scripts
Verify the tests and scripts with the OJTIs
Validate the new training procedures
Validate the training manuals
Operational system using a Facility Interrupt
Use the Transition scripts
Standby
Load the software and test in standby mode as much as possible
Connect all available peripherals
Arrange a Facility Interrupt(F.I.)
ATC operations to manual /loss of Automated FDP mode
Co-ordinate with adjacent facilities (might participate in the test)
Switch the standby into operational service
Live
Verify the Operational live system has no problems
Verify the Users have no problems
Verify the adjacent FIRs have no problems
Run the Automated and Live manual systems in parallel
Use the reversion scripts to end the test


Solution Production
Document production and amendment
Will this be done In-house
Will the changes to your documents be provided by someone else
Training documents identification
Controller procedures
Validation criteria documents
Flight Plan reception staff
Doc 4444 updates
Points of contact with Flight Plan originators
Engineers
System Schematics
Interface documentation
Software programme listings
OJTI
Training scripts and scenarios
Regional and documents
SUPPS doc 7030
State documents
AIP
LOA
Special coordination agreements
Contract agreements with other Stakeholders
Airline special arrangements
Airports
Military
Vendors
Other documents
Review stakeholder contact numbers
Airport documents

Flight Plan Implementation Tracking System (FITS)

Are you ready for November 2012?

The ICAO FITS database contains the information you need!



http://www2.icao.int/en/FITS/Pages/home.aspx

See the timeline overleaf...

FPL 2012 Programme

- **Programme Phases**
  - **Negotiation and Approval Phase** (October 2008 – May 2010)
    - Acceptance and agreement of the changes to the Flight Plan Form by States
      - All State differences to be identified in the AIP
      - All Regional differences to be identified in the SUPPs
    - Approval of the amendment by the ICAO Council
    - This Phase is complete (01/May/2010)
  - **Impact Assessment and Requirements Phase** (December 2010)
    - Awareness of impact of changes
      - Regional Task Force meetings
        - All regions have now had at least one task force meeting with others planned throughout the duration of the programme
      - Regional Seminars and Workshops
        - Many have commenced and all regions are planning future events.
      - ICAO HQ guidelines and amendment identification
      - Regional transition strategies
    - This Phase is ongoing and planned to end of Dec 2010)
  - **Solution Production Phase** (December 2011)
    - Inventory of FDP systems
      - Include all Interfaces
        - AIDC
        - OLDI
        - CPDLC
        - AMHS
      - Include Support systems
        - Record and Replay
        - Conflict Alert Systems
      - Include stand-alone management systems
        - Metrics/statistics capture systems
        - Route Charges
    - Audit the Inventory.
      - From the Inventory identify those Systems and Interfaces which will require a change.
    - Solution Identification
      - In-house
      - Vendor provided
      - Most Vendors will only identify and supply a solution for their own systems
      - Ensure all systems or interfaces requiring a change are identified
    - Solution Production
      - In-house
      - Vendor provided
    - Factory testing if Vendor supplied
    - This Phase should complete by 31st Dec 2011
  - **Transition Phase 1** (January 2012)
    - ANSP Implementation
      - Solution Delivery and Testing
        - Development system
        - Offline system
        - Training system
      - Identify Key Transition Entry criteria
        - All safety assurances available
        - All training complete
        - All documentation produced and distributed
        - Operational Interfaces checked with adjacent centres using FPL data of NEW, PRESENT and NEW to PRESENT
        - Transition rehearsals complete on Operational Systems
        - Produce a Transition Plan
          - walk-through the Plan
        - Produce and validate a reversion Plan
          - walk-through the Plan
        - Operational Readiness Demonstration (ORD)
          - to Users
          - to Management
          - to Regulators
          - to any other Key Stakeholders
    - Guideline 5: use the FITS database
    - 1 Jan 2012- 31 March 2012
  - **Transition Phase 2** (April 2012)
    - Transition into Operations
      - Guideline 1 : ANSPs will support PRESENT and NEW as they Transition
      - Guideline 2: Coordinated regional transitions. New information may not be coordinated with ANSPs who have yet to transition
      - Guideline 5: use the FITS database
    - 01 April 2012 -30 June 2012
  - **Transition Phase 3** (July 2012)
    - Airspace User Implementation
      - Guideline 3: Airspace users can file PRESENT or NEW
      - Guideline 4: ANSP accepting NEW will not be able to coordinate NEW with ANSP using PRESENT
      - Guideline 5: use the FITS database
    - 01 July 2012 - 14 Nov 2012
  - **Closure Phase** (November 2012)
    - Only NEW Flight Plans filed
      - Guideline 6: PRESENT flight Plans will be rejected.
    - From 15 Nov 2012 onwards

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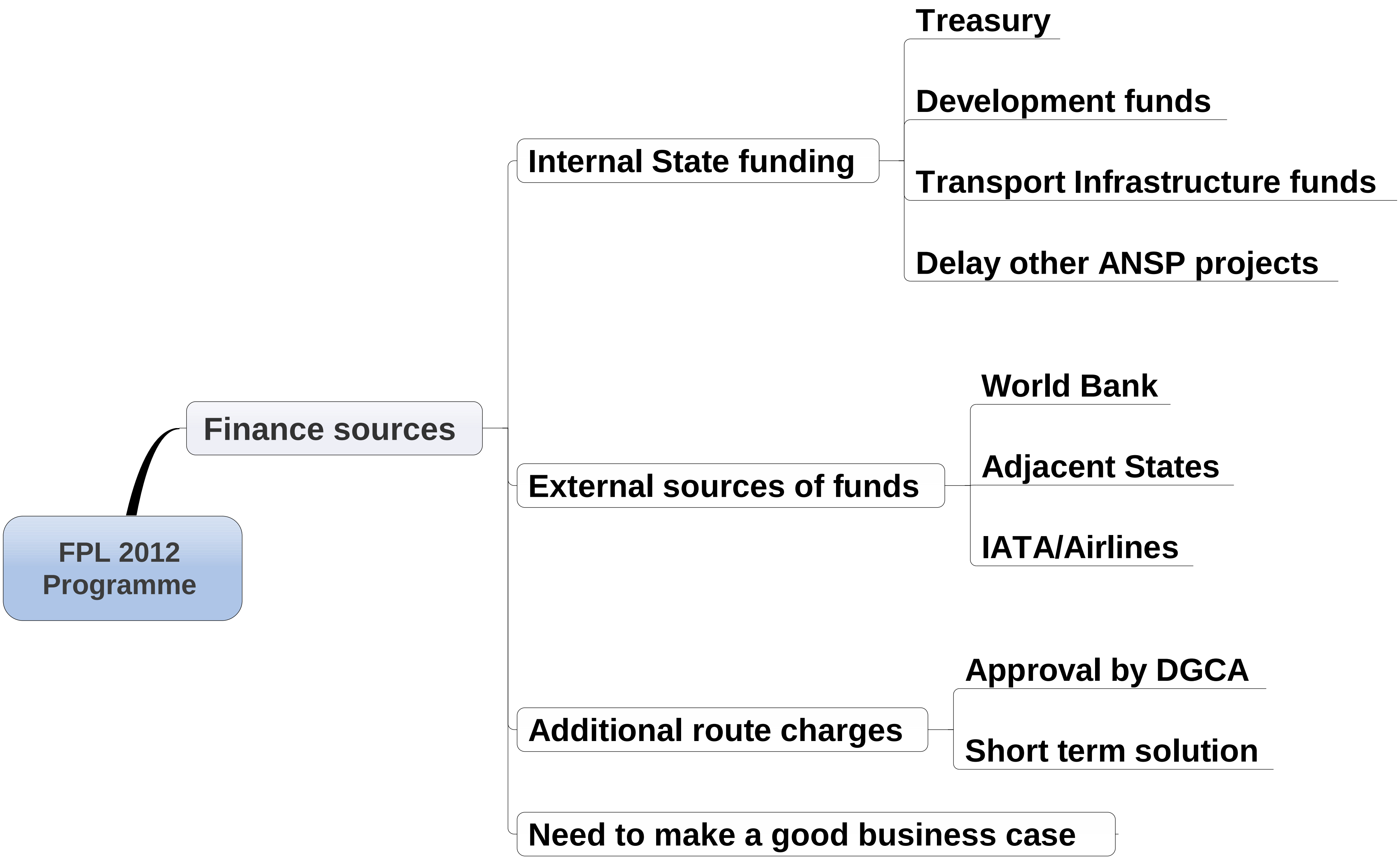
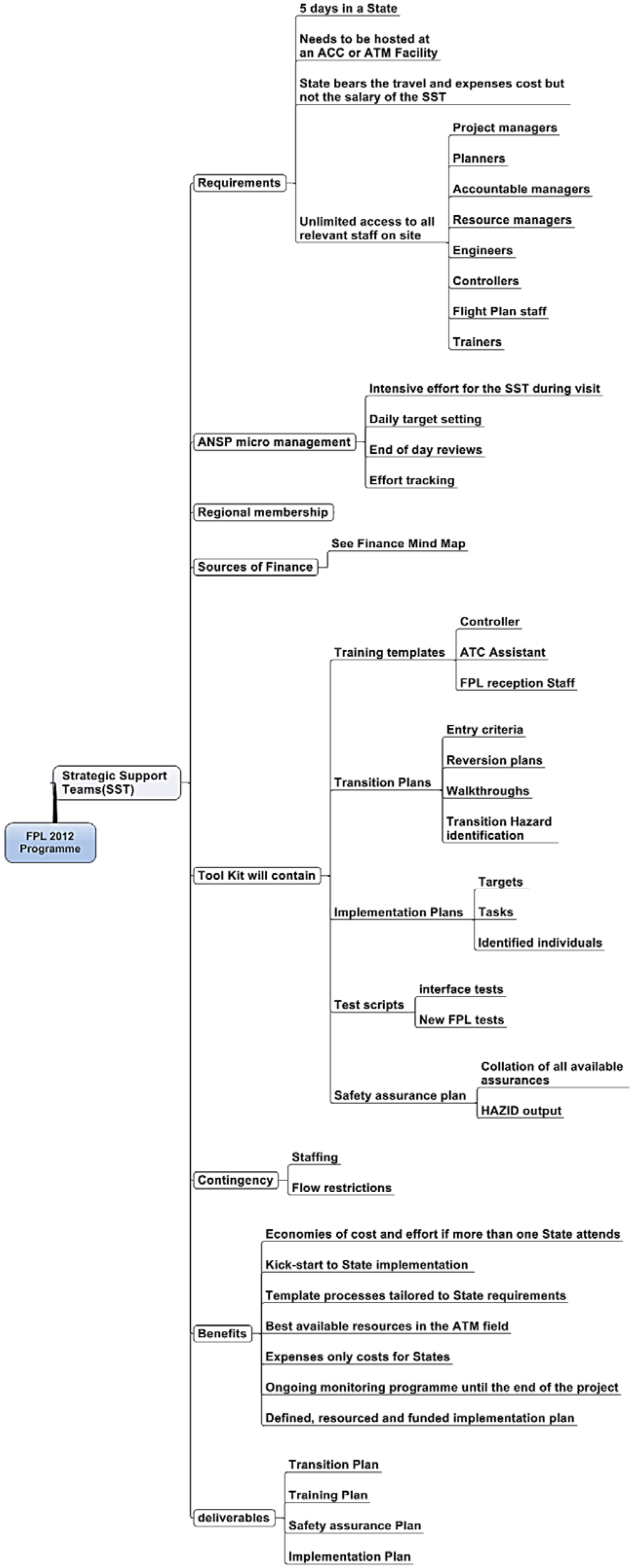


FPL 2012 Programme Finance sources.mmap - 20/05/11 - Mindjet


FPL 2012 Programme
Strategic Support Teams(SST)
Requirements
5 days in a State
Needs to be hosted at an ACC or ATM Facility
State bears the travel and expenses cost but not the salary of the SST
Unlimited access to all relevant staff on site
Project managers
Planners
Accountable managers
Resource managers
Engineers
Controllers
Flight Plan staff
Trainers
ANSP micro management
Intensive effort for the SST during visit
Daily target setting
End of day reviews
Effort tracking
Regional membership
Sources of Finance
See Finance Mind Map
Tool Kit will contain
Training templates
Controller
ATC Assistant
FPL reception Staff
Transition Plans
Entry criteria
Reversion plans
Walkthroughs
Transition Hazard identification
Implementation Plans
Targets
Tasks
Identified individuals
Test scripts
interface tests
New FPL tests
Safety assurance plan
Collation of all available assurances
HAZID output
Contingency
Staffing
Flow restrictions
Benefits
Economies of cost and effort if more than one State attends
Kick-start to State implementation
Template processes tailored to State requirements
Best available resources in the ATM field
Expenses only costs for States
Ongoing monitoring programme until the end of the project
Defined, resourced and funded implementation plan
deliverables
Transition Plan
Training Plan
Safety assurance Plan
Implementation Plan

Agenda Item 9: Other business

Access by unmanned aircraft systems (UAS) to Brazilian airspace

9.1 The Meeting took note that the Brazilian legislation concerning unmanned systems had been prepared on the basis of ICAO recommendations contained in Circular 328 and the knowledge acquired through participation in the Unmanned Aircraft System Study Group (UASSG). The current Brazilian legislation is not definitive and a new broader legislation is foreseen to be published by the end of the first semester of 2011.

Support of States of ICAO position within the ITU

9.2 In reviewing the activity of UAS, the Meeting considered that the States should actively participate in the activities related to preserve the radio frequency spectrum and to support the ICAO position at the events organised by the ITU for this purpose.