SAM/IG/10

INTERNATIONAL CIVIL AVIATION ORGANIZATION
South American Office

Regional Project RLA/06/901

TENTH WORKSHOP/MEETING OF THE SAM IMPLEMENTATION GROUP

(SAM/IG/10)

FINAL REPORT

Lima, Peru, 01 to 05 October 2012

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HISTORY OF THE MEETING

ii-1 PLACE AND DURATION OF THE MEETING

The Tenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/10) was held at the premises of the ICAO South American Regional Office in Lima, Peru, from 01 to 05 October 2012, under the auspices of Regional Project RLA/06/901.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Franklin Hoyer, Regional Director of the ICAO South American Office, and 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.

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

The Meeting agreed to hold its sessions from 09:00 to 16:30 hours, with appropriate breaks. The work was done with the Meeting as a Single Committee, Working Groups and Ad-hoc Groups.

Mr. Luiz Ricardo de Souza Nascimento, delegate from Brazil, was unanimously elected as Chairman of the Meeting. Also, Mr. José Luis Chávez, delegate from Paraguay, was elected as Vice-Chairman.

Mr. Celso Figueiredo, RO/ATM/SAR, SAM Office, Lima, acted as Secretary, assisted by Mr. Onofrio Smarrelli, RO/CNS, Roberto Arca, RO/ATM/SAR/AIM, from the Lima Office, and Mr. Jorge Fernández, ATM/SAR Expert.

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, Phase 3, Version 02

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

Agenda Item 4: Air Traffic Flow Management Implementation (ATFM) in the SAM Region

Agenda Item 5: 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 6: Operational implementation of new ATM automated systems and integration of the existing systems

Agenda Item 7: Implementation of the new flight plan format

Agenda Item 8: Other business

ii-6 **ATTENDANCE**

The meeting was attended by 53 participants from 10 States of the SAM Region Argentina, Bolivia, Brazil, Chile, Colombia, Paraguay, Perú, Suriname, Uruguay and Venezuela, 1 International Organization, IATA, and 4 International Companies, ARINC, ATECH, Boeing and Thales Air Systems. The list of participants is shown in page iii-1.

ii.7 LIST OF CONCLUSIONS

No.	Title of the Conclusion	Page
Conclusion SAM/IG/10-1	Safety Plan for the implementation of routes Phase 3, Version 02	2-4
Conclusion SAM/IG/10-2	Implementation of the new concept on flexible use of the airspace in the ICAO South American Region	2-4
Conclusion SAM/IG/10-3	Review of the Guide on technical and operational considerations for the implementation of ADS-B	6-3
Conclusion SAM/IG/10-4	Effective date for the NEW flight plan format	7-1

SAM/IG/10

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Agenda Item 1: Follow up to conclusions and decisions adopted by SAM/IG meetings

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

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

1.2 The meeting carried out a revision of the valid conclusions, and pending activities of the SAM Implementation Group (SAM/IG) workshops/meetings.

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

a) SAM ATS routes network optimisation.
b) Performance Based Navigation (PBN) both for en-route, terminal area and approach areas.
c) Air Traffic Flow Management (ATFM).
d) CNS systems improvements;
e) Automation; and
f) Implementation of the new flight plan format

Summary of the status of implemenetation of tasks and conclusions

1.4 The meeting decided to maintain the status of implementation of the conclusions and actions adopted, only valid and the list shown in **Appendix A** to this part of the report has been prepared. The information attached refers to the information available in the Secretariat with each one of the agenda items.

1.5 The list of conclusions and actions comprises:

a) Tasks to develop and/or the corresponding conclusion in the areas under analysis;
b) Specific tasks which will lead to compliance of the main task;
c) Expected results in each task;
d) Finalization dates;
e) Responsible persons for its execution;
f) Supporting members for each task; and
g) Status of implementation of the same, and when necessary, for a better understanding, an explanatory comment on the status of implementaiton is included.

1.6 The Meeting analysed each task identified and assessed the need to modify the finalisation date, a well as the status of implementation of each specific task. The meeting also updated the chart shown in **Appendix B** to this part of the report, showing the tasks in charge of the States, in order to make a follow-up of the same.

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							
1-3	UM 662 Guayaquil – Madrid	• Coordinate the implementation. • Issue AIC. • Train personnel. • Amend CAR/SAM ANP	Route implemented	Agreement with FAV Venezuela is pending SAM/ ATSRO/4	States Secretariat	RO/ATM RO/AIM	**VALID** (see SAM/IG/5, Agenda Item 2) The enquiry was reiterated to Venezuela who proposed an alternative and Ecuador is pending a reply on agreement with the rest of the States.
2. Optimisation of ATS routes in the SAM Region							
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/9	States	N/A	**VALID** Check fuel savings estimate chart. Permanent task.
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/9	RLA/06/901	RO/ATM	**VALID** This task was included in the optimisation programme of the action plan.

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 network optimisation	As per action plan	States RLA/06/901 IATA Regional Office	RO/ATM RO/AIM	**VALID**
3. Implementation of Performance Based Navigation (PBN) in the SAM Region							
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/9	States	RO/ATM	**VALID** 11 States in the SAM Region presented their national PBN plan for its harmonization. States that have updated their plans will send them for the Regional Office. It is expected that the 3 remaining States (Ecuador, French Guiana, 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
3-17	**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/10	States	RO/ATM	**VALID** Some States introduced CDO in their national plans.
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	October 2011	States	RO/ATM	**VALID**
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	Permanent	States	RO/ATM	**VALID** It is considered a permanent task.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-23	**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.	• Use Forms CMA F5 and CMA F6. • Taking into consideration that some listings contain all data foreseen in such form, and in such cases, the meeting concluded that the submission of the corresponding F5 forms is not necessary. In cases in which the lists do not contain information foreseen in Form F5, States should send them to CARSAMMA.	Safe RNAV5 implementation	First Phase September 2011	States	RO/ATM	**VALID** States should implement procedures to keep data base updated.
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	SAM/IG/10	States	RO/ATM/	**VALID**

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							
4-11	**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
5-5	**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/8	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. When the workshop held at the SAM Office from 24 to 28 October 2011 was completed, it was agreed to carry out additional e-distance training for students to become instructors. Such training is currently being. carried out
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/8	States	RO/ATM	**VALID** States maintain web conferences due to communication problems in TELCONs held. The use of SKYPE and go-to-meeting is planned. REDDIG II includes a speech communications sub-network to support this application.

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 the SAM Region	December 2012	States	RO/ATM	**VALID**
5-18	Message exchange in the ATFM manual be prepared as a MOU among States to be included in the ATFM Manual	Preparation of MOU for ATFM messages exchange among States	MOU prepared and approved.	SAM/IG/10	States Regional Project RLA/06/901	RO/ATM RO/CNS	**VALID**
5-19	Preliminary exercise on runway capacity and ATC sectors. The remaining States are encouraged to present their studies for SAM/IG/8	Carry out a preliminary study on runway capacity and ATC sectors	Present studies on exercises carried out	SAM/IG/10	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							
6-3	**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** During SAM/IG/8 meeting, updated information was received from Brazil and Guyana on CNS improvement plans. Any change made by States to the Guide should be notified to the ICAO SAM Regional Office

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 coordination; 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 2013	SAM States	SAM States AMHS providers RO/CNS	**VALID** Coordination has been carried out with providers to complete the interconnection Pending implementation of MOUs
6-10	**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 RNAV5.	Inform of any change in the current geometry change of DME systems.	Inform the Regional Office with sufficient time in advance	Permanent	States	RO/CNS	**VALID**

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 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	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. Additional information in SAM/IG/10-WP/16 During SAM/IG/10 THE MOU for interconnection of automated systems between Brazil and Peru is signed.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	initial plan for ACC automated systems. e) Preliminary reference system/ subsystem specification for the air traffic control automation system (SSS).						
7-7	**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.**	Carry out safety assessment for the implementation of the content o amendment 1 to the PANS-ATM, based on the guidelines prepared during the SAM/RA/02 Meeting.	Report of the safety assessment for the implementation of FPL 2012	30 November 2011	States	RO/ATM RO/AIM RO/CNS	**VALID** Brazil, Panama, Paraguay have completed the safety assessment. The rest of the States have started this activity, and are finishing the analysis and drafting of the contingency plan

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
8-3	**Conclusion SAM/IG/8-3 Implementation of a RAIM/FDE prediction system in the SAM Region** That, in order for the FDE SAM Region to have a common service for predicting RAIM and FDE availability to support PBN operation for en-route, non-precision approach, vertical guide approach (APV) and terminal area: a) the Fifth Meeting of the Coordination Committee of Regional Project RLA/06/901 consider the purchase of the RAIM prediction service selected between the proposals presented by DWI and Colombia; and b) ICAO analyse the most convenient way for States that are not members of Regional Project RLA/06/901 to pay the corresponding fee for the RAIM prediction service.	a) Approval by RCC/5 of the acquisition of a common RAIM availability prediction service. b) Analysis of the most appropriate manner so that non-member States of RLA/06/901 contribute with the quota for the RAIM availability prediction service.	Acquisition approval of a RAIM availability prediction service in the SAM Region. Procedure for contribution quota for non-member States of RLA/06/901.	a) 12/11 b) 10/12	a) RLA/06/901 Members b) States		**VALID** An amendment to the Project document will be presented at RLA/06/901 RCC/6 meeting (Lima, Peru, 21-23 November 2012), related with the implementation of the RAIM predicion service implementation, for its review and approval. Thereafter, the bidding process with start through the ICAO TCB

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
9-4	Conclusion SAM/IG/9-4 - Active participation in all regional activities for the implementation of Amendment 1 to Doc 4444, 15th Edition That the SAM States, with the aim of complying with the implementation of Amendment 1 to ICAO Doc 4444, 15th Edition: a) Inform of any changes in the list of focal points shown in Appendix B to this Agenda Item; b) Actively participate through their focal points in the web teleconferences scheduled in the following dates: 25 May, 29 June, 31 August, 28 September and 31 October 2012; and c) Participate in the scheduling of the regional and inter-regional trials described in Appendix E to this Agenda Item	a) Updating of FPL list; b) Active participation in web teleconferences on the FPL; c) Participation in FPL trials.	Documentation updated Participation in FPL web teleconferences Regional and interregional tests on the NEW FPL	14 Nov 12	SAM States		**VALID** Even though telefonferences and tests have been held in the dates indicated, still pending are additional teleconferences and the completion of the trials. Further informatin in SAM/IG/10-WP/11,

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**	**YES**	**YES**	**YES**	**YES**	**PER:** Dec 2009
1-1 That States examine: a) Impact of RNAV routes implementation in the 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**	**YES**	**YES**	**YES**	**OG**	**--**	**OG**	**OG**	**OG**	**YES**	**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**	**YES**	**YES**	**YES**	**YES**	**ECU**: Venezuela is pending reply for effective implementation date of route Guayaquil/Madrid
2-3 Conclusion SAM/IG/2-1 PBN implementation Programme for en-route operations That the ICAO SAM States take appropriate	**YES**	**YES**	**YES**	**YES**	**YES**	**--**	**--**	**YES**	**YES**	**YES**	**OG**	**YES**	**YES**	**YES**	**PER**: Nov 2010

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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.															
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) 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.	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**--**	**YES**	**YES**	**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
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 have less than 5 700 kg. of MTOW – 15 May 2009; c) Other aircraft registered in the Region– 15 Aug 2009	**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.
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**	**YES**	**OG**	**YES**	**YES**	**YES**	**OG**	**--**	**YES**	**OG**	**YES**	**YES**	**OG**	**YES**	**YES**	**ECU**: Developing **PER:** Dec 2009, this model is being used **SUR**: 15 Nov 2009 **VEN**: 18 Nov 2010

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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															
3-1 **Conclusion SAM/IG/2-5 Advisory Circular CA 91-002 and Job Aid for Aircraft and operators 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.	**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 published and may be seen at the hyperlink:CI 5102-082-002 **PAR:** signature pending Oct. 2010 **PER**: Dec 2009

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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	**YES**	**YES**	**YES**	**YES**	**YES**					**YES**	**YES**		**YES**	**YES**	**BOL:** delivered Dec. 2009 **VEN:** finalised and delivered.
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 actions deemed pertinent	**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
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**	**YES**	**O/G**	**--**	**--**	**--**	**-**	**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 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.	**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
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 for each runway and ATC selected sector. d) Identification of problems found in the methodology applied.	**OG**	**YES**	**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 **BOL:** training was provided to personnel in Viru Viru. **URU**: Continues with personnel problems. Support will be requested to the Regional Office to carry out activities.
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

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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	**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.
b) that job aids of aforesaid circulars be incorporated into Inspector's manuals of Operations and airworthiness.	--	--	--	**YES**	**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	**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

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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, 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.															are now in the implementation 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.
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	**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.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
this part of the report, which recommends that SAM States apply the Brazilian methodology for calculating airport and ATC sector capacity, is approved.															
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**: Training was initiated. **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 corresponding approval procedures.	**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. **URU**: August 2011 **VEN**: continuously.
Conclusion SAMIG/5-3 Data Collection That:	**YES**	**YES**	**YES**	**YES**	**NO**	**--**	**--**	**OG**	**--**	**YES**	**YES**	**--**	**YES**	**YES**	**VEN**: sent to the regional office and delivered during

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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.															SAM/IG/6 Meeting
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.	**OG**	**OG**	**OG**	**YES**	**O/G**	**--**	**--**	**OG**	**--**	**YES**	**NO**	**--**	**NO**	**NO**	**Uru:** will request support of Regional Office to restructure airspace and procedures construction.
Conclusion SAM/IG/5-5 Prediction Program for the FDE Availability	**NO**	**NO**	**NO**	**NO**	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**COL**: Working with the SAPET software and in the process of validating

Conclusión/Tarea Conclusion/Task	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**OBSERVACIONES REMARKS**
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) 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															the prediction. It is submitted to consideration whether process is correct for its application in PBN. **URU**: is waiting for the decision of ICAO RO. Conclusion SAM/IG/8-3 - *Implementation of a RAIM/FDE prediction system in the SAM Region*, presents follow-up on the study and implementation of RAIM prediction availability An amendment to the Project document will be presented at RLA/06/901 RCC/6 meeting (Lima, Peru, 21-23 November 2012), related with the implementation of the RAIM prediction service implementation, for its review and approval. Thereafter, the bidding process with start through the ICAO TCB
d) ICAO Regional Office evaluate the possibility to lead a development process for development of an availability forecasting FDE programme for the SAM															

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Region for its use in all flight phases															
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.	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	Web REDDIG II includes a speech communications sub-network to meet initial ATFM requirements
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.	**NO**	**O/G**	**YES**	**O/G**	**O/G**	**--**	**--**	**--**	**--**	**O/G**	**NO**	**--**	**YES**	**YES**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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.	**--**	**--**	**YES**	**O/G**	**NO**	**--**	**--**	**--**	**--**	**O/G**	**NO**	**--**	**YES**	**YES**	
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**	**O/G**	**YES**	**YES**	**YES**	**--**	**--**	**--**	**--**	**O/G**	**NO**	**--**	**YES**	**YES**	**BOL:** Approvals completed
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**	**--**	**--**	**--**	**--**	**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.	**NO**	**--**	**YES**	**YES**	**YES**	**--**	**--**	**--**	**--**	**YES**	**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**	**YES**	**YES**	**YES**	**--**	**--**	**--**	**--**	**YES**	**YES**	**--**	**YES**	**YES**	**CHI:** NOTAM
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**	**YES**	**YES**	**--**	**--**	**--**	**--**	**YES**	**NO**	**--**	**O/G**	**YES**	**BOL:** the Manual of the FAA was adopted.
Conclusion SAM/IG/6-8 ATFM AIP SUPP/AIC MODEL	**--**	**YES**	**N/A**	**YES**	**NO**	**--**	**--**	**--**	**--**	**YES**	**YES**	**--**	**NO**	**YES**	**URU:** depends on the delivery date by the provider (INDRA).

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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.															
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;	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**YES**	**NO**	**YES**	**YES**	**YES**	**N/A**	**YES**	An AMHS course has been coordinated with the Eurocontrol Instilux institute, to support States in AMHS interconnection
b) Make necessary arrangements to train personnel in the interconnection tasks, with the aim of minimizing the dependency with their providers;	**YES**	**NO**	**YES**	**YES**	**YES**	**YES**	**N/A**	**YES**	**NO**	**YES**	**YES**	**YES**	**N/A**	**YES**	
c) Maximize pertinent coordination; and	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**YES**	
d) States that have not yet done so, complete the drafting and signature of the MoU.	**O/G**	**N/A**	**O/G**	**O/G**	**O/G**	**N/A**	**N/A**	**O/G**	**O/G**	**YES**	**O/G**	**O/G**	**N/A**	**YES**	
Conclusion SAM/IG/6-10 Review to the study for a new SAM digital network That SAM States analyse the study for the implementation of a new	**YES**	**YES**	**YES**	**YES**	**YES**	**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
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.															
Conclusion SAM/IG/6-11 **Changes in the AMHS systems and in the FDP for the implementation of 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.	**YES**	**O/G**	**YES**	**O/G**	**O/G**	**YES**	**O/G**	**YES**	**O/G**	**O/G**	**YES**	**YES**	**O/G**	**O/G**	Further information in SAM/IG/10-WP/11

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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..	**YES**	**YES**	**YES**	**YES**	**NO**	**NO**	**NO**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	The ICAO SAM RO received the action plan from French Guiana (France). In addition, it is important that all action plans be signed by the respective authorities; of the action plans received, very few have been signed.
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	**--**	**YES**	**--**	**YES**	**O/G**	**--**	**--**	**--**	**--**	**O/G**	**--**	**--**	**NO**	**--**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Region, shown in Appendix A to this part of the report.															
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.	**YES**	**YES**	**--**	**YES**	**YES**	--	--	--	--	**YES**	--	--	**YES**	**YES**	
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.	**YES**	**YES**	**--**	**YES**	**YES**	--	--	--	--	**YES**	--	--	**YES**	**--**	
Conclusion SAM/IG/7-4 Publication of the trigger NOTAM	**YES**	**YES**	**YES**	**YES**	**YES**	--	--	--	--	**YES**	**YES**	**NOV/12**	**YES**	**YES**	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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.															
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.	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**Completed**
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.	**YES**	**YES**	**NO**	**--**	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	Continuous activity.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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.**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	All States have issued the AIC informing the aeronautical commuicty of the NEW FPL. Next step will be the issuance of a trigger NOTAM in which States should inform the validity date of the NEW FPL. To date, only Argentina and Chile have issued the NOTAM.
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	**O/G**	**SI**	**YES**	**O/G**	**O/G**	**O/G**	**NO**	**O/G**	**YES**	**YES**	**YES**	**O/G**	**YES**	**O/G**	

Conclusión/Tarea Conclusion/Task	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**	**OBSERVACIONES REMARKS**
Regional Office no later than **30 November 2011**.															
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.**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**Completed** All States have elaborated a national training programme and are carrying it out. Some States have arteady completed the training.
Preliminary exercise on runway capacity and ATC sectors estimation. The rest of the States are encouraged to present studies by SAM/IG/8										**O/G**			**NO**		
Conclusion SAM/IG/8-1 - Updating to FASID Tables CNS 1Ba and CNS 1Bb That, in view of the implementation of new	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO	YES	NO	YES	YES	**Completed**

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
AMHS, the interconnection of automated systems including AIDC, among other applications, as well as the REDDIG II digital network implementation plan: a) The ICAO South American Regional Office circulate FASID Tables CNS1Ba and CNS 1Bb to all SAM States by the end of October 2011 for their review; and b) States of the Region send the results to their Tables review by mid-December 2011.															
Conclusion SAM/IG/8-2 - Updating of FASID Table CNS 3 That, with the aim of updating the information in FASID Table CNS 3: a) The ICAO South American Regional Office circulate FASID Table CNS 3 to all SAM States by the end of October 2011 for their review; and b) States of the Region send the results to the Table review by mid-December 2011.	NO	YES	YES	YES	YES	NO	NO	NO	NO	NO	YES	NO	YES	YES	**Completed**
Conclusion SAM/IG/8-3 - Implementation of a RAIM/FDE prediction system in the SAM Region That, in order for the FDE SAM Region to have a common service for predicting RAIM and	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**NO**	**O/G**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	In follow-up to this conclusion and to agreement reached at RCC/5 meeting, the ICAO SAM RO sent a State letter requesting SAM States opinion on the implementation of the RAIM prediction

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
FDE availability to support PBN operation for en-route, non-precision approach, vertical guide approach (APV) and terminal area: a) the Fifth Meeting of the Coordination Committee of Regional Project RLA/06/901 consider the purchase of the RAIM prediction service selected between the proposals presented by DWI and Colombia; and b) ICAO analyse the most convenient way for States that are not members of Regional Project RLA/06/901 to pay the corresponding fee for the RAIM prediction service.															availability service through RLA/06/901. All States have replied minus Guyana. Practically all agree in the purchasing of the service. France informed it can use Augur, but same no longer provides RAIM prediction outside Europe.
Conclusion SAM/IG/9-4 - **Active participation in all regional activities for the implementation of Amendment 1 to Doc 4444, 15th Edition** That the SAM States, with the aim of complying with the implementation of Amendment 1 to ICAO Doc 4444, 15th Edition: a) Inform of any changes in the list of focal points shown in Appendix B to this Agenda Item; b) Actively participate through their focal points in the web teleconferences scheduled in the following dates: 25 May, 29 June,	YES	YES	YES	YES	YES	YES	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
31 August, 28 September and 31 October 2012; and c) Participate in the scheduling of the regional and inter-regional trials described in Appendix E to this Agenda Item	YES O/G	YES O/G	YES O/G	YES O/G	YES O/G	YES O/G	NO O/G	NO O/G	YES O/G	YES O/G	YES O/G	YES O/G	YES O/G	O/G	

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, Phase 3, Version 02

Optimisation of the ATS Route Network of the South American Region

2.1 As established by SAM/IG/8 Meeting, and with the support of Regional Project RLA/06/901, consultants Messrs’ Jorge Fernández and Tomás Yentzch were hired to draft a preliminary report for the Optimisation of the ATS Route Network of the SAM Region, Phase 3, Version 02.

2.2 Further, the SAM ATS/RO/4 meeting continued analysing the feasibility of the approved routes in order to proceed with the scheduled analyses of such routes, and to provide information on RNAV/RNP gateways of terminal areas, so as to continue with the work foreseen.

2.3 In parallel, airline operators flying these routes conducted the corresponding studies of the proposed routes, taking into account flight time over the mountain range, flight time with only one engine operative, weather conditions, volcano conditions, etc. that might affect them, and contributed with these complementary analyses.

2.4 In view of the results obtained, the SAM ATSRO/4 meeting invited the main operators of the Region to cooperate with their experts in the planning of operations, allowing them to attend the meetings for the development of the second stage of this route optimisation phase, and establish an extended Optimisation Group to analyse and optimise the ATS route network.

2.5 The meeting took note of the request of Brazil to divide implementation into stages, by route packages in certain flows with complex traffic volumes, taking in consideration that in some critical areas, an air traffic increase was expected in view of global sports events.

2.6 The Meeting recognised that possibly the whole route package could not be implemented by the applicable date, and that some routes could not be implemented until the second half of 2014 in Brazil.

2.7 The Meeting recalled that the direct route between Guayaquil and Madrid (UM662) could not be implemented and has been postponed for several years, and that an alternative proposal for the same was required. In this connection, Venezuela proposed a possible variation for the following trajectory: Guayaquil/BIVAN/ILVIR/AMAYA/EGOSU/DAREK/Madrid, and with the agreement of the parties involved, the Secretariat is requested to promote the proposal for amendment for an early implementation in lieu of the significant operational benefits. LAN shall coordinate with Ecuador the alternate proposal for the implementation of route UM662.

2.8 The Meeting analysed and updated **Appendix A** to this part of the report, which contains the routes package for the SAM ATS route network optimisation, Phase 3, Version 02. Comments and reports from States and Operators of the Region, who have analysed the feasibility of the proposed routes and the distances of current and new routes proposed, were adjusted as shown at Appendix A, taking into consideration terminal areas enter and exit points, and updating savings in nautical miles to facilitate future fuel saving estimations.

2.9 Regarding the current non-viability on some routes by some of the States, it was understood that a deadline was required to select the definitive package of this Phase 3, version 02, and in this connection SAM/IG/11, was established as a definitive date. Routes that are not in condition to be implemented could be re-considered in future versions of the ATSRO programme or in divisions of the package, as proposed by Brazil, in view of the above-mentioned global sports events.

2.10 The meeting also deemed pertinent that the Secretariat considers to request States and operators who so think it appropriate and advisable the hiring of an additional expert to work with those experts hired by the project for the planning of its airspace.

Programme for the Optimisation of the SAM ATS Route Network, Phase 3 Version 2 (ATSRO) and the associated Action Plan

2.11 The meeting agreed that the ATSRO programme seeks to significantly improve airspace organisation and management, and it was agreed that it should be executed in phases, in order to achieve operational benefits as early as possible and acquire the necessary experience in each of these phases, in order to facilitate the implementation of the programme.

2.12 **Phase 1** of the route optimisation programme was completed on 20 October 2011 with the implementation of RNAV5, and **Phase 2** of the implementation of Version 1 of the SAM ATS route network was completed in March 2011.

2.13 **Phase 3**, which corresponds to the implementation of Version 2 of the SAM ATS route network, involves planning the complete re-structuring of the route network to achieve full integration of ATS routes, control sectors, TMAs, etc., applying the flexible use of airspace concept, which adds complexity and requires much coordination and work within the States themselves, in addition to work at regional level.

2.14 The ATS route network optimisation programme, initially approved by the SAM/IG/9 meeting, contains the lessons learned during the implementation of Phase 2 of the ATSRO Programme, the general planning principles on which the programme is based, guidelines for the application of the flexible use of airspace concept, and specifies the tools and material used for the analysis of the SAM ATS route network.

2.15 Likewise, this Programme assesses available statistical data on air traffic movement and fleet capabilities, makes a diagnosis of the SAM ATS route network, and makes a series of consistent proposals to improve the regional route network, proposes some guidelines for applying continuous descent (CDO) techniques, and finally, establishes guidelines for the interface between the SAM route network and the route networks of adjacent Regions.

2.16 The meeting analysed the ATSRO Programme, SAM ATS Route Network Optimisation Programme (implementation of Phase 3, Version 2) as approved by the ATSRO/4 meeting, which appears in **Appendix B** to this part of the report, and approved it without any changes.

2.17 The Action Plan associated with the implementation of the SAM ATS Route Network Optimisation Programme (implementation of Phase 3, Version 2) that was updated by the ATSRO/4 meeting is shown in **Appendix C** to this part of the report.

Safety plan for the optimisation of the ATS route network (ATSRO) in the SAM Region phase 3 Version 02

2.18 SAMIG meetings have reviewed the safety assessment issue on several occasions, not only for the purpose of optimising the airspace structure and implementing Version 01 of the ATS route network, but also within the scope of RNAV 5 implementation.

2.19 Likewise, with the support of Regional Project RLA/06/901, and pursuant to the action plan of the airspace structure optimisation programme, task 3.2.9 - *Conduct the required safety assessment applying the qualitative methodology using the SMS*, was implemented prior to the implementation of Phase 3 Version 02 of the SAM ATS route network. In this regard, the Implementation Group determined that the qualitative methodology shown in ICAO Doc 9859, *Safety Management Manual (SMM)* would be used through a "safety case".

2.20 The meeting was informed that, with the support of Regional Project RLA/06/901, the meeting/workshop SAM/RA/3 was scheduled to assess the risks of the system prior to the implementation of Phase 3 Version 02 of the SAM ATS Route Network Optimisation (ATSRO) Programme, in order to comply with the safety provisions of Annex 11 before introducing important changes in the aeronautical system structure. Also, it contemplated the participation of an expert for a period of three weeks to assist the Secretariat at the meeting/workshop SAM/RA/3 and in the drafting of the safety case. Such responsibility was assigned to ATM/SAR consultant, Mr. Jorge Fernández Demarco.

2.21 This meeting/workshop permitted the participation of experts in the various fields of knowledge, as well as civil aviation authorities and air traffic service providers. The creation of this group of experts enabled the identification of hazards that might affect or prevent optimisation, the assessment of consequences in terms of probability and severity, the tolerability of operational risks, and the mitigation measures required to increase the resulting safety.

2.22 This multidisciplinary team applied the aforementioned risk management methodology contained in the Safety Management Manual (Doc 9859) through the application of safety systems (SMS). To this end, operational risks were identified and the different stages of the operational risk management process were applied to measure safety levels.

2.23 The ATSRO safety study shown in **Appendix D** to this part of the report starts with a brief description of the system, based on the planning defined for the SAM Region and the ATS route network optimisation programme. The objective of this study is to determine the feasibility of the aforementioned optimisation, based on a risk assessment, in order to ensure the safety of operations in the SAM Region within this new scope of application.

2.24 This study showed that the level of risk related to the optimisation of the ATS route network was acceptable, and permitted the use of the existing network and the introduction of modifications without affecting its normal operation, thus achieving an orderly transition. Finally, it provides recommendations for its implementation by the various participating organisations of the Region in order to enhance safety in the airspace analysed. In summary, the implementation of Phase 3 Version 02 of the ATSRO Programme in the SAM Region is feasible, as shown by this study.

2.25 The meeting reviewed the safety plan for Phase 3 Version 02 of the SAM ATS Route Network Optimisation (ATSRO) Programme and agreed that the same complies with the objectives contained in the action plan, and serves as a basis for safety assessment to be carried out by States in their respective FIRs.

2.26 With regard to the above, the meeting agreed on the following Conclusion:

Conclusion SAM/IG/10-01 Safety Plan for the implementation of routes Phase 3, Version 02

That SAM Region States determine the viability of the SAM ATS Route Network Optimisation (ATSRO) Programme, based on a risk assessment, in order to ensure safety within their FIRs.

Flexible Use of Airspace in the South American Region

2.27 The meeting agreed that, as part of the airspace optimisation programme, it was requested that guidelines be drafted for the implementation of the flexible use of airspace concept in the ICAO South American Region (SAM/FUA Guidelines).

2.28 The SAM/IG/9 approved the FUA Guidance Manual, shown in **Appendix E** to this part of the report, and the SAM ATSRO/4 meeting also analysed and approved the document without any changes.

2.29 The meeting considered that the document had been thoroughly analysed and understood that it was mature enough for its application in SAM Region States, and decided, taking into consideration the importance for an efficient international civil air navigation in the SAM Region, approving the following conclusion:

Conclusion SAM/IG/10-02 Implementation of the new concept on flexible use of the airspace in the ICAO South American Region

That States in the SAM Region use, if deemed appropriate, recommend the definitive approval of the Guidelines for the Implementation of the Flexible Use of Airspace Concept in the ICAO South American Region for the design and airspace management of the flight information region under their jurisdiction.

Letters of Agreement among Argentina, Brazil and Uruguay

2.30 Proposals for modification of the Letter of Agreement among Argentina, Brazil and Uruguay in order to avoid impact in safety of traffic in route UM402 remain pending until the Argentinean administration internally agrees with the services provider the changes proposed to the letter of agreement.

Aspects related to realignment of routes between NACC and SAM Regions

2.31 Venezuela proposed to the meeting that it was required to align routes UA563 and UM423/UA300, and that consequently coordination was required on this realignment with Curaçao and Puerto Rico in the ICAO NACC Region. Venezuela requested the possibility to hold a meeting in Caracas, in order to agree optimization of these routes and sign the corresponding letters of agreement. The presence of ICAO Regional Officers from both Regions would be requested. Also, advantage would be taken from this opportunity to deal with bilateral related matters that might impact in safety.

APÉNDICE / APPENDIX A

PLANILLA DE RUTAS ANALIZADAS EN LA REGIÓN SAM /
TABLE OF SAM REGION ROUTES ANALYSED

01	**Buenos Aires /Sao Paulo (Unidireccional)**	
Ruta actual /Current route (FliteStar)	**UA 305 UN857 UM671 RONUT**	**Notas/Notes**
Distancia actual Current distance	1001 NM	
*Número de vuelos mensuales *Number of monthly flights	722	
*Tipo de aeronave más utilizada *Type of most used aircraft	A320, A330, B735, B737, B738, B744, B763, MD88, LJ45	
Trayectoria propuesta Trajectory proposed	Desde/From DORVO a/to RONUT	
Distancia de trayectoria propuesta Distance of proposed trajectory	994 NM	
Millas reducidas Reduced miles	7 NM	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	Argentina, Brazil, Uruguay	
Observaciones Remarks	Argentina por Nota ANAC Nro.464/2012 informa que actualmente no es viable la propuesta. Queda pendiente la posibilidad de un punto intermedio entre PAPIX y DORVO, que ya fue aprobado por Uruguay. Argentina by Nota ANAC Nro.464/2012 informs the proposal is not currently feasible. Pending the possibility of a point between PAPIX and DORVO, it was approved by Uruguay NOTA SAM/IG/10; Reunion decidió optimizar la Ruta entre DORVO y RONUT.NOTE SAM/IG/10; The meeting decides to continue route optimization between DORVO and RONUT.	
*De acuerdo a información disponible/As per available information		

02	**Sao Paulo/Buenos Aires (Unidireccional) APROBADA CON LAS OBSERVACIONES Y REALIZAR CHEQUEO DE DISTANCIAS REDUCIDAS Y AHORRO APPROVED WITH REMARKS. CHECK REDUCED DISTANCES AND SAVINGS**	
Ruta actual /Current route (FliteStar)	**UM788, UN741**	**Notas/Notes**
Distancia actual Current distance	935	
*Número de vuelos mensuales *Number of monthly flights	777	
*Tipo de aeronave más utilizada *Type of most used aircraft	A320, A330, A332, B735, B737, B738, B744, B763, MD88, LJ45	
Trayectoria propuesta Trajectory proposed	CGO/PAPIX/EZE	
Distancia de trayectoria propuesta Distance of proposed trajectory	931	
Millas reducidas Reduced miles	4 NM	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	Argentina, Brazil, Uruguay	
Observaciones Remarks	Esta ruta se corresponde con la solicitada por LAN/ This route corresponds to the route requested by LAN Argentina por Nota ANAC Nro.464/2012 informa que es viable la propuesta. Argentina by Nota ANAC Nro.464/2012 informs the proposal is feasible. NOTA SAM/IG/10; Aprobado. NOTE SAM/IG/10; Approved.	
*De acuerdo a información disponible/As per available information		
Como ruta paralela de llegada desde Sao Paulo a Buenos Aires, el ahorro de milla no es muy preponderante como la ruta de salida anteriormente propuesta pero en definitiva contribuye en el ahorro, el trayecto propuesto es de VOR CGO en la TMA SAO PAULO directo a PAPIX punto de ingreso a la TMA BAIRES. As parallel route for arrival from Sao Paulo to Buenos Aires, the saving of miles is not so predominant as the exit route previously proposed, but definitely contributes in the savings, the segment proposed is position CURSE in Sao Paulo TMA direct to PAPIX, entry point to BAIRES TMA.		

03	**Buenos Aires/Rio Unidireccional/Uni-directional**	
Ruta actual /Current route (FliteStar)	**UN857,**	**Realineamiento de la UN857 Realignment of UN857**
Distancia actual Current distance	1090	
*Número de vuelos mensuales *Number of monthly flights	572	
*Tipo de aeronave más utilizada *Type of most used aircraft	A320, A319, A318, B735, B738, CR9	
Trayectoria propuesta Trajectory proposed	DORVO/POR/BITAK	Queda pendiente la posibilidad de un punto intermedio entre PAPIX y DORVO, que ya fue aprobado por Uruguay. (SAM/IG/10) Pending the possibility of a point between PAPIX and DORVO, it was approved by Uruguay. (SAM/IG/10)
Distancia de trayectoria propuesta Distance of proposed trajectory	1083	
Millas reducidas Reduced miles	7 NM	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-49100/ 155008,7	
Estados involucrados States involved	Brazil, Uruguay, Argentina	
Observaciones Remarks	Argentina por Nota ANAC Nro.464/2012 informa que es viable la propuesta. Argentina by Nota ANAC Nro.464/2012 informs the proposal is feasible.	
*De acuerdo a información disponible/As per available information		
Por tanto una opción aplicable sería: saliendo de Bs As a la posición DORVO y directo a BITAK punto de ingreso para Rio en el sector, podría servir también como ruta alterna de Carrasco a Rio. El flujo de tránsito es relativamente alto y el ahorro en millas es representativo comparado con el número de operaciones. This route is bi-directional up to Porto Alegre. Then Uni-directional from South to North. The question is: how are flights planned from Rio de Janeiro to Buenos Aires? Therefore, an option to be applied would be: leaving Buenos Aires to position DORVO and direct to BITAK entry point for Rio de Janeiro in the sector, could serve also as alternate route from Carrasco to Rio. The traffic flow is relatively high and the savings in miles is representative compared to the number of ooperations.		

Nota: Los operadores deberán efectuar un estudio analizando esta propuesta en contraposición con los beneficios de mayor fluidez en el tráfico usando la Ruta establecida UM 661 y Brasil deberá analizar la factibilidad de instrumentar Salidas y Entradas standarizadas para la Ruta UM 661 a los Principales Aeropuertos laterales a esta Ruta.
Note: operators should carry out a study analysing this proposal against benefits of greater air traffic flow using the route established UM661 and Brazil whould analyse the feasibility of implementing standard arrivals and departures for rute UM661 to the main lateral airports of this route.
No fueron presentados estudios por parte de los operadores. Uruguay solicita sea utilizado el punto de salida propuesto como WPA1 para aquellos vuelos que sobrevolaran la FIR Uruguay.
No studies were presented by operators. Uruguay requests to use the exit point proposed as WPA1 for those flights overflying Uruguay FIR.

04	**Montevideo/ Sao Paulo (Unidireccional)**	
Ruta actual /Current route (FliteStar)	**UM540, UM671,**	**Notas/Notes**
Distancia actual Current distance	852	
*Número de vuelos mensuales *Number of monthly flights	224	
*Tipo de aeronave más utilizada *Type of most used aircraft	A320, B744, CRJ9	
Trayectoria propuesta Trajectory proposed	CRR/AKPODPOR/ANISE	Realinear UM540 posterior POR Realign UM540 POR
Distancia de trayectoria propuesta Distance of proposed trajectory	843	
Millas reducidas Reduced miles	9 Verificar ahorro/check savings	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-16900/ 53353,3	
Estados involucrados States involved	Uruguay, Brazil	
Observaciones Remarks	Ruta paralela 20 NM, a la opción 04-B / Parallel route 20 NM to option 04-B.	
*De acuerdo a información disponible/As per available information		

06	**Sao Paulo/ Santiago (Unidireccional)**	
Ruta actual /Current route (FliteStar)	**UL310, UM400, UA307, UA306**	**Notas/Notes**
Distancia actual Current distance	1419	
*Número de vuelos mensuales *Number of monthly flights	332	
*Tipo de aeronave más utilizada *Type of most used aircraft	A319, A320, B738, B763, B773	
Trayectoria propuesta Trajectory proposed	Ruta Unidireccional, sentido CGO a UMKAL/ Uni-directional route, direction CGO to UMKAL	ESTA TRAYECTORIA ES DESDE RIO A SANTIAGO BITAK/PAKOV/PUNTO DE CRUCE AWY SCL/SAO/NEDOK This trajectory is from Rio to Santiago BITAK/PAKOV/Crossing point AWY SCL/SAO/NEDOK.
Distancia de trayectoria propuesta Distance of proposed trajectory	1402	
Millas reducidas Reduced miles	17	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-70500/ 222568.5	
Estados involucrados States involved	Brazil, , Argentina, Chile	Argentina estudiarÁ la propuesta, Brasil y Chile están de acuerdo. Argentina will study proposal, Brazil and Chile agree.
Observaciones Remarks	Propuesta basada en pedido de Brazil para disponer de rutas paralelas de TMA Sao Paulo/Rio y al pedido de LAN en esos tramos Propsal based on request from Brazil to have parallel routes from Sao Paulo/Rio TMA and te request of LAN in these segments. Argentina por Nota ANAC Nro.464/2012 informa que actualmente no es viable la propuesta. Argentina by Nota ANAC Nro.464/2012 informs the proposal is not currently feasible. **NOTA SAM/IG/10; Se incluye una nueva alternativa en siguiente formato 6A.Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas.** **NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.**	
*De acuerdo a información disponible/As per available information		

<table>
<tr><td>06</td><td colspan="3">Sao Paulo/ Santiago
(Unidireccional)</td></tr>
<tr><td colspan="2">Ruta actual /Current route
(FliteStar)</td><td>UL310, UM400, UA307,
UA306</td><td>Notas/Notes</td></tr>
<tr><td colspan="4">Nueva Ruta Unidireccional, sentido Sao Paulo a Santiago entre CGO a UMKAL, sirviendo de salida de la TMA San Paulo o Rio, además tanto Brazil como LAN han solicitado el trayecto en cuestión, puede apreciarse de hecho un ahorro 17 NM del trayecto actualmente utilizado y la RNAV propuesta
New uni-directional route, direction Sao Paulo to Santiago between CGOto UMKAL, serving as exit to Sao Paulo or Rio TMA, in addition both Brazil and LAN have requested the referred segment, there is in fact a saving of 17 NM of segment currently used and the RNAV proposed.

Nota- PROPUESTA RUTA 6/
Sao Paulo/Santiago
Trayectoria propuesta VOR CGO-UMKAL UNIDIRECCIONAL
Note- ROUTE 6 PROPOSED
Sao Paulo/Santiago
Nota.- PROPUESTA RUTA 6A
Rio de Janeiro / Santiago
Trajectory proposed Unidirectional VOR CGO-UMKAL
Trayectoria propuesta BITAK-PAKOV-XXXX1-NEDOK-UMKAL
BIDIRECCIONAL BITAK-PAKOV-XXXX1
UNIDIRECCIONAL XXXX1-NEDOK-UMKAL
Trajectory proposed BITAK-PAKOV-XXXX1-NEDOK-UMKAL
Bidirectional BITAK-PAKOV-XXXX1
Unidirectional XXXX1-NEDOK-UMKAL.</td></tr>
</table>

06A	**São Paulo/Santiago**	
Ruta actual /Current route (FliteStar)	**UL310/UM400**	**Notas/Notes**
Distancia actual Current distance		
*Número de vuelos mensuales *Number of monthly flights		
*Tipo de aeronave más utilizada *Type of most used aircraft		
Trayectoria propuesta Trajectory proposed	VOR CGO, UL310, VOR POSADAS	Realineamiento de la ruta UL310, UNIDIRECCIONAL
Distancia de trayectoria propuesta Distance of proposed trajectory		
Millas reducidas Reduced miles		
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	BRASIL/ARGENTINA	
Observaciones Remarks	NOTA SAM/IG/10; Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas. NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.	

07A	**Rio de Janeiro/Santiago/Rio de Janeiro**	
Ruta actual /Current route (FliteStar)	**UZ45/UL310/UM400**	**Notas/Notes**
Distancia actual Current distance		
*Número de vuelos mensuales *Number of monthly flights		
*Tipo de aeronave más utilizada *Type of most used aircraft		
Trayectoria propuesta Trajectory proposed	VOR ADA/VOR CORDOBA BIDIRECIONAL	TORNAR LA RUTA UM400 BIDIRECIONAL TRAMO OR ADA/ERVAS
Distancia de trayectoria propuesta Distance of proposed trajectory		
Millas reducidas Reduced miles		
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	BRASIL,	
Observaciones Remarks	SAM/IG/10; Reunión la aprobó. Tramo esta dentro de Brasil. SAM/IG/10; Meeting has approved it. Segment within Brazil.	

07 B	**Santiago/São Paulo** **Propuesta alterna a la propuesta incluida en formato 7.**	
Ruta actual /Current route (FliteStar)	**UM400/UM671**	**Notas/Notes**
Distancia actual Current distance		
*Número de vuelos mensuales *Number of monthly flights		
*Tipo de aeronave más utilizada *Type of most used aircraft		
Trayectoria propuesta Trajectory proposed	CORDOBA, ERVAS, CTB, NEGUS, VOR RDE.	MANTENIMIENTO DE LA RUTA UM400 BIDIRECCIONAL TRAMO CORDOBA/ERVAS Y ACTIVAR NA RUTA RNAV DOMÉSTICA UNIDIRECIONAL TRAMO ERVAS, VOR RDE.
Distancia de trayectoria propuesta Distance of proposed trajectory		
Millas reducidas Reduced miles		
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	ARGENTINA/BRASIL	
Observaciones Remarks	NOTA SAM/IG/10; Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas. NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.	

08	Montevideo/Buenos Aires/Santiago	
Ruta actual /Current route (FliteStar)	**UA306,**	**Notas/Notes**
Distancia actual Current distance	637	
*Número de vuelos mensuales *Number of monthly flights	773	
*Tipo de aeronave más utilizada *Type of most used aircraft	A319, A320, B738, B763, B773	
Trayectoria propuesta Trajectory proposed	Trayectoria directa de TOSOR a UMKAL/Direct trajectory from TOSOR to UMKAL	
Distancia de trayectoria propuesta Distance of proposed trajectory	635	
Millas reducidas Reduced miles	2	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-19100/ 60298,7	
Estados involucrados States involved	Argentina, Chile, Uruguay	Argentina no cambia trayectoria. Argentina does not change trajectory.
Observaciones Remarks	Argentina por Nota ANAC Nro.464/2012 informa que actualmente no es viable la propuesta. Argentina by Nota ANAC Nro.464/2012 informs the proposal is not currently feasible. NOTA SAM/IG/10; Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas. NOTE SAMI/G/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.	
*De acuerdo a información disponible/As per available information		

Esta ruta será de utilidad tanto para las salidas de BsAs como de Carrasco.
Saliendo de Carrasco por la UA306 hasta posición TOSOR, luego la ruta propuesta hasta UMKAL.

This route will be useful for departures from both Bs. As. and Carrasco.
Leaving Carrasco through UA306 up to position TOSOR, then the route proposed up to UMKAL.
Nota: .- PROPUESTA RUTA 8
Montevideo/Buenos Aires/Santiago
Trayectoria directa TOSOR/UMKAL
Quedando pendiente la viabilidad de la propuesta por la Administración Argentina.

Note: PROPOSED ROUTE 8**Montevideo/Buenos Aires/Santiago**
Direct Trajectory TOSOR/UMKAL
Pending approval of the proposal by the Argentinean Administration.

12a	**Sao Paulo - Bogotá** **(Bidireccional)** **SE PRESENTA NUEVA PROPUESTA**	
Ruta actual /Current route (FliteStar)		**Notas/Notes**
Distancia actual Current distance	2484	
*Número de vuelos mensuales *Number of monthly flights		
*Tipo de aeronave más utilizada *Type of most used aircraft	A330 / A320	
Trayectoria propuesta Trajectory proposed	UM782 CIA/VVC	Realineación de UM782 entre CIA/VVC, sentido bidireccional.
Distancia de trayectoria propuesta Distance of proposed trajectory	2481	
Millas reducidas Reduced miles	3	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	(86Kg/ vuelo)	
Estados involucrados States involved	Colombia, Brazil	SAM/IG/10; Propuesta acordada con Estados y AviancaTaca y LAN. Colombia esta de acuerdo. SAM/IG/10; Have been coordinated, between states and AviancaTaca and LAN. Colombia agrees.
Observaciones Remarks	Realineación de UM782 entre CIA y VVC	
*De acuerdo a información disponible/As per available information		

13	**Sao Paulo/ Caracas**	
Ruta actual /Current route (FliteStar)	**UL304 UM417**	**Notas/Notes**
Distancia actual Current distance	2408	
*Número de vuelos mensuales *Number of monthly flights	49	
*Tipo de aeronave más utilizada *Type of most used aircraft	B738	
Trayectoria propuesta Trajectory proposed	UM417 TUY, /CPN UL304 RPR/ CBC	Realinear UM417 TUY/. CPN, bi-direccional en FIR Maiquetia. Realign UM417 TUY/ , CPN, bi-directional in FIR Maiquetia. Realinear UL304 RPR/ CBC, unidireccional. Realign UL304 RPR/ CBC, uni-directional.
Distancia de trayectoria propuesta Distance of proposed trajectory	2388	
Millas reducidas Reduced miles	20	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-12000/ 37884	
Estados involucrados States involved	Brazil, Venezuela	Brasil propone realinear la UL304 desde RPR hasta CBC en sentido Sao Paulo/Caracas, esta trayectoria será analizada por Venezuela y confirmará. Referente a la UM417 Venezuela y Brasil aprueban la realineación en ambos sentidos en la FIR Maiquetia y de solo llegada a Sao Paulo Brazil proposes to realign UL304 from RPR to CBC in direction Sao Paulo/Caracas, this trajectory will be analysed by Venezuela and will confirm. With regard to UM417, Venezuela and Brazil approve realignment in two directions in Maiquetía FIR and only arrival to Sao Paulo.
Observaciones Remarks		
*De acuerdo a información disponible/As per available information		

17	**Lima/Asuncion/Foz Iguacu**	
Ruta actual /Current route (FliteStar)	**UA320, UM548**	**Notas/Notes**
Distancia actual Current distance	1552 -	
*Número de vuelos mensuales *Number of monthly flights	124	TACA vuela a diario LIMA/ASU/LIMA Taca is flying daily LIMA/ASU/LIMA
*Tipo de aeronave más utilizada *Type of most used aircraft	A319, DC10	
Trayectoria propuesta Trajectory proposed	LIMA/ASIA/EQU/ORALO /PILCO/VAS	Bidireccional/Bi-directionalde/from LIMA hasta/to ASIA a/to VOR AREQUIPA a/to ORALO a/to PILCO a/to VOR VAS SAM/IG/10; Bolivia confirma que permanece UA320. SAM/IG/10; Bolivia confirms that UA320 remains with no changes.
Distancia de trayectoria propuesta Distance of proposed trajectory	1370	
Millas reducidas Reduced miles	17	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	Perú, Bolivia, Paraguay, Brazil	
Observaciones Remarks	Igualmente esta ruta puede servir a Asunción, Cataratas Guaraní y Foz de Iguazú Likewise this route may serve Asunción, Cataratas ,Guaraní and Foz de Igauzú.	

*De acuerdo a información disponible/As per available information.

NOTA: HAY UN INCREMENTO DE VUELOS EN LOS TRAMOS LIMA ASUNCION Y LIMA FOZ DE IGUAZU
ADEMAS SE PROPONE ELIMINAR LA UA320 EN EL TRAMO ASUNCION/LA PAZ
SE AGUARDA LOS COMENTARIOS DE TACA EN REFERENCIA A LA CAPACIDAD DE LA FLOTA QUE UTILIZAN ESTA TRAYECTORIA

.- PROPUESTA RUTA 17
Lima/ASU/Foz Iguacu UA320, UM548
Paraguay y Perú coinciden en trayectoria: ASIA/EQU/ORALO/PILCO/VAS/

NOTE: There is an increase of flights in the segments LIMA ASUNCION and LIMA FOZ DE IGUAZU
In addition, the elimination of UA320 in the segment ASUNCION/LA PAZ is proposed.
Comments from TACA are expected with regard the capacity of the fleet using this trajectory

ROUTE PROPOSED 17
Lima/ASU/Foz Iguacu UA320, UM548
Paraguay and Perú agree in the trajectory: ASIA/EQU/ORALO PILCO/VAS/

19	**Lima/Buenos Aires** **CARGAR COMENTARIOS DEL GRUPO DE TRABAJO/LOAD COMMENTS FROM THE WORK GROUP**	
Ruta actual /Current route (FliteStar)	**UL550, UA558, UW24**	**Notas/Notes**
Distancia actual Current distance	1715	
*Número de vuelos mensuales *Number of monthly flights	570	
*Tipo de aeronave más utilizada *Type of most used aircraft	A319, A320, B738, B763, B773	
Trayectoria propuesta Trajectory proposed	UL550/ VOR CALAMA/	
Distancia de trayectoria propuesta Distance of proposed trajectory	1707	
Millas reducidas Reduced miles	8	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-56000/ 176792	
Estados involucrados States involved	Perú, Chile, Argentina	
Observaciones Remarks	También se sugiere analizar el realineamiento de la UL550, VOR Calama a ASIA, en el descenso, afectaría a Zona Restringida San Juan de Marcona. It is also suggested to analyse the realignment of UL550, Calama VOR to ASIS in the descent, it would affect the restricted area of San Juan de Marcona. Argentina por Nota ANAC Nro.464/2012 informa que no es viable la propuesta.Argentina by Nota ANAC Nro.464/2012 informs the proposal is not feasible. SAM/IG/10; Chile informa que se encuentra en progreso coordinacion sobre zona SCR32. Pendiente confirmación. SAM/IG/10; Chile informs that coordination about zone SCR32 is on progress. Confirmation pending.	
*De acuerdo a información disponible/As per available information. Nota: .- PROPUESTA RUTA 19 **Lima/Buenos Aires UL550** Perú define que el tramo correspondiente LOA - ASI se ha analizado en el contexto de la propuesta 15.Argentina continuará el análisis de la trayectoria Calama – Rosario. Note: ROUTE PROPOSED 19 **Lima/Buenos Aires UL550** Peru stated that the segment LOA – ASI was analysed under proposal 15. Argentina will continue analysis of trajectory Calama-Rosario.		

20	**Buenos Aires/Bogotá**	
Ruta actual /Current route (FliteStar)	**UB689, UA301, UL417, UW8,**	**Notas/Notes**
Distancia actual Current distance	2551	
*Número de vuelos mensuales *Number of monthly flights	44	
*Tipo de aeronave más utilizada *Type of most used aircraft	A332, A342, B763, MD11	
Trayectoria propuesta Trajectory proposed	VOR ROSARIO/Posición MORRO (no figura en la base de datos 5LCN) ROSARIO VOR/Position MORRO (does not appear in the 5LCN database)	ARGENTINA CONFIRMARA PARECER DE LA PROPUESTA GIRAR NOTA A COLOMBIA SOLICITANDO PARECER Bolivia propone mantener la ruta UL417 o la UR550 ambos salida RBC Brasil no tendría inconvenientes en esta trayectoria y coordinará con Perú el punto de salida de la FIR Amazonica Perú acepta la propuesta ajustando la salida de la FIR Peru por la posición ARPEN IATA propone reanalizar esta trayectoria en vista a las futuras demandas en el par de ciudades Argentina will confirm feasibility of proposal. Send note to Colombia requesting opinion. Bolivia proposes to maintain route UL417 or UR550 both exiting RBC. Brazil would have no problem with this trajectory and will coordinate with Peru the exit point of Amazonica FIR. Peru accepts proposal, adjusting exit of FIR Peru through position ARPEN IATA proposes to revisit this trajectory in view of future demands in the city pair.
Distancia de trayectoria propuesta Distance of proposed trajectory	2549	
Millas reducidas Reduced miles	2	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-2200/ 6945,4	
Estados involucrados States involved	Argentina, Bolivia, Brazil, Peru, Colombia	
Observaciones Remarks	Argentina por Nota ANAC Nro.464/2012 informa que es viable la propuesta estando de acuerdo con Bolivia de mantener la Ruta UL417 actual dentro del espacio aéreo argentino.	

<table>
<tr><td>20</td><td colspan="3">Buenos Aires/Bogotá</td></tr>
<tr><td colspan="2">Ruta actual /Current route (FliteStar)</td><td>UB689, UA301, UL417, UW8,</td><td>Notas/Notes</td></tr>
<tr><td colspan="2"></td><td colspan="2">Argentina by Nota ANAC Nro.464/2012 informs the proposal is feasible agreeing with Bolivia to maintain in the Argentinian airspacethe current UL417 route .
NOTA SAM/IG/10; Colombia informa que evaluará la ruta propuesta entre ARPEN y GIR VOR. Se require ademas diseñar nuevas SID-STAR.
La reunion aprobó realinear UM784 desde KILEV hasta ARPEN. Distancias: actual 2697, con mejora 2654 NM.
NOTE SAMI/G/10; Colombia informs that will evaluate the route proposal between ARPEN y GIR VOR. Also new SID-STAR is required.
Meeting approved to realign UM784 from KILEV to ARPEN. Distances: now 2697, improved 2654 NM.</td></tr>
</table>

21	**Buenos Aires/GUAYAQUIL/Quito** **ESTA PROPUESTA QUEDA PENDIENTE, SERA TRATADA PARA OTRAS VERSIONES/PROPOSAL LEFT PENDING FOR DISCUSSION IN SUBSQUENT VERSIONS**	
Ruta actual /Current route (FliteStar)	**UW5, UL550, UG436, UL780**	**Notas/Notes**
Distancia actual Current distance	2337	
*Número de vuelos mensuales *Number of monthly flights	22	
*Tipo de aeronave más utilizada *Type of most used aircraft	B737	
Trayectoria propuesta Trajectory proposed	VOR ROSARIO/ Posición CANOA	Realineamiento/ Realignment REVISAR PUNTO CANOA POR AREA PROHIBIDA Review CANOA due to PROHIBITED AREA.
Distancia de trayectoria propuesta Distance of proposed trajectory	2300	
Millas reducidas Reduced miles	37	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-10000/ 31570	
Estados involucrados States involved	Argentina, Chile, Perú, Ecuador	
Observaciones Remarks	Argentina por Nota ANAC Nro.464/2012 informa que actualmente no es viable la propuesta. Argentina by Nota ANAC Nro.464/2012 informs the proposal is not currently feasible. NOTA SAM/IG/10; Se debe definir la implantación en SAMI/G/11 o su inclusion en proxima version de rutas. NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.	
*De acuerdo a información disponible/As per available information .- PROPUESTA RUTA 21 **Buenos Aires/GUAYAQUIL/Quito UW5, UL550, UG436, UL780** Peru: Postergar el análisis de la propuesta para la próxima ATSRO una vez estabilizado su espacio aéreo por cambios, previsto para 2013. Argentina: Queda pendiente la viabilidad de la propuesta ECUADOR RECOMIENDA REVISAR LA TRAYECTORIA PUES LA ACTUAL POR CANOA AFECTA A UN AREA PROHIBIDA EN RESUMEN SE RECOMIENDA NO ELIMINAR DEL TODO ESTA PROPUESTA PERO SI REPLANTAEARLA PROPOSAL ROUTE 21 **Buenos Aires/GUAYAQUIL/Quito UW5, UL550, UG436, UL780** Peru: Postpone analysis of proposal until SAM ATRSO/5, once its airspace is stabilised due to changes foreseen for 2013. Pending approval of proposal by Argentinean Administration. ECUADOR RECOMMENDS TO REVIEW TRAJECTORY, SINCE THE EXISTING ONE THROUGH CANOA AFFECTS A PROHIBITED AREA IN SUMMARY, IT IS NOT RECOMMENDED TO ELIMINATE THIS PROPOSAL IN FULL, BUT TO RE-CONSIDER IT.		

23	**SAO PAULO/ QUITO TRAYECTORIA MIXTA BI Y UNI-DIRECCIONAL/BI-DIRECTIONAL AND UNI-DIRECTIONAL MIXED TRAJECTORY**	
Ruta actual /Current route (FliteStar)	**UM776, UA321, UB554, UZ8, UL201,**	**Notas/Notes**
Distancia actual Current distance	2377	
*Número de vuelos mensuales *Number of monthly flights	70	Solo se registran vuelos de carga/ Only freight flights are registered
*Tipo de aeronave más utilizada *Type of most used aircraft	B744, B763, MD11	
Trayectoria propuesta Trajectory proposed	/BAURÚ/BUVKI/LIMPO/ IQT/UM776/QIT Doble sentido desde el punto VULTO (S21 15.6 W50 55.2) a IQT Bi-directional from point VULTO (S21 15.6 W50 55.2) to IQT	NOTA SAM/IG/10; Se aprueba realineacion. No hay cambios en FIR Lima y FIR Guayaquil. NOTE SAM/IG/10; Has been approved realigned. No changes in FIR Lima y FIR Guayaquil.
Distancia de trayectoria propuesta Distance of proposed trajectory	2332	
Millas reducidas Reduced miles	45	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-38600/ 121860,2	
Estados involucrados States involved	Ecuador, Perú, Brazil, Bolivia	
Observaciones Remarks		
*De acuerdo a información disponible/As per available information.		

24	**LIMA/CARACAS**	
Ruta actual /Current route (FliteStar)	**UM414, UG427, TOSAL**	**Notas/Notes**
Distancia actual Current distance	1540	
*Número de vuelos mensuales *Number of monthly flights	272	
*Tipo de aeronave más utilizada *Type of most used aircraft	A319, A320, A321, A343, B733, B762, B763	
Trayectoria propuesta Trajectory proposed	UM414/ IQT/ DAVEX/ UL216	
Distancia de trayectoria propuesta Distance of proposed trajectory	1521	
Millas reducidas Reduced miles	19 NM	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	- Calcular	
Estados involucrados States involved	Perú, Colombia, Venezuela	Venezuela informa que esta ruta afecta a espacio aéreo de uso militar por lo que están aguardando la respuesta de las autoridades militares para su confirmación en la trayectoria propuesta/Venezuela reports that this route affects military airspace and thus is awaiting the response from the military authorities before confirming the proposed trajectory. GIRAR CONSULTA ESCRITA A COLOMBIA PARA RESPONDER ANTES DEL 31 DE JULIO/SEND A WRITTEN REQUEST TO COLOMBIA, TO RESPOND BEFORE 31 JULY.
Observaciones Remarks	Implantar nueva ruta RNAV o realinear la UM414, desde posición IQT a DAVEX/ NOTA; SAM/IG/10, mediante Coordinacion de Colombia, Venezuela , IATA la reunion aprueba, realineacion ruta UM414, IQT/PALIR/SFD (San Fernando VOR) . Se debe acordar un Nuevo punto entre FIR LIMA/BOGOTA en reemplazo de ILMUX Implement new RNAV route or realign UM414 from IQT to DAVEX.	
*De acuerdo a información disponible/As per available information.		

26	**ASUNCIÓN/SANTA CRUZ**	
Ruta actual /Current route (FliteStar)	**UA321**	**Notas/Notes**
Distancia actual Current distance	559	
*Número de vuelos mensuales *Number of monthly flights	80	
*Tipo de aeronave más utilizada *Type of most used aircraft	A320, B732	
Trayectoria propuesta Trajectory proposed	UKELA/WPYBO (S19 37 52,16 W61 42 40,05)/VIR	Eliminar la UA321 en el tramo VAS/VIR/ Eliminate UA321 in the VAS/VIR segment SAM/IG/10; Se debe asignar nuevo designador RNAV a la ruta y el 5LNC para WPT. SAM/IG/10; Its necessary to assign new route indicator and 5LNC for WPT. UKELA/WPYBO (S19 37 52,16 W61 42 40,05)/VIR
Distancia de trayectoria propuesta Distance of proposed trajectory	503	
Millas reducidas Reduced miles	56	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved		
Observaciones Remarks	SAM/IG/10; Se aprobó. SAM/IG/10; It has been approved.	
*De acuerdo a información disponible/As per available information.		

29	**LIMA/BOGOTÁ**	
Ruta actual /Current route (FliteStar)	**UL305**	**Notas/Notes**
Distancia actual Current distance	1036	
*Número de vuelos mensuales *Number of monthly flights	390	
*Tipo de aeronave más utilizada *Type of most used aircraft	A319, A320, B732, B735, B752, B762, B763. MD11	
Trayectoria propuesta Trajectory proposed	AMVEX/NDB TGM(TINGO MARIA)/PTO LEGUIZAMO(PLG)/MORRO (VERIFICAR EN BASE DE DATOS 5CLN)/(CHECK WITH 5CLN DATABASE)	
Distancia de trayectoria propuesta Distance of proposed trajectory	1014	
Millas reducidas Reduced miles	22	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	- Recalcular/Recalculate	
Estados involucrados States involved	Perú, Colombia	
Observaciones Remarks	SAM/IG/10; Se aprobó. SAM/IG/10; It has been approved.	
*De acuerdo a información disponible/As per available information.		

30	**BOGOTÁ/QUITO/GUAYAQUIL ST BY a confirmación de ambos estados/pending confirmation by both States**	
Ruta actual /Current route (FliteStar)	**UQ104, UA550, UG438**	**Notas/Notes**
Distancia actual Current distance	394	
*Número de vuelos mensuales *Number of monthly flights	309	NILL
*Tipo de aeronave más utilizada *Type of most used aircraft	NILL	
Trayectoria propuesta Trajectory proposed	COLTA/MORRO Chequear en 5LNC MORRO	Ecuador confirmara esta trayectoria una vez terminada la re-estructuracion del espacio aéreo y solicitari concretar el punto de entrada/salida a la FIR Ecuador y suministrara punto sustitutivo de COLTA/Ecuador will confirm this trajectory after completing airspace restructuring. Request definition of the point of entry/exit to the Ecuador FIR. Ecuador will provide a point to replace COLTA.
Distancia de trayectoria propuesta Distance of proposed trajectory	388	
Millas reducidas Reduced miles	6	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-53400/ 168583,8	
Estados involucrados States involved	Colombia, Ecuador	Analizar la factibilidad. Analyse feasibility.
Observaciones Remarks	Analizar la posibilidad de transformar la UA550 en RNAV/ Analyse the possibility to convert US550 into RNAV. NOTA SAM/IG/10; Ecuador no esta en la reunion. Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas. NOTE SAM/IG/10; Ecuador its not present. Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.	
*De acuerdo a información disponible/As per available information.		

32	**PANAMÁ/BOGOTÁ/BRASILIA**	
Ruta actual /Current route (FliteStar)	**UA317**	**Notas/Notes**
Distancia actual Current distance	410	
*Número de vuelos mensuales *Number of monthly flights	NILL	
*Tipo de aeronave más utilizada *Type of most used aircraft	NILL	
Trayectoria propuesta Trajectory proposed	NIL	
Distancia de trayectoria propuesta Distance of proposed trajectory		Panama manifiesta que es factible migrar para ruta RNAV la UA317 Brasil propone que la misma sea RNAV hasta el VOR BSI/Panama states that it is possible to convert UA317 to an RNAV route. Brazil proposes convertion to RNAV route up to the BSI VOR.
Millas reducidas Reduced miles		
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	0/0	
Estados involucrados States involved	Panamá, , Colombia, Brasil	
Observaciones Remarks	SAM/IG/10; Eliminar propuesta , ya existe RNAV UQ109 entre DAKMO/MTU. SAM/IG/10; Eliminates proposal, RNAV UQ109 between DAKMO/MTU already exists.	
*De acuerdo a información disponible/As per available information.		

34	**PANAMÁ/SAO PAULO**	
Ruta actual /Current route (FliteStar)	UA317, UL201	Notas/Notes
Observaciones Remarks	Se sugiere analizar la Extensión de la UL201 de MITU hasta ISAKU, Reducción de millas no es significativa/It is suggested that the extension of UL201 from MITU to ISAKU be analysed. Mile reduction not significant. NOTA SAM/IG/10; Ya existe UQ109 tramo MITU /DAKMO. NOTE SAM/IG/10; RNAV UQ109 on segment MITU/ DAKMO already exist.	
*De acuerdo a información disponible/As per available information		

35	**PANAMÁ/SANTIAGO** **MANTENERLA EN ST BY PARA UNA IMPLEMENTACION EN FUTURAS VERSIONES/KEEP IN ST BY FOR IMPLEMENTATION IN FUTURE VERSIONS**	
Ruta actual /Current route (FliteStar)	**UL 780**	**Notas/Notes**
Distancia actual Current distance	2618	
*Número de vuelos mensuales *Number of monthly flights	170	
*Tipo de aeronave más utilizada *Type of most used aircraft	B737, B738 ,B744	
Trayectoria propuesta Trajectory proposed	REPAL/TABON	
Distancia de trayectoria propuesta Distance of proposed trajectory	2590	
Millas reducidas Reduced miles	28	Recalcular ahorros
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	Panamá, Colombia, Ecuador, Perú, Chile	
Observaciones Remarks	Panama concuerda co la propuesta/Panama agrees with proposal Ecuador concuerda y revisara los puntos de entrada y salida en la FIR Ecuador /Ecuador agrees and will review the points of entry/exit to the Ecuador FIR Chile	
*De acuerdo a información disponible/As per available information		

Nota los expertos deben tomar en consideración replantear la trayectoria de esta ruta y reconsiderar una trayectoria considerando el alto flujo de transito que registra y sus efectos en la ruta UL302 y espacio RNP10.

Note: the experts must consider reformulating the trajectory of this route in view of its intense traffic and its impact on route UL302 and RNP10 airspace.

36	**PANAMÁ/BS AS**	
Ruta actual /Current route (FliteStar)	**UA558, UW8(CHK AWY)**	**Notas/Notes**
Distancia actual Current distance	2894	
*Número de vuelos mensuales *Number of monthly flights	109	
*Tipo de aeronave más utilizada *Type of most used aircraft	B737, B738	
Trayectoria propuesta Trajectory proposed	REPAL(CHK POINT)/VOR PAR	
Distancia de trayectoria propuesta Distance of proposed trajectory	2858	
Millas reducidas Reduced miles	36	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	-116500/ 367790,5	BOLIVIA propone el tramo RAXUN/PAZ/OROKO y mantener la UA558, se analizara la conversión a RNAV la UA558 Brasil/ BOLIVIA proposes the RAXUN/PAZ/OROKO segment and to maintain UA558. The conversion of UA558 to RNAV will be analysed.
Estados involucrados States involved	Panamá, Colombia, Ecuador, Perú, Brazil, Bolivia, Argentina	Panamá está de acuerdo. Demás Estados involucrados analizar factibilidad./ Panama is in agreement. The rest of States should analyse feasibility.
Observaciones Remarks	Argentina por Nota ANAC Nro.464/2012 informa que actualmente no es viable la propuesta. Argentina by Nota ANAC Nro.464/2012 informs the proposal is not currently feasible. SAM/IG/10; No esta presente Panamá, Ecuador en reunión. SAM/IG/10; Panamá, Ecuador not present in the meeting. NOTA SAM/IG/10; Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas. NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.	
*De acuerdo a información disponible/As per available information. Nota: .- PROPUESTA RUTA 36 **PANAMÁ/BS AS UA558, UW8** Queda pendiente la viabilidad de la propuesta por la Administración Argentina. Note: PROPOSED ROUTE 36 **PANAMÁ/BS AS UA558, UW8** Pending approval of the proposal by the Argentinean Administration.		

41	**CARACAS/BSAS**	
Ruta actual /Current route (FliteStar)	**UL793**	**Notas/Notes**
Distancia actual Current distance	2784	
*Número de vuelos mensuales *Number of monthly flights	86	
*Tipo de aeronave más utilizada *Type of most used aircraft	A319, B735	
Trayectoria propuesta Trajectory proposed	DAVEX/PAR	Venezuela acepta la propuesta/Venezuela agrees with the proposal. Bolivia propone en su FIR el tramo DAVEX/VIR/PILCO /Bolivia proposes the DAVEX/VIR/PILCO segment in its FIR. Argentina realizara el estudio pertinente e informara a la oficina/ Argentina will do the analysis and inform the Office. Paraguay no tendría inconveniente/Paraguay has no problem. Brasil solicita los puntos de entrada y salida a la FIR Amazonica/Brazil requests the points of entry/exit to the Amazonica FIR
Distancia de trayectoria propuesta Distance of proposed trajectory	2637	
Millas reducidas Reduced miles		
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	155000/ 489335	
Estados involucrados States involved	Venezuela, Brazil, Bolivia, Paraguay, Argentina	
Observaciones/Remarks	Actualmente no hay ruta directa/Currently there is no direct route. Argentina por Nota ANAC Nro.464/2012 informa que no es viable la propuesta. Argentina by Nota ANAC Nro.464/2012 informs the proposal is not feasible. NOTA SAM/IG/10; Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas. NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.	
*De acuerdo a información disponible/As per available information. Nota: .- PROPUESTA RUTA 41 **CARACAS/BSAS UL793** Queda pendiente la viabilidad de la propuesta por la Administración Argentina. Note: PROPOSED ROUTE 41 **CARACAS/BSAS UL793** Pending approval of the proposal by the Argentinean Administration		

42	**GUAYAQUIL/MADRID**	
Ruta actual /Current route (FliteStar)	**UA550**	**Notas/Notes**
Distancia actual Current distance	1369NM	Hasta limite/Up to boundary FIR Maiquetía/Piarco/
*Número de vuelos mensuales *Number of monthly flights	62	
*Tipo de aeronave más utilizada *Type of most used aircraft	B763	
Trayectoria propuesta Trajectory proposed	BIVAN/ILVIR/AMAYA/EGOSU /DAREK	Venezuela expresa que luego de las coordinaciones con las autoridades militares de Venezuela, no habrá inconveniente en el tramo propuesto/Venezuela states that after coordinating with its military authorities, there would be no problem with the proposed segment. Ecuador expresa su acuerdo con la propuesta/Ecuador agrees with the proposal. Colombia en reuniones anteriores expreso que no tendría inconveniente, sin embargo queda pendiente la confirmacion /In previous meetings, Colombia stated that it had no problem. However, it is pending confirmation.
Distancia de trayectoria propuesta Distance of proposed trajectory	1345	
Millas reducidas Reduced miles	24	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	Ecuador, Colombia, Venezuela,	
Observaciones Remarks	Actualmente no hay ruta directa/Currently there is no direct route. SAM/IG/10; Se aprobó modificar UA550 con un tramo directo PBL VOR /ITEGO. SAM/IG/10; It was approved to modify UA550 incluiding a direct segment PBL VOR /ITEGO.	
*De acuerdo a información disponible/As per available information.		

43	**SAO PAULO/GUAYAQUIL**	
Ruta actual /Current route (FliteStar)	**UM656, UM655, UB554, UA321, UM665**	**Notas/Notes**
Distancia actual Current distance	2392	
*Número de vuelos mensuales *Number of monthly flights	NILL	
*Tipo de aeronave más utilizada *Type of most used aircraft	NILL NDB BAURÚ/ CANOA	Brasil tramo unidireccional desde Sao paulo a cruce con la UZ22 punto denominado VULTO y desde este punto a Guayaquil bidireccional /Brazil uni-directional segment from Sao Paulo to crossing with UZ22 point VULTO and from there to Guayaquil bi-directional Bolivia propone el tramo de Rio Branco a VAROM Bolivia proposes segment Rio Branco to VAROM. **Peru** solicita tiempo para evaluación/Peru requests time for doing the assessment Ecuador calculara el punto al cual llegara esta trayectoria/Ecuador will calculate the end point of the trajectory.
Trayectoria propuesta Trajectory proposed	2329	
Distancia de trayectoria propuesta Distance of proposed trajectory		
Millas reducidas Reduced miles	63	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	BRASIL, BOLIVIA, ECUADOR	
Observaciones Remarks		Equipo de expertos volver a analizar la Ruta. Experts team analyse again the route. NOTA SAM/IG/10; Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas. NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.
*De acuerdo a información disponible/As per available information.		

<table>
<tr><td>46</td><td colspan="2">Córdoba/Lima
(Bidireccional/bi-directional)</td></tr>
<tr><td>Ruta actual /Current route (FliteStar)</td><td>NUEVA RUTA</td><td>Notas/Notes</td></tr>
<tr><td>Distancia actual
Current distance</td><td>1393 NM</td><td></td></tr>
<tr><td>*Número de vuelos mensuales
*Number of monthly flights</td><td>60 vuelos LAN</td><td></td></tr>
<tr><td>*Tipo de aeronave más utilizada
*Type of most used aircraft</td><td>A320, A330, B735, B737, B738, B744, B763, MD88, LJ45</td><td></td></tr>
<tr><td>Trayectoriapropuesta
Trajectory proposed</td><td>VOR CBA-VOR PISCO</td><td>Argentina informa que realizaran el analisis pertinente a confirmer el siguiente tramo desde CBA/LOA como primera opción y la segunda opción seria LITOR/CAT/LOA/Argentina will do the analysis and confirm the subsequent segment CBA/LOA as first option. The second option would be LITOR/CAT/LOA
Chile concuerda y engancharía este tramo con la revisada de la UL550/Chile agrees and would connect this segment with the revised UL550.</td></tr>
<tr><td>Distancia de trayectoria propuesta
Distance of proposedtrajectory</td><td>1357 NM</td><td></td></tr>
<tr><td>Millas reducidas
Reduced miles</td><td>36 NM</td><td></td></tr>
<tr><td>Reducción de Combustible/ CO_2 aproximado
Fuel Savings / approximate CO_2</td><td>-311210/1120357</td><td></td></tr>
<tr><td>Estados involucrados
States involved</td><td>Argentina, Chile, Perú</td><td></td></tr>
<tr><td>Observaciones
Remarks</td><td colspan="2">Esta ruta se corresponde con la solicitada por LAN/This route corresponds to the route requested by LAN/This route corresponds to the route requested by LAN
Argentina por Nota ANAC Nro.464/2012 informa que actualmente no es viable la propuesta.
Argentina by Nota ANAC Nro.464/2012 informs the proposal is not currently feasible.
NOTA SAM/IG/10; Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas.
NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.</td></tr>
<tr><td colspan="3">*De acuerdo a información disponible/As per availableinformation</td></tr>
<tr><td colspan="3">Esta ruta atiende un flujo importante de operaciones entre Buenos Aires y Lima, por lo que sería importante implantar una ruta directa./This route serves an important flow of operations between Buenos Aires and Lima. Thus, it would be important to implement a direct route.
Solo se consideran los vuelos de LAN./Only LAN flights are considered.</td></tr>
</table>

47	**Santiago/Lima (Bidireccional – Unidireccional desde/Bi-directional - Uni-directional from)**	
Ruta actual /Current route (FliteStar)	**UL302**	**Notas/Notes**
Distancia actual Current distance	1349 NM	
*Número de vuelos mensuales *Number of monthly flights	210 vuelos LAN/210 LAN flights	
*Tipo de aeronave más utilizada *Type of most used aircraft	A320, A330, B735, B737, B738, B744, B763, MD88, LJ45	
Trayectoriapropuesta Trajectory proposed	VOR VTN-DCT ATEDA y UL302	Ruta de empalme a la UL302/Connecting route to UL302
Distancia de trayectoria propuesta Distance of proposedtrajectory	1342 NM	
Millas reducidas Reduced miles	7 NM	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2	**-229950/827820**	
Estados involucrados States involved	Chile, Perú	
Observaciones Remarks	Esta ruta se corresponde con la solicitadapor LAN/This route corresponds to the route requested by LAN/This route corresponds to the route requested by LAN SAM/IG/10; Se aprobó. SAM/IG/10; It has been approved.	
*De acuerdo a información disponible/As per availableinformation		
Esta ruta atiende un flujo importante de operaciones entre Santiago y Lima, por lo que sería importante implantar una ruta directa./This route serves an important flow between Santiago and Lima. Thus, it would be important to implement a direct route. Esta modificación descongestionaría el VOR TOY, quedando solo para llegadas./This modification would decongest the TOY VOR, which would be only for arrivals. Solo se consideran los vuelos de LAN./Only LAN flights are considered.		

<table>
<tr><td>48</td><td colspan="2">Puerto Montt/Punta Arenas
(Bidireccional/Bi-directional)</td></tr>
<tr><td>Ruta actual /Current route (FliteStar)</td><td>UT100/UT102</td><td>Notas/Notes</td></tr>
<tr><td>Distancia actual
Current distance</td><td>730 NM</td><td></td></tr>
<tr><td>*Número de vuelos mensuales
*Number of monthly flights</td><td>360 vuelos LAN</td><td></td></tr>
<tr><td>*Tipo de aeronave más utilizada
*Type of most used aircraft</td><td>A320, A330, B735, B737, B738, B744, B763, MD88, LJ45</td><td></td></tr>
<tr><td>Trayectoriapropuesta
Trajectory proposed</td><td>VOR MON-VOR PNT-VOR NAS</td><td>Chile no tiene inconvenientes/Chile has no problem
Argentina evaluara la solicitud/Argentina will assess the request</td></tr>
<tr><td>Distancia de trayectoria propuesta
Distance of proposedtrajectory</td><td>704 NM</td><td></td></tr>
<tr><td>Millas reducidas
Reduced miles</td><td>26 NM</td><td></td></tr>
<tr><td>Reducción de Combustible/ CO_2 aproximado
Fuel Savings / approximate CO_2</td><td>-615567,56/2216043,2</td><td></td></tr>
<tr><td>Estados involucrados
States involved</td><td>Chile, Argentina</td><td></td></tr>
<tr><td>Observaciones
Remarks</td><td colspan="2">Estaruta se corresponde con la solicitadapor LAN/This route corresponds to the route requested by LAN/This route corresponds to the route requested by LAN
Argentina por Nota ANAC Nro.464/2012 informa que actualmente no es viable la propuesta.
Argentina by Nota ANAC Nro.464/2012 informs the proposal is not currently feasible.
NOTA SAM/IG/10; Se debe definir la implantación en SAM/IG/11 o su inclusion en proxima version de rutas.
NOTE SAM/IG/10; Its necessary to decide implementation in SAM/IG/11 or to include in the next routes version.</td></tr>
<tr><td colspan="3">*De acuerdo a información disponible/As per availableinformation</td></tr>
<tr><td colspan="3">Esta ruta atiende un flujo importante de operaciones entre Santiago y Punta Arenas, por lo que sería importante implantar una ruta directa./This route serves an important flow of operations from Santiago to Punta Arenas. Thus, it would be important to implement a direct route.
Es necesaria una reunión bilateral entre Chile-Argentina./A bilateral meeting between Chile and Argentina is required.
Se consideran solo los vuelos de LAN./Only LAN flights are considered.</td></tr>
</table>

<table>
<tr><td>49</td><td colspan="2">Buenos Aires- Miami 1 con enganche con la UL417
(Bidireccional)</td></tr>
<tr><td>Ruta actual /Current route (FliteStar)</td><td>NUEVA RUTA</td><td>Notas/Notes</td></tr>
<tr><td>Distancia actual
Current distance</td><td>3943 NM</td><td></td></tr>
<tr><td>*Número de vuelos mensuales
*Number of monthly flights</td><td>60 vuelos LAN</td><td></td></tr>
<tr><td>*Tipo de aeronave más utilizada
*Type of most used aircraft</td><td>A330,B767,B777</td><td></td></tr>
<tr><td>Trayectoriapropuesta
Trajectory proposed</td><td>PAR-UBRIX-UL417</td><td></td></tr>
<tr><td>Distancia de trayectoria propuesta
Distance of proposedtrajectory</td><td>3937 NM</td><td></td></tr>
<tr><td>Millas reducidas
Reduced miles</td><td>6 NM</td><td></td></tr>
<tr><td>Reducción de Combustible/ CO_2 aproximado
Fuel Savings / approximate CO_2</td><td></td><td></td></tr>
<tr><td>Estados involucrados
States involved</td><td>Argentina, Bolivia, Brasil</td><td>Brasil está de acuerdo/Brasil agrees
Bolivia está de acuerdo/Bolivia agrees
Argentina estudia la posibilidad/ Argentina study the feasibility</td></tr>
<tr><td>Observaciones
Remarks</td><td colspan="2">Esta ruta se corresponde con la solicitada por LAN/This route corresponds to the route requested by LAN/</td></tr>
<tr><td colspan="3">*De acuerdo a información disponible/As per availableinformation</td></tr>
<tr><td colspan="3">Esta ruta atiende un flujo importante de operaciones entre Buenos Aires y Miami, por lo que sería importante implantar una ruta directa.
Solo se consideran los vuelos de LAN.
ANAC analizará esta ruta para su futura implantación.</td></tr>
</table>

50	**Buenos Aires- Miami 2 (Bidireccional)**	
Ruta actual /Current route (FliteStar)	**NUEVA RUTA**	**Notas/Notes**
Distancia actual Current distance	3964 NM	
*Número de vuelos mensuales *Number of monthly flights	60 vuelos LAN	
*Tipo de aeronave más utilizada *Type of most used aircraft	A330,B767,B777	
Trayectoriapropuesta Trajectory proposed	GUA-PILCO-VIR	
Distancia de trayectoria propuesta Distance of proposedtrajectory	3947 NM	
Millas reducidas Reduced miles	**17 NM**	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	Argentina, Bolivia, Brasil	Brasil está de acuerdo/Brasil agrees Bolivia está de acuerdo/Bolivia agrees Argentina estudia la posibilidad/ Argentina study the feasibility Brasil está de acuerdo/Brasil agrees Bolivia está de acuerdo/Bolivia agrees Argentina estudia la posibilidad/ Argentina study the feasibility
Observaciones Remarks	Estaruta se corresponde con la solicitadapor LAN/This route corresponds to the route requested by LAN/This route corresponds to the route requested by LAN	
*De acuerdo a información disponible/As per availableinformation		
Esta ruta atiende un flujo importante de operaciones entre Buenos Aires y Miami, por lo que sería importante implantar una ruta directa. Solo se consideran los vuelos de LAN. ANAC analizará esta ruta para su futura implantación.		

51	**Sao Pablo-Lima (Unidireccional-Bidireccional)**	
Ruta actual /Current route (FliteStar)	**NUEVA RUTA**	**Notas/Notes**
Distancia actual Current distance	1924 NM	
*Número de vuelos mensuales *Number of monthly flights	120 vuelos LATAM/TACA	
*Tipo de aeronave más utilizada *Type of most used aircraft	A330,B767,B777	
Trayectoriapropuesta Trajectory proposed	SCB-VIR-LIM	
Distancia de trayectoria propuesta Distance of proposedtrajectory	1916 NM	
Millas reducidas Reduced miles	**8 NM**	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	Bolivia, Brasil, Perú	
Observaciones Remarks	Esta ruta se corresponde con la solicitadapor LATAM/TACA This route corresponds to the route requested by LAN/This route corresponds to the route requested by LAN	
*De acuerdo a información disponible/As per availableinformation		
Esta ruta atiende un flujo importante de operaciones entre Sao Paulo y Lima, por lo que sería importante implantar una ruta directa. Solo se consideran los vuelos de LATAM/TACA. Los operadores realizarán un estudio operacional para determinar la viabilidad del nuevo cruce de cordillera.		

52	**Lima-Sao Pablo (Unidireccional-Bidireccional)**	
Ruta actual /Current route (FliteStar)	**NUEVA RUTA**	**Notas/Notes**
Distancia actual Current distance	1924 NM	
*Número de vuelos mensuales *Number of monthly flights	120 vuelos LATAM/TACA	
*Tipo de aeronave más utilizada *Type of most used aircraft	A330,B767,B777	
Trayectoriapropuesta Trajectory proposed	MEXUR-VIR-RCL	
Distancia de trayectoria propuesta Distance of proposedtrajectory	1916 NM	
Millas reducidas Reduced miles	**8 NM**	
Reducción de Combustible/ CO_2 aproximado Fuel Savings / approximate CO_2		
Estados involucrados States involved	Bolivia, Brasil, Perú	
Observaciones Remarks	Solicitada por LAN/TACA/ Requested by LAN/TACA	
*De acuerdo a información disponible/As per availableinformation		
Esta ruta atiende un flujo importante de operaciones entre Sao Paulo y Lima, por lo que sería importante implantar una ruta directa. Los operadores realizarán un estudio operacional para determinar la viabilidad del nuevo cruce de cordillera.		

APPENDIX B

DRAFT

Project RLA/06/901
Assistance for the implementation of a regional ATM system according to the ATM operational concept and the corresponding technological support for CNS

PROGRAMME FOR THE OPTIMISATION OF THE ATS ROUTE NETWORK IN THE ICAO SOUTH AMERICAN REGION (PHASE 3, VERSION 02)

Version 0.5
April 2012

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Programme for the Optimisation of the ATS Route Network in the ICAO South American Region (Phase 3, Version 02)

TABLE OF CONTENTS

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FOREWORD

The Programme for the optimisation of the ATS route network of the ICAO South American Region (SAM ATSRO Programme - Phase 3, Version 02) is published by the ICAO South American Region on behalf of the ICAO South American Implementation Group (SAMIG).

The SAM ATSRO Programme - Phase 3, Version 02 addresses the different aspects that States should take into account when introducing improvements to the ATS route network in the upper airspace, and offers some guidelines regarding terminal areas.

The Regional Office, on behalf of the SAMIG, will publish revised versions of the SAM ATSRO Programme as necessary to keep the document duly updated.

Copies of the SAM ATSRO Programme - Phase 3, Version 02 may be requested to:

ICAO SAM OFFICE - LIMA, PERU

E-mail	:	mail@lima.icao.int
Web site	:	www.lima.icao.int
Tel:	:	+511 6118686
Fax	:	+511 6118689
Postal address	:	Apartado Postal 4127, Lima 100, Perú
E-mail - Points of contact:		***cfigueiredo@lima.icao.int*** ***rlarca@lima.icao.int***

This edition (*Version 0.0)* includes all revisions and modifications made since April 2011. Subsequent amendments and/or corrigenda will be listed in the Record of Amendments and Corrigenda table, in accordance with the procedure established in the following page.

The publication of amendments and corrigenda is announced regularly by correspondence sent to the States and International Organizations and on the website of the ICAO South American Regional Office, which should be consulted by those using this publication. Blank boxes facilitate annotations.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Effective date	Date recorded	Recorded by

CORRIGENDA			
No.	Effective date	Date recorded	Recorded by

ACRONYMS AND ABBREVIATIONS

ANIP-PB	Plan de Implantación de navegación aérea basado en rendimiento/Performance-based air navigation implementation plan
ANP	Plan de navegación aérea/Air navigation plan
ANS	Servicios de navegación aérea/ Air navigation services
ANSP	Proveedores de Servicios de Navegación Aérea/Air Navigation Service Providers
ASM	Gestión del espacio aéreo/ Airspace Management
ATC	Control de tránsito aéreo/ Air Traffic Control
ATFM	Gestión de afluencia del tránsito aéreo/ Air Traffic Flow Management
ATM	Gestión del tránsito aéreo/ Air Traffic Management
ATS	Servicio de tránsito aéreo/ Air Traffic Services
ATSRO	Programa de Optimización de la red de rutas ATS/ ATS Route network Optimization Programme
CAR/SAM	Regiones Caribe y Sudamérica/Caribbean/South American Regions
CDO	Operaciones de Descenso Continuo/Continue Descent Operation
CNS/ATM	Comunicaciones, navegación y vigilancia/Gestión del tránsito aéreo/ Communications, Navigation and Surveillance/Air Traffic Management
CO_2	Dióxido de carbono/Carbon dioxide
CTA	Area de control /Control Area
DME	Equipo Radiotelemetrico/Distance-Measuring Equipment
FIR	Región de información de vuelo /Flight Information Region
FUA	Uso flexible del espacio aéreo/Flexible use of airspace
GANP	Plan mundial de navegación aérea/Global air navigation plan
GNSS	Sistema mundial de navegación por satélite / Global Navigation Satellite System
GREPECAS	Grupo Regional de Planificación y Ejecución CAR/SAM/ CAR/SAM Regional Planning and Implementation Group
IATA	Asociación del Transporte Aéreo Internacional/ Internacional Air Transport Association
IFALPA	Federación Internacional de Asociaciones de Pilotos de Líneas Aéreas/International Federation of Air Line Pilots' Associations
IFATCA	Federación Internacional de Asociaciones de Controladores de Tránsito Aéreo/International Federation of Air Traffic Controllers' Associations
IFSET	Herramienta de estimación de ahorro de combustibule/ICAO fuel saving estimation tool)
PBN	Navegación Basada en la Performance /Performance-Based Navigation
RNAV	Navegación de área/Area Navigation - RNAV Route: Ruta de navegación de área/Area navigation route
RNP	Performance de navegación requerida /Required Navigation Performance
RNP AR	Requerimiento de aprobación para la performance de navegación requerida/ Required Navigation Performance Aproval Required
SAMIG	Grupo de Implantación de la Región Sudamericana/South American Region Implementation Group
SARPS	Normas y métodos recomendados (OACI)/ Standards and Recommended Practices (ICAO)

SID	Salida Normalizada por Instrumentos/Standard Instrument Departure
SSR	Radar secundario de vigilancia/Secondary Surveillance Radar
STAR	Llegada Normalizada por Instrumentos/Standard Instrument Arrival
TLS	Nivel de seguridad deseado/Target Level of Safety
TMA	Area Terminal/Terminal Area
VHF	Muy alta frecuencia /Very High Frequency
VOR/DME	Radiofaro omnidireccional VHF/Equipo radiotelemétrico/Very High Frequency Omnidirectional Radio Range/Distance-Measuring Equipment

1 Introduction

1.1 Since 2001, the States of the ICAO South American Region, together with airspace users, have been decidedly and constantly working for the introduction of improvements to the structure of the airspace under their jurisdiction.

1.2 Starting in 2008 and with the support of Project RLA 06/901, the SAM Region developed an airspace optimisation programme to maximise the efficient use of airspace, while maintaining the required level of safety.

1.3 One of the first steps taken in the Region in this regard was the conduction of a feasibility study to design an ATS route network that would respond to the new aviation requirements and address the new operational concept of performance-based navigation.

1.4 The feasibility study made a diagnosis of the ATS route network, developed a strategy for the completion of tasks in phases, drafted a list of deliverables, proposed a work programme, identified the data required and a data collection method, defined the support tools required to execute the task, specified the required reference documentation, and other aspects deemed relevant for the execution of the task, such as the interests of each State, geographical characteristics, etc. In addition to the aforementioned aspects, consideration was given to issues related to safety and other expectations described in the Global ATM Operational Concept.

1.5 As a result of this feasibility study, the airspace optimisation programme was approved, covering two essential elements: the optimisation of the SAM ATS route network and the implementation of performance-based navigation (PBN) pursuant to GREPECAS guidance contained in the PBN Roadmap. In order to facilitate project management, both objectives were included in the SAM ATS Route Network Optimisation Programme (SAM ATSRO Programme).

1.6 The ATSRO Programme is aimed at achieving significant improvements in airspace organisation and management, based on the Global Plan Initiatives (GPIs) directly related to the set of airspace management (AOM) initiatives that provide the necessary guidance for planning and implementing a optimum airspace structure.

1.7 It was agreed that the ATSRO Programme should be implemented in phases in order to achieve operational benefits as soon as possible and acquire the necessary experience in each phase to facilitate the execution of the programme.

1.8 Phase 1 corresponded to the implementation of RNAV-5, taking into account that the implementation of this concept would facilitate optimisation. This phase of the programme was implemented in October 2011. RNAV-5 was implemented on all RNAV routes that existed in the SAM Region; consequently, it is not necessary to extend the volume of exclusionary RNAV-5 airspace.

1.9 It was agreed that, starting in Phase 2 of the programme, the route network version concept would be incorporated, taking into account that airspace structure changes based on air traffic growth, the displacement of air traffic demand from one region or airport to another, available technology, amongst other aspects. The use of route network versions reflects the need for an integrated periodic revision to ensure the best possible airspace structure at all times. Version 01 of the ATS route network was successfully implemented in March 2011.

1.10 The SAM Implementation Group, at its eighth meeting (SAMIG/8) held in Lima in October 2011, reviewed the results of the analysis conducted at the third meeting of the ATS Route Network Optimisation Group (ATSRO/3, Lima, July 2011) regarding Phases 1 and 2 of the programme, particularly the lessons learned during the implementation of Phase 2, in order to incorporate that experience in Phase 3 of the Programme.

1.11 Furthermore, the performance-based air navigation plan for the SAM Region (SAM-ANIP/PB), upon analysing ATM evolution, recognised that it should be based on the following scenarios:

a) En-route operations;

b) TMA operations; and

c) Air operations in general

1.12 The SAM ANIP/PB establishes the gradual strategy for achieving the objective(s) identified, and includes the tasks and activities that better represent regional planning processes, in accordance with the global planning framework. The goal is to achieve a harmonised implementation process that evolves towards a seamless regional ATM system. To that end, a short- and medium-term work programme was developed, focusing on system improvements reflecting a clear work commitment of the parties involved.

1.13 Amongst its performance objectives, the SAM ANIP/PB included the optimisation of en-route airspace (PFF SAM 01), establishing the benefits to be derived in terms of safety and environmental protection and sustainable development of air transport. This performance objective includes, in addition to the optimisation of the ATS route network, the evolution towards en-route application of more precise navigation specifications, such as RNP2 in selected continental airspaces and RNP4 in oceanic areas.

1.14 Regarding safety, it was noted that en-route airspace optimisation would strengthen airspace safety, and with respect to environmental protection and sustainable development of air transport, it would reduce miles flown, fuel consumption and, consequently, CO_2 emissions into the atmosphere; it would increase airspace capacity; and finally, it would be possible to use aircraft capabilities to fly optimum paths.

Note: The goals of SAM PFF 01 are the number of PBN routes (RNAV/RNP) implemented and the reduction of CO_2 emissions.

1.15 It should also be noted that, in light of the new *Aviation System Block Upgrade* (ASBU) methodology advocated by ICAO, the SAM Region will have to update the SAM ANIP-PB and the PFFs, which will be replaced by air navigation report forms (ANRFs). The purpose of this new methodology is to develop a set of ATM solutions or improvements, take advantage of existing equipment, establish a transition plan, and allow system interoperability.

1.16 The aviation system block upgrade concept is a new way of approaching global, regional, and national planning in the short, medium and long term, and is intended to define the way of achieving system interoperability, generate more certainty amongst ATSPs and airspace users with respect to implementation, give transparency to early benefits, and finally generate competition based on information known to equipment manufacturers. The current initiatives of the global plan (GPIs) will be inserted in the various modules of each of the blocks proposed in this methodology.

2 Lessons learned during the implementation of Phase 2 of the ATSRO Programme

2.1 The Meeting noted that during the implementation of Version 01 of the ATS route network, some difficulties and other aspects had been identified that should be taken into account when analysing Version 02 of the ATS route network, as listed below:

a) The route network should meet all the requirements of the users (civil, military, general aviation, UAS, etc.), and allow most flights to operate direct routes or as direct as possible between points of origin and destination.

b) Optimum capacity should be achieved, taking into account the need to reduce the complexity of the airspace structure.

c) Improve airspace sectorisation to optimise ATC capacity, including the possibility of ATS delegation.

d) Reduce controller workload, reorganising the airspace as necessary.

e) Define the type of route (unidirectional/bidirectional) and the direction of unidirectional routes, taking into account the need to have a more efficient sectorisation.

f) Resolve civil/military coordination deficiencies to ensure the efficiency of the route network.

g) Permit the use of the flexible use of airspace (FUA) concept to ensure that the requirements of all airspace users are met.

h) Permit integration with the domestic route network of the States.

i) Eliminate or reduce congested areas as much as possible.

j) Keep the number of ATS routes as low as possible, always taking into account traffic demand in relation to ATC capacity and the possibility of applying direct routes.

k) Keep the number of crossings as low as possible, and where crossing are necessary, they should be planned in such a way as to avoid more congested sectors.

l) Avoid redundant ATS routes.

m) Airspace planners and procedure designers should coordinate to ensure compliance with ICAO SARPs and, where applicable, make sure that air navigation data include the information contained in Doc 8168 Vol. 2, PANS-OPS.

n) Consider the use of unidirectional routes, especially in areas where the interaction of climbing/descending traffic is a limiting factor.

o) Consider the application of parallel routes in areas where it is necessary to increase airspace capacity, using RNAV 5.

p) States should avoid taking isolated action to restructure the airspace or the domestic ATS route network in a way that could have significant effect on traffic beyond the area under the jurisdiction of the State involved.

q) Administrations should meet the dates agreed for the publication of amendments to their respective AIP, since failure to do so would jeopardise the implementation of the route network on the date agreed and generate a safety hazard.

r) Define, in addition to the implementation date, a common schedule that is convenient to all States for the implementation of the various versions of the ATS route network.

s) The ATS Route Working Group should set, duly in advance, a deadline for presenting optimisation proposals to allow States and users duly plan the implementation.

t) Assess the transfer of airspaces between States.

2.2 Following the discussion and exchange of opinions at the SAMIG/8 meeting, and taking into account the experience obtained, the Group introduced a series of improvements to the action plan Phase 2 Version 02 of the ATSRO Programme.

2.3 One of the critical issues identified was the need and advisability to collect new data on aircraft movement in order to analyse the evolution of air traffic demand in the Region for all flights conducted in the upper airspace (FL245 or above), in domestic and international routes, during the period between 1 and 31 August 2011, and for that information to be sent to the SAM Regional Office before 30 September 2011. However, only 4 States (Argentina, Chile, Colombia, and Paraguay) sent the data, and out of the data received, few could be analysed since they did not contain the information requested or it was not complete.

2.4 Another aspect to highlight is that States should send to the ICAO SAM Regional Office information on gateways of the main TMAs in the Region (see 3.2.3 of the plan of action of Phase 3) in order to facilitate the analysis and its incorporation in Version 02 of the ATS route network. At the time of conducting this preliminary study, only one State had sent such information.

2.5 SAMIG established a series of general and planning principles to be taken into account by airspace planners of the States, and that were also considered during the analysis of Phase 3 Version 02 of the ATS route network.

3 General principles

3.1 The general principles to be taken into account during Phase 3 Version 02 of the ATS route network are as follows:

a) the development of a harmonised and consistent route network requires States to participate actively in the international working groups established for conducting the planning or review of the regional route network,

b) the main regional air traffic flows must be identified, as well as those that extend beyond the Region and that have a direct impact on the regional route network, in order to identify deficiencies in the route network and in ATC sectorisation,

c) establish and review the ATS route network and supporting sectors to accommodate the main air traffic flows, reducing the complexity of the airspace structure and balancing ATC workload,

d) integrate the routes required in order to provide access to the regional route network to/from airports not served by that network. Likewise, non-permanent routes must be integrated as needed to alleviate air traffic load in the main ATS routes and ensure flights use their optimum profiles,

e) ensure the connectivity between the ATS route network to/from TMA airspace,

f) establish a phased implementation to ensure consistency with State implementation.

4 Planning principles

4.1 The following planning principles were established:

a) Air traffic volume in existing and proposed routes;

b) Establish paths as short as possible for most flights;

c) Prioritise planning in areas with higher air traffic volume;

d) Meet the needs of civil and military users;

e) Integrate the route network and supporting sectors at the beginning of the planning process;

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

g) Check that at least 30 monthly flights are conducted on the route requested. This criterion should also be applied when considering the elimination of an existing route.

h) Avoid the independent implementation of RNAV routes unless absolutely necessary.

4.2 Furthermore, it was recognised that, in addition to the expected growth of air traffic, planners will have to face other challenges when designing the airspace, including:

a) Meet ATS demands to ensure that capacity is at least maintained at current levels and that delays due to terminal airspace restrictions are minimised;

b) Meet safety requirements;

c) Meet environmental protection requirements;

d) Meet the various demands and requirements of airspace users, taking into account new and various development plans of users.

4.3 The purpose of these guidelines is to avoid the tendency to create an airspace that is “independent” from the route network, and planners, together with PANS/OPS procedure designers, must consider ATC operational requirements in their TMA design, obviously taking into account environmental protection and the associated costs and benefits.

4.4 As already seen, the route network is closely related to TMAs and approach procedures. Accordingly, it was deemed appropriate that the following aspects be also taken into account in the design of TMAs and instrument approaches:

a) systematic implementation of the FUA and progress in PBN implementation in TMAs and instrument approaches,

b) safety must be enhanced or at least maintained at current levels, complying with ICAO SARPs on this matter and conducting the corresponding risk analysis,

c) the design must respond to operational requirements, maintaining a balance between the interests of ATC, airspace users, and the environment, promoting the flexible use of airspace,

d) the collaborative decision-making concept (see the SAM collaborative decision-making manual) must be applied to airspace design; therefore, the TMA redesign project must involve a multidisciplinary team of experts representing all those involved,

e) the terminal area should be designed as an integral part of airspace, from both the horizontal and vertical viewpoints, to ensure a continuous flow of operations, and

f) use continuous descent techniques to maximise operational efficiency between airspace requirements and restrictions, optimising arrivals as much as possible (Doc 9931),

g) States should present their airspace optimisation plans to the SAMIG and ATSRO meetings.

5 Flexible use of airspace

5.1 There is regional agreement that in order to develop a comprehensive ATS route network that responds to the interests of all users, including commercial, military, general, and sport aviation, and unmanned aircraft systems, it is necessary to establish a civil/military cooperation system to analyse all the restricted, prohibited, and dangerous areas established in the South American Region with a view to implementing the flexible use of airspace concept.

5.2 Furthermore, it was recognised that the analysis is not aimed to arbitrarily eliminate or reduce special use airspaces, but rather implement the collaborative decision-making concept, which looks for the best options to satisfy all airspace users and ensure that the needs set forth are met, regardless of the application of airspace restrictions.

5.3 In view of the above, Project RLA 06/901, at the request of the SAMIG, and with the assistance of two experts, drafted the Guidelines for the Implementation of the Flexible Use of Airspace (FUA) Concept in the South American Region (SAM/FUA Guidelines). These guidelines will be presented to the corresponding regional instances for assessment and, if applicable, for use at regional level.

6 Tools and material used for the analysis of the SAM ATS route network

6.1 For the analysis, two tools were basically used: Jeppesen's FliteStar, provided by the Regional office, and the Google Earth programme, which was used by the experts of Project RLA 06/901 for the study on DME/DME coverage, which included upper airspace ATS routes. For the purpose of using this tool, it was necessary to update the data on new routes implemented after the aforementioned work was completed.

6.2 Jeppesen and DOD aeronautical charts were also used, as well as aeronautical charts published by the States.

6.3 As established in the action plan of the ATS route network optimisation programme, once Phase 3 Version 02 of the ATS route network has been analysed by the States of the Region and airspace users prior to its implementation, it should be assessed using "airspace modelling" and fast-time ATC simulation tools. This task will permit an assessment of how aircraft operations will be affected in the new scenario and, if applicable, the adoption of additional measures prior to implementation.

6.4 Also prior to implementation, a regional risk analysis will be required to ensure that the new version of the route network will not create additional and/or residual safety risks within the system. This risk analysis will not replace the safety assessment that each State must conduct in accordance with ICAO SARPs.

6.5 In the absence of updated information, 2009 data had to be used, year in which data was collected on aircraft movements in the Region to study the possibility of implementing RNAV 5. This data was adjusted in 6% for 2010 and a similar adjustment was applied to the data resulting from the aforementioned increase, for 2011. Although this information is not precise, it is the only one available for conducting an approximate analysis of traffic movement in the Region. A summary of the resulting data is shown in **Appendix A.** The whole information is posted on the SAM Regional Office website.

6.6 Likewise, since information on the entry and exit points of the main terminal areas of the Region was not available, the traffic flow shown in available aeronautical charts was taken into account.

6.7 Although States were requested to send information on their airspace optimisation plans, no information was received, except from two States. Consequently, available information from the ATSRO and SAMIG meetings was analysed, together with information sent by an airline requesting the revision of some paths that could be improved.

6.8 In order to assess fuel savings and environmental benefits derived from the new proposed paths, the ICAO IFSET tool was used. The results of this task are for reference purposes only, because, since SIDs and STARs were not available, it was not possible to conduct a complete assessment. Once the final paths and the SIDs and STARs connecting the new paths are defined, a new assessment should be done on fuel savings and the corresponding environmental benefit.

7 Statistical data on air traffic movement and fleet capacity

7.1 The analysis of the route network based on statistical data on air traffic movement has resulted in a database that has permitted a diagnosis of the main air traffic flows in the SAM Region, defined by the number of operations recorded along the various routes, whether ATS or RNAV.

7.2 The analysis addressed the following general aspects, which can be seen individually in Appendix A, and Attachment 1 to that appendix, by FIR.

Number of flights by city pairs

7.3 The number of flights by city pairs has permitted the identification of the main air traffic flows in the SAM Region, based on which suggestions were made for the implementation of RNAV routes with paths as direct as possible, or the elimination, realignment, extension, or implementation of new or parallel routes, and for the reorganisation of the paths of traffic flows therein.

Number of flights in each ATS route

7.4 The number of flights in each ATS route provides information on the number of operations in each of them, indicating the individual and cumulative percentage of each route over the total sample. This information is important because it shows if the routes are being used and, based on that, decide whether or not they should continue to be operational.

7.5 Upon reviewing the number of operations by route, it was determined that routes with more movement owe such movement to their location in FIRs with a greater number of operations, and to their crossing of several other FIRs, thus increasing the number of users in the respective routes. Based on this, the possibility was identified of improving capacity by reorganising flows through the incorporation of parallel routes.

City pairs served by each ATS route

7.6 The combination of the number of flights by city pair with the number of flights in each ATS route has permitted the identification of city pairs served by each ATS route. These values permit the analysis of traffic flows between each city pair and route, facilitating the realignment of existing routes when implementing parallel routes and reorienting the existing traffic flow.

7.7 In this regard, the main flows between cities that register greater movement have been considered, based on which situations have been identified in which it would be advisable to implement parallel routes to optimise the airspace involved.

7.8 The identification of flows between city pairs reflects the need to reorganise, in some cases, the direction of traffic. This will result in a substantial improvement of airspace capacity and will contribute to its optimisation.

7.9 Within this same context, routes have been identified between city pairs that do not have sufficient traffic to maintain such routes. It would be necessary to study the possibility of eliminating them or, otherwise, depending on their low utilisation, moving them to temporary routes in case there is no intention to eliminate them.

7.10 The main flows between city pairs allow benefits from PBN procedures to be derived. This is noted in airspaces with high traffic density, which benefit from the implementation of parallel routes with differed traffic directions, that is unidirectional, thus optimising the capacity of the area involved.

Number of flights by aircraft operator

7.11 The data contained in this part identifies companies or operators and the number of operations and types of aircraft used in the Region.

7.12 It was noted that the aircraft fleet operating in the Region has improved significantly, since most aircraft are of the latest generation, thus contributing to the improvement of the airspace structure.

Number of flights by flight level

7.13 Based on the analysis of the number of flights by flight level, the flight levels with the highest demand for the various operations in the Region were identified.

7.14 In order to meet the growing demand for optimum flight profiles, it would be interesting for service providers to take into account the facilities offered by continuous descent or climb procedures applied to flight paths with significant flows, and implement parallel routes with a defined traffic direction for arrivals and departures, thus increasing airspace capacity.

8 Diagnosis of the SAM ATS route network and resulting proposals

8.1 In view of the foregoing, a study of the existing ATS route network in the upper airspace was conducted in order to propose a possible improvement to the route network to the States.

8.2 The requests of States and airspace users concerning specific routes/paths were addressed first.

8.3 The available traffic sample was compared with the SAM ATS route network published in the CAR/SAM ANP, which lists 167 routes, defining the traffic volume in each of the routes studied.

8.4 Subsequently, using FliteStar, 86 routes were analysed, from origin to destination, including path and distances. Based on the information available, the number and type of aircraft most frequently used on the route involved were analysed, to finally analyse the advantages and/or disadvantages of a new route, the realignment of some, as well as the possible elimination of routes that did not offer any operational advantage and/or were not being used or were barely used by airspace users.

8.5 The path of most of the routes assessed lied within the Region. In some cases, however, routes affecting other Regions were also reviewed. In such cases, an attempt was made to select a point of entry into the adjacent Region that did not affect its route network structure.

8.6 Notwithstanding the above, States could deem it advisable to propose changes that affect adjacent Regions, in which case, the ICAO Secretariat could coordinate as necessary.

8.7 Following that initial analysis, and taking into account the principles established by the SAM/IG, an assessment was made of the best possible path, balancing advantages and disadvantages and, where applicable, a series of RNAV routes was submitted to the consideration of the States.

8.8 This preliminary analysis identified 45 routes that could improve the regional airspace structure. Subsequent meetings analysed the list of routes, and a preliminary agreement was reached at the ATSRO/4 meeting (May 2012). However, the work of States and airspace users continues under the coordination of the Regional Office. **Appendix B** lists SAM routes and those suggested for implementation in Version 02. It should be noted that work will continue at subsequent SAMIG and ATSRO meetings. In order to keep the Table updated until a consensus is reached on the routes to be implemented, this programme will be modified as necessary.

8.9 The description includes the scenario with cities of origin and destination, the route normally being used, the distance, number of flights, and types of aircraft most frequently used in this segment. Likewise, a proposal is made for a new path, with its distance, number of nautical miles saved, and the resulting reduction in fuel consumption and CO_2 emissions. Finally, States involved in the new proposed path are listed and, where applicable, remarks on the assessed path.

8.10 As already stated, in order to calculate fuel currently used and fuel to be saved with the implementation of the new paths, the ICAO IFSET tool was used.

8.11 In the absence of SIDs and STARs to relate the route to the departure and arrival airport, the calculation was based on the total distance between the points in question and assuming that the aircraft would be at FL 360 throughout the flight, which is the most representative level used in the Region. In other words, the climb and descent phases were not taken into account.

8.12 Calculations have been conservative since only operations with origin and destination on the proposed path were taken into account, excluding other operations that could use that given route. For example, overflights from adjacent Regions using that same path were not considered.

8.11 For calculating CO_2 emissions, a conversion factor of 3.157 per kg of fuel approved by the Intergovernmental Panel on Climate Change (IPCC) was used.

8.13 In general terms and approximate figures, it could be said that fuel consumption in one month of operations in the assessed scenario could be reduced by 1’440,500 kg, *i.e.*, 1.536% of the total and, in terms of reduction of CO_2 emissions, it amounts to 4’547,658.5 kg, *i.e.*, 0.920%. If the figure for saved fuel were converted into litres, calculating the price per litre of fuel at $ 1.57, savings would amount to $2’713,902 per month. For better reference, **Appendix C** contains the table on fuel savings, with calculations for each path proposed. These calculations shall be updated following approval of the routes to be implemented in Version 02 of the ATS route network.

8.14 Appendix A also lists the routes that should be analysed in light of their low occupancy or lack of information on operations in those routes. States should analyse the relevance of maintaining such routes and, if applicable, propose their elimination from the corresponding air navigation plan.

9 Application of techniques for continuous descent operations (CDO)

9.1 Continuous descent is one of the various tools that aircraft operators and ANSPs have for improving safety, flight prediction capabilities, and airspace capacity, while reducing noise, ATC/pilot communications, fuel, and greenhouse gas emissions. Throughout the years, different route models have been developed to facilitate continuous descent, and several attempts have been made to strike a balance between environmentally friendly procedures and the requirements of a given airport or airspace.

9.2 Phase 3 Version 02 of the route network requires that States analyse the application of CDO techniques. It is recognised that these continuous descent (CD) operations are possible by virtue of airspace design, procedure design, and ATC facilitation, whereby an incoming aircraft descends continuously to the extent possible, using minimum engine thrust, ideally in a low resistance configuration, prior to the final approach fix (FAF)/final approach point (FAP).

9.3 The application of CDO must be reviewed on a case-by-case basis, depending on the individual requirements of each airport of the Region, taking into account that an optimum CD starts at the top of descent, and uses descent profiles that reduce ATC/pilot communications, level flight segments, noise, fuel burn, and emissions, while increasing ATC/pilot prediction capability, and flight stability.

9.4 It is extremely important to maintain safety in all flight phases, and nothing in the guidance will prevail over the requirement for a safe operation and control of aircraft at all times. In order to eliminate any doubts, all recommendations shall be understood as "subject to safety requirements". Before starting any CD testing or operation, the proposed implementation should be subject to a local safety assessment.

9.5 In order to standardise and harmonise the development and implementation of CD operations, airspace and instrument flight procedure design should be used, together with ATC techniques. This will allow flight crews to use in-flight techniques to reduce the overall environmental footprint and increase the efficiency of commercial aviation. ICAO Doc 9931, Continuous Descent Operations Manual, provides full information on the application of CDO techniques.

10 Interface between the SAM route network and the route network of adjacent Regions

10.1 One of the most complex aspects of ATS route network optimisation is the interface with adjacent Regions. For an overall improvement of the route network, States must be able to analyse changes and amendments on a bilateral or multilateral basis, depending on the circumstances. In many cases, it is also necessary to include improvements in letters of operational agreement between ATC units, as well as in the corresponding ATS contingency plans.

10.2 In the SAM Region, this has been achieved through the SAMIG and ATS/RO meetings, under the auspices of Regional Project RLA/06/901, providing the appropriate spaces to analyse each proposal, but this facility is not available with the States of adjacent Regions.

10.3 In order to solve this issue, the ICAO Secretariat, through its official channels, normally coordinates with those involved in order to resolve any issue that may arise in the implementation process. If any improvement that is to be introduced affects or could affect States of other Regions, the Secretariat encourages the holding of bilateral or multilateral meetings.

10.4 In addition to the above, consideration could be given to the possibility of holding broader inter-regional meetings at given periods, in accordance with the process of implementation of the SAM ATSRO programme, to analyse how the ATS route network could be further improved.

11 Initial draft proposal of amendment to the CAR/SAM ANP

11.1 This work is an initial proposal that shall be assessed by the States and by the ATM community, in general. Accordingly, it is at a very initial stage and will undergo various changes, and it would not be advisable, at this point, to prepare an initial draft proposal of amendment to the CAR/SAM ANP.

11.2 However, by way of information, **Appendix D** contains the format that would be used for circulating the proposal of amendment to the plan once the paths, geographical coordinates, and other data required for processing the amendment have been defined.

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APPENDIX C (revised 04/10/12)

ACTION PLAN FOR THE OPTIMISATION OF THE SAM ATS ROUTE NETWORK (GPIs 1, 5, 7, 8, 10, 11)

Activity	Start	End	Responsible party	Remarks
1. **First Phase – Implementation of RNAV-5**				
2. **Second Phase – Implementation of Version 1 of the SAM ATS route network**				
Activity	**Start**	**End**	**Responsible party**	**Remarks**
2.1. Airspace concept				
2.3 Implementation of Version 1 of the SAM ATS route network				
3. **Third Phase – Implementation of Version 2 of the SAM ATS route network**				
Activity	**Start**	**End**	**Responsible party**	**Remarks**
3.1. **Flexible use of airspace**				
3.1.1. Establish a civil/military coordination committee to assess the application of the flexible use of airspace concept cited in item 3.1.1.	SAM/IG/7	SAM/IG/11	States	Civil/military committees must be implemented in those States that have not done it yet. Meeting/Workshop on Civil/Military Coordination held on 16-19 August 2011.
3.1.2. Develop proposals of implementation and/or realignment of routes, based on FUA application	SAM/IG/7	SAM/IG/11	States	See 3.1.2
3.2. **Airspace concept**				
3.2.1. Collect traffic data to understand airspace traffic flows	SAM/IG/9	30 Sep 2012	SAM/PBN/IG (Project RLA/06/901)	The Secretariat sent a letter to States:

			States	Response date: September 2012. Chile, Colombia, Paraguay and Uruguay sent on time traffic data.
3.2.2. Identify the gateways of the main TMAs of the SAM Region	SAM/IG/7	SAM/IG/11	States	
3.2.3. Prepare the update of the letters of agreement and contingency with adjacent States		SAMIG/12	States	
3.2.4. Conduct a comprehensive study of the SAM ATS route network with a view to preparing Version 2 of the route network, including: • Identify the tools required for conducting the study cited in item 3.2.5 (Aeronautical Charts, specific software) • Define SAM airspace structure scenarios, including ATS routes, control sectors, interface with TMAs, to be assessed using “airspace modelling” and fast-time ATC simulation tools • List the ATS routes that should be eliminated, based on their utilisation; • Propose, if necessary, the expansion of exclusionary airspace volume for RNAV-5 application • List, if necessary, the “conventional” ATS routes that should be eliminated or replaced with RNAV routes based on possible expansion of exclusionary RNAV-5 airspace volume. • List the RNAV routes that should be realigned, based on possible modification of the gateways of the main SAM TMAs. • Describe possible scenarios for Version 2 of the SAM route network and control sectors, based on the analysis of the aforementioned	SAM/IG/7	SAM/IG/9 SAM/IG/11	SAM/PBN/IG (Project RLA/06/901)	The hiring of 2 experts for a period of 3 weeks during the second half of February 2012 has been carried out. First part completed. The first draft to be submitted to the States and operators was completed, and support was requested from the Project to proceed with the optimisation study through the engagement of 2 experts for a second period of 3 weeks before March 2013, with the new traffic data to be collected in August 2012 and the feasibility studies conducted by the States, together with the modified TMAs of the Region. SAMIG and ATSRO Meetings have revised and modified first draft, establishing the deadline for definition for SAM/IG/11.

items. • Describe the interface between the SAM route network and the CAR route network. • Submit an initial draft proposal of amendment of the CAR/SAM ANP. • Based on traffic data, consider the possibility of implementing parallel RNAV routes with the appropriate separation. • Draft planning criteria to be used by States and airspace users in this implementation process (see paragraph 2.13 of the ATSRO/03 report). • Draft the optimisation plan for restricted, prohibited, dangerous, and reserved use areas in the SAM Region. • Apply CDO techniques.				
3.2.5. Conduct seminar/workshop/work meeting on airspace planning	ATSRO/3	April 2013	Project RLA/06/901	Request the support of Project RLA/06/901 and DECEA (Brazil). The Secretariat should send a letter to DECEA requesting two instructors. The objective is to train airspace planners of the States of the Region during the second half of April 2013 in Lima.

3.2.6.	Conduct “Airspace Modelling” and fast-time simulation studies to assess the scenarios described in 3.2.5	July 2013	SAM/IG/12	Project RLA/06/901 States	The Secretariat should consult on the use of the tool available in Brazil. If the tool can be used, secure, through Project RLA/06/901, the participation of 2 experts of the States of the Region.
3.2.7.	Conduct the required safety assessment applying the qualitative methodology using the SMS	31/07/12	SAM/IG/10 SAM/IG/11	Project RLA/06/901 States	An expert needs to be hired for 2 weeks to carry out this task. This task has been completed. Pending the following task: States shall conduct a safety analysis for introducing changes in their terminal areas (TMAs)
3.2.8.	Conduct the fifth workshop/meeting for the optimisation of the SAM ATS route network (SAM ATSRO/5) to review and validate the studies cited in items 3.2.-5 and 3.2.8.	SAM/IG/10	August 2013	Project RLA/06/901 States	
3.3.	**Implementation of Version 2 of the SAM ATS route network**				
3.3.1.	Process proposal of amendment to the CAR/SAM Air Navigation Plan	August 2013		SAM Regional Office	
3.3.2.	Publish Version 2 of the SAM ATS route network.	22 August 2013		States	
3.3.3.	Entry into force of Version 2 of the SAM ATS route network Or of a division of the routes package, as per the SAM/IG/10 Report, item 2.5	17 October 2013			

APPENDIX D

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO)

SOUTH AMERICAN REGIONAL OFFICE

PRELIMINARY SAFETY PLAN FOR THE IMPLEMENTATION OF THE ATS ROUTE NETWORK OF THE SOUTH AMERICAN REGION, PHASE 3, VERSION 02 (ATSRO PROGRAM, PHASE 3)

Version 1.0	
Date	September 2012

FOREWORD

The *Safety Plan for the Implementation of the ATS Route Network of the SAM Region, Phase 3, Version 02* is published by the SAM Implementation Group (SAMIG). This paper describes the risk analysis conducted before the implementation.

SAMIG will publish revised editions of this Document, as needed, to reflect the activities already completed and that could impact this document. Copies of this *SP* may be requested to:

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This edition (Version 1.0) includes all revisions and changes made until September 2012. Subsequent changes and corrections will be reflected in the Amendments and Corrections Record, in accordance with the procedure set out on page 2.

Publication of amendments and corrections shall be announced regularly through correspondence with the States and International Organisations, and on the web page of the ICAO South American Regional Office; users of this publication should check those sources. Blank slots allow for easier annotation.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Effective date:	Date recorded:	Recorded by:

CORRIGENDA			
No.	Effective date:	Date recorded:	Recorded by:

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Executive Summary

1. This safety plan aims to conduct a risk analysis using the qualitative methodology to assess the impact that the implementation of the SAM ATS route network Phase 3, Version 02 might have on safety, and to demonstrate that implementation will be acceptably safe.

2. The criterion used to define that implementation will be acceptably safe in this context is established by comparison, which requires that the risk of an accident / incident in the proposed route system does not exceed the implemented reference system, the reference system being the ATS route network before the implementation of Phase 3, Version 02.

3. The implementation of airspace improvements contributes directly to the achievement of ICAO Strategic Objectives related to safety and environmental protection.

4. A regional assessment does not always contain the information necessary to meet specific local requirements. It should be noted then that this safety assessment does not replace the responsibility of States for conducting their own safety assessment following the implementation of the routes included in Phase 3, Version 02 of the SAM ATS Route Network in their respective FIRs, as established in ICAO SARPs.

5. The area covered by the safety assessment includes the airspace under the responsibility of the SAM States that have agreed to implement Phase 3 Version 02 of the ATS Route Network, encompassing air operations under normal conditions within the boundaries of the following flight information regions (FIRs): Antofagasta, Amazónica, Asunción, Barranquilla, Brasilia, Bogotá, Comodoro Rivadavia, Córdoba, Curitiba, Ezeiza, Georgetown, Guayaquil, La Paz, Lima, Maiquetía, Mendoza, Montevideo, Panama, Paramaribo, Puerto Montt, Punta Arenas, Recife, Resistencia, Rochambeau, and Santiago.

6. Chapter 1 of the document analyzes the background related to the optimization of the ATS route network carried out since 2001 and explains in summary how SAM States, together with airspace users, have resolutely and constantly been working to make improvements to the structure of the airspace under their jurisdiction.

7. Chapter 2 analyzes the current situation of the SAM ATS route system, briefly describes its design, identifies a set of general and planning principles that were considered during the analysis of Phase 3 Version 02 of the ATS route network that should also be taken into account by the airspace planners of the States.

8. It also summarizes the planning principles and challenges planners face in designing airspace besides the expected growth in air traffic, such as meeting, among other things, ATS demand to ensure that sector capacity is at least maintained at current levels and that delays due to restrictions in terminal airspace are minimized; safety requirements; requirements to ensure environmental protection and the different demands and requirements of airspace users taking into account new and diverse user development plans.

9. This Chapter also assesses the situation of the ATS route network optimization after implementing Phase 3, Version 02 of the ATS route network, highlighting the operational benefits to be derived from the implementation.

10. Chapter 3 analyzes the general aspects of safety management considering that, according to the universally accepted definition of the International Civil Aviation Organization (ICAO), safety in civil aviation is the condition whereby risk of personal injury or property damage is reduced and maintained at or below an acceptable level through a continuous process of hazard identification and risk assessment.

11. The chapter then explains the methodology used and the hazard identification processes, which are defined as a potential situation that could affect the acceptable level of safety. Then, the document reviews the hazard identification methodology based on the one described in the ICAO SMM (Doc 9859), which identifies potential hazards in a logical and sequential manner, based on which it is possible to determine the feasibility of the implementation of ATSRO Phase 3 Version 02 of the ATS route network.

12. The document states that hazards and their consequences were identified and recorded by a team of experts that conducted the risk analysis during the Meeting / Workshop SAMRA/03 (September 2012), evaluating in each case the probability of occurrence and severity of an event, considering a predictable worst case scenario, based on a qualitative analysis, and finally, applying the operational risk matrix and determining what further actions could be applicable to minimize or contain efficiently the operational risks that could result from the implementation of Phase 3, Version 02 of the ATS Route Network.

13. That meeting / workshop approved the use of different matrices to determine the probability, severity, risk classification and criteria for mitigating operational risks, taking into account the experience of States at regional and global level.

14. Chapter 4 explains the work done by the multidisciplinary team that participated in the SAMRA/3 meeting/workshop, identifying first the generic hazard and then striving to identify specific components of the hazard that could affect air navigation in the ATS Route Network in its Phase 3, Version 02.

15. Chapter 5 analyzed and compared the information available and that defined by the experts participating in the SAMRA/03 meeting/workshop and once this information was validated, the methodology was applied to determine the level of operational risk for each hazard identified by the panel. This Chapter shows the main causes leading to the identified hazard, the current barriers to hazard control, and the risk assessment with the existing barriers, and then, proposes a number of mitigation measures that would permit the implementation of Phase 3, Version 02 of the ATS route network with acceptable levels of safety for the Region.

16. Chapter 6 summarizes the conclusions and recommendations of the risk analysis, taking into account that the current SAM ATS route network, with currently available air traffic services, communication, navigation, and surveillance systems, aeronautical and meteorological information, and all the support systems available for ATM are sufficient for conducting safe and efficient air operations in the Region.

17. However, with the implementation of a new route network version with a structure that is different from the existing one, opportunities for improvement were identified in order to enhance and maintain safety standards through the implementation of the measures proposed by this document as described in detail in Chapter 5, which will permit the optimization of safety in the new operational environment, thus contributing to the achievement of the strategic objectives of the regional performance-based air navigation implementation plan.

18. Finally, the document provides a series of conclusions and recommendations for civil aviation authorities, aircraft operators, air navigation service providers, the South American Implementation Group, and ICAO, which, if applied efficiently, will permit a safe and orderly implementation of Phase 3, Version 02 of the ATS route network.

Definitions and acronyms

For the purposes hereof, the following definitions and acronyms shall apply with the following meaning:

Definitions

Accident: An occurrence associated with the operation of an aircraft that takes place between the moment any person boards the aircraft with the intention of flight until such time as all persons have disembarked, in which:

a) Any person is fatally or seriously injured as a result of:
   - being in the aircraft; or
   - direct contact with any part of the aircraft, including parts which have become detached from the aircraft; or
   - direct exposure to jet blast;
   - except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to passengers and crew; or

b) the aircraft sustains damage or structural breakage that:
   - adversely affects its structural strength, performance or flight characteristics; and
   - would normally require major repair or replacement of the affected component, except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tyres, brakes, fairings, small dents or puncture holes in the aircraft skin; or

c) the aircraft is missing or is completely inaccessible.

AIRPROX. Code word used in an air traffic incident report to designate aircraft proximity.

Safety Barriers: Term used to indicate systems, sub-systems or methods used to reduce the probability of a hazard escalating into an incident or accident, and/or reduce their severity.

Air Traffic Control: A service provided for the purpose of preventing collisions between aircraft or between aircraft and obstructions (in the manoeuvring area) and for the purpose of expediting and maintaining an orderly flow of air traffic.

Hazard Consequence: Probable outcome of a hazard.

Safety Assessment Criteria: The set of quantitative or qualitative criteria to be used in a safety assessment to determine the acceptability of the assessed level of safety.

Integrated Aeronautical Information Package: A package which consists of the following elements;

- aeronautical information publications (AIP), including amendments;
- AIP supplements;
- the NOTAM and pre-flight information bulletins (PIB);
- aeronautical information circulars (AIC); and
- checklists and lists of valid NOTAMs.

Risk Assessment: A process that for identified hazards, evaluates their risk in terms of probability and severity of consequences.

Safety Assessment: Assessment consisting of a structured hazard identification process and a systematically coherent operational risk assessment.

Risk Management: Identification, analysis and elimination (or mitigation down to an acceptable or tolerable level) of the hazards and subsequent risk threatening the feasibility of an organization.

Incident: An occurrence, other than an accident, associated with the operation of an aircraft which affects, or would affect, the safety of operation.

Serious incident: An incident involving circumstances indicating that there was a high probability of an accident and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down. Typical examples include:

a) A near collision requiring an avoidance manoeuvre, or when an avoiding manoeuvre would have been appropriate to avoid a collision or an unsafe situation.

b) Controlled flight into terrain (CFIT) only marginally avoided.
c) An aborted take-off on a closed or engaged runway or a take-off from such runway with marginal separation from obstacle.
d) A landing or attempted landing on a closed or engaged runway.
e) Gross failure to achieve predicted performance during take-off or initial climb.
f) All fires and smoke in the passenger compartment or in cargo compartments, or engine fires, even though such fires are extinguished with extinguishing agents.
g) Any events that required the emergency use of oxygen by the flight crew.
h) Aircraft structural failure or engine disintegration that is not classified as an accident.
i) Multiple malfunctions of one or more aircraft systems that seriously affect the operation of the aircraft.
j) Any case of flight crew incapacitation in flight.
k) Any fuel state that would require the declaration of an emergency by the pilot.
l) Take-off or landing incidents, such as undershooting, overrunning or running off the side of runways.
m) System failures, weather phenomena, operation outside the approved flight envelope or other occurrences that could have caused difficulties controlling the aircraft.
n) Failure of more than one system in a redundancy system that is mandatory for flight guidance and navigation.

Mitigation: Measures to address the potential hazard or to reduce the risk probability or severity.

Acceptable Level of Safety (ALoS): expresses the established safety goals. It constitutes a reference against which safety performance can be measured. This level is expressed by safety indicators and safety goals.

Safety Objective: The definition of a hazard together with its target maximum rate of occurrence. A goal or target that, where achieved, demonstrates that a tolerable level of safety is being, or will be achieved for the hazard concerned.

Hazard: A condition or an object with the potential of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

Risk Probability: probability that an unsafe event or condition might occur.

Acceptable region: The risk is acceptable under the existing circumstances.

Emergency Response: Description of the steps to follow in case of an emergency in which the responsibilities in the execution of the procedure and duties to be performed are defined.

Intolerable Region: Risk that is unacceptable at any level.

Tolerable Region: Risk that is acceptable based on risk mitigation. It might require a cost/benefit analysis.

Safety Risk: The assessment, expressed in terms of predicted probability and severity, of the consequence of a hazard, taking as a reference the worst foreseeable situation.

Safety Requirements: Specified system criteria that are required in order to reduce the risk of an accident or incident to an acceptable level. Also, it is defined as the requirement to help achieve a safety goal.

Applicable Safety Regulatory Requirements: The requirements for the provision of air traffic services or for the operation of an aerodrome in respect of facilities applicable to a specific situation under review in relation to, among others:

a) The technical and operational competence and suitability to provide the service or facility;
b) Systems and processes for security management, and
c) Technical systems, their constituents and associated procedures.

Safety: Condition in which the risk of personal injury or property damage is reduced and maintained at an acceptable level, or below it, through a continuing process of hazard identification and risk management.

Severity: The possible consequences of an unsafe event or condition, taking as reference the worst foreseeable situation

System: A term used to describe the collection of equipment, procedures and / or personnel to perform a function.

As Low As Reasonably Practical: A risk is low enough so as not to try to lower it further, or the cost of the evaluation of the improvement in an attempt to reduce risk, it would actually be more expensive than any costs likely to come from one's own risk.

Risk Tolerability: This criterion relates to the probability and severity of risk.

Acronyms

AIC	Aeronautical information circular
ALARP	As low as reasonably practicable
ALoS	Acceptance level of safety
AIP	Aeronautical information publication
AIRAC	Aeronautical information regulation and control
AIREP	Air-report
AIS	Aeronautical information service(s)
AMS	Aeronautical mobile service
APP	Approach control office or approach control service
ASHTAM	NOTAM on volcanic ash
ASM	Airspace management
ATC	Air traffic control (in general)
ATCO	Air traffic controller
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic service
ATSRO	ATS Route Network Optimization Program
AC	Advisory circular
CB	Cumulus nimbus clouds
CDO	Continuous descent operations
CDM	Collaborative decision-making
CEO	Executive director
CFIT	Controlled flight into terrain
CATC	Civil aviation training centre
CU	Cumulus clouds
DME	Distance measuring equipment
CO2	Carbon dioxide
FTS	Fast-time simulation
FDE	Failure detection and exclusion
FIR	Flight information region
FPL	Filed flight plan
GANP	Global air navigation plan
GNSS	Global navigation satellite system
GREPECAS	Caribbean/South American Regional Planning and Implementation Group
HIRA	Hazard identification and risk assessment
LOA	Letter of operational agreement
MET	Meteorological or meteorology
NOTAM	Notice to airmen
NAV	Navigation
NAVAID	Navigation aids
ICAO	International Civil Aviation Organization
OPS	Operations
PANS	Procedures for air navigation services

PBN	Performance-based navigation
PIREP	Pilot report
SP	Safety plan
QMS	Quality management system
RAIM	Receiver autonomous integrity monitoring
RNAV	Area navigation
SAM	South America
SAMIG	South American Implementation Group
SARPS	Standards and recommended practices (ICAO)
SLA	Service level agreement
SMS	Safety management system
SMM	Safety Management Manual (Doc 9859)
SUA	Special use airspace
TMA	Terminal control area
TCU	Towering cumulus
UAS	Unmanned aircraft system
WPT	Waypoint
WGS 84	World geodetic system 1984

Chapter 1 Preface

Purpose of the Safety Assessment

1.1 In order to comply with ICAO standards and recommended practices and to meet the aspirations of the ATM community, a safety assessment needs to be conducted before implementing Phase 3 Version 02 of the SAM ATS route network.

1.2 The purpose of this safety plan is to conduct a risk analysis using the qualitative methodology, assess the impact that the implementation of Phase 3, Version 02 of the SAM ATS route network could have on safety, and demonstrate that the implementation will be acceptably safe.

1.3 *What does acceptably safe implementation mean in this context?* The criterion used to determine that the implementation will be acceptably safe is established by a comparison that requires that the risk of an accident/incident in the proposed route system shall not exceed the reference system in place, the reference system being the ATS route network before the implementation of Phase 3, Version 02.

1.4 In principle, it is recognized that absolute safety is unachievable and that the arguments used herein are intended to evaluate and determine whether the analyzed system is acceptably safe to operate in its current context.

1.5 This safety plan by itself does not improve safety and will only do so if there is a commitment by stakeholders to develop and implement it.

1.6 The introduction of airspace improvements contributes directly to the achievement of the following ICAO Strategic Objectives:

- Safety **—** *To improve the safety of civil aviation worldwide*
- Environmental protection **—** *To minimize the adverse effect of global civil aviation on the environment*

1.7 The safety plan discusses the hazards identified at the third workshop/meeting for risk assessment prior to the implementation of Phase 3 - Version 02 of the SAM ATS route network – Regional Project RLA/06/901 (SAM/RA/3 Lima, Peru, 3-7 September 2012).

1.8 The safety assessment on the implementation of Phase 3, Version 2 of the ATS Route Network seeks to establish the safety levels before this implementation, taking into account existing barriers, and, if appropriate, to propose mitigation measures for these risk levels to remain within acceptance margins and serve as reference material for States that so require as a sort of "benchmarking".

1.9 States should consider that a regional assessment does not always contain the information necessary to meet specific local requirements. Then it should be noted that this safety assessment does not replace the responsibility of the States or the air navigation services provider,as applicable, to carry out their safety assessment following the implementation of the routes included in Phase 3, Version 2 of the SAM ATS route network in their respective FIRs, as established in ICAO SARPs.

1.10 The safety assessment process seeks to answer questions like:

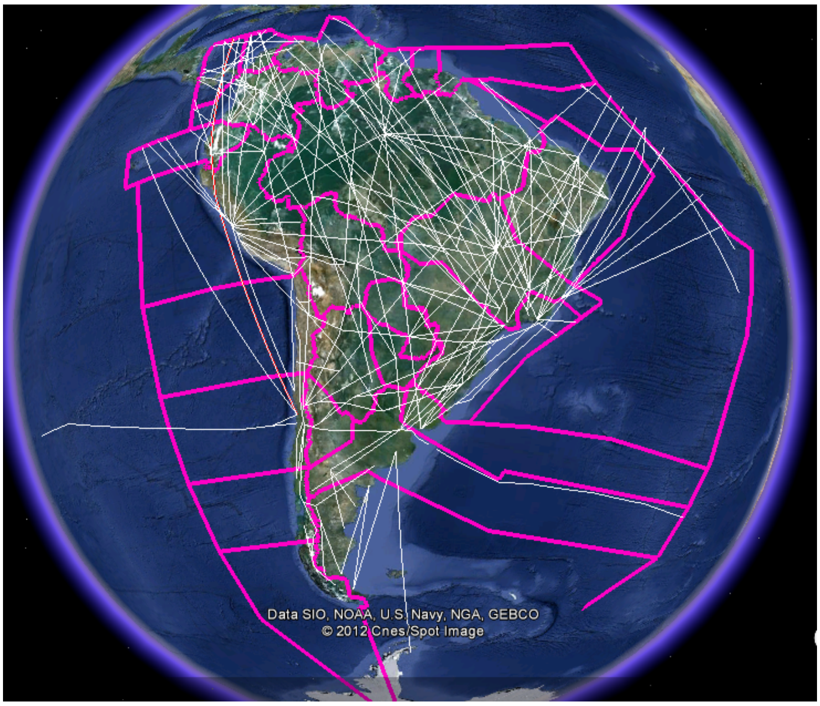
a) What could be wrong with the evaluated system that could affect safety during the implementation and post-implementation of Phase 3, Version 02 of the SAM ATS route network?
b) What could be the consequences for air traffic if the findings and decisions made during the planning and implementation of the action plan for the implementation of Phase 3, Version 02 of the optimization program are not met?
c) What would be the consequences if mitigation measures identified during the analysis to reduce risk were not applied?

1.11 The implementation of Phase 3, Version 02 of the SAM ATS route network requires applying a standard methodology to identify hazards, analyze their consequences and thereby allow managing operational risks during the optimization of the route network. Consequently, the Safety Management manual (Doc 9859) has been applied to this assessment, that is, a structured process of hazard identification and a systematic and consistent assessment of operational risk. Likewise, the experience of the Region and of individual States in the application of risk analysis has been taken into account.

1.12 Taking into account the diversity of scenarios in the Region and the agreements reached at different workshops by the SAM Implementation Group (SAMIG), it was considered that this type of safety studies would be a complex task that should be supported by the Regional Project RLA/06/901. In this regard, the aforementioned regional project assisted the Region in the preparation and conduction of the SAM/RA/3 meeting/workshop and in the development of this safety plan.

Scope

1.13 The area covered by the safety assessment includes the airspace under the responsibility of SAM States that have agreed to implement Phase 3 Version 02 of the ATS Route Network and covers air operations under normal conditions within the boundaries of the following flight information regions (FIR): Antofagasta, Amazónica, Asunción, Barranquilla, Brasilia, Bogotá, Comodoro Rivadavia, Córdoba, Curitiba, Ezeiza, Georgetown, Guayaquil, La Paz, Lima, Maiquetía, Mendoza, Montevideo, Panama, Paramaribo, Puerto Montt, Punta Arenas, Recife, Resistencia, Rochambeau, and Santiago. By way of reference, a chart with SAM FIRs and the ATS route network in the upper airspace is shown below.



Work Program

1.14 In order to implement the work program, Project RLA 06/901 hired a specialist to assist the Regional Office in the safety assessment process. Initially, work was done for a period of two weeks involving the preparation of the third meeting/workshop for the risk assessment prior to the implementation of Phase 3 - Version 02 of the SAM ATS route network, and the drafting of the various working papers and the corresponding presentations. Then, during a second period of three weeks, support was given to the ATM officers of the SAM Regional Office for the conduction of the meeting/workshop and the development of the safety plan.

Background

1.15 Since 2001, SAM States, together with airspace users, have been working constantly to make improvements in the structure of the airspace under their jurisdiction.

1.16 Since 2008 and with the support of the Regional Project RLA/06/901, the SAM Region developed an airspace optimization program to maximize the efficient use of airspace while maintaining the required levels of safety.

1.17 The ATSRO Program seeks to achieve significant improvements in airspace organization and management and it was agreed that it should be executed in phases in order to achieve operational benefits as early as possible and to get the necessary experience in each of these phases to facilitate program implementation.

1.18 Phase 1 corresponded to the implementation of RNAV-5, taking into account that the implementation of this navigation specification would facilitate the optimization of the ATS route network. This phase of the program was implemented in October 2011. The RNAV-5 was implemented in all RNAV routes of the SAM Region, except in oceanic airspace where RNAV / RNP 10 had already been implemented.

1.19 It was agreed that, starting in Phase 2 of the program, the concept of route network versions would be incorporated, since airspace structure changes due to air traffic growth, the shifting of air traffic demand from one region or airport to another region or airport, available technology, among others. The use of versions of the route network reflects the need for a periodic review in an integrated manner to always ensure the best possible airspace structure. The implementation of Version 01 of the ATS route network was successfully completed in March 2011.

1.20 The SAM Implementation Group at its eighth meeting (SAMIG/8), held in Lima in November 2011, reviewed the results of the analysis conducted by the third meeting of the ATS Route Network Optimization Group (ATSRO/3, Lima, July 2011) in relation to Phases 1 and 2 of the program and particularly the lessons learned during the implementation of Phase 2 in order to incorporate that experience in Phase 3 of the program.

1.21 Phase 3 of the program aims at the implementation of Version 2 of the ATS Route Network and has taken into account the difficulties encountered during the previous implementation processes.

1.22 This implementation program was initially analyzed at the SAMIG/9 meeting and subsequently at the ATSRO/4 meeting, which introduced a number of modifications to meet the requirements of States and airspace users.

1.23 The ATS route network optimization program contains the lessons learned during the implementation of Phases 1 and 2 of the ATSRO Program, the general planning principles on which the program is based, and the guidelines for the implementation of the concept of flexible use airspace. It also specifies the tools and equipment used during the analysis of the SAM ATS route network, analyzes the available statistical data on air traffic movement and fleet capacity, makes a diagnosis of the SAM ATS Route Network, provides a consistent set of proposals to improve the structure of the regional route network, proposes guidelines for the application of techniques for continuous descent operations (CDO), and finally proposes interface guidance between the SAM route network and the route network of adjacent Regions.

1.24 At the time of preparing this safety plan, the program continued to be coordinated by the ICAO Regional Office and analyzed by States and airspace users. While progress has been satisfactory, it still needs to define some of the routes that will be implemented, especially in certain parts of the airspace. Nevertheless, progress has been significant and the safety analysis was performed without any problem.

1.25 Therefore, this SP should be considered a living document that will incorporate, and will be enhanced as necessary with, additional information that will come from SAMIG meetings and particularly the results of the fast-time simulation (FTS) to be conducted in 2013. This simulation can provide additional arguments and evidence to the SP and will be key to demonstrate the acceptably safe performance of the route system in the pre-operational phase.

Chapter 2 Description of the Air Traffic System in the SAM Region

General Situation of the ATS Route System in the SAM region

2.1 The ATS route network is part of the structure and organization of airspace where the recommended facilities, services and air navigation procedures are provided in order to achieve a safe, orderly and efficient flow of air operations. SAM airspace is divided into upper and lower airspace, the limit being set at FL 250. This study applies to the ATS route network in the upper airspace.

2.2 In general, the development of the SAM route network was always based on the specific requirements of isolated routes, without a comprehensive analysis that took into account broader operational requirements and sought a functional relationship between the various elements of the airspace structure, such as ATS routes, control sectors, control areas, TMAs, and others.

2.3 Based on the work done by States and the SAM Implementation Group (SAMIG), with the support of Regional Project RLA/06/901, improvements were introduced to the ATS route network in phases and in route network versions. Phase 2 involved the introduction of Version 01 in March 2011.

2.4 During the implementation of Version 01, the SAMIG identified some difficulties that were taken into account when analyzing Version 02 of the ATS route network and resulted in a series of improvements to Phase 3, Version 02 of the ATSRO program action plan.

2.5 The SAMIG also developed a set of general and planning principles as described below, which were considered for the analysis of Phase 3 Version 02 of the ATS route network. These principles should also be taken into account by airspace planners of the States:

a) request States to participate actively in the international working groups established to plan or review the regional route network in order to develop a harmonized and consistent route network,

b) identify the main regional air traffic flows as well as those that extend beyond the Region and have a direct impact on the regional route network, in order to find gaps in the route network and in the organization of ATC sectors,

c) establish and review the ATS route network and the supporting sectorization to accommodate the main air traffic flows, reducing the complexity of the airspace structure and balancing ATC workload,

d) integrate the required routes to provide access to the regional routes network to/from airports not served by it. It is also necessary to integrate the non-permanent routes required to ease air traffic load on the main ATS routes and to ensure optimum flight profiles,

e) ensure connectivity between the ATS route network to/from TMA airspace,

f) establish a phased implementation to ensure consistency with the implementation by States,

2.6 The SAMIG/8 meeting established planning principles and identified the challenges planners face when designing airspace. Among these challenges, in addition to the expected growth in air traffic, the highlights were:

a) how to meet ATS demands to ensure that sector capacity is maintained at current levels and that delays due to restrictions in terminal airspace are minimized;
b) safety requirements;
c) environmental protection requirements; and
d) the various demands and requirements of airspace users, taking into account the new and diverse user development plans.

2.7 All these guidelines are intended to avoid the tendency to create terminal areas (TMA) independent of the route network. That is to say, planners should consider, together with PANS/OPS procedure designers, the ATC operational requirements, taking into account environmental protection and the associated costs and benefits.

2.8 The systematic application of flexible use of airspace (FUA), the collaborative decision making (CDM) concept and, insofar as possible, the use of techniques for continuous descent operations (CDO) have also been identified as essential in the optimization program.

2.9 Unidirectional routes have been partially used in the Region, since they were considered to be a limiting factor and, except for exceptional cases, there are no parallel route structures with sufficient spacing between route centre lines to facilitate traffic management and consequently, increase airspace capacity.

2.10 Regarding longitudinal separation, the Region applies 10 minutes between aircraft flying at the same cruising level in FIR boundaries, while for vertical separation RVSM is used between flight levels 290 and 410, inclusive.

2.11 Within the airspace under study, air traffic services are provided that include en-route air traffic control services, flight information services, and alert services. In the upper airspace, ground-air communications are available in all the airspace through the use of VHF, and in recent years the availability of surveillance systems has increased significantly in the SAM Region.

2.12 Curently, the route network is based on the application of RNAV 5 routes, but conventional routes are still maintained in order to allow aircraft operations that cannot yet meet this navigation specification. A high percentage of the fleet has autonomous navigation systems available to fly on any desired flight path within the coverage of station referenced navigation aids, or within the limits of autonomous aids, or a combination of both, and a large percentage of the fleet has been approved for RNAV 5. In order to comply with the RNAV 5 specification, the navigation structure maintains fixed radio aids (VOR, VOR/DME).

2.13 Regarding the aeronautical fixed service communications, the Region has a strong AMHS system support and ATS speech circuits through the REDDIG, which ensures communications between ATC units responsible for air traffic services.

2.14 An aeronautical meteorological and aeronautical information service that meets the standards set out in the relevant ICAO Annexes is also available. All the States of the region provide search and rescue services.

2.15 In case of ATS system failure, there are contingency plans that have been duly agreed and harmonized among all the States in the region. In the event of a partial or total interruption of ATS and/or related support services, these contingency plans ensure the continuation of air operations and that major international air routes remain open, contemplating the agreed safety levels.

2.16 In summary, the States in the Region have taken steps to facilitate, establish, and provide traffic services in the airspace under study, in accordance with the provisions of ICAO Annex 11.

Situation after the implemention of Phase 3, Version 02 of the ATS route network

2.17 As noted earlier, the optimization of the SAM route network is being carried out in phases in order to achieve the corresponding operational benefits as early as possible.

2.18 It is expected that the implementation of Phase 3, Version 02 of the ATS route network will favour the necessary conditions for the introduction of substantial improvements for establishing the proper spacing among routes and a significant reduction of CO_2 emissions into the atmosphere by reducing the distances flown by aircraft.

2.19 The application of unidirectional routes will be an advantage for enhancing the airspace structure, leading to an increase in ATC capacity of ATC sectors. The vast majority of ATS routes will be established on a permanent basis. However, there are cases where the application of non-permanent routes, depending on the existence of temporary special use airspace (SUA) may allow the optimization of the airspace structure, either to reduce the the traffic load in the main routes or to allow optimum flight profiles.

2.20 The implementation of Phase 3, Version 02 of the ATS route network is expected to provide, *inter alia,* the following benefits:

- Maintain and / or improve safety levels
- Reduce CO2 emissions to the atmosphere
- Meet the needs of users (civil, military, general aviation, UAS, etc.)
- Operate in direct routes, or as close as possible, between the point of origin/destination of flights
- Reduce the complexity of the airspace structure
- Improve airspace sectorization
- Reduce controller workload
- Improve deficiencies in civil/military cooperation and coordination
- Allow the use of the flexible use of airspace (FUA) concept
- Allow the integration of the regional network with State domestic routes
- Eliminate or reduce bottlenecks where possible
- Avoid ATS redundant routes
- Apply CDM
- Apply CDO wherever possible

2.21 Once Phase 3 Version 02 of the ATS Route Network is implemented, and pursuant to the Performance-based Air Navigation Implementation Regional Plan for SAM (SAM ANIP PB), the Region will be ready to continue with plans to optimize the airspace in the short and medium term.

Chapter 3. General Aspects of Safety Management

3.1 According to the universally accepted definition of the International Civil Aviation Organization (ICAO), safety in civil aviation is the state in which the risk of personal injury or property damage is reduced and maintained at or below an acceptable level, by means of a continuous process of hazard identification and risk management.

3.2 Safety has always been a matter to be considered in all aviation activities. This activity should, at least:

a) Identify safety hazards;

b) Ensure the implementation of the corrective measures necessary to maintain an acceptable level of safety;

c) Provide permanent oversight and regular assessment of safety level achieved; and

d) Continuously improve overall performance of the safety management system.

Risk analysis methodology

3.3 The safety assessment process was carried out in orderly stages or steps as detailed below, following the provisions contained in Doc 9859 SMM:

a) Full description of the system being assessed and of the environment in which the system must operate;
b) Identification of hazards and consequences;
c) Risk assessment, expressed in terms of probability;
d) Risk assessment, expressed in terms of severity;
e) Tolerability index/risk;
f) Risk mitigation; and
g) Prepare safety plan.

Analysis of the hazard identification process

3.4 In the aeronautical activity, hazards are defined as a potential situation that may affect the acceptable level of safety. Materialization of a hazard produces consequences that affect all operational areas, such as: technical aspects, loss of separation between aircraft, flight into terrain and loss of separation between aircraft and obstacles, increased workload in the services, and others. Once the relationship between hazards and their consequences is clearly understood, the next stage can be executed, which involves operational risk management.

3.5 For purposes of safety management, the consequences of hazards are described in operational terms. Many hazards have the potential to produce the final and ultimate consequence (loss of human lives). However, describing the consequences of hazards in extreme terms makes it difficult to design mitigation strategies, except for the cancellation of the operation. In order to design mitigation strategies that address the safety issues underlying low-level and not-extreme operational consequences of the hazard, such consequences are described in operational terms, not in extreme terms (loss of life).

3.6 The hazard identification process identified only the hazards within the scope of the described system that were related to, or were a consequence of, the implementation of Phase 3, Version 02 of the ATS route network. Therefore, system boundaries are defined broad enough to cover all possible repercussions of the system, but always within the setting described above.

3.7 The safety impact of a possible loss or degradation of the analyzed system is determined by the characteristics of the operational environment in which the new scenario or system will be integrated. Therefore, the description of such environment included all factors that could have a significant effect on the safety of the SAM ATS route network.

Hazard Identification Methodology

3.8 As noted above, the methodology used was that described in the ICAO SMM (Doc 9859), which allows for the identification in a logical and sequential way of all possible hazardous situations, making it possible to determine the technical feasibility of the implementation of the ATSRO Program Phase 3 Version 02 of the ATS route network.

3.9 To document this process, a hazard identification and risk assessment (HIRA) form was used, that meets regional needs and was approved by the SAMRA/03 meeting. (See **Appendix A** to this part of the SP).

3.10 It is important to note that the process used for the identification of hazards and specific hazard components has permitted the analysis of all possible alternatives that could have an impact on the implementation of Phase 3, Version 02, going from low incidence up to the most likely scenario, foreseeing the “worst” possible conditions or contexts.

3.11 It is also important to note that the team of experts that carried out the risk analysis recorded hazards making sure they were based on credible or plausible data, according to the context and operational experience of all participants. The list of participants of the SAMRA/03 neeting/workshop appears in **Appendix B** of this part of the SP.

3.12 With the techniques applied in this workshop, it was possible to achieve a structured, multidisciplinary approach, which included the following aspects:

a) The lessons learned in previous implementation processes were taken into account, as well as the planning criteria of the ATSRO program.

b) Plenary sessions have permitted a free and extensive generation of ideas on hazards, as well as a detailed analysis of possible scenarios. This type of sessions could be carried out because there were participants with different operational and technical experience, and the work was done through guided discussions. In the SAM/RA/03 meeting/workshop, a facilitator was appointed who was familiar with teamwork techniques.

c) The experts were representatives validated by each participating State of the Region, with knowledge of the relevant areas of the ATSRO program. The range of knowledge was wide enough to ensure that all aspects of the ATSRO route system were addressed; however, it is also important to note that the group has contributed its operational experience, which facilitated the qualitative analysis.

d) Through the participation of all workshop attendees in the plenary sessions, it was possible to reach a consensus and validate each hazard and its relationship with the consequences, which was documented for the “safety library” of the Region.

Operational risk management process

3.13 At this stage of the process, the background information described in the preceding paragraphs was analyzed and compared, and using this information, the methodology was applied to determine the associated risk level. The analysis was based on two defined variables, namely probability of the occurrence of an event and severity of an event considering the worst foreseeable scenario, based on a qualitative analysis, to finally apply the operational risk matrix and determine what further action could be applied to minimize or efficiently contain operational risks that could result from the implementation of Phase 3, Version 02 of the ATS route network.

Aspects considered to determine risk probability

3.14 For this stage of the study, the matrix proposed in the last version of the SMM was applied, with some amendments resulting from the experience in previous analysis processes and that of the States at regional and global level. The matrix that was reviewed and approved by the SAM/RA/3 meeting/workshop and then used in the safety evaluation is shown below:

Matrix for determining the probability of an event

PROBABILITY MATRIX			
Probability of the event	**Qualitative definition**	**Quantitative definition**	**Equivalent annual/daily quantitative (approx..)**
1. Extremely unlikely	Almost inconceivable that the event will occur	Less than 10^{-9} per hour	One event in more than 100,000 years. Never.
2. Unlikely	Not known to have occurred. Event may be possible.	$10^{-7} – 10^{-9}$ per hour	From once every 1,000 years up to once every 100,000 years
3. Remote	Unlikely to occur during the total operational life of the system	$10^{-5} – 10^{-7}$ per hour	From once every 10 years up to once every 1,000 years
4. Occasional	It has occurred infrequently. (It occurs less than once per interval of exposure and is likely to occur again within that interval)	$10^{-3} – 10^{-5}$ per hour	From once every 40 days up to once every 10 years
5. Frequent	It has occurred frequently. (It occurs once per interval of exposure and is very likely that it will occur again within this interval)	$1 – 10^{-3}$ per hour	From once per hour up to once every 40 days

Aspects considered to determine severity

3.15 At this stage of the process, all hazards and consequences identified are analyzed in order to determine the worst plausible scenario and, based on this point of reference, identify defences to promote a scenario that is more solid and tolerant to operational errors.

3.16 In order to determine this important risk management function, use was also made of the matrix suggested in the SMM as amended based on the experience of the States at regional and global level regarding the meaning of the different severity elements of the event. The matrix used in the severity assessment is shown below:

Severity matrix for safety risks

SEVERITY MATRIX		
SEVERITY	**MEANING**	**VALUE**
Catastrophic	• Accident • Destruction of equipment • Deaths	A
Major	• Severe incident • Major damage to equipment • For the aerodrome, an event that could have caused an accident • There are no safety barriers left. • The results are uncontrolled and may lead to an accident. • Damage to the main facilities of the aerodrome. • Severe injury to the staff and/or the public. • Total loss of ATC capacity (zero ATC)	B
Moderate	• Incident • An incident related to the operation of an aircraft in which the safety of aircraft has been jeopardized, which could have led to an airprox or CFIT • Significant reduction of safety margins • Significant reduction of airspace and/or ATC capacity • Significant reduction of aircraft navigation capacity • The result can be controlled using emergency o non-standard procedures and/or emergency equipment. • Very few safety barriers. • Mild injury to staff and/or public.	C
Minor	• Significant incident indicating that an accident may have occurred if the risk had not been managed within the safety margins. • Significant reduction of safety margins, but several safety barriers remain for the prevention of accidents. • Slight reduction of airspace and/or ATC capacity • Slight reduction of aircraft navigation capacity • Inconveniences to passengers on board the aircraft, the staff or the public. • Significant increase in the workload of ATCO and/or the crew	D
Insignificant	• Slight increase in the workload of ATCO and/or the crew • Safety barriers come into play to prevent the event from becoming an incident or an important accident.	E

Note: The States, when performing the risk analysis, may extend the matrix according to their needs.

Classification of safety risk

3.17 According to the risk assessment process, once the severity assessment of all consequences of the identified hazards has been completed, along with classification of results, they were recorded in the HIRA Form.

3.18 In the fifth stage of the process and after the risk assessment in terms of probability and severity, the safety risk classification matrix shown below was used. This matrix gives more flexibility to the analysis for establishing the risk index or tolerability. Also, as in the previous matrices, this matrix was assessed and approved for use by the SAM/RA/03 meeting/workshop.

Matrix for safety risk classification

TOLERABILITY ASSESSMENT MATRIX					
RISK CLASSIFICATION					
PROBABILITY	SEVERITY				
	Catastrophic A	Major B	Moderate C	Minor D	Insignificant E
Frequent (5)	5A	5B	5C	5D	5E
Occasional (4)	4A	4B	4C	4D	4E
Remote (3)	3A	3B	3C	3D	3E
Unlikely (2)	2A	2B	2C	2D	2E
Extremely Unlikely (1)	1A	1B	1C	1D	1E

Criteria for operational risk mitigation

3.19 Concerning the concept of tolerable risk, it was acknowledged that there is an area between acceptable and unacceptable risk in which the decision regarding acceptability is not clear and decisive. These last risks are part of a category in which risk may be tolerable if reduced to a level as low as reasonably practicable (ALARP).

3.20 In the case of risks classified in the intermediate area (low, medium, high risk) for operational risk mitigation (as shown in the picture below), they are marked as acceptable based on risk mitigation. Risks included in this category were not thoughtlessly classified as tolerable. Each case has been individually examined as stated in the preceding paragraphs, taking into account the costs and benefits to be derived from the implementation of the proposed changes.

Table of criteria for operational risk mitigation

Risk index	Tolerability	Suggested criteria
5A 5B 4A	EXTREME RISK	Immediately stop operations or process. Unacceptable under the current circumstances. No operation is allowed until enough measures are implemented to reduce risk to an acceptable level. It requires CEO approval
5C 4B 3A	HIGH RISK	Attention. Ensure that the risk analysis has been successfully completed and that preventive controls have been implemented. It requires managerial approval before starting the operation or continuing the process
1A 2A 2B 3B 3C 4C 4D 5D 5E	MEDIUM RISK	It is necessary to implement mitigating measures or review the risk. It requires approval at the SMS unit level
1B 1C 2C 2D 3D 3E 4E	LOW RISK	Risk mitigation or review is optional

1D 1E 2E	**ACCEPTABLE RISK**	It is acceptable the way it is. It does not require mitigating actions

APPENDIX A

<table>
<tr><th colspan="3">HAZARD IDENTIFICATION AND RISK ASSESSMENT FORM (HIRA)</th></tr>
<tr><td colspan="2">1. Hazard record ID:</td><td>2. Identification date:</td></tr>
<tr><td colspan="3">3. Hazard description:</td></tr>
<tr><td colspan="3">4. Causes of hazard:</td></tr>
<tr><td colspan="3">5. Consequence of hazard:</td></tr>
<tr><td colspan="3">6. Existing barriers:</td></tr>
<tr><td>7. Probability:</td><td>8. Severity:</td><td>9. Risk Index:</td></tr>
<tr><td colspan="3">10. Mitigation/action proposed:</td></tr>
<tr><td>11. Resulting probability after mitigation:</td><td>12. Resulting severity after mitigation:</td><td>13. Resulting risk Index:</td></tr>
<tr><td colspan="2">14. Entity responsible for applying the proposed mitigation/action:</td><td>15. Date of implementation of the proposed mitigation/ action:</td></tr>
</table>

Explanation of HIRA Form

1. Hazard record ID: Unique code identifying the hazard identified.
2. Date of identification: It indicates the date in which the identified hazard or the occurrence of the event is reported, as applicable.
3. Hazard description: Describe briefly and clearly the identified hazard.
4. Causes: Describe briefly and clearly the causes of hazard.
5. Consequence of hazard: Describe briefly and clearly the possible consequences of the hazard.
   NOTE: a single hazard may generate more than one consequence. Several forms should be used whenever other significant consequences are required to be recorded.
6. Existing barriers: Mitigation currently implemented (if any). If known, it should include the defence(s) currently implemented.
7. Hazard probability: Enter, in coded format and in clear text, the probability index that would be achieved with the existent barriers.
8. Severity: Enter, in coded format and in clear text, the severity index that would be achieved with the existent barriers.
9. Risk level: Enter the risk level estimated with the existent barriers.
10. Proposed mitigation/action: Enter the action(s) or mitigation identified to control this hazard.
11. Resulting hazard probability after mitigation: Enter the resulting probability after the implementation of the actions suggested.
12. Resulting severity after mitigation: Enter resulting severity after the implementation of the proposed action.
13. Resulting risk Index: Enter resulting index after the implementation of the proposed action.

14. Identify the entity or unit responsible for implementing the proposed mitigation or action.
15. Date of implementation of the proposed mitigation or action(s).

APPENDIX B

LIST OF EXPERTS PARTICIPATING AT THE

SAMRA/03 MEETING/WORKSHOP

BOLIVIA

Miguel Ángel Castillo Ochoa

BRAZIL

Enidio Arestides dos Santos

PANAMA

Ricardo Deville

PERU

Fredy Núñez Munárriz
José Víctor Mondragón Hernández
Walter Warthon Ortiz
Renzo Gallegos Begazo
Manuel Fernando Cabredo Castro

URUGUAY

Alberto Raúl Fernández Moyano

VENEZUELA

Carlos Alberto Castañeda Parra

ICAO / ICAO

Celso Figueiredo
Roberto Arca Jaurena
Jorge Fernández Demarco

Chapter 4. Hazard Identification

Generic Hazard Identification

4.1 The work of the multidisciplinary team that attended the SAMRA/3 meeting/workshop served to identify hazards and link them to their consequences, to eventually determine their level of operational risk in order to validate the implementation.

4.2 Taking into consideration the foregoing, experts, in the first place, identified as a generic hazard the implementation of ATS route network Phase 3, Version 2.

Identification of Specific Hazard Components

4.2.1 After establishing the generic hazard, the specific components of hazard that may affect the operation in the new ATS route network were identified.

4.3 In the phase of identification of the hazard components, all possible sources of system failure were studied including air traffic services, aeronautical information, communications, navigation and oversight, aeronautical meteorology and aircraft operators and their navigation and communication systems. Among these sources, the following were considered:

a) equipment (design, logical and physical support);
b) operational environment;
c) regulatory factors, including their application, equipment certification, oversight, etc.;
d) human operators;
e) person-machine interphase;
f) operational practices and procedures;
g) barriers, including factors such as supply of adequate detection and warning systems, error tolerance of the equipment, and capacity of equipment to recover following errors and failures; and
h) organizational factors, such as resource allocation, operational pressures , etc.

4.4 It should be noted that, in this process, hazards within the scope of the system described were identified. Therefore, system limitations comprised all possible repercussions.

4.5 The materialization of a hazard has consequences that affect the operational environment, such as technical aspects, loss of separation, increased workload in services and others. For natural hazards defined as severe turbulence or volcanic ash, the consequences of damage to aircraft components will be immediate. Another aspect to be considered is the degradation of communication systems, thus affecting the integrity of the ATM system.

4.6 From the analysis conducted at the SAMRA/3 meeting/workshop, the following hazards and their respective consequences were identified:

Hazard Description	Consequences
1. Outdated ATS route database not update	Increased flight crew or air traffic control workload
2. Adverse weather conditions	Significant reduction of airspace and/or ATC capacity
3. Special use airspace	Serious incident
4. Failure to apply SAM ATS route network planning criteria	A significant reduction of safety margins
5. Lack of training of ATCOs/pilots in the use of ATS route network	A significant reduction of safety margins
6. Aircraft not capable of maintaining RNAV5 route	A significant reduction of safety margins

Once hazards have been identified, risks are assessed and mitigated as shown in the next Chapter.

Chapter 5 Operational Risk Management Process for the Implementation of the ATS (ATSRO) route network, Phase 3, Version 2

5.1 In this phase of the process, available background information and that defined by experts attending the SAMRA/03 meeting/workshop was analyzed and compared, and based on this validated information, the methodology to determine the level of operational risk for each hazard identified by the group of experts was applied.

5.2 This analysis phase was executed based on two variables: the probability of occurrence of an event and the worst foreseeable scenario defined as the severity of an event, based on a qualitative analysis, to finally apply the operational risk matrices and determine subsequent actions that could be applied and agreed by the panel of experts to efficiently minimize or restrain operational risks in the optimization of the ATS route network.

5.3 Each of the identified hazards is herein explained and **Appendix A** to this part of the Safety Plan includes the HIRA form related to the 6 hazards.

HAZARD 1. OUTDATED ATS ROUTE DATABASE

Note: See Appendix A, FORM HID01

Hazard Description

At present, databases are essential for aircraft navigation in a performance-based navigation (PBN) environment.

But, although a navigation database is not part of the functions required for RNAV 5, the lack of such database requires manual entry of WPTs, which significantly increases the possibility of WPT errors. Route charts should support the verification of serious errors by the flight crew, publishing information on the fixes for the WPTs selected on RNAV 5 routes.

Notwithstanding the above, most of the fleet that operates in the Region has an on-board navigation database. Therefore, these databases must be current and suited for the region where the foreseen operations will be conducted and must include navigation aids, waypoints, and the relevant coded ATS routes for departures, arrivals, and alternate aerodromes.

Navigation databases must be current throughout the flight. If the AIRAC cycle must change during the flight, operators and pilots should establish procedures to ensure the accuracy of navigation data and make sure that navigation facilities used are capable of defining the routes and procedures for the flight.

The navigation database must be obtained from a provider that meets the requirements set forth in Document DO 200 A from RTCA/ED 76 of EUROCAE and should be compatible with the function of the equipment foreseen in Annex 6. The provider of the navigation database must be advised of discrepancies invalidating a route, and the affected routes must be prohibited through a notice from the operator to its flight crew.

Outdated databases can have immediate consequences and affect the air navigation system.

Causes of the Hazard

When assessing the possible or potential causes of the hazard, the following were identified:

1. Failure to publish the AIRAC dates agreed for the implementation of Phase 3, Version 02.
2. Lack of harmonization of geographical coordinates of the points of transfer between adjacent FIRs.
3. Provision to the AIS of information and data lacking the integrity or accuracy required, beyond the publishing deadlines.
4. Failure to meet coordination agreements or processes between States and database providers.
5. Failure to meet coordination agreements or processes between database providers and aircraft operators.
6. Lack of specific regulations for handling navigation databases.

Consequences of the Hazard

The immediate consequence of this hazard would be an increased workload for flight crews or air traffic control.

Existing Barriers

Existing barriers for mitigating the probability and/or severity of the consequences of hazard are listed below, assuming these have been already implemented by all the administrations and organizations involved:

- Annex 4 or the corresponding national regulations
- Annex 15 or the corresponding national regulations
- Oversight system available practically throughout the entire analyzed Region
- Contingency operational procedures
- ATS messaging system
- AIRAC system for AIS publication
- SLAs (service level agreements–State/internal or external navigation database provider)
- Letters of operational agreement (LOAs) between ATC units
- WGS 84 implemented

Estimation of Probability

With the existing barriers, the probability of an event of this nature occurring if all aircraft flying over the airspace in question do not have updated databases would be one for every exposure interval and would quite probably occur again within this interval, being qualified as: **FREQUENT 5.**

Estimation of Severity

A significant increase of ATCO and/or crew workload is qualified as **MINOR D** severity.

Risk Index

Applying the Risk Tolerability Matrix used in this study, a risk index is obtained: **MEDIUM RISK 5D**.

Therefore, it is necessary to implement mitigating measures and to review the risk to reduce its impact.

Mitigation Proposed to Reduce the Risk Index

In order to control and mitigate the safety risks identified, several mitigations aimed at reinforcing defences and reducing safety risks at a level "as low as reasonably practicable" (ALARP) are proposed. Further measures related to the aforementioned causes of the hazard, include:

(**Cause 1**)

- Ensure compliance with AIRAC cycles.

(**Cause 2**)

- Apply the WGS84.
- Ensure coordination between mapping units of adjacent States.

(**Cause 3**)

- Establish and meet the schedule for delivering information and data to the AIS with the integrity and accuracy required for the publication of ATS route network Phase 3, Version 2.
- Apply a Quality Management System (QMS) pursuant to Annex 15.

(**Cause 4**) (**Cause 5**)

- Improve and ensure the establishment of agreements and processes with database providers.

(Cause 6)

- Publish and comply with regulations established by the State related to navigation database handling.

Resulting Probability after Applying Mitigating Measures

After implementing further measures, the probability index is: **4 OCCASIONAL.**

Resulting Severity after Applying Mitigating Measures

The resulting severity is: **INSIGNIFICANT E.**

Resulting Risk Index:
The resulting index after applying mitigating measures is: **LOW RISK 4E**, risk mitigation is acceptable and its revision is optional.

Entity or entities responsible for implementing further measures:

- SAM States.
- ANS providers (ATS/AIS/MET).

HAZARD 2. ADVERSE WEATHER CONDITIONS

Note: See Appendix A, FORM HID02

Hazard Description

The effects related to adverse weather conditions are frequent and affect air navigation worldwide. In adverse weather conditions, such as hurricanes, storms, (CB/TCU), volcanic eruptions, severe turbulence, etc., aircraft, in coordination with air traffic services, seek to avoid those airspaces in order to preserve aircraft safety. Therefore, the ATS route network could be significantly affected; however, it is recognized that adverse weather conditions are independent from the implementation of the ATS route network Phase 3, Version 02.

Although aircraft carry equipment that help minimize weather effects, such as weather radars, deicing equipment, and others, the need to reach and operate in airspaces not affected by adverse weather conditions increases the workload of pilots and controllers and therefore, significantly reduces airspace and ATC capacity. Sometimes, it could also mean the reduction in aircraft navigation capacity depending on the circumstances in which the event occurs.

Causes of the Hazard

The causes identified by the Working Group are referred to:

1. Hurricanes
2. Volcanic eruptions
3. Storms (CB/TCU)
4. Severe Turbulence

Consequences of the Hazard

The immediate consequence of this hazard would be a significant reduction in airspace and/or ATC capacity.

Existing Barriers

Existing barriers to mitigate the probability and/or the severity of the consequences of hazard are listed below, assuming these have already been implemented by all administrations and organizations concerned:

- Annex 3 or the corresponding national regulations
- Weather radars

- On-board equipment to mitigate adverse weather conditions
- MET reports
- MET forecasts
- PIREP
- NOTAMs/ASHTAMs
- Contingency plans
- ATS/MET letters of agreement
- ATC letters of operational agreement
- ATC Procedural Handbook and Operators' Operating Manuals
- Doc 4444 Chapter 15
- Guidance on volcanic ash contingencies
- Guidance on the implementation of ATFM and the CDM concept of the SAM Region

Estimation of Probability

With the existing barriers, the probability of a significant reduction in airspace and/or ATC capacity is occasional and could occur frequently but less than one per interval of exposure to weather conditions and it is quite likely to occur again within that interval, its classification being: **OCCASIONAL 4.**

Estimation of Severity

The significant reduction in airspace and/or ATC capacity is considered to be high-risk severity, as is qualified as **MAJOR B.**

Risk Index

Applying the Risk Tolerability Matrix used in this study, the resulting risk index is: **HIGH RISK 4B.**

Therefore, the hazard must be immediately addressed, making sure preventive controls are implemented or the risk checked in order to reduce its impact.

Proposed Mitigation Measures to Reduce the Risk Index

In order to control and mitigate the identified safety risks, several mitigation measures aimed at reinforcing defences and reducing safety risks to a level "as low as reasonably practicable" (ALARP) are proposed. Further measures related to the aforementioned causes of the hazard include:

(Causes 1, 2, 3 and 4)

- Establish a MET QMS system in accordance with Annex 3.
- Apply ATFM and CDM procedures.

(Causes 1, 2 and 3)

- Improve training in MET aspects for flight crews, ATCOs, operational personnel, and flight dispatchers.
- Apply ATFM measures and the CDM concept.

(Causes 1 and 2)

- Apply contingency plans.

(Causes 1, 2 and 3)

- Apply ATC letters of operational agreement.

(Cause 2)

- Effective exchange of ASHTAM information.
  Incorporate volcanic ash management procedures in ATC letters of operational agreement.
- Incorporate volcanic ash procedures in the operators' operating manuals.

(Cause 4)

- Apply procedures in case of severe turbulence.
- Improve training in MET aspects for flight crews, ATCOs, operational personnel, and flight dispatchers.

Resulting Probability after Applying Mitigating Measures

Considering the new defences introduced, flight safety risks in adverse weather conditions continue to be classified as: **OCCASIONAL 4**.

Resulting Severity after Applying Mitigating Measures

The resulting severity is: **MINOR D.**

Resulting Risk Index:
The resulting index after applying mitigating measures is: **MEDIUM RISK 4D**, which would require approval by the organization's SMS unit.

Entity or entities responsible for implementing further measures:

- SAM States

- ANS (ATS/ MET) providers
- Aircraft operators

HAZARD 3. SPECIAL USE AIRSPACE

Note: See Appendix A, FORM HID03

Hazard Description

The demand for air transportation has multiplied in recent years; therefore, airspace and airport capacity must increase to address this demand.

Within the ATM operational concept, airspace management (ASM) is the process whereby airspace utilization options are selected and applied to meet user needs.

In the South American Region, there are different and sometimes conflicting interests concerning the use of airspace, reason why ASM is such a complex exercise. Moreover, there are activities, whether military or civil, for which a certain volume of airspace needs to be reserved for their exclusive or special use during certain periods of time, due to their flight profile characteristics, the importance of their operations, risks related to operations to be conducted in such airspace, and the need to have an effective and safe separation between them and other types of air activities.

Airspace management must be based on certain principles and strategies, such as application of dynamic flight paths. When conditions require segregation based on different types of operations and/or aircraft, the extent, shape and time schedules of this airspace must be identified in order to minimize the impact on operations, etc.

Therefore, the lack or incorrect definition of special use airspaces and the lack of adequate regulations may lead to a potential risk for air operations.

Causes of the Hazard

The identified causes of the hazard are referred to:

1. Lack of an ATC/civil/military coordination committee or an appropriate organic unit for coordination purposes.
2. Lack of boundaries or errors in the designation of special use areas.
3. Inadequate coordination for airspace restructuring.
4. Complexity of the airspace structure (congestion and number of routes).
5. Lack of operational agreements for the use of procedures in certain airspaces
6. Failure to publish special use areas.

7. Lack of ATC/civil/military coordination for the use of special use airspaces.
8. Failure to meet operational agreements.
9. Failure of communications between the units involved.
10. Inadequate video charts.

Consequences of the Hazard

The potential immediate consequence of this hazard would be a severe incident.

Existing Barriers

The barriers that exist to mitigate the probability and/or the severity of the consequences of the hazard are listed below, assuming these have already been implemented by all the administrations and organizations concerned:

- Annex 11 or the corresponding national regulations.
- Circular 330 AN189 on civil/military cooperation for air traffic management.
- Regional guidelines on the application of the flexible use of airspace (FUA) concept.
- Doc 4444 (PANS/ATM).
- CARSAM/3 recommendations (1999).
- GREPECAS recommendations
- ATSRO program.
- Letters of operational agreement.
- Integrated aeronautical information documentation
- ATC procedural handbooks.
- International agreements.
- Communication systems.
- Surveillance systems.

Estimation of the Probability

With the existing barriers, events affecting civil aviation or civil aircraft that have entered into special use airspaces have occurred infrequently, less than one per exposure interval, and are likely to occur again within this interval. The probability of occurrence of a serious event is **OCCASIONAL 4.**

Estimation of the Severity

A serious incident is classified with a severity: **MAJOR B.**

Risk Index

Applying the Risk Tolerability Matrix used in this safety plan, the resulting risk index is: **HIGH RISK 4B.**

Therefore, it is necessary to make sure that the risk analysis has been satisfactorily completed and additional preventive controls have been implemented.

Proposed Mitigation Measures to Reduce the Risk Index

In order to control and mitigate the identified safety risks, several mitigation measures aimed at reinforcing defences and reducing safety risks at a level "as low as reasonably practicable" (ALARP) are proposed. Further measures related to the aforementioned causes of the hazard, include:

(Cause 1, Cause 7 and Cause 8)

- Effectively implement an ATC/civil/military coordination committee and/or body

(Cause 2, Cause 6)

- Define and publish special use airspaces in the AIP.

(Cause 3, Cause 4)

- Consider airspace complexity in ATC/civil/military coordination.

(Cause 5)

- Prepare and apply complete and structured ATC/civil/military letters of operational agreement.

(Cause 9)

- Establish redundant communication systems where applicable.
- Establish contingency measures in the event of communication failure between the units involved, where applicable.

(Cause 10)

- Update video charts of the surveillance system where applicable.

Resulting Probability after Applying Mitigating Measures

After implementing further measures, the probability index is: **REMOTE 3.**

Severity Resulting after Applying Mitigating Measures

The resulting severity is: **MINOR D.**

Resulting Risk Index:
The resulting index after applying mitigation measures is: **LOW RISK 3D**, risk mitigation is acceptable and its revision is optional.

Entity or entities responsible for implementing further measures:

- SAM States.
- ANS [(ATS/AIS/MET)] providers.

- Military authorities.
- Aircraft operators.

HAZARD 4. FAILURE TO APPLY THE SAM ATS ROUTE NETWORK PLANNING CRITERIA

Note: See Appendix A, FORM HID04

Hazard Description

The SAM airspace optimization program comprises two essential elements, the optimization of the SAM ATS route network and the implementation of performance-based navigation (PBN) according to GREPECAS directions contained in the PBN Roadmap. To facilitate project management, both objectives were included in the SAM ATS Route Network Optimization Program (SAM ATSRO Program).

The ATSRO Program aims at achieving significant improvements in airspace organization and management, using as a reference the Global Air Navigation Plan (GANP) and airspace management (AOM), which offer the necessary guidelines to plan and implement an optimal airspace infrastructure.

It was agreed that the ATSRO Program would be conducted in phases, in order to reach operational benefits as soon as possible and to obtain the necessary experience in each of these phases to facilitate program execution.

In order to execute the program, the SAM Region has identified a set of planning criteria for the ATS route network and has requested the States to follow these planning criteria for a safe and efficient implementation of the ATS route network Phase 3, Version 02.

Failure to apply regional criteria, for example, not ensuring the connectivity of the route network with the TMAs, or failure to apply the established requirements and/or criteria, or failure to analyze sectorization at national level, *inter alia*, may reduce or jeopardize airspace safety.

Causes of the Hazard

The identified causes of the hazard are referred to:

1. Failure to ensure connectivity between the route network and the TMAs.
2. Failure to apply the requirements and/or criteria established in Doc 8168 concerning the establishment of RNAV-5 routes, arrival, approach, and take-off procedures.
3. Lack of a detailed analysis of airspace sectorization.
4. Lack of the proper integration between the domestic route network and the regional network.

5. Failure to review the ATS route network structure with the affected TMAs.
6. Lack of participation and/or continuity of States and organizations in regional implementation groups.
7. Lack of statistics on the aircraft and fleet movements, thus preventing good planning.
8. Insufficient number of ATCOs available.

Consequences of the Hazard

The immediate consequence of this hazard would be a significant reduction in safety margins.

Existing Barriers

The barriers that exist to mitigate the probability and/or the severity of the consequences of the hazard are listed below, assuming these have already been implemented by all the administrations and organizations concerned:

- ATSRO Program (planning criteria developed by the SAMIG).
- Doc 8168 PANS OPS.
- Annex 11 or the corresponding national regulations.
- Doc 9426, ATS Planning Manual.
- Invitations to participate in Project RLA/06/901 and in implementation activities of the regular program and of the project.
- Conclusions and decisions of SAMIG/ATSRO meetings.

Estimation of the Probability

With the existing barriers, the probability of a significant reduction in safety margins due to failure of SAM States to apply the planning criteria of the ATS route network implementation program, Phase 3, Version 02 would be less than one event per exposure interval, and quite likely to occur again within this interval, its classification being: **OCCASIONAL 4.**

Estimation of the Severity

A significant reduction in safety margins is qualified with a severity index: **MODERATE C.**

Risk Index

Applying the Risk Tolerability Matrix used in this study, the resulting risk index is **MEDIUM RISK 4C.**

Therefore, it is necessary to implement additional mitigating measure or review the risk in order to reduce its impact.

Proposed Mitigation Measures to Reduce the Risk Index

In order to control and mitigate the identified safety risks, several mitigation measures aimed at reinforcing defences and reducing safety risks to a level "as low as reasonably practicable" (ALARP) are proposed. Further measures related to the abovementioned causes of the hazard include:

(Cause 1)

- Ensure connectivity between the route network and TMAs through an optimum planning of airspace structure.

(Cause 2)

- Meet the requirements and/or criteria established in Doc 8168 for en-route, TMA, approach and take-off operations.

(Cause 3- Cause 4 -Cause 5 and Cause 6)

- Analyze the airspace sectorization when planning the implementation of Phase 3, Version 02 and verify post-implementation performance.
- Analyze and plan the integration of the domestic route network with the regional network.
- Review the ATS route network structure with the incorporation of the main TMAs of the State.
- Encourage the on-going participation of States and organizations in regional implementation groups.

(Cause 7)

- Develop statistics on aircraft and fleet movement and send that data to the Regional Office in accordance with SAMIG conclusions and decisions.
- Apply and execute the ATSRO action plan.
- Incorporate into the ATSRO program the need for medium-term aircraft movement forecasts for planning purposes.

(Cause 8)

- Have a sufficient number of ATCOs.

Resulting Probability after Applying Mitigating Measures

After implanting further measures, the probability index is: **REMOTE 3.**

Resulting Severity after Applying Mitigating Measures

The resulting severity is: **INSIGNIFICANT E.**

Resulting Risk Index:

The resulting index after applying mitigating measures is: **LOW RISK 3E**, risk mitigation is acceptable and its revision is optional.

Entity or entities responsible for implementing further measures:

- SAM States.
- ANS (ATS) providers.
- SAMIG.

HAZARD 5. LACK OF TRAINING OF ATCOs/PILOTS AND FLIGHT DISPATCHERS IN THE USE OF THE ATS ROUTE NETWORK

Note: see Appendix A, FORM HID05

Description of the Hazard

The participation of safety experts, air traffic controllers, as well as of the pilots and flight dispatchers involved in the ATSRO program since the beginning will permit a better planning of training, with the introduction of two different phases: validation of simulation scenarios and training of controllers and pilots based on validated procedures.

Training provided in advance of the effective date of the new route network and its associated procedures will reduce the impact on air traffic due to the introduction of Phase 3, Version 02 of the ATS route network, especially in those areas where new routes, parallel routes based on RNAV 5, and possibly changes in coordination procedures between adjacent ATC units will be applied. Although the proposed changes may not be significant, it is absolutely necessary to train the personnel on the proposed new routes and procedures and to make them deeply aware of what the implementation entails.

Failure to meet the publication dates, as well as the lack of resources and prioritization of training for ATCOs, pilots, and flight dispatchers prior to implementation could result in a significant impact and a reduction of safety margins.

Also, upon analyzing the ATSRO program, it was noted that its action plan did not define a task on personnel training prior to the effective implementation of Phase 3, Version 02. Therefore, it would be necessary to include that task in the action plan, and also in the national action plans of the States.

Causes of the Hazard

The identified causes of the hazard are referred to:

1. Failure to meet the publication dates.
2. Lack of a plan and failure to provide training.
3. Lack of resources (financial, personnel, material, technological, etc.) and their allocation for training as a matter of priority.

Consequences of the Hazard

The immediate consequence of this hazard could be a significant reduction of safety margins.

Existing Barriers

The barriers that exist to mitigate the probability and/or severity of the consequences of the hazard are listed below, assuming that they have already been implemented by all administrations and organizations concerned:

- Annex 1 or the corresponding national regulations.
- Integrated aeronautical information documentation.
- Training programs.
- Resources and their allocation for training as a matter of priority (financial, personnel, material, technological, etc.).
- Surveillance and communications system.
- ATSRO program.
- Regional guidelines on training.
- Meetings of the directors of civil aviation training centres (CATCs) to address training issues.

Estimation of the Probability

With the existing barriers, the probability that the lack of training of ATCOs/pilots and aircraft dispatchers in the use of the ATS route network will result in a significant reduction in safety margins is less than one per exposure interval and quite likely to occur again within that interval, its classification being: **OCCASIONAL 4.**

Estimation of the Severity

The lack of training of ATCOs/pilots and aircraft dispatchers in the use of the ATS route network is classified with a severity: **MODERATE C.**

Risk Index

Applying the Risk Tolerability Matrix used in this study, the resulting risk index is: **MEDIUM RISK 4C.**

Therefore, it is necessary to implement additional mitigating measures or review the risk in order to reduce its impact.

Proposed Mitigation to Reduce the Risk Index

In order to control and mitigate the identified safety risks, several mitigation measures aimed at reinforcing defences and reducing safety risks to a level "as low as reasonably practicable" (ALARP) are proposed. Further measures related to the aforementioned causes of the hazard include:

(Cause 1)

- Meet the publication dates in accordance with the ATSRO action plan.

(Cause 2)

- Incorporate the training activity in the national action plans and in the regional action plan for the implementation of Phase 3, Version 02.
- Develop and implement a theoretical and practical (simulation) training program (simulación) on a date suitable for the implementation of Phase 3, Version 02.
- Analyse regional implementation programs at CATC meetings and plan training based on those programs.

(Cause 3)

- Have available the necessary resources (personnel, financial, material, technological, etc.) for timely implementation of the training plan, and assign priority to training according to operational requirements.

Resulting Probability After Applying Mitigating Measures

After implementing further measures, the probability index is: **REMOTE 3.**

Resulting Severity After Applying Mitigating Measures

The resulting severity is: **INSIGNIFICANT E.**

Resulting Risk Index:
The resulting index after applying mitigating measures is: **LOW RISK 3E**, risk mitigation is acceptable and its revision is optional.

Entity or entities responsible for implementing further measures:

- SAM States.
- ANS providers (ATS/AIS).
- SAMIG.
- CATCs.
- Aircraft operators.

•

HAZARD 6. INABILITY OF THE AIRCRAFT TO MAINTAIN THE RNAV 5 ROUTE

Note: see Appendix A, FORM HID06

Description of the Hazard

The inability of the aircraft to maintain the approved RNAV 5 route may be due to different causes, for example, aircraft without RNAV approval, in-flight loss of on-board RNAV capacity, lack of ground-based navaid or GNSS coverage, including events caused by weather conditions, etc.

Also, as noted when analysing Hazard 1, outdated on-board databases could also have serious consequences on navigation.

Any of these alternatives could cause the aircraft to be unable to maintain the RNAV route approved by the ATC, which could result in a reduction of the safety margins.

Causes of the Hazard

1. Failure of the GNSS.
2. Loss of RNAV 5 capacity of the aircraft due to failure of on-board navigation systems d.
3. Loss of RNAV 5 capacity of the aircraft due to failure of ground navigation systems.
4. Weather contingencies.
5. Outdated on-board database.
6. Aircraft without RNAV 5 approval.
7. Solar storms.

Consequences of the Hazard

The immediate consequence of this hazard would be a significant reduction of safety margins.

Existing Barriers

The barriers that exist to mitigate the probability and/or severity of the consequences of the hazard are listed below, assuming that they have already been implemented by all administrations and organizations concerned:

- Regional RNAV 5 implementation program.
- Advisory circular RNAV 5 (CA: 91-002).
- RNAV 5 approval process for aircraft and operators.
- RAIM.
- GNSS.
- ATS surveillance system.
- Ground-based navigation aids.
- MET reporting systems.
- Volcanic ash reporting systems.
- Safety oversight program for aircraft operators.
- DME/DME coverage study.
- RAIM and FDE availability prediction.
- New FPL format.
- Procedures to revert to conventional systems in the event of a navigation failure.
- Operators’ operating manuals and ATC procedural handbooks.

Estimation of Probability

With the existing barriers, the probability that an aircraft unable to maintain the RNAV 5 route approved by the ATC could generate a significant reduction in safety margins would be less than one per exposure interval and quite likely to occur again within this interval, its classification being: **OCCASIONAL 4.**

Estimation of the Severity

A significant reduction in safety margins is classified with a severity: **MODERATE C.**

Risk Index

Applying the Risk Tolerability Matri used in this study, the resulting risk index is: **MEDIUM RISK 4C.**

Therefore, it is necessary to implement additional mitigating measures or review the risk in order to reduce its impact.

Proposed Mitigation to Reduce the Risk Index

In order to control and mitigate the identified safety risks, several mitigation measures aimed at reinforcing defences and reducing safety risks to a level "as low as reasonably practicable" (ALARP) are proposed. Further measures related to the aforementioned causes of the hazard include:

(Cause 1)

- Revert to another navigation system.

(Cause 2, Cause 3, Cause 4 and Cause 6)

- Establish and apply contingency procedures for operators and ATC.

(Cause 5)

- Ensure the updating of databases (see Hazard 1 on updated databases).

.

(Cause 7)

- Implement a regional RAIM and FDE availability prediction service.

Resulting Probability After Applying Migitating Measures

After implementing further measures, the probability index is: **OCCASIONAL 4.**

Resulting Severity After Applying Mitigating Measures:

The resulting severity is: **INSIGNIFICANT E.**

Resulting Risk Index:
The resulting index after applying the mitigating measures is: **LOW RISK 4E**, risk mitigation is acceptable and its revision is optional.

Entity or entities responsible for implementing further measures:

- SAM States.
- ANS providers (ATS/AIS/CNS/MET).
- Aircraft operators.

APPENDIX A

<table>
<tr><th colspan="3">HAZARD IDENTIFICATION AND RISK MANAGEMENT (HIRA) FORM</th></tr>
<tr><td colspan="2">1. Hazard record ID: HID01</td><td>2. Date of identification: 4/09/12</td></tr>
<tr><td colspan="3">3. Description of the hazard: Outdated ATS route database</td></tr>
<tr><td colspan="3">4. Causes of the hazard:
1) Failure to comply with the agreed AIRAC publication dates for the implementation of Phase 3, Version 02
2) Lack of harmonization of geographical coordinates of the points of transfer between adjacent FIRs
3) Provision to the AIS of information and data lacking the integrity and precision required and beyond the publication dates
4) Failure to comply with coordination agreements or processes between States and database providers
5) Failure to comply with coordination agreements or processes between database providers and aircraft operators
6) Lack of specific regulations for the management of navigation databases</td></tr>
<tr><td colspan="3">5. Consequence of the hazard:
Increased workload of the flight crew or air traffic control</td></tr>
<tr><td colspan="3">6. Existing barriers:
• Surveillance system
• Operational contingency procedures
• ATS messaging system
• AIRAC system for AIS publication
• SLAs (Service level agreements –State/internal or external navigation database providers)
• Letters of operational agreement (LOAs) between ATC units
• WGS 84
• Annex 4
• Annex 15</td></tr>
<tr><td>7. Probability:
FREQUENT 5</td><td>8. Severity:
MINOR D</td><td>9. Risk Index:
MEDIUM RISK 5D</td></tr>
<tr><td colspan="3">10. Proposed mitigation/action:
(Cause 1)
Enure compliane with AIRAC cycles
(Cause 2)
Apply WGS84
Ensure coordination between mapping units of adjacent States
(Cause 3)
Establish and meet the timetable for the delivery to the AIS of information and data with the integrity and precision required for publication of Phase 3, Version 2 of the</td></tr>
</table>

ATS route network Apply a quality management system (QMS) in accordance with Annex 15 (**Cause 4**) (**Cause 5**) Improve and ensure the establishment of agreements and processes with database providers **(Cause 6)** Publish and comply with the regulatios established by the State concerning management of navigation databases		
11. Resulting probability after mitigation: OCCASIONAL 4	**12. Resulting severity after mitigation:** INSIGNIFICANT E	**13. Resulting risk index:** LOW RISK 4E
14. Responsible entity: • SAM States, ANS providers (ATS/AIS/MET)		**15. Date of implementation of the proposed mitigation/action:** 31/07/13

HAZARD IDENTIFICATION AND RISK MANAGEMENT (HIRA) FORM		
1. Hazard record ID: HID02		**2. Date of identification: 5-09-12**
3. Description of the hazard: Adverse weather conditions		
4. Causes of the hazard: 1) Hurricanes 2) Volcanic eruptions 3) Storms (CB/TCU) 4) Severe turbulence		
5. Consequence of the hazard: Significant reduction of airspace and/or ATC capacity		
6. Existing barriers: • Annex 3 or the corresponding national regulations • Weather radars • MET reports • MET forecasts • PIREPs • NOTAMs/ASHTAMs • Contingency plans • ATS/MET letters of agreement • ATC letters of operational agreement • ATC procedural handbook and operators' operating manuals • Doc 4444 Chapter 15 • Air Traffic Management (ATM) Volcanic Ash Contingency Plan template • Guidelines for the implementation of ATFM and the CDM concept in the SAM Region		
7. Probability: 4 Occasional	**8. Severity:** B Major	**9. Risk Index:** 4B High risk
10. Proposed mitigation/action: (Causes 1,2,3, and 4) Establish a MET QMS system in accordance with Annex 3. Application of ATFM procedures and the CDM concept (Causes 1,2, and 3) Improve MET training for flight crews, ATCOs, operational personnel, and flight dispatchers. Apply ATFM measures and the CDM concept (Causes 4) Apply procedures in the event of severe turbulence Improve traning in MET aspects for flight crews, ATCOs, operational personnel, and flight dispatchers. (Cause 2) Exchange ASHTAM information in an effective manner Incorporate volcanic ash management procedures into ATC letters of operational agreement Incorporate volcanic ash procedures into the operators' operating manuals (Causes 1 and 2) Apply contingency plans (Causes 1,2, and 3) Apply ATC letters of operational agreement		
11. Resulting probability after mitigation: Occasional 4	**12. Resulting severity after mitigation:** Minor D	**13. Reulting risk Index:** Medium risk 4D
14. Responsible entity: • SAM States • ANS providers (ATS//MET) • Aircraft operators		**15. Date of implementation of the proposed mitigation/action:** 31/07/13

HAZARD IDENTIFICATION AND RISK MANAGEMENT (HIRA) FORM		
1. Hazard record ID: HID03		**2. Date of identification: 05/09/12**
3. Description of the hazard: Special use airspaces		
4. Causes of the hazard: 1) Lack of an ATC/civil/military coordination committee or organic unit charged with coordination. 2) Lack of definition in the designation of special use areas 3) Inadequate coordination for the restructuring of airspace 4) Complexity of airspace structure (congestion and number of routes) 5) Failure to develop operational agreements for applying procedures in given airspaces 6) Failure to publish special use areas 7) Lack of ATC/civil/militar coordination for the use of special use airspaces 8) Failure to comply with operational agreements 9) Lack of means of communication between the units involved 10) Inadequate video charts		
5. Consequence of the hazard: Serious incident.		
6. Existing barriers: • Annex 11 • Circular 330 AN189 on civil/military cooperation for air traffic management. • Regional guidelines for the application of the flexible use of airspace (FUA) concept • Doc 4444 (PANS/ATM) • CARSAM/3 recommendations (1999) • GREPECAS recommendations • ATSRO program • Letters of operational agreement • Integrated aeronautical information documentation • ATC procedural handbooks • International agreements • Communication systems • Surveillance systems		
7. Probability: Occasional 4	**8. Severity:** Major B	**9. Risk Index:** HIGH RISK 4B
10. Proposed mitigation/action: (Cause 1, Cause 7, and Cause 8) Effective implementation of an ATC/civil/military coordination committee and/or body (Cause 2, Cause 6) Define and publish in the AIP the special use airspaces (Cause 3, Cause 4) Consider airspace complexity in ATC/civil/military coordination (Cause 5) Develop and apply complete and structured ATC/civil/military letters of operational agreement (Cause 9) Establish redundant communication systems where applicable Establish contingency measures in the event of communication failure between units concerned, where applicable (Cause 10) Update video charts of surveillance systems where applicable		
11. Resulting probability after mitigation: 3. Remote	**12. Resulting severity after mitigation:** D Minor	**13. Resulting risk Index:** 3D LOW RISK

14. Responsible entity: • SAM States • ANS providers (ATS/AIS/MET) • Military authorities • Aircraft operators	**15. Date of implementation of the proposed mitigation/action:** 31/07/13

<table>
<tr><td colspan="3">HAZARD IDENTIFICATION AND RISK MANAGEMENT (HIRA) FORM</td></tr>
<tr><td colspan="2">1. Hazard record ID: HID04</td><td>2. Date of identication: 5/9/12</td></tr>
<tr><td colspan="3">3. Description of the hazard: Failure to apply SAM ATS route network planning criteria</td></tr>
<tr><td colspan="3">4. Causes of the hazard:
1) The connectivity of the route network with TMAs is not guaranteed
2) Failure to apply the requirements and/or criteria established in Doc 8168 regarding the development of RNAV-5 routes, and arrival, approach, and take-off procedures.
3) Airspace sectorization is not analyzed in detail
4) The domestic route network and the regional route network are not properly integrated
5) Failure to review the structure of the ATS route network with the affected TMAs
6) Failure of States and organisations to participate in, and/or continue with, regional implementation groups
7) There are no statistics on aircraft and fleet movement, thus preventing good planning
8) Insufficient ATCOs available.</td></tr>
<tr><td colspan="3">5. Consequences of the hazard: Significant reduction of safety margins</td></tr>
<tr><td colspan="3">6. Existing barriers:
• ATSO Program (planning criteria developed by the SAMIG)
• Doc 8168 PANS OPS
• Annex 11
• Doc 9426
• Invitations to participate in Project RLA 06/901 and in activities related to the execution of the regular program and the project
• Conclusions and decisions of SAMIG/ATSRO meetings</td></tr>
<tr><td>7. Probability:
OCCASIONAL 4</td><td>8. Severity:
Moderate C</td><td>9. Risk Index:
MEDIUM RISK 4C</td></tr>
<tr><td colspan="3">10. Proposed mitigation/action:
(Cause 1)
Ensure the connectivity of the route network with TMAs through optimum planning of the airspace structure
(Cause 2)
Meet the requirements and/or criteria established in Doc 8168 regarding en-route, TMA, approach, and take-off operations
(Cause 3- Cause 4 -Cause 5, and Cause 6)
Analyze airspace sectorization during the planning of Phase 3, Version 02, and verify post-implementation performance.
Study and plan the integration between the domestic routes and the regional network
Review the structure of the ATS route network with the incorporation of the main TMAs
Continuous participation by States and organisations in regional implementation groups
(Cause 7)
Prepare statistics on aircraft and fleet movements and send this information to the Regional Office, pursuant to the conclusions and decisions of the regional implementation groups
Apply the ATSRO action plan
Incorporate in the ATSRO program the need for medium-term aircraft movement forecasts for planning purposes
(Cause 8)
Have sufficient number of ATCOs</td></tr>
<tr><td>11. Resulting probability after mitigation:
Remote 3</td><td>12. Resulting severity after mitigation:
Insignificant E</td><td>13. Resulting risk index:
LOW RISK 3E</td></tr>
</table>

14. Responsible entity:

- SAM States
- ANS (ATS) providers
- SAMIG

15. Date of implementation of proposed mitigation/action: 31/07/13

HAZARD IDENTIFICATION AND RISK MANAGEMENT (HIRA) FORM

1. Hazard record ID: HID05

2. Date of identification: 06/09/12

3. Description of the hazard: **ATCOs/pilots lack training in the use of the ATS route network**

4. Causes of the hazard:

1) Failure to meet publication dates
2) Lack of plan and training implementation
3) Lack of resources (financial, personnel, material, technological, etc.) and prioritization of training

5. Consequences of the hazard: Significant reduction in safety margins

6. Existing barriers:

- Integrated aeronautical information system (IAIP)
- Training programs
- Lack of resources (financial, personnel, material, technological, etc.) and prioritization of training
- Annex 1 or the corresponding national regulations
- Surveillance and communication system
- ATSRO program
- Regional guidelines
- CATC directors’ meetings

7. Probability:	8. Severity:	9. Risk Index:
OCCASIONAL 4	Moderate C	MEDIUM RISK 4C

10. Proposed mitigation/action:

(Cause 1)

Comply with the publication dates, in accordance with the ATSRO action plan

(Cause 2)

Incorporate a training activity in the national action plans and in the regional plan for the implementation of Phase 3, Version 02

Develop and execute a theoretical and practical (simulation) training program on a date suitable for the implementation of Phase 3, Version 02

CATC meetings should analyze regional implementation programs and schedule training bsed on such programs

(Cause 3)

Have the resources necessary (financial, personnel, material, technological, etc.) for timely implementation of the training program and determine the priority to be assigned to training based on operational requirements

11. Resulting probability after mitigation:	12. Resulting severity after mitigation:	13. Resulting risk index:
Remote 3	Insignificant E	LOW RISK 3E

14. Responsible entity:

- SAM States
- ANS (ATS/AIS) providers
- CATCs
- Aircraft operators
- SAMIG

15. Date of implementation of proposed mitigation/action: 31/07/13

HAZARD IDENTIFICATION AND RISK MANAGEMENT (HIRA) FORM		
1. Hazard record ID: HID06		**2. Date of identification: 07/09/12**
3. Description of the hazard: Inability of aircraft to maintain RNAV5 route		
4. Causes of the hazard: 1) Failure of GNSS 2) Loss of RNAV 5 capacity of the aircraft due to failure of airborne navigation systems 3) Loss of RNAV 5 capacity of the aircraft due to failure of ground navigation systems 4) Weather contingencies 5) Outdated airborne database 6) Aircraft not approved for RNAV 5 7) Solar storms		
5. Consequences of the hazard: Significant reduction in safety margins		
6. Existing barriers: • Regional RNAV 5 implementation program • Advisory circular on RNAV 5 (CA 91-002) • RNAV 5 approval process for aircraft and operators • RAIM • GNSS • Surveillance system • Ground navigation aids • MET reporting systems • Volcanic ash reporting systems • Safety oversight program for aircraft operators • DME/DME coverage study • RAIM and FDE availability prediction • New FPL format		
7. Probability: OCCASIONAL 4	**8. Severity:** Moderate C	**9. Risk index:** MEDIUM RISK 4C
10. Proposed mitigation/action: (Cause 1) Revert to another navigation system (Cause 2, Cause 3, Cause 4, and Cause 6) Establish and apply contingency procedures for operators and ATC (Cause 5) Ensure the updating of the database (see Hazard 1) (Cause 7) Implement regional RAIM and FDE availability prediction service		
11. Resulting probability after mitigation: OCCASIONAL 4	**12. Resulting severity after mitigation:** Insignificant E	**13. Resulting risk index:** LOW RISK 4E
14. Responsible entity: • SAM States • ANS providers (ATS/AIS/CNS/MET) • Aircraft operators		**15. Date of implementation of poposed mitigation/action: 31/07/13**

Chapter 6 Conclusions and Recommendations

Conclusions

6.1 The existing SAM ATS route network, with the available air traffic services, communication, navigation, and surveillance systems, all the aeronautical and meteorological information, and all the ATM supporting systems are sufficient for the safe and efficient conduction of air operations in the route network of the Region.

6.2 Based on the risk analysis performed in this safety plan, it could be said that the hazards identified and the consequences associated to these hazards as the reason for the implementation of the ATS route network Phase 3, Version 02 are at a relatively acceptable level with the existing barriers, none of them is considered extremely risky, and two have a high level of risk, and have barriers to reduce their impact.

6.3 Within the implementation of Phase 3, Version 02, new concepts apply, such as the flexible use of airspace or the spacing of parallel routes under the RNAV 5 concept, or continuous descent operations, which could eventually increase risk regarding certain hazards if no additional measure is taken.

6.4 The identified hazards, along with the existing barriers and additional barriers proposed do not exceed the low risk index. Accordingly, they can be considered to be within acceptable levels, except for adverse weather conditions that have a medium risk level, recognizing however that weather conditions are independent from the implementation of the ATS route network Phase 3, Version 02.

6.5 In connection with the ATS route network Phase 3, Version 02, a table with a summary of the risk index calculated for each hazard is shown below as a reference, together with its consequences before mitigation, and the risk index calculated after mitigation or implementation of the proposed actions.

Summary Table with the Calculated Risk Index

Hazard identified if Phase 3, Version 02 is implemented	Risk index before mitigation	Risk index after mitigation
1. Outdated ATS route database	FREQUENT 5 MINOR D **MEDIUM RISK 5D**	OCCASIONAL 4 INSIGNIFICANT AND **LOW RISK 4E**
2. Adverse weather conditions	OCCASIONAL 4 MAJOR B **HIGH RISK 4B**	OCCASIONAL 4 MINOR D **MEDIUM RISK4D**
3. Special use airspaces	OCCASIONAL 4 MAJOR B **HIGH RISK 4B**	REMOTE 3 MINOR D **LOW RISK 3D**
4. Failure to apply ATS SAM route network planning criteria	OCCASIONAL 4 MODERATE C **MEDIUM RISK 4C**	REMOTE 3 INSIGNIFICANT AND **LOW RISK 3E**

Hazard identified if Phase 3, Version 02 is implemented	Risk index before mitigation	Risk index after mitigation
5. Lack of training of ATCOs/pilots in the use of the ATS route network	OCCASIONAL 4 MODERATE C **MEDIUM RISK4C**	REMOTE 3 INSIGNIFICANT AND **LOW RISK 3E**
6. Inability of the aircraft to maintain RNAV5 route	OCCASIONAL 4 MODERATE C **MEDIUM RISK4C**	OCCASIONAL 4 INSIGNIFICANT AND **LOW RISK 4E**

6.6 As a result of the analysis performed, it may be concluded that with the existing barriers, the implementation of the ATSRO route network, Phase 3, Version 02 does not entail any major inconveniences and will not generate any additional hazards to the existing airspace structure, and that the hazards and their consequences are duly controlled. Nevertheless, with the implementation of a new version of the route network with a structure that is different from the existing one, opportunities for improvement were identified to enhance and preserve safety standards through the implementation of the measures proposed in this document and detailed under Chapter 5. This will permit the optimization of safety in the new operational environment contributing to the attainment of the strategic objectives set out in the regional performance-based air navigation implementation plan.

Recommendations

6.7 The commitment of the States and organisations of the Region, whether civil aviation authorities (CAAs), air navigation service providers (ANSPs), operators, or airspace users, is necessary for the implementation of the ATS route network, Phase 3, Version 02 in the SAM Region. Consequently, all parties involved must be strongly committed with the execution of the action plan of the ATSRO program and particularly with the implementation of the national plans for the implementation of enhancements to the ATS route network, as approved by the Region.

6.8 **Civil aviation authorities** must ensure that the proposed actions are completed prior to the implementation of Phase 3, Version 02 in order to maintain the risk index at acceptable levels, and conduct a specific follow up and continuous monitoring of preparedness activities to be carried out by air navigation service providers, aircraft operators, and the various airspace users, coordinating and assisting as necessary all stakeholders in this process.

6.9 Likewise, they should commit to the development, approval, and publication, on the dates defined in the regional and national action plan, of rules, regulations, advisory circulars, and other documentation containing guidelines and procedures for the implementation of the ATS route network, Phase 3, Version 02, that will assist the ATM community to fulfill the regional agreements.

6.10 If applicable, they shall have an adequate number of duly trained human resources, as well as technological and financial resources for the implementation of the action plan. As an additional measure, the authorities, where applicable, must hold seminars, workshops, and courses, publish bulletins, and post on their websites sufficient information on the expected changes and the required documentation.

6.11 The mitigation measures proposed are mostly associated with regulatory aspects and the training of personnel involved. Although these measures have an associated cost, the figures do not prevent the efficient implementation of the ATSRO program.

6.12 CAAs must exchange safety data and relevant information at regional level, which, in the medium and long term, will result in better regional safety policies and will permit the definition and promotion of better performance indicators for the Region.

6.13 Furthermore, any aircraft navigation deviation shall be recorded and investigated, whether such deviations are technical and/or operational in nature. Regional experience concerning vertical navigation deviations and the number of such deviations shows that most are related to operational causes and coordination errors between adjacent ATCs. This leads to think that potentially, and for the same reasons, there could be lateral deviations that should be taken into account by civil aviation authorities.

6.14 In case this type of lateral navigation deviations is detected, the States should continue with the firm commitment to enact contingency measures to minimize such operational errors.

6.15 Likewise, and to the extent necessary, the States must establish training programs for operational personnel and conduct continuous safety oversight in ATC units.

6.16 **Aircraft operators.** Although this safety plan is not directly intended for aircraft operators, they, in turn, will have to perform a risk analysis of the operation of the new ATS route network. Aircraft operators shall promote and apply the exchange of safety data at the regional level in order to develop a database of performance indicators for the Region and to provide the necessary information to identify specific lateral deviations that could affect safety levels in the Region.

6.17 Regarding regulations, aircraft operators shall update their contingency plans and programs in order to operate in an optimized ATS route environment, as necessary.

6.18 Concerning training, they shall encourage recurrent training of pilots and aircraft dispatchers in operations in ATS routes, using navigation system failure simulation and exercises for timely identification if failures that affect or could affect aircraft capacity to maintain RNAV 5 routes, and in the efficient application of contingency procedures as applicable.

6.19 **Air navigation service providers (ANSPs)** must carefully apply mitigation measures and the proposed action to reduce risk indices. As may be noted in this safety plan, most of the measures proposed are related to the operation and are geared to the ANSPs.

6.20 In general, these measures seek to improve the provision of ATS, AIS, CNS, and MET services; optimize coordination between adjacent ATCs; encourage recurrent training of staff; use simulations with standard scenarios and contingency program exercises, with a view to timely identifying failures affecting the capacity of the units.

6.21 As to regulations, update the CAA contingency plans and programs required to operate in an optimized ATS route environment. Promote oversight and eliminate operational errors between ATC units, one of the main causes that significantly increase risk to operations in the Region.

6.22 They shall also verify and implement the appropriate measures concerning communications, navigation, and surveillance, as well as in ARO/AIS units, particularly in connection with timing, accuracy, and reliability of data to be inserted in aeronautical information publications. The implementation of a quality system in aeronautical information services is a key element to ensure the quality and accuracy of data to be inserted in aircraft databases. In this same sense, and in order to have accurate and timely meteorological information, the States that have not yet done so should focus on implementing a quality management system in their MET units.

6.23 ANSPs are encouraged to exchange safety data to permit the definition and establishment of performance indicators in the Region, and to provide information on the identification and establishment of specific lateral deviations that affect operations in the Region.

6.24 The **South America Implementation Group (SAMIG)** shall do a follow up both before and after the implementation of the ATS route network, Phase 3, Version 02 in order to first verify that the mitigation measures and actions proposed in the safety plan have been adopted by the parties concerned, and subsequently, once Phase 3, Version 02 has been implemented, if the proposed mitigating measures have yielded the expected results and make sure no additional hazards have been introduced to the ATS route system.

6.25 As may be noted, work will not be finished, not even after the plan has been defined and delivered to the organizations and individuals responsible for leading the implementation. Implementation activities must be followed closely and continuously to make sure that measures are introduced, obstacles to implementation are eliminated, and attention continues focused on any new hazard that is identified.

6.26 Likewise, the SAMIG shall include an activity related to personnel training in the action plan for the implementation of Phase 3, Version 02. This training shall be provided before the entry into force of the new ATS route network.

6.27 The SAMIG shall make sure that the FTS foreseen in the action plan to be carried out in 2013 is conducted. This simulation shall provide valuable information on the performance of the new route system in the pre-operational phase.

6.28 In turn, the **ICAO South American Regional Office** will continue to offer its full support to the implementation of Phase 3, Version 02 of the ATS route network, by organizing regional events and facilitating the participation of States, ANSPs, aircraft operators, and users in general. Furthermore, the Regional Office, together with the States that are having difficulties in implementing the ATSRO program, should review the assistance mechanisms, whether specific missions or personnel training.

6.29 It should be stressed that the purpose of this safety assessment is for use by States as reference material. It is worth noting that this safety assessment does not replace the responsibility of the States to conduct their own safety assessment following the implementation of the ATS route network, Phase 3, Version 02, as established in the action plans related to this topic.

6.30 The remarks, conclusions, and mitigation measures proposed in this safety plan must be kept as part of the safety library of the Region and will serve as a baseline to record the improvements to be suggested in the future concerning risk management and the safety level achieved by the SAM Region.

Bibliography

Annex 3, Meteorological Service for International Air Navigation
Annex 11, Air Traffic Services
Annex 10, Aeronautical Telecommunications
Annex 15, Aeronautical Information Services
CAR/SAM Air Navigation Plan
Performance-based Air Navigation Implementation Plan for the SAM Region
Doc 4444, Procedures for Air Navigation Services - Air Traffic Management
Doc 9613, Performance-Based Navigation (PBN) Manual
Doc 9750, Global Air Navigation Plan
Doc 9854 AN/458 Air Traffic Management Operational Concept
Doc 9859, Safety Management Manual
Doc 9331, Continuous Descent Operation (CDO)
Circular 330, Civil/Military Cooperation for air traffic management
GREPECAS meeting reports
SAMIG meeting reports
ATSRO Meeting Reports
ATS Route Network Optimisation Program
Regional Project RLA 06/901
CAP 760, Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases (UK)
SAM regional guidance for the application of the flexible use of airspace (FUA)
SAM regional guidance for the application of the collaborative decision-making concept (CDM)

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APPENDIX E

Project RLA 06/901
Assistance for the implementation of a regional ATM system based on the ATM operational concept and the corresponding technological support for communications, navigation, and surveillance (CNS)

GUIDANCE FOR THE IMPLEMENTATION OF FLEXIBLE USE OF AIRSPACE (FUA) CONCEPT IN THE SOUTH AMERICAN REGION

First Edition
April 2012

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Guidance for the Implementation of Flexible Use of Airspace (Fua) Concept in the South American Region

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PREFACE

The Guidance for the Implementation of the Flexible Use of Airspace (FUA) Concept at ICAO South American Region (Guidance FUA / SAM) is published by the ICAO's South American Regional Office on behalf of ICAO's South American Regional Implementation Group (SAMIG). It considers the different aspects that States should take into account for the coordination and cooperation between civil and military air traffic, recognizing that the airspace is a common resource of civil and military aviation, that allows to achieve safety, consistency and efficiency of civil aviation and to meet military air traffic requirements through the implementation of dynamic airspace.

The Regional Office, on behalf of SAMIG shall publish revised versions of the SAM/FUA Guidance needed to keep a duly updated document.

You can request copies of the SAM/FUA Guidance at:

ICAO's SAM OFFICE LIMA, PERU

E-mail	:	mail@lima.icao.int
Website	:	www.lima.icao.int
Tel:	:	+511 6118686
Fax	:	+511 6118689
Address	:	P.O. Box 4127, Lima 100, Peru
Contact e-mail	:	***cfigueiredo@lima.icao.int*** ***rlarca@lima.icao.int***

This edition (*Version 0.0)* includes all other revisions and amendments as of April 2011. Subsequent amendments and corrigenda shall appear in the Amendment and Corrigenda Record Table, pursuant to the procedure set forth below.

The publishing of amendments and corrigenda is announced regularly through correspondence with the States and International Organisations, and at the ICAO's Regional South American Office website, mandatory reference for those who use this publication. Blank cells are meant to facilitate note-taking.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
Num.	Effective date	Date recorded	Recorded by

CORRIGENDA			
Num.	Effective date	Date recorded	Recorded by

ACRONYMS AND ABBREVIATIONS

ACC	Area Control Centre
AD	Aerodrome
ADIZ	Air Defence Identification Zone
AIP	Aeronautical Information Publication
AMC	Airspace Management Cell (AMC)
ANSP	Air Navigation Service Provider
ASM	Airspace Management
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATS	Air Traffic Services
AUP	Airspace Utilization Plan
CADF	Centralised Airspace Data Function
CBA	Cross Border Area
CBP	Customs and Border Protection
CDM	Collaborative Decision Making
CDR	Conditional Route
CFMU	Central Flow Management Unit
CNS/ATM	Communication, Navigation and Surveillance/Air Traffic Management
CRAM	Conditional Route Availability Message
ENR	En route
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAA	Federal Aviation Administration
FAUP	Forecast Airspace Utilization Plan
FIR	Flight Information Region
FMU/FMP	Flow Management Unit/Flow Management Position
FUA	Flexible Use of Airspace
FUUP	Forecast Update of the Utilization Plan
GAT	General Air Traffic
GEN	General
GNSS	Global Navigation Satellite System
GPI	Global Plan Initiatives
LOA	Letter of Agreement
MOA	Military Operation Area
MOU	Memorandum of Agreement
MSL	Mean Sea Level
NextGen	Next Generation
NOTAM	Notice to Airmen
PANS	Procedures for Air Navigation Services
PBN	Performance-Based Navigation
PIRG	Planning and Implementation Regional Group
PFF	Performance Framework Form
RPA	Remotely Piloted Aircraft
RPAS	Remotely Piloted Aircraft System
RPS	Remotely Piloted Station
SAR	Search and Rescue
SARPS	Standards and Recommended Practices

SAM-PBIP	Performance-Based Implementation Plan for SAM Region
SESAR	Single European Sky ATM Research
SMS	Safety Management Systems
SUA	Special Use Airspace
SUPPS	Regional Supplementary Procedures
TRA	Temporary Reserved Areas
TSA	Temporary Segregated Areas
UAS	Unmanned Aircraft System
UIR	Upper Flight Information Region

APPLICABLE DEFINITIONS IN THIS SAM/FUA GUIDANCE

Remotely Piloted Aircraft. Aircraft whose pilot is not on board.

Temporary Reserved Area (TRA). Airspace temporarily reserved and allocated for the specific use of a particular user during a determined period of time, through which other flights may pass with permission from air traffic control (ATC).

Temporary Segregated Area (TSA). Airspace temporarily reserved and allocated for the exclusive use of a specific user during a determined period of time, through which no other flights may pass.

Cross Border Area (CBA). Reserved or segregated airspace established for specific operational requirements on international borders.

Air traffic service unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Segregated Airspace. Airspace of specific dimensions allocated for the exclusive use of a user or users.

Remote Pilot Station (RPS). A station from which the pilot remotely operates the flight of an unmanned aircraft.

Air Traffic Flow Management (ATFM). A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that AT capacity is utilised to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

Airspace Management (ASM). Process whereby airspace options are selected and applied in order to meet the airspace users' needs.

Air Traffic Management (ATM). The dynamic, integrated management of air traffic and airspace (including air traffic services, airspace management and air traffic flow management) under safe, cost-effective, and efficient conditions by providing facilities and seamless services in collaboration with all stakeholders and incorporating ground and on-board features.

Global Plan Initiatives (GPI). They are designed to support the planning and implementation of performance objectives in ICAO Regions.

Performance-Based Navigation (PBN). Performance-based area navigation requirements applicable to aircraft operating along an ATS route, on an instrument approach procedure, or in a designated airspace.

Standards and Recommended Practices (SARPS). The Council adopts standards and recommended practices pursuant to Articles 54, 37 and 90 of the Convention on International Civil Aviation and are defined as follows:

Standard. A standard is a specification of physical characteristics, configuration, material, performance, personnel or procedure, whose uniform application is recognized as necessary for the safety or regularity of international air navigation which contracting States shall comply pursuant to the Convention; in case compliance is not possible, notification to the Council is mandatory, as set forth in Article 38 of the Convention.

Recommended practice. A recommended practice is a specification of physical characteristics, configuration, material, performance, personnel or procedure, whose uniform application is deemed convenient for safety, regularity or efficiency of international air navigation which contracting States shall comply pursuant to the Convention.

Remote pilot. Person remotely operating the flight controls of a remotely piloted aircraft during flight.

Procedures for Air Navigation Services (PANS). Procedures adopted by the Council, including general operational procedures that are not considered mature enough to be adopted as international standards and recommended practices, or more permanent texts that are inappropriate or too detailed to be included in an Annex.

Regional Supplementary Procedures (SUPPS). Operational procedures that supplement the Annexes and PANS developed largely through ICAO's regional air navigation meetings to meet the needs of a specific ICAO region. It addresses issues related to safety and consistency of international air navigation. They are published in a single document for all regions. ICAO's Regional Supplementary Procedures (SUPPS) are part of the air navigation plan prepared by the Regional Air Navigation Conferences (ANC) to meet those needs in certain areas not covered by global provisions.
They complement the requirement exhibition for facilities and services contained in the air navigation plan publications.

Collaborative Decision-Making (CDM). A process whereby all ATM decisions, except for ATC tactical decisions that are based on the exchange of all relevant information for transit operations between civilian and military parties.

Flight Information Region (FIR). An airspace of defined dimensions within which flight information service and alerting service are provided.

Conditional Route (CDR). A non-permanent ATS route or part of it that can be planned and used under special conditions.

ATM security. Contribution of the ATM system to the protection of civil aviation, safety, and national defence, law enforcement and protection of the ATM system against security threats and vulnerabilities.

Air Traffic Services (ATS). A generic term meaning variously, flight information, alerting, air traffic advisory, air traffic control services (area control, approach control or aerodrome control services).

Customs and Border Protection Services (CBP). Protect the State by preventing illegal entry of persons and goods while facilitating legitimate travelling and trade.

Unmanned Aircraft System (UAS). Aircraft and its associated elements operated without a pilot on board.

Remotely Piloted Aircraft System (RPAS). Configurable set of elements consisting of a remotely piloted aircraft, its remote pilot station(s), the mandatory command and control links, and any other system element required at some point during the flight operation.

Air Traffic Management. A system that provides ATM through the integration of human resources, information technology, and facilities, in collaboration with the support of ground-, air-, and/or space-based communications, navigation and surveillance.

Global Navigation Satellite System (GNSS). A worldwide position and time determination system that includes one or more satellite constellations, aircraft receivers and system integrity monitoring, augmented as necessary to support the required navigation performance for the intended operation.

Flexible Use of Airspace (FUA). Concept of airspace management based on the principle that airspace should not be designated as exclusively military or civilian, but as a continuous space that meets the requirements of all users to the extent possible.

Danger area. An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

Prohibited area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

Restricted area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

1 Preamble

1.1 Objective

1.1.1 The Guidance for the Implementation of the Flexible Use of Airspace in ICAO's South American Region (SAM/FUA Guidance) has been designed to help ensure that the States of the Region have the applicable regional procedures, in harmonic fashion.

1.1.2 The development of the guidance has been taken into consideration the recommendations of the International Civil Aviation Organization in this regard, the Global Air Navigation Plan (Doc 9850) and the guidelines set forth in the Performance-Based Implementation Plan for the SAM Region (SAM-PBIP) which states that the optimal, balanced and equitable use of airspace by civil and military users, shall be facilitated through both strategic coordination and dynamic interaction, thus allowing the implementation of optimal flight paths, reducing operating costs of airspace users while protecting the environment.

1.2 Scope

1.2.1 The SAM/FUA Guidance has been developed to be used by SAM States in the FIRs under their jurisdiction, taking into account the operational improvements and airspace optimization initiatives in the short and medium term, and particularly in accordance with ATS route network optimization in the SAM Region.

2 Global background

2.1 Annex 2 - *Rules of the Air*, contains rules concerning flight and aircraft manoeuvring within the scope of Article 12 of the Convention, and provisions for coordination with military authorities for reasons of integrity and territorial sovereignty of a State, whereas Annex 11 - *Air Traffic Services*, contains provisions concerning the need to coordinate with military authorities or units, mainly to the extent that State aircraft activities may affect civilian operations and *vice versa*.

2.2 In addition, the *Procedures for Air Navigation Services - Air Traffic Management* (PANS-ATM, Doc. 4444) contain procedures applicable to other in-flight contingencies, such as lost or unidentified aircraft, that require coordination with military authorities, and describe procedures for the implementation of special military operations.

2.3 Information on coordination requirements between military units and air traffic services can also be found in the *Manual concerning safety measures relating to military activities potentially hazardous to civil aircraft operations* (Doc 9554) and in the *Air traffic services planning manual* (Doc 9426).

2.4 Likewise, the *Global Air Navigation Plan* (Doc 9750) proposes 23 initiatives (GPI) oriented to the implementation of the ATM operational concept. GPI 1 refers precisely to the *"Flexible use of airspace"* (**APPENDIX B**

Note: In light of the new aviation system block upgrade (ASBU) methodology fostered by ICAO, the Global Air Navigation Plan shall be updated and the current global plan initiatives (GPI) shall be inserted in the different modules of each block proposed in this methodology.

2.5 The *ICAO Global Air Traffic Management Operational Concept* (Doc 9854) describes the services required to operate the global air traffic system in the near future and beyond, and lists the requirements to provide more flexibility for users, maximize efficiency, and increase system capacity, while improving safety. Integral parts of these elements are interoperability and military system operations.

2.6 *Appendix O of Assembly Resolution A 37-15: Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation* (**APPENDIX B**

2.7 The resolution states, among other things, that the joint use of airspace and some facilities by civil and military aviation will be provided in such a way so as to attain safety, regularity and efficiency of civil aviation and to meet the requirements of military air traffic, and promotes the dissemination of best practices and the adoption of follow-up action building upon the success of the *Global air traffic management forum on civil-military cooperation* (2009) with the support of the civil and military stakeholders.

2.8 The Forum recognized that most ICAO Regions had made great progress in airspace management and military-civilian cooperation; however, it recognized the need to further improve cooperation between authorities and with air navigation service suppliers. It was suggested that, in order to promote cooperation, military representatives should participate at ICAO meetings, seminars and other relevant events as part of State delegations.

2.9 Upon summarizing the results of the Forum, the following was stated:

a) Peace and stability are essential conditions for social and economic development;

b) Trust and mutual understanding are key requirements for collaboration between civil and military authorities;

c) The safety, security and efficiency are common civil and military values;

d) For civil aviation, efficiency means greater capacity, less delays, and a reduction in costs, fuel consumption and emissions;

e) For military aviation, efficiency means mission efficacy (in times of peace and crisis) and realistic training, together with greater capacity, less delays and a reduction in costs, fuel consumption and emissions;

f) Cooperation and coordination require communication;

g) Civil-military cooperation is essential at national, regional and international level;

h) Airspace is a continuum and a limited common resource for all civil and military users;

i) Better knowledge and application of flexible use of airspace principles are a good basis for civil-military coordination of ATM;

j) Civil-military interaction is essential to optimize the safe and efficient use of airspace for all users, and the global aviation community must properly resolve gaps;

k) The integration of UAS is a challenge as well as an opportunity for the growth of the aviation system;

l) Civil-military cooperation and coordination are essential, both in times of peace and crisis;

m) A global civil-military approach to security and incident management is needed, taking into account positive experiences that can help improve the system;

n) Greater efforts are needed, not only within the context of flexible use of airspace, but also in terms of standards and compatible procedures and global interoperability of ATM systems; and

o) Good collaboration requires communication, education, good relationships and trust.

2.10 Finally, in response to the agreements reached at the 2009 Global air traffic management forum on civil-military cooperation, ICAO and civil and military experts developed Circular 330-AN/189, which contains examples of good practices in civil-military cooperation and recognizes that growing civil air traffic and military air missions would benefit significantly from a more flexible use of airspace, and recommends and provides guidance on best practices in civil-military cooperation that could be adopted by States.

3 Regional background

3.1 Civil-military cooperation and coordination in the South American Region have traditionally been based on a dialogue between civilian and military authorities with the view to making better use of airspace for both and improving cooperation for the use and integration, where possible, of their respective air traffic control facilities.

3.2 The States of the South American Region, taking into account the provisions of the Global Air Navigation Plan, the ATM operational concept and the conclusions of the Caribbean and South American Regional Planning and Implementation Group (GREPECAS), developed the Performance-Based Air Navigation System Implementation Plan for the SAM Region (SAM-PBIP), a plan that was approved for regional implementation through *Conclusion RAAC/12-1 Performance-Based Air Navigation System Implementation Plan for the SAM Region (SAM PBIP)* of the Twelfth Meeting of Directors of Civil Aviation (RAAC/12) of the SAM Region held in October 2011 (**APPENDIX C**

3.3 The main gap identified in the current system is the lack of a policy and procedures for the flexible use of airspace, which hampers airspace design and management by not allowing the application of an optimal airspace structure and the use of optimum flight paths. The limitations that have been identified include the existence of permanently reserved airspace, primarily for military purposes, and inadequate airspace planning, which prevents direct flights between airports of origin - destination and/or city pairs.

3.4 The period considered by the SAM PB ANIP runs from 2012 to 2018 and the expected evolution is based on the Global Plan Initiatives that apply to en-route operations, TMA operations, and air operations in general.

3.5 ATM planning has been based on seven global aspects, for which the respective performance framework forms (PFF) have been developed. One of these aspects is the Flexible Use of Airspace, which has been identified as (PFF SAM/ATM 04 **APPENDIX D**). This activity identified the following benefits for the ATM community, which should be attained through operational and technical activities aligned with this performance objective:

a) Improved civil/military coordination and cooperation strengthens airspace safety;

b) It allows for a more efficient ATS route structure, reducing miles flown and fuel consumption and, consequently, CO^2 emissions into the atmosphere;

c) It increases airspace capacity; and

d) Increased availability of reserved airspace at times when there is no activity by the users of such airspace.

Note: In light of the new aviation system block upgrade (ASBU) methodology fostered by ICAO, the SAM Region will have to update the SAM PB ANIP, as well as the PFFs that will be replaced by the air navigation report forms (ANRF).

3.6 As part of regional activities and in order to improve civil/military coordination and cooperation and in response to Assembly Resolution A 37-15, ICAO organized the Seminar on Civil/Military Coordination and

Cooperation and flexible use of airspace in the NAM, CAR and SAM Regions, which was held on 16-19 August 2011, in Lima, Peru.

3.7 This seminar was attended by civil and military authorities, that had the opportunity to exchange views, receive valuable information on activities being carried out worldwide. As a result of the discussions, they issued a series of recommendations that should be implemented by the States and ICAO as appropriate:

a) Support to the holding of an event as a follow-up to the Global Civil-Military Cooperation Forum (2009);

b) The seminar requested ICAO to coordinate the drafting of regional guidelines on civil-military cooperation for the CAR/SAM regions;

c) The seminar recommended to make arrangements for civil-military work at regional level;

d) States are encouraged to apply the Flexible Use of Airspace (FUA) principles (Annex 11 - Air Traffic Services, Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM, Doc 4444) and Circular 330-An/189 Civil-Military Cooperation in Air Traffic Management);

e) ICAO is requested to develop guidance material on the Flexible Use of Airspace (FUA);

f) The participation of military authorities at ICAO meetings is recommended (Resolution A37-15, Appendix O: Coordination and Cooperation of Civil and Military Air Traffic);

g) The ICAO NACC and SAM Regional Offices are requested to organize a workshop on ATM crisis management; and

h) CAR/SAM States, whenever possible, should establish a liaison office for civil-military coordination within their Civil Aviation Department in order to facilitate coordination between civil and military sectors.

4 Rationale

4.1 As world economies grow, demand for air travel multiplies; thus, airspace and airport capacity must increase to meet this demand. Traditional methods of increasing capacity have reached the end of their possibilities, so new, improved methods and concepts will be needed to maximize existing capacity and increase it where possible.

4.2 In the context of the ATM Operational Concept, airspace management (ASM) is the process whereby options for the use of airspace are selected and applied to meet user needs. The objective of ASM is to achieve a more efficient use of airspace, taking into account actual needs and, whenever possible, to avoid permanent segregation of airspace.

4.3 There are several and sometimes conflicting interests regarding the use of airspace, so ASM is a complex exercise. Additionally, there are also activities that require the reservation of a certain volume of airspace for its exclusive or special use (SUA) for defined periods of time due to the characteristics of its flight profile, the importance of its operations or the risks involved by the operations to be performed in said space and the need to separate them effectively and safely from other types of aeronautical activities.

4.4 Airspace management should be based on the following principles and strategies:

a) all available airspace should be managed in a flexible manner;

b) airspace management processes should incorporate dynamic flight paths and provide optimal operational solutions;

c) when conditions require segregation, based on different types of operations and/or aircraft, the size, shape and time zones of said airspace should be determined to minimize impact on operations;

d) the use of airspace should be coordinated and monitored to meet the different requirements of all users and minimize operational limitations;

e) Airspace reservation should be planned in advance, making dynamic changes where possible. The system must also be able to meet unexpected last minute requirements; and

f) The complexity of operations may limit the degree of flexibility.

g) According to the guidelines established in the SAM PBIP, the optimal, balanced, and equitable use of airspace by civil and military users shall be facilitated through both strategic coordination and dynamic interaction, allowing for the establishment of optimal flight paths while reducing operating costs for airspace users.

4.5 The flexible use of airspace must also include airspace over high seas within the jurisdiction of the FIR, considered without detriment to the rights and obligations of Member States under the Convention on International Civil Aviation (Chicago Convention) of 7 December 1944 and its Annexes.

5 Basic guiding principles of civil-military coordination and cooperation

5.1 The concept of flexible use of space should basically consider the following guiding principles:

a) coordination and cooperation between civil and military authorities shall be organized at strategic, pre-tactical and tactical management level by establishing letters of operational agreement and/or special procedures for a given activity, aimed at increasing airspace safety and capacity and improving the efficiency and flexibility of air operations;

b) consistency among airspace management, air traffic management, air traffic flow and management, and air traffic service functions must be established and maintained to ensure efficient planning, distribution and use by all users at the three airspace management levels (strategic, tactical and pre-tactical);

c) airspace reservation for exclusive or specific use of certain user categories shall be temporarily applied only during limited periods of time depending on actual use and it shall be disregarded as the activity that motivated it ceases to be, and it shall follow the procedures set forth in ICAO documents and Annexes as well as those prescribed in the Letters of Operational Agreement and/or special procedures.

d) air traffic service units and users will make the best possible use of available airspace,

e) coordination and collaborative decision-making by ATS, ATFM units, and effective application of the flexible use of airspace concept must be consistent and permanent during the strategic, pre-tactical and tactical phases of airspace management; and

f) Adequate resources should be allocated for an effective implementation of the flexible use of airspace concept, taking into account both civil and military needs.

6 General guidelines for the implementation of the FUA concept

6.1 SAM States should establish policies on the use of temporarily or permanently reserved airspace in order to avoid the adoption of airspace restrictions as much as possible.

6.2 The process of implementing the Flexible Use of Airspace should start with an assessment of restricted, prohibited and danger airspace that affect or could affect air traffic. To this end, this paper provides an initial analysis from a regional perspective.

6.3 If they have not done it yet, States should implement the Civil/Military Coordination and Cooperation Committees or a similar body, aimed at assessing the various of airspace management and air traffic control issues that somehow affect civil and military activities.

6.4 The relevant aviation authority should encourage the development of the necessary letters of operational agreement between ATS and military units or other users for the dynamic and flexible use of airspace, avoiding restrictions on the use of airspace, thus meeting the needs of all users.

6.5 In cases where airspace restriction is inevitable, the letters of agreement should specify that the activation of airspace reservation should not extend beyond the time required. This will require the development of paths that permit the dynamic re-routing of aircraft to avoid such airspaces.

6.6 The aforementioned paths should be published in the AIP in order to alert users of the need to consider said possible deviations in flight planning.

6.7 Appropriate measures should be taken to improve the effectiveness of air traffic flow management in order to assist existing operational units ensure efficient flight operations.

6.8 The implementation of the FUA requires convincing the users of reserved airspace, mainly the military authorities of the States involved, that their needs will be met, regardless of the application of airspace restrictions. Thus, seminars/meetings with the authorities will be essential to demonstrate the importance of optimized use of airspace.

7 National policies for the implementation of the FUA concept

7.1 FUA is an airspace management concept based on the principle that airspace should not be designated as exclusively military or civilian, but as a continuum that meets the maximum possible requirements of all users.

7.2 The effective and harmonized implementation of the flexible use of airspace in the volume of airspace under consideration requires precise civil-military coordination rules and dynamics, taking into account the needs of all users and the nature of their various activities, avoiding permanent reservation inasmuch as possible and optimizing its flexible use, without detriment to the privileges and defense responsibilities of Member States.

7.3 In order to accomplish that stated above, the effectiveness of civil-military coordination procedures must be based on rules and procedures for the efficient use of airspace by all users, which should be reflected in the Letters of Operational Agreement between the military authorities and Air Traffic Services (ATS), and on some basic guiding principles.

7.4 The objective of establishing common policies for SAM States responds to the need to ensure a uniform and harmonized implementation of the provisions on the adoption of the flexible use of airspace concept.

7.5 The States should, if they have not done it yet, insert the text on the application of the flexible use of airspace concept in their national legislation. The purpose of regulating FUA is to support the concept of an operating airspace that is increasingly integrated into the framework of the common transport policy and to establish common design, planning and management procedures to ensure an efficient and safe air traffic management.

7.6 The legislation should reinforce the need for coordination and cooperation between civil and military authorities, especially for the allocation and efficient use of airspace for military purposes, including the criteria and principles that should govern said allocation and use, particularly its opening to civilian flights.

7.7 National legislation should include a safeguard clause enabling States to suspend the application of the standard if so required for national military purposes. **APPENDIX E** contains a sample of a national standard, as reference.

8 Analysis of the use and management of Restricted, Prohibited, Danger and Special use areas

8.1 In order to achieve a comprehensive ATS route network that serves the interests of all users, including commercial, military, general, sports aviation, and unmanned aircraft systems (UAS), it will be necessary to analyze all restricted, prohibited and danger areas that have been implemented in each State in order to apply the flexible use of airspace concept.

8.2 This work is not intended to eliminate or arbitrarily reduce the special use airspace assigned, but rather, through the implementation of collaborative decision making (CDM), find the best options that may satisfy all airspace users and ensure that the needs identified are met, regardless of the application of airspace restrictions.

8.3 The States should analyze the different cases in which, for safety reasons, it would be necessary to establish procedures or letters of agreement to avoid tactical airspace management, as this implies the adoption of real-time decisions by the control service. While tactical management should be included in every action plan, this should be the tool of last resort, as it is not possible to apply the most appropriate solution when time is scarce and data to consider are varied.

8.4 Note was taken of the existence of permanently reserved airspace, primarily for military purposes, in a way that could prevent proper airspace planning, not allowing direct flights between airports of origin - destination and/or city pairs, as well as operations at inappropriate flight levels and/or speeds that prevented aircraft from maintaining optimum flight profiles, and major ground and/or en-route system delays.

8.5 SAM States should establish policies on the use of temporarily or permanently reserved airspace, to avoid, as much as possible, the adoption of airspace restrictions, and to consider and integrate the unmanned aircraft systems (UAS) into its air navigation system, which adds a new component to the aviation system that should start being considered.

8.6 There is a high percentage of special use airspace that should be analyzed within the context of civil/military cooperation in each particular State. There are 124 published prohibited areas, 421 restricted areas, 41 danger areas and 83 special areas in the Region, including volcanic areas and other special areas for aerial sports and recreational activities (**APPENDIX F**).

8.7 In order to proceed to assess the Restricted, Prohibited, Hazardous and Special use areas, the States could use as a model the form in **APPENDIX G**.

8.8 The purpose of the form is to identify the type of area or special use airspace, the lateral dimension in square kilometers and the vertical dimension with upper and lower limits, the period of use, the nature of the activity, the body or entity responsible for activating the area, the impact on the current design of airspace and finally, if planning could be potentially affected by the area.

9 Establishment of the Civil/Military Coordination and Cooperation Committee

9.1 ICAO Standards and Recommended Practices (SARPs), the recommendations and conclusions of different events on Civil/Military coordination and cooperation that have been approved for regional application aim at mutual cooperation between civil and military authorities; however, not every State has a formal civil/military coordination and cooperation committee.

9.2 In order to ensure FUA implementation, each State should establish a civil/military coordination and cooperation committee or similar body to assess opportunities for implementing Special Use Airspace (SUA). It is noteworthy that success of this initiative depends on the committee having the power to ensure the use of airspace by all users according to their specific needs, while avoiding, inasmuch as possible, the permanent reservation of airspace that would lead to a limited use of airspace when not being used.

9.3 These civil/military coordination and cooperation committees ensure coordination of decisions on civil and military airspace management and air traffic control issues at all levels, and are essential for the implementation of an ATS route network that meets the current requirements of airspace users.

9.4 Civil/military coordination and cooperation committees should include representatives of civil and military aviation and other airspace users as needed.

9.5 For these civil/military coordination and cooperation committees to be established, civil aviation administrations must propose terms of reference or objectives for that committee and then agree on a work program based on those terms of reference. States may consider the following aspects, *inter alia*:

a) Achieve civil-military coordination and optimum joint use of airspace with the highest degree of safety, regularity and efficiency of international civil air traffic;

b) Develop national policies regarding flexible use of airspace (FUA);

c) Review and provide the necessary links between civil ATS units and the relevant air defense military units to ensure day-to-day integration or segregation of civil/military air traffic operating in the same airspace segments;

d) Review the existing ICAO provisions on cooperation and civil/military coordination;

e) Consider the special use of airspace in order to validate the actual use and reach agreement on the joint use of airspace;

f) Establish procedures for joint and flexible use of airspace;

g) Develop and implement security measures related to military activities potentially hazardous for civil aircraft operations;

h) Prepare and sign letters of operational agreement between civil and military ATS units for air traffic management in the airspace concerned;

i) If prohibited, restricted and danger areas need to be maintained, make sure that they conform to Annexes 2 and 15 and that the following principles are applied:

    i) Pay due attention to the need of not hampering the safe and economical operation of civil aircraft operations;
    ii) Provide appropriate intermediate areas within the designated area, based on the time and size of the activities to be conducted;
    iii) Use of standard ICAO terminology to define the areas;

j) Analyse and determine at regular intervals if it is still necessary to keep prohibited, restricted and danger zones;

k) Develop appropriate arrangements and procedures for establishing a temporary reservation of airspace, and

l) Other aspects that civil and military authorities consider should be analyzed in the context of the civil/military coordination and cooperation committee or body they deem most appropriate.

9.6 Based on the flexible use of airspace achieved through the civil/military coordination and cooperation committee, airspace planners in the States should develop proposals for the implementation, realignment or elimination of routes that would significantly influence the development of the ATS route network, taking into account the possibility of offering better flight profile to users and a possible reduction in airspace complexity.

9.7 The establishment of a civil/military cooperation and coordination committee to manage the application of the flexible use of airspace concept is absolutely necessary and it must be managed taking into account all users, applying guiding principles aligned with the flexible use of airspace concept.

10 Letters of Operational Agreement between civil and military ATS units

10.1 As provided in the PANS/ATM (Doc 4444), the Letters of Operational Agreement between civil and military ATS units may define agreements and procedures for the flexible use of airspace, and should specify, *inter alia*, the following points:

a) The horizontal and vertical boundaries of the airspace concerned;
b) The classification of airspace available for use by civil air traffic;
c) The units or authorities responsible for airspace handover;
d) Airspace handover conditions to the ATC unit concerned;
e) Airspace handover conditions from the ATC unit concerned;
f) Airspace availability periods;
g) Any limitations on the use of the airspace in question; and
h) Any other relevant procedures or information.

10.2 A sample Letter of Operational Agreement between civil and military authorities is shown in **APPENDIX H**

11 Airspace management within the scope of FUA

11.1 The flexible use of airspace is an airspace management concept based on the principle of accommodating all the users of that space to the extent possible, considering effective communication, cooperation and the necessary coordination to ensure the security, safety, efficiency and environmental sustainability.

11.2 This concept includes strategic (Level 1), pre-tactical (Level 2), and tactical (Level 3) self-management functions that are independent but closely linked, and that are to be carried out in a coordinated manner to ensure an efficient use of airspace.

11.3 When several aviation activities with different requirements take place in the same airspace, coordination must be aimed at the safe conduct of flights and the optimum use of available airspace.

11.4 The systematic application of this concept should be taken into account for the optimization of the route network, especially for the definition of scenarios with non-permanent or conditional routes.

11.5 In addition, some SAR activities, exercises or military operations may require coordination and cooperation with more than one State at a given moment, and the establishment of civil/military cooperation and coordination committees in every State acquires greater important in these cases.

11.6 The support of traffic flow management (ATFM) units to air operations is crucial to provide the necessary conditions for mitigating possible adverse effects on civil aviation.

11.7 **Strategic Management of Airspace (Level 1)**

11.7.1 To ensure the strategic management of airspace within the scope of FUA, civil and military air traffic service providers should perform at least the following functions:

a) Ensure the implementation of flexible use of airspace at the strategic, tactical and pre-tactical levels;

b) Review the needs of users on a regular basis;

c) Review and approve the activities that require reservation or restriction of airspace;

d) Define temporary airspace structures and procedures to offer multiple reservation options and routes;

e) Establish criteria and procedures for the creation and use of adjustable lateral and vertical boundaries of the airspace needed to accept variations in flight paths and short-term changes in flights;

f) Assess national airspace structures and the route network in order to plan flexible airspace structures and procedures;

g) Determine the conditions under which the responsibility for separating civil and military flights will rest on civil and military ATS units or on the controlling military units;

h) Establish and provide users with airspace structures in close cooperation and coordination with neighboring member States when the corresponding airspace structures have major repercussions on cross-border traffic or on the boundaries of flight information regions, with a view to ensuring an optimum use of airspace for all users;

i) Establish mechanisms for consultation between persons or agencies and all interested parties and organizations, in order to properly meet user needs;

j) Include the corresponding air traffic flow management (ATFM) units in the planning and implementation of the FUA concept from the beginning;

k) Develop, assess and periodically review the procedures, coordination and performance of operations within the flexible use of airspace concept;

l) Establish mechanisms for storing data about the requests, allocation and actual use of airspace for subsequent analysis and planning of activities;

m) Make sure that the areas designated for training, recreation, ATC sectors, route network, arrival and departure procedures are implemented and published on a timely basis, in coordination with the requirements of all airspace users, taking into account ICAO strategic objectives.

11.8 Pre-tactical Management of Airspace (Level 2)

11.8.1 The civil and military units should ensure the introduction of appropriate support systems, preferably automated, that will allow timely communication of airspace availability to all users involved, special airspace management units, if any, air traffic service providers, and all the corresponding parties and organizations by airspace managers.

11.8.2 Military control units and air traffic service units should inform each other of any change in the planned activation of airspace in a timely and efficient manner, and inform all the users involved about the actual status of airspace.

11.9 Tactical Management of Airspace (Level 3)

11.9.1 Tactical ASM should take place at the level of ATS and military control units. Safety procedures for coordination and cooperation between these agencies should be established to allow direct, real-time communication of relevant information in order to resolve specific traffic situations in the same volume of airspace and in adjacent airspaces to where civil and military controllers provide services.

11.9.2 Information should be available to civil and military controllers and military control units through a quick exchange of flight data, including aircraft position and flight intention, particularly when required for security reasons.

11.9.3 When civil and military controllers are providing services in the same airspace, there should be highly reliable direct communications between civil and military ATS units to resolve specific traffic situations. If minimum levels of safety are required, ATC civil units and military control units shall exchange flight data, including aircraft position and flight intention.

Post-operation analysis (Level 4)

11.9.4 The SAM region deemed it advisable to add a level of post-operation analysis to this process in order to assess the operations performed, communications, and possible safety gaps that may have been identified so as to ensure continuous improvement of civil-military coordination and cooperation.

11.9.5 A report registry can be created at this level to help the different stakeholders and the training section to focus on activities that will improve operations.

12 Flexible and adjustable airspace structures and procedures

12.1 Circular 330 -AN 189, in addressing this issue, states that the FUA concept may be based on the potential offered by flexible and adjustable structures and procedures, which are especially suitable for the assignment and temporary use of conditional routes, temporary reserved areas (TRA), temporary segregated areas (TSA) and cross border areas (CBA).

12.2 The FUA concept thus complements organizing airspace with a series of flexible structures as defined below:

12.2.1 Conditional Route (CDR): Non-permanent ATS route (see Figure 1) or portion thereof that can be planned and used under specified conditions. According to their foreseen availability and flight planning possibilities, and the level of activity expected from the associated TSA, conditional routes can be divided into the following categories:

a) Category one (CDR1): permanently schedulable;

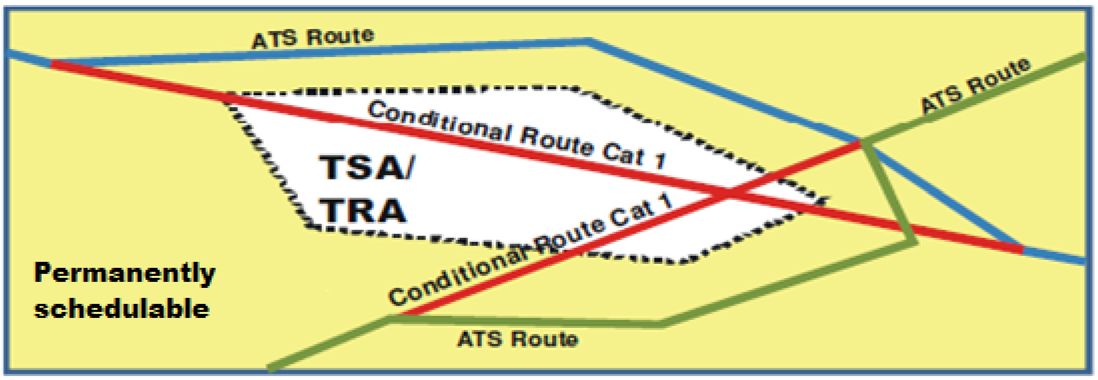
b) Category two (CDR2): non-permanently schedulable; and

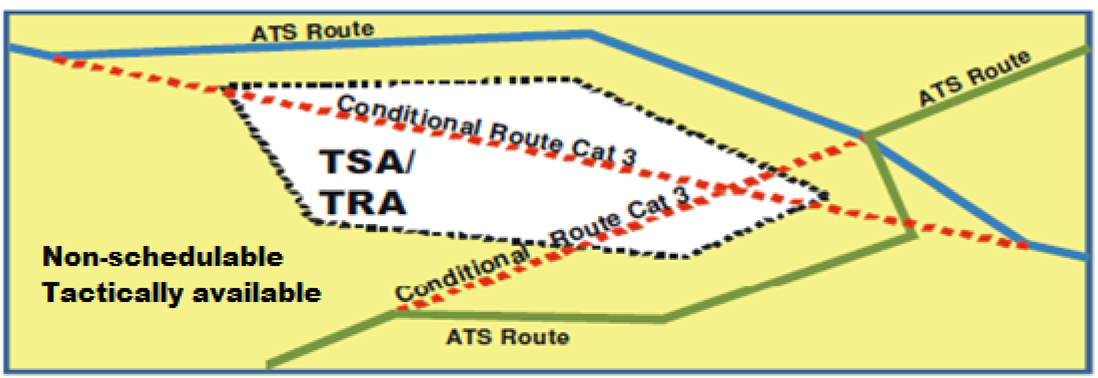
c) Category three (CDR3): not schedulable.

12.2.2 Temporary reserved area (TRA): A TRA (see Figure 1) is airspace temporarily reserved and allocated for the exclusive use of a user during a determined a period of time, through which other flights can operate with ATC permission.

12.2.3 Temporary segregated area (TSA): A TSA (see Figure 1) is airspace temporarily reserved and allocated for the exclusive use of a specific user during a determined period of time, through which no other flight traffic is allowed.

12.2.4 Cross border area (CBA): A CBA (see Figure 2) is a reserved or segregated airspace established on international borders to meet specific operational requirements. CBAs are established for purposes of instruction and military training and for other flights operating on both sides of a border. Since CBAs are not bound to national borders, they can be defined so as to benefit both civil and military aviation. CBAs in combination with conditional routes crossing them improve airspace structure in border areas and help improve the ATS route network. Before establishing CBAs, political, legal, technical, and operational agreements between the States concerned are required. Formal agreements for the establishment and use of CBAs should take into account sovereignty, defense, law, operations, the environment, and search and rescue.





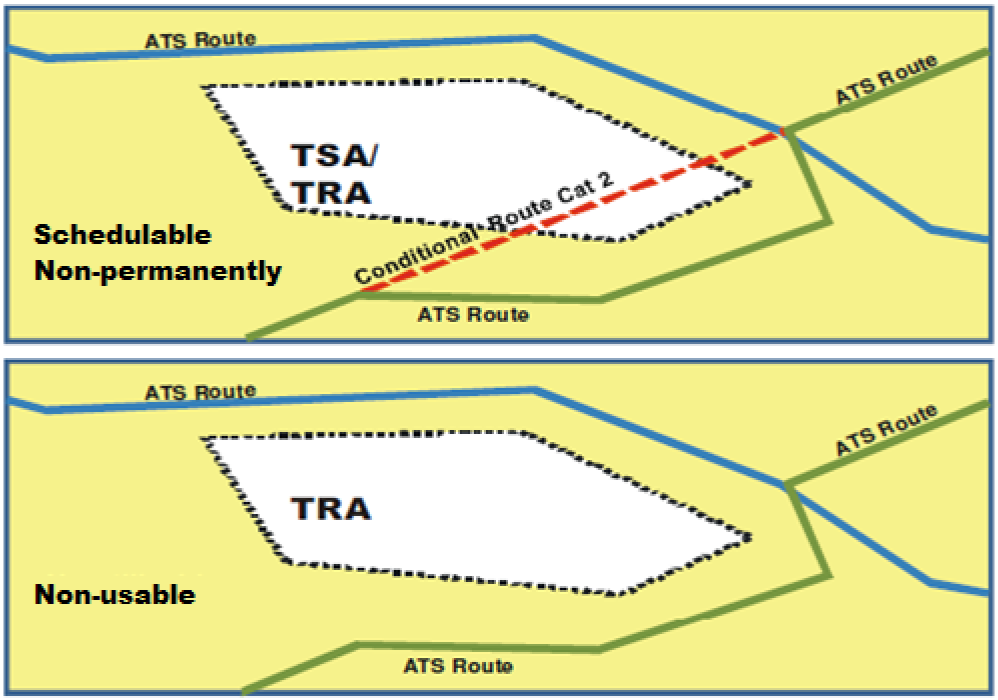


Figure 1

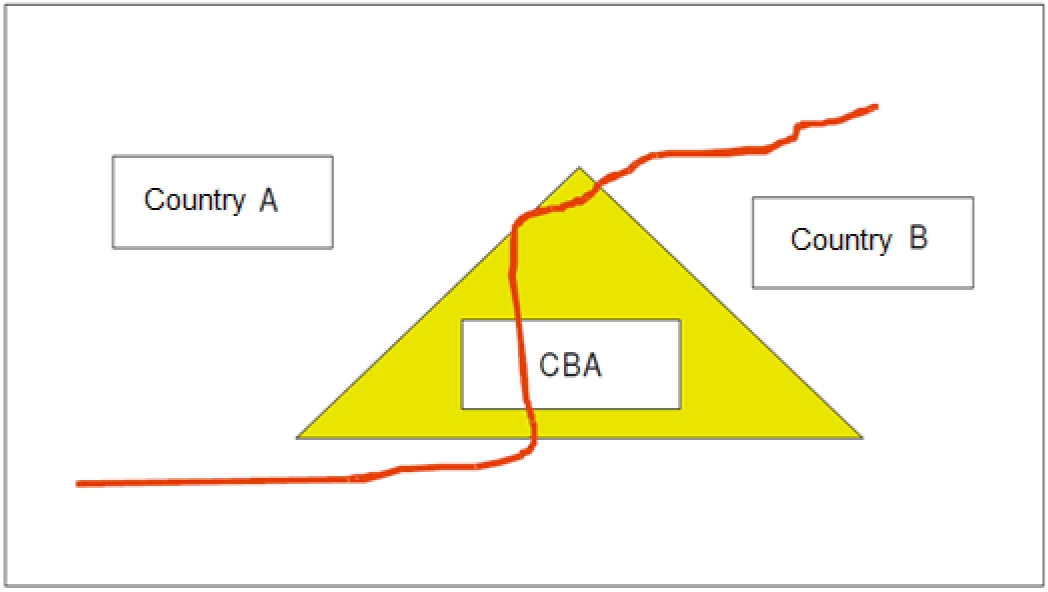


Figure 2

12.2.5 Airspace management cell (AMC): A national joint civil/military unit responsible for managing on a day-to-day basis or upon request (pre-tactical phase) the allocation of airspace in accordance with requests from users (ACC, FMU / FMP, management units and other military zones and accredited agencies).

12.2.6 There is no experience in the South American Region with this type of conditional routes. Therefore, the establishment of modes of employment of non-permanent routes should be assessed in light of experiences elsewhere in the world. The Region should take action on this issue and establish criteria for defining the scenarios where non-permanent routes are to be applied.

12.2.7 It would be interesting for States to begin implementation by adopting some procedures used in other Regions. To this end, **APPENDIX I** contains concepts and procedures of the European Region.

13 Safety assessment

13.1 During the safety management process and before introducing any change in the implementation of FUA, it is important to conduct a safety assessment that includes hazard identification and risk assessment and mitigation in accordance with SMS procedures.

13.2 In a stage following the operational phase, an assessment will be made of issues identified, inspection and audit findings, SMS analyses, which may produce important information that should be used for continuous airspace optimization.

13.3 Therefore, the reports of joint actions in the flexible use of airspace as well as the analysis by a multidisciplinary group of experts are of great importance for the analysis of lessons learned, with a view to improving the procedures and rules applied to optimize safety and the flexible use of airspace.

14 Information management

14.1 Good information management is critical to the successful implementation of the FUA concept; thus the critical importance of timely distribution and accuracy of information transmitted to civil and military controllers concerning airspace status and specific air traffic conditions that directly affect safety, efficacy and efficiency of operations.

14.2 In relation to the above, timely access to updated information on airspace status is vital for all parties wishing to use the available airspace structures for preparing or modifying their flight plan.

14.3 In accordance with the provisions of the AIS Manual (Doc 8126), the AIP is divided into three parts, Part 1 - General (GEN), consisting of administrative and explanatory information that is not of such importance or significance that requires the issuance of a NOTAM, Part 2 - En route (ENR), containing information on the airspace and its utilization, and Part 3 - Aerodromes (AD), with information on aerodromes / heliports and their utilization.

14.4 In light of the above, all aspects of the flexible use of airspace should be included in Part 2 ENR.

14.5 Section 3 - ATS routes, in Part 2, ENR includes detailed lists of all ATS routes established within the territory covered by the AIP, whether they are part of ICAO regional air navigation agreements or used only for domestic traffic. Where applicable, a description of the routes or portions thereof where special procedures are required to eliminate or reduce the need for interceptions should be included. The relevant special procedures should also be included. Particularly in ENR 3.5, *Other routes*, a description of other specifically designated routes that are mandatory within specified areas is required.

14.6 In order to comply with the provisions of Doc 8126, conditional routes (CDR) will be published in ENR 3.5.

14.7 Furthermore, in accordance with the AIS Manual, Section ENR 5.2 *Military exercise and training areas and air defense identification zone* (ADIZ), there shall be a description, as appropriate, of the areas established for the military exercise and training taking place at regular intervals and of the ADIZ zone.

14.8 In view of the above, this Section will contain temporary segregated areas, with the geographical coordinates of boundaries, upper and lower limits, and the system and the means established to announce the initiation of activities, together with all relevant information on civil flights.

15 Seminars/meetings

15.1 State administrations, working with air navigation service providers (ANSPs) and with the military authorities, should take steps to create the political will, establish institutional arrangements, bringing together civil and military authorities nationwide, set goals, apply practical and operational measures, and finally, make the necessary changes to make all this possible.

15.2 The seminars, meetings, and other similar events will raise awareness among all stakeholders about the need to achieve these common objectives for the benefit of international civil aviation.

16 Collaborative Decision Making (CDM)

16.1 Decision-making (CDM) is the process whereby all ATM decisions, except for ATC tactical decisions, are based on the exchange of all relevant information for traffic operations between civil and military parties. States and service providers should adopt CDM principles, with the participation of military planners as a means to support ASM.

16.2 CDM brings together airlines, civil aviation and military authorities and airports, in an effort to improve ATM through the exchange of information and data, and improved automated decision-support tools.

16.3 The collaboration philosophy may become an aviation standard. CDM allows the exchange of information and facilitates decision-making processes to ensure that stakeholders receive timely and accurate information essential to plan their operations, whether civil or military.

16.4 For example, accurate estimates of arrival or departure times can improve the processing of aircraft, apron services, the allocation of stands and exit gates, ATC and ATFM. The involvement of military airspace users and planners in national or regional airspace planning ensures proper planning, both in time and size, which not only benefits military aviation but also minimizes conflicts with civil traffic.

16.5 With decisions based on the sharing of accurate information, CDM improves predictability in case of unforeseen problems or events. If properly implemented, CDM also leads to an optimum use of airspace, with benefits for all participants in the system.

16.6 For CDM implementation, the use of the Manual on collaborative decision making that was approved for regional implementation by the SAMIG/6 Meeting, Conclusion SAMIG/6/7 is suggested. The *CDM Manual for South America (SAM)* is posted at the following address of the ICAO South American Regional Office:
http://www.lima.icao.int/eDocuments/ATM/ATFM/4CDM%20Manual%20Spa.pdf

16.7 The CDM Manual describes methods and procedures to manage the Collaborative Decision Making process to be applied in the SAM Region. The purpose of this paper has been to provide assistance to SAM States in reaching a common understanding of the collaborative Decision Making (CDM) process with a view to the application of this methodology, which seeks the participation of all parties involved in ATFM in the implementation of equitable measures among ATM system users.

17 Action Plan for the implementation of the FUA concept

17.1 As a reference and to assist SAM States in the implementation of the FUA concept, a model action plan has been developed, as shown in **APPENDIX J**. This action plan has been developed taking into account ICAO indications as well as the activities of the PFF SAM/ATM 04 of the SAM PB ANIP.

17.2 The action plan identifies some of the tasks to be executed by SAM States, starting with the establishment of a policy for developing standards related to the FUA concept, if it has not been done yet. It also encourages States to establish a high-level national civil-military coordination body, to conduct a uniform and collaborative national airspace planning process, taking into account the needs of all users as well as national security, defense and police requirements. It also invites States to establish rules and procedures of communication, negotiation and setting of priorities for civil-military coordination.

17.3 Furthermore, it encourages States to start assessing their special use airspace as soon as possible to verify the suitability and possibility of an early dynamic use or modification of such airspace for its use by civil aviation. It also defines some tasks for the establishment and publication of procedures for activities that require airspace reservation and restriction, and for the establishment of frame agreements or letters of operational agreement, as applicable, between civil and military authorities to facilitate coordination.

17.4 Finally, it includes tasks related to the need of establishing a system for periodically reviewing airspace requirements, organization and management, and conducting a timely risk assessment by applying the SMS methodology to ensure that changes in the system maintain and/or improve the agreed safety levels.

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APPENDICES

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APPENDIX A

GPI - Flexible Use of Airspace

Scope: Optimized, balanced and equitable use of airspace by civil and military users, facilitated by strategic coordination and dynamic interaction

Components associated to the operational concept: AOM and AUO

Strategy description

Airspace use could be optimized through dynamic interaction of civil and military air traffic, including real-time coordination among civil and military controllers. This needs system support, operational procedures, and appropriate information on the position and intentions of civil traffic.

The flexible use of airspace concept (FUA) is based on the principle that the airspace should not be designated as purely civil or military, but, instead, it should be a continuous space in which the requirements of all users are met inasmuch as possible. The flexible use of airspace should translate into the elimination of extended temporarily or permanently restricted airspace segments or special use airspace.

In those cases in which it is still necessary to reserve airspace for specific individual uses, thus blocking airspace of a given size, an attempt should be done to do it on a temporary basis. Airspace should be cleared immediately after the operations that gave rise to such restrictions have been completed.

Greater benefits associated to FUA implementation can be achieved through cooperation among States, which may require regional and sub-regional agreements since reserved airspace is frequently established along critical flight paths along national borders.

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APPENDIX B

Assembly Resolution A 37-15

A37-15: Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation

Whereas in Resolution A15-9 the Assembly resolved to adopt in each session for which a Technical Commission is established a consolidated statement of continuing policies related specifically to air navigation up to date as at the end of that session;

Whereas a statement of continuing policies and associated practices related specifically to air navigation as they existed at the end of the 36th Session of the Assembly was adopted by the Assembly in Resolution A36-131, Appendices A to W inclusive;

Whereas the Assembly has reviewed proposals by the Council for the amendment of the statement of continuing policies and associated practices in Resolution A36-13, Appendices A to W inclusive, and has amended the statement to reflect the decisions taken during the 37th Session; and

Whereas the statement of continuing policies in Resolution A36-13 is hereby superseded:

The Assembly:

1. *Resolves* that:

   a) the Appendices attached to this resolution constitute the consolidated statement of continuing air navigation policies and associated practices of the Organization as they exist at the close of the 37th Session of the Assembly; and

   b) the practices associated with the individual policies in the appendices constitute guidance intended to facilitate and ensure implementation of the respective policies; and

2. *Declares* that this resolution supersedes Resolution A36-13 with its Appendices A to W inclusive.

APPENDIX O TO ASSEMBLY RESOLUTION A 37-15

Coordination and cooperation of civil and military air traffic

Whereas the airspace is a resource common to both civil and military aviation and given that many air navigation facilities and services are provided and used by both civil and military aviation;

Whereas the Preamble of the *Convention on International Civil Aviation* stipulates that signatories thereto had "agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically";

Whereas Article 3 a) of the Convention states that “the Convention shall be applicable only to civil aircraft, and shall not be applicable to state aircraft” and Article 3 d) requires that “contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft”;

Recognizing that growing civil air traffic and mission-oriented military air traffic would benefit greatly from a more flexible use of airspace used for military purposes and that satisfactory solutions to the problem of cooperative access to airspace have not evolved in all areas;

Whereas the flexible use of airspace by both civil and military air traffic may be regarded as the ultimate goal, improvement in civil/military coordination and cooperation, offers an immediate approach towards more effective airspace management; and

Recalling that the ICAO Global ATM Operational Concept states that all airspace should be a usable resource, any restriction on the use of any particular volume of airspace should be considered transitory, and all airspace should be managed flexibly:

The Assembly resolves that:

1. the common use by civil and military aviation of airspace and of certain facilities and services shall be arranged so as to ensure the safety, regularity and efficiency of civil aviation as well as to ensure the requirements of military air traffic are met;

2. the regulations and procedures established by Contracting States to govern the operation of their state aircraft over the high seas shall ensure that these operations do not compromise the safety, regularity and efficiency of international civil air traffic and that, to the extent practicable, these operations comply with the rules of the air in Annex 2;

3. the Secretary General shall provide guidance on best practices for civil/military coordination and cooperation;

4. Contracting States may include, when appropriate, representatives of military authorities in their delegations to ICAO meetings; and

5. ICAO serves as an international forum that plays a role in facilitating improved civil/military cooperation, collaboration and the sharing of best practices, and to provide the necessary follow-up activities that build on the success of the Global Air Traffic Management Forum on Civil/Military Cooperation (2009) with the support of civil/military partners.

Associated practices

1. Contracting States should as necessary initiate or improve the coordination and cooperation between their civil and military air traffic services to implement the policy in Resolving Clause 1 above.

2. When establishing the regulations and procedures mentioned in Resolving Clause 2, the State concerned should coordinate the matter with all States responsible for the provision of air traffic services over the high seas in the area in question.

3. The Council should ensure that the matter of civil and military coordination and cooperation in the use of airspace is included, when appropriate, in the agenda of divisional and regional meetings, in accordance with Resolving Clauses 3, 4 and 5 above.

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APPENDIX C

Conclusion RAAC/12-1 Performance-based Air Navigation Implementation Plan for the SAM Region (SAM PBIP)

The States of the ICAO South American Region and the international organisations involved:

a) approve the Performance-based Air Navigation Implementation Plan for the SAM Region shown in **Appendix A** (*i.e. RAAC 12 Report*), for its implementation at regional level;

b) encourage those States that have not done so to prepare their national performance-based air navigation plan in accordance with the guidelines contained in the cited implementation plan; and

c) request the ICAO South American Regional Office to review Project RLA 06/901 in order to align it with the performance objectives established in the cited implementation plan.

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APPENDIX D

<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM/ATM 04</u>
FLEXIBLE USE OF AIRSPACE</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Enhanced civil/military coordination and cooperation reinforces airspace safety</td></tr>
<tr><td>Environment protection and sustainable development of air transport</td><td colspan="4">• Permits a more efficient ATS route structure, reducing miles flown and fuel consumption, and thus CO2 emissions into the atmosphere.
• Increases airspace capacity.
• Increased availability of reserved airspace when there is no activity by airspace users.</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Percentage of implemented civil/military coordination committees or similar organisations
• Number of implemented civil/military cooperation and coordination agreements
• Reduction in the number of permanently reserved airspaces</td></tr>
<tr><td colspan="5">Strategy
2012 – 2018</td></tr>
<tr><td>OC ATM COMPO-NENTS</td><td>TASKS</td><td>START-END</td><td>RESPONSIBLE PARTY</td><td>STATUS</td></tr>
<tr><td rowspan="7">AOM
AUO
CM</td><td>a) prepare guidance material on civil/military coordination and cooperation for the establishment of policies, procedures and national regulations</td><td>(*) - 2012</td><td>Regional Project
States</td><td>In progress</td></tr>
<tr><td>b) evaluate the number and size of reserved airspaces</td><td>(*) – 2012</td><td>States</td><td>In progress</td></tr>
<tr><td>c) establish civil/military coordination committees or similar organisations</td><td>(*) - 2012</td><td>States</td><td>In progress</td></tr>
<tr><td>d) make arrangements for permanent linkage and close cooperation between civil ATS units and the appropriate military units, as well as with reserved airspace users</td><td>(*) - 2012</td><td>States</td><td>In progress</td></tr>
<tr><td>e) establish, when required by ANSPs, procedures for coordinating temporary reserved airspace through the issuance of NOTAMs or specific real-time reservation activation/deactivation procedures</td><td>(*) – 2013</td><td>States</td><td>Valid</td></tr>
<tr><td>f) develop a strategy and work programme for the implementation of flexible use of airspace, through a stage-based approach, starting with a more dynamic sharing of reserved airspace</td><td>2012 - 2018</td><td>Regional Project
States</td><td>Valid</td></tr>
<tr><td>g) track progress during implementation</td><td>(*) – 2013</td><td>GREPECAS</td><td>In progress</td></tr>
<tr><td>Link to GPI</td><td colspan="4">GPI/1: Flexible use of airspace; GPI/18: Aeronautical information.
(*) Indicates that this task was started before the the scheduled date.</td></tr>
</table>

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APPENDIX E

Example of national regulation for the implementation of flexible use of airspace

Preamble

Appendix O to Assembly Resolution A 37-15: *Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation* refers specifically to coordination and cooperation between civil and military air traffic. Hence, it recognizes that airspace is a common resource for civil aviation and military aviation and that a large number of air navigation facilities are available to, and used by, both civil and military aviation.

This resolution also states, among other aspects, that the shared use of airspace and certain facilities by both civil and military aviation will be arranged in such a way as to achieve safety, regularity and efficiency of civil aviation and meet the requirements of military air traffic.

Taking into account the organization of military aspects under its responsibility, XXX (*Name of State*) shall guarantee the sound application of the flexible use of airspace concept described by ICAO within the airspace under its responsibility to facilitate airspace and air traffic management.

Objective

The purpose of this standard is to define guidelines for the application of the flexible use of airspace (FUA) concept within Flight Information Regions (FIR) XXXX, **XXXX** (*name of FIR(s)*) to facilitate its use and harmonize its application within the context of airspace management (ASM) and air traffic management (ATM).

Background

The flexible use of airspace is a concept developed by the International Civil Aviation Organization (ICAO) that is being developed by the SAM Implementation Group (SAMIG) of the ICAO South American Region. FUA is an airspace management concept based on the principle that airspace should not be used exclusively for military or civil purposes but rather should be a continuous space in which the requirements of users are met as far as possible.

Likewise, it is recognized that the shared use of airspace and certain facilities by both civil and military aviation will be such that it will be possible to achieve safety, regularity and efficiency of civil aviation and meet the requirements of military air traffic, and encourages the dissemination of best practices.

Scope

These regulations establish a number of parameters to ensure better cooperation and coordination among civil and military entities responsible for managing the airspace under the responsibility of **XXX** (*name of State*).

FUA Principles

An FUA concept should be based on the following principles:

Coordination among civil and military authorities shall be articulated at a strategic, pre-tactical and tactical level in order to increase safety and airspace capacity, and improve the efficiency of air operations.

Consistency should be established and maintained between ASM, air traffic flow management (ATFM), and ATS at the three ASM levels.

Airspace reservation should be temporary, applied only during limited periods of time, and based on actual use of the airspace.

Wherever possible, the FUA concept should be applied beyond national borders or flight information region (FIR) boundaries.

Strategic Airspace Management

In order to ensure full application of the FUA concept at the ASM strategic level, it is necessary to establish airspace structures, develop coordination and airspace management procedures, and establish cross-border coordination and separation standards for civil and military flights.

Strategic airspace management is known as FUA Level 1.

Pre-tactical Airspace Management

An ASM entity should be established for the allocation of airspace in accordance with the conditions and procedures agreed at the strategic level.

In XXX (*State*), civil and military authorities are jointly responsible for airspace management. Therefore, the ASM entity shall be a joint civil-military unit. If necessary, the unit can also be established by two or more States. XXX (*name of State*) shall provide entities with the appropriate ASM support systems to ensure a timely and efficient process.

Pre-tactical airspace management is known as FUA Level 2.

Tactical Airspace Management

Tactical ASM should be carried out at the level of ATS units and military control units. Through special coordination and communication procedures, airspace data can be exchanged on a timely basis so that the airspace allocated to the pre-tactical level may be activated, deactivated or reassigned in real time. Updated airspace status should be communicated to all affected users.

When civil and military controllers provide services in the same airspace, direct and highly reliable communications should be available between civil and military ATS units in order to resolve specific traffic issues. If minimum safety levels are required, civil ATCs and military control units can exchange flight data, including aircraft position and flight intention data.

Tactical airspace management is known as FUA Level 3.

Post-operation analysis (Level 4)

At this level, an assessment shall be made of the mechanisms and processes used for management, creating a registry of reports on aspects that could be improved and lessons learned. This analysis will help to improve FUA processes and management, and material will be available to train all parties with a view to improving operations.

Safety Assessment

Within the safety management processes, and before introducing any change to the implementation of flexible use of airspace, it is necessary to perform a safety assessment for hazard identification and risk analysis and mitigation in accordance with SMS procedures.

Temporary Suspension

When the application of the FUA concept generates major operational difficulties, XXX (*Name of State*) may temporarily suspend such application provided the ATM community is immediately informed thereof.

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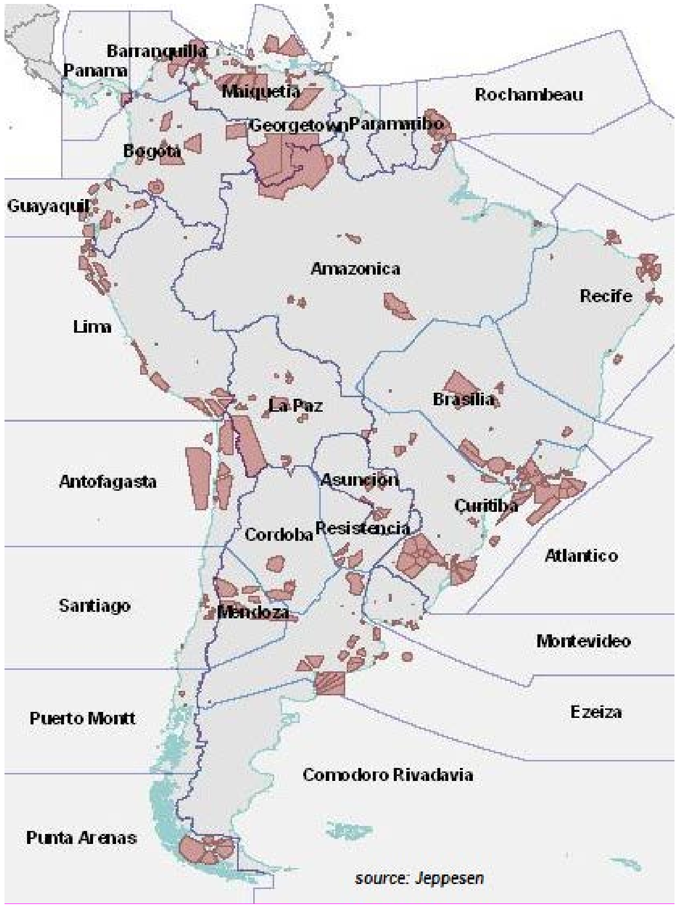
APPENDIX F

Prohibited, restricted and danger areas in the SAM Region

Country	PA	RA	DA	Others	Remarks
Argentina	15	50	1	N/A	
Bolivia	1	23	NIL	N/A	
Brazil	44	228	11	N/A	
Chile	12	32	9	78 areas of volcanic activity	Chile has defined climb areas for weather balloons (5) as prohibited areas.
Colombia	5	11	NIL		
Ecuador	2	11	1	N/A	Ecuador has designated SANGAY volcano area as a danger area.
French Guiana	1	4	9		
Guyana	1	NIL	NIL		
Panama	4	2	4	4 and 1 ADIZ	Panama has designated other areas for air sports and recreational activities
Paraguay	2	9	3	N/A	
Peru	14	22	NIL	N/A	
Suriname	2	1	NIL	N/A	
Uruguay	19	4	2	N/A	
Venezuela	6	36	2	N/A	
TOTAL	**126**	**432**	**42**	**83**	

PA: Prohibited Area
RA: Restricted Area
DA: Danger Area
N/A: Not applicable
NIL: Nothing

Prohibited, restricted and danger areas in the SAM Region



In the South American Region, there are 26 FIRs covering 38'565,578 km2.

Prohibited, restricted and danger areas in the ICAO South American Region
• 628 special use airspaces
• 683 in total, including special areas, such as volcanic, training and others areas

• 2'121,753 km2 in total, defined as special use areas

11.9% of the continental area

APPENDIX G

Sample Form on the use and management of restricted, forbidden and danger areas and special use airspace in the SAM Region

Country: ______________________________
FIR: ______________________________

Date: ______________________________

Type of area or special use airspace (1)	Size (2)		Period of use (3)	Nature of the Activity (4)	Managed by (5)	Does it affect current operation? (6)	Does it affect ANSP planning? (7)	Remarks (8)
	Lateral in Km^2	Vertical limit						

Instructions to complete the form:

1. Type of area or special use aircraft: insert prohibited, restricted, danger area or special use area (recreational, farming activities, etc.).
2. Size: Insert lateral dimension in square kilometers, and vertical dimension indicating upper and lower limits
3. Period of use: Insert the area activation schedule or period, if applicable.
4. Nature of the activity: Insert detailed information of the activity carried out in the area (parachuting, training, etc.).
5. Managed by: Insert the name of the organization or person responsible for area activation.
6. Does it affect current operation? Insert information regarding the impact on the current design of the area.
7. Does it affect ANSP planning? Indicate if ANSP planning may be potentially affected by the area
8. Remarks: Insert additional information that the State should take into account.

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APPENDIX H

Sample of Letter of operational agreement for joint use of restricted areas

(ref. ICAO Circular 330 and Doc 9433)

SUBJECT: Procedures for drawing up the letter of operational agreement for joint use of restricted areas (identify the area or areas related to the LoA)

EFFECTIVE DATE: (insert date).

In accordance with ICAO regulations and procedures and national regulations (insert national reference), the procedures for the use of restricted areas (identify the list of Restricted/Danger Areas on which the LoA is based) are hereby established by (identify civil ATS units) and (identify military units)

Airspace under (identify civil or military units responsible, as required) jurisdiction is exhibited in Annex 1 to this LoA.

At least the following shall be included in Annex 1:

a) Horizontal and vertical limits of the corresponding airspace;

b) Classification of airspace available for civil air traffic;

c) Units or authorities responsible for airspace handover;

d) Conditions for airspace handover to the corresponding ATC unit;

e) Conditions for airspace handover from the corresponding ATC unit;

f) Airspace availability periods;

g) Any limitations on the use of the corresponding airspace; and

h) Any other appropriate procedures or information.

This letter revokes or supersedes the Letter of operational agreement (if any) for joint use of restricted areas (insert previous agreements) dated (insert date).

1. Personnel of (identify the coordinating unit) shall act as liaison between the user and the control body.

2. The user shall:

   2.1. Coordinate activation/release periods of (identify the area or areas related to the LoA) with (identify ATC units to coordinate with)

   2.2. Notify (identify unit) at least 30 minutes prior to the activation of airspace above (identify flight level or altitude expressed in feet, as appropriate) in area (identify the area(s) related to the LoA)

   2.3. Notify (identify unit) at least 2 hours prior to the activation of airspace during periods other than those published in the (identify the area(s) related to the LoA) AIP

   2.4. Notify (identify unit) at least 30 minutes prior to the activation of airspace (identify flight level or altitude expressed in feet, as appropriate) in area (identify the area(s) related to the LoA)

   2.5. Notify (identify unit) at least 48 hours prior to the activation of airspace in (identify the area(s) related to the LoA).

   2.6. Release the (identify the area(s) related to the LoA), as appropriate, above (identify flight level or altitude expressed in feet, as appropriate) to (identify unit) when the area is not being used for the designated purpose.

   2.7. Release the (identify the area(s) related to LoA), as may be appropriate, at maximum required altitudes above (identify flight level or altitude expressed in feet, as appropriate) to (identify unit) due to a traffic emergency situation. The release of airspace to (identify unit) shall be done within 30 minutes after the request is transmitted.

3. The control body shall:

   3.1. Exhaust all possible traffic management procedures before requesting user to release the airspace, as specified in paragraph 2 g.

   3.2. Return (identify the area(s) related to the LoA) promptly to the user once the traffic emergency situation has been resolved.

   3.3. Be responsible for issuing the appropriate NOTAMs for the airspace being use above (identify flight level or altitude expressed in feet, as appropriate)

   3.4. Notify (identify unit) of airspace release periods of (identify the area(s) related to the LoA).

   3.5. Submit in writing, upon written requested from the user, the reasons for requesting the recovery of airspace in restricted areas.

4. The (identify unit) shall be responsible for issuing the appropriate NOTAMs for the airspace being used (identify flight level or altitude expressed in feet, as appropriate)

5. During periods in which airspace is released to the control body, (the user) shall authorize traffic under instrument flight rules (IFR), visual flight rules (VFR) in and throughout the (identify the area(s) related to the LoA)

6. The decision to recover airspace from a restricted area shall be made by supervisory staff of the control body.

Note: Non-supervisory staff of (identify unit) may act as liaison with the user for the release/recovery of (identify the area(s) related to the LoA)

7. Communication between (the user) and (the control body)

7.1. In order to enable effective coordination between the units concerned regarding the procedures established in this LoA, the means of communication described in Appendix 2 will be used and/or implemented.

7.2. These means of communication shall enable communication within (insert time as necessary) seconds and shall have an automatic recording system.

8. Revisions

8.1. This LoA will be revised when the procedures contained therein or in its appendices are affected by amendments to ICAO SARPS, regional supplementary procedures or regional plans, or when the corresponding ATS units implement new communication facilities.

8.2. The body implementing new communication systems is responsible for initiating coordination with the counterpart body.

8.3. If the amendment only affects part of the Appendices, the new amendment may be inserted without modifying the LoA upon agreement between the parties. The effective date of the amendment shall be agreed between the parties.

(ORIGINAL DOCUMENT SIGNED BY) User Representative

(ORIGINAL DOCUMENT SIGNED BY) Control Body Representative

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APPENDIX I

Procedures applicable in Europe for the Flexible Use of Airspace (Ref. Spain AIP)

INTRODUCTION

The flexible use of airspace (FUA) concept is based on that airspace no longer being considered as military or civil airspace but rather as one single continuum that is used flexibly in accordance with day-to-day needs. Consequently, any necessary airspace segregation shall be only temporary.

There are three levels of airspace management:

- Level 1 - Strategic: where long-term planning of the national airspace and airspace structure management policy is defined through a joint civil/military process.
- Level 2 – Pre-tactical: where management is done on a day-to-day basis, on the day before operations, and temporary allocation of airspace is done through the Airspace Management Cell (AMC), which collects and analyses all airspace requests and decides airspace allocation on a daily basis.
- Level 3 - Tactical: where airspace use is managed in real time.

FLEXIBLE AIRSPACE STRUCTURES

The FUA concept complements airspace organization into a series of flexible structures as defined below:

- Temporary Segregated Areas (TSA): airspace of predefined dimensions established in response to civil and military needs that may require temporary reservation of airspace. TSAs are described in ENR 5.2. The AMC manages TSAs at the pre-tactical level the day before operations. They are activated during the period published in the AUP.
- Manageable Danger and Restricted Areas: military areas that, while maintaining their D or R concept, can be managed and allocated by the AMC in the same way as TSAs during the periods of time published in section ENR 5.1.
- Conditional Routes (CDR): non-permanent ATS routes or portions thereof that can only be planned and used under certain specific conditions within the periods of time published in the description of the Conditional Route. Each CDR published in section ENR 3.5 is associated to an alternative route.

CDRs are divided into three categories according to their possible use in the flight plans:

CDR 1 **-** they are established at the strategic phase (Level 1). They are available most of the time, so they can be permanently included in the flight plans (RPL and FPL). Every day, the AUP and CRAM are distributed with the CDR1 routes that are being closed. The RPLs affected by temporarily closed routes shall be cancelled and a new FPL containing item 15, the published alternate route corresponding to each unavailable CDR1, will be filed. If it is known sufficiently in advance that it will be closed, then it will also be included in the FAUP (AUP forecast issued 30 days in advance of the day of operation). If a CDR1 must be closed to traffic on a short notice, ATC will instruct flights to use alternate routes in the tactical phase.

CDR 2 – they are managed at the pre-tactical phase (Level 2). They cannot be permanently planned. CDR2s may only be included in the FPL, according to the conditions published daily, on the day before operations, though the Conditional Route Availability Message (CRAM). The AMC will issue an AUP forecast (FAUP).

CDR 3 they are managed at the tactical phase (Level 3). They cannot be planned in flight plan. They can only be used subject to ATC clearance, following civil-military coordination. CDRs cross Temporary Segregated Areas (TSA) or Manageable Danger and Restricted Areas. The periods of time during which such routes or route segments are classified as CDR 2 or CDR 3 must coincide with the activity periods of the areas crossed. One same ATS route segment may be conditional 1, 2, or 3 in different periods of times. In Spain, the ATS route is used normally outside of the periods of time and vertical limits published as CDR.

AIRSPACE MANAGEMENT UNITS

Airspace Management Cell (AMC)

It is a national joint civil/military unit responsible for day-to-day management (pre-tactical phase) and temporary allocation of airspace according to the requirements of airspace users (ACC, FMP, military area managing units and other approved agencies). It prepares the Forecast Airspace Use Plan (FAUP) 30 days before the operation. The day before the operation, it prepares the Airspace Use Plan (AUP). In exceptional circumstances, between day D-30 and day D-1, authorized agencies can make modifications to the FAUP, which shall be reflected in the corresponding AUP message.

Centralized Airspace Data Function (CADF)

CADF is a EUROCONTROL unit that collects, analyzes and consolidates all information related to CDRs, as provided by national AMCs through the "Airspace Use Plan" (AUP). The day before operations, the CADF prepares and issues a list of available CDRs through the Conditional Route Availability Message (CRAM)"

PUBLICATION OF INFORMATION ON THE AVAILABILITY OF FLEXIBLE STRUCTURES

Forecast Airspace Use Plan (FAUP)

Every day, the AMC prepares a "Forecast Airspace Use Plan" (FAUP) 30 days before the day of operations. This information will be disseminated through the CFMU, the NOP website and Aena's air navigation website, or through the most effective means available at any time. It is prepared before 1400 hours UTC and is valid for 24 hours starting at 0600 hours UTC of the day of operation. Any exceptional changes that may be introduced will be included in the corresponding AUP.

Update of the Forecast Airspace Use Plan (FUUP)

The AMC may issue and "Update to the Forecast Airspace Use Plan" (FUUP) to amend the FAUP. It will have the same means of distribution as the FAUP. The FUUP will be disseminated before 0900 UTC of day D-29, and will have the same validity period as the original FAUP to which it refers.

Airspace Use Plan (AUP)

The AMC sends the "Airspace Use Plan (AUP)" through the CIAM (CFMU Interface for airspace managers) to the CFMU/CADF before 1400 UTC of the day before the operation, with a validity period of 24 hours starting at 0600 UTC of the next day. The AUP may contain variations to the FAUP. The AUP has the following sections:

A) – List of available CDR 2s.

B) - List of permanent ATS routes and temporarily closed CDR1s.
C) – List of active TSAs and manageable R and D areas.

Example of AUP:

LECBUIR

No.	Route-Portion	FL Block	Validity Period	Remarks
1	UG850: VLC-RESTU	F350-F460	14:30 - 15:30	——
2	UH300: ADX-CLS	F250-F460	12:30 - 14:30	——

LECMUIR

No.	Route-Portion	FL Block	Validity Period	Remarks
1	UA31: CJN-ASTRO	F250-F460	12:30 - 15:00	——
2	UA31: CJN-ASTRO	F250-F460	22:00 - 22:59	——
3	UA31: CJN-ASTRO	F250-F460	05:00 - 06:00	——

B) Closed ATS routes and Category 1 CDR.

LECMUIR

No.	Route-Portion	FL Block	Validity Period	Remarks
1	UG25: STG-KORET	F245-F300	09:00 - 11:30	——

C) Active TSA and AMC Manageable R & D Areas.

LECMUIR

No.	Route-Portion	FL Block	Validity Period	Remarks	Resp. Unit
1	TSA 28 STG	F245-F300	09:00 - 11:30	——	LECMZAMC

Updated Airspace Use Plan (UUP)

The AMC issues the “Updated Airspace Use Plan (UUP)”, which amends the AUP. It has the same format and addressees as the AUP. It makes reference to the number of the AUP it is updating and includes any changes that may occur on the day of operations. It is issued before 0900 UTC on the same day of operations. It has a validity period of 18 hours from 1200 UTC of that day to 0600 UTC of the following day.

Conditional Route Availability Message (CRAM)

The “Conditional Route Availability Message (CRAM)” is issued by the CADF to aircraft operators, ARO, ACC/FMP, AMC of the ECAC area and to the CFMU at 1500 UTC of the previous day of operations and is valid for 24 hours starting at 0600 UTC of the next day. The CRAM is transmitted through the AFTN or SITA and is available on CFMU terminals. It contains the list of airway segments classified as CDR2 that will be available for the period indicated in the message. For security reasons, information published by the AIS on the CDR1s and permanent ATS routes that are closed for specific periods is repeated in the CRAM.

Example of CRAM:

```
GG  LEANZDZX
041524  EUCHZMTA
PART  001  OF  006
CRAM VALID FROM 05/01/1998  06:00  TO: 06/01/1998  06:00  RELEASED: 04:15

A) CDR TYPE 2 AVAILABILITY:

    UA10       TRA            RESIA    (LSAZUIR)
1              F200-590       0700-1230

    UA23       ELVAR          BEJ    (LPPCUIR)
2              F245-255       0600-0600

    UA31       CJN            ASTRO    (LECMUIR)
3              F250-460       0600-0730
4              F250-460       1330-2359

    UA41       SRN            FRANE    (LSAGUIR)
5              F200-590       0600-0730

..............

    UZ917      KRH            ADENU    (EDUUUIR)
93             F250-290       0600-0600


B) ATS ROUTE AND CDR TYPE 1 CLOSURE:

    UG15       TRT            VIBER    (EDBBUIR)
1              F310-350       0730-0930
2              F310-350       1100-1230
3              F310-350       1345-1600

    UG102      HAM            FLD    (EDBBUIR)
4              F310-350       0730-0930
5              F310-350       1100-1230
6              F310-350       1345-1600
```

APPENDIX J

Model of Action plan for the flexible use of airspace (FUA)

<table>
<tr><td colspan="5">NATIONAL PERFORMANCE OBJECTIVE XXX
Flexible use of airspace (FUA)</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Improved civil/military coordination and cooperation reinforces airspace safety.
Note: include other benefits as necessary)</td></tr>
<tr><td>Environmental protection and sustainable development of air transport</td><td colspan="4">• Allows for a more efficient ATS route structure, reducing miles flown and fuel consumption, and thus CO2 emissions into the atmosphere.
• Increases airspace capacity
• Greater availability of reserved airspace at times where there is no activity by the users of this airspace.
Note: include other benefits as necessary)</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Percentage of special use areas (SUA) coordinated for the application of the FUA concept
• Number of letters of operational agreements on civil/military coordination and cooperation
• Permanent reduction of the amount of reserved airspace.
• Note: include other metrics as necessary</td></tr>
<tr><td colspan="5">Strategy
2012 – 2018</td></tr>
<tr><td>*Activity</td><td>Start</td><td>End</td><td>Responsible party</td><td>Remarks</td></tr>
<tr><td>1. Establish policies and develop standards on FUA (subtasks)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Establish a national high-level committee for civil-Military cooperation and coordination (subtasks)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3. Sign a memorandum of understanding (MOU) between civil and military authorities (subtasks)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4. Hold seminars/meetings with civil and military authorities and reserved airspace users to show the importance to airspace use optimization (subtasks)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5. Evaluate, in an early stage, all restricted, prohibited and danger areas that affect or could affect air flow in order to reduce them as much as possible (subtasks)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>6. Develop a medium-term uniform and collaborative national airspace planning process, taking into account</td><td></td><td></td><td></td><td></td></tr>
</table>

all user needs and national security, defense and police requirements (see subtasks)				
7. Implement an airspace management cell (AMC) to conduct an effective coordination in real time (subtasks)				
8. Adopt adequate measures to improve the efficacy of traffic flow management, by developing conditional routes (CDR) that allow dynamic rerouting of aircrafts to avoid special use airspace (subtasks)				
9. establish regulations and procedures to communicate, negotiate and determine priorities for civil-military coordination (subtasks)				
10. Establish, when required by ANSPs, **procedures to coordinate temporary reserved airspace** through the issuance of NOTAMs or specific real-time reservation activation/deactivation procedures (subtasks)				
11. Draft the necessary letters of operational agreement between ATS units and military units or other users for the activation of restricted airspace when necessary (subtasks)				
12. Manage information in order to establish and publish in the AIP the CDR routes and the procedures for activities requiring airspace reservation and restriction (subtasks)				
13. Carry out the safety assessment and risk analysis when FUA measures are introduced (subtasks)				
14. Establish a system to periodically revise airspace requirements, organization and management (subtasks)				
15. Assess training requirements for FUA application and provide the courses that are deemed necessary (subtasks)				
16. Track progress during FUA implementation (subtask)				

* Activity: Indicates the activities required for achieving the performance objective.
* End: Insert the date when the task ends.
* Responsible party: Insert the name of the unit/person responsible for carrying out the task.
* Remarks: Insert any remarks that may help understand the purpose of the task.

LIST OF SUBTASKS TO ACHIEVE THE FUA PERFORMANCE OBJECTIVE

Note: Tasks included here are for reference only, and are not exhaustive.

1 - Subtasks to establish policies and draw up FUA-related regulations

1. Analyze national documentation and verify if there are any regulations or policies related to the flexible use of airspace.
2. If there are no regulations, revise global and regional documentation as reference material
3. Draft the corresponding standard.
4. Submit the standard to the consideration of the corresponding authorities to check compliance with current legislation.
5. Review remarks that may have been identified in the previous item.
6. Finish the document
7. Submit the document to the aeronautical authority for approval.
8. Take all corresponding action for its inclusion in the national legislation, if applicable.

2- Subtasks to establish a High-Level Committee for Civil-Military Cooperation and Coordination

1. Select the person or group of persons in charge of developing the task and the Committee Secretariat.
2. Evaluate ICAO current provisions related to civil-military cooperation and coordination.
3. Analyze national regulations and status concerning civil-military coordination and cooperation.
4. Draft the terms of reference and committee objectives.
5. Develop a work program
6. Evaluate who is eligible to participate in the National Committee (civil/military aviation representatives, and/or other airspace users, where necessary)
7. Send invitations for the first Meeting of the Civil/Military Coordination and Cooperation Committee
8. Hold the first Meeting of the Committee
9. Submit the terms of reference and work program to the Committee for its consideration.
10. Approve the terms of reference and work program.
11. Set meeting schedule based on the work program.

3- Subtasks to draft the Memorandum of Understanding (MOU)

1. Review national regulations related to Civil-military coordination.
2. Evaluate previous global and national experiences
3. Draft the MOU
4. Submit the MOU for consideration by national authorities for review.
5. Review all observations made to the document, if applicable.
6. Submit MOU to the consideration of the high level Committee for civil-military cooperation and coordination.
7. Approve the MOU
8. Take appropriate actions for MOU to come into effect.

4 – Subtasks to hold seminars and meetings with civil and military authorities, and reserved airspace users

1. Evaluate the need for seminars related to FUA
2. Evaluate the need to hold meetings with the parties involved in the FUA concept.
3. Prepare a plan of activities regarding seminars and/or meetings.

4. Prepare material for seminars on FUA
5. Prepare material and documentation for holding meetings on FUA.
6. Coordinate the development of activities with all the parties involved.
7. Send invitations for scheduled activities.
8. Carry out the activity
9. Prepare a report with the results of the activities
10. Submit the results of the activities, as established.
11. If necessary, track results and their implementation in terms of time and form.

5- Subtasks to evaluate, in an early stage, all restricted, prohibited, and danger areas that affect or could affect circulation

1. Review national regulations related to the implementation of prohibited, restricted, and danger areas.
2. Analyze all restricted, prohibited, and danger areas that have been implemented in each State, using the sample form for the use and management of restricted, prohibited, and danger areas and special use airspace in the SAM Region contained in Appendix F.
3. Consider in the analysis the unmanned aircraft systems (UAS)
4. Verify if it is possible to reduce, eliminate or modify SUA structure
5. Identify those SUAs that may be used dynamically by applying the FUA concept.
6. Analyze different scenarios in order to apply strategic airspace management.
7. Analyze different scenarios in which, due to safety, it may be necessary to establish procedures or conventions to avoid tactical airspace management.
8. Establish guidelines, in an early stage, to allow timely and foreseeable access to restricted or reserved airspace, in order to maximize benefits.
9. Take appropriate action in order to authorize dynamic use of special use areas.

6- Subtasks to develop a uniform and collaborative national airspace planning process regarding FUA

1. Analyze ICAO regulations regarding CDM.
2. Evaluate national regulations on CDM, and if there are none, establish the criteria for their application (See CDM SAM).
3. Identify the areas that will participate in airspace planning.
4. Verify that FMUs and/or FMPs are represented.
5. Analyze airspace structure taking into account user needs, especially national security, defense and police requirements.
6. Identify special use airspace at national level that may prevent flexible use of airspace.
7. Create national plans to optimize airspace structure taking into account the application of the FUA and CDO concepts.
8. Review national plans to optimize airspace structure in accordance with FUA and CDO, where applicable.
9. Propose to the corresponding planning area the adjustments necessary to accommodate national, defense and police requirements.
10. Verify that all proposals are incorporated into the national air navigation plan of the State.

7- Subtasks to implement the airspace management cell (AMC)

1. Analyze the need to establish an AMC for the management of special use airspace in the pre-tactical and tactical phase.
2. Define activities that AMC will carry out when coordinating civil/military/police operations including the following:
   a) Granting of authorizations for aircraft overflights
   b) Coordination of unusual military traffic in airspace

c) Real-time coordination of SUA activation/release periods with ATC units
d) Application of the FUA concept in daily operations
e) Management of conditional routes (CDR) in close cooperation with ATC units.
f) Drafting of the Forecast Airspace Use Plan (FAUP)
g) Drafting of the Airspace Use Plan (AUP).

3. Establish agreements between ATC and AMC units.
4. Develop applicable procedures.

8 - Subtasks to adopt suitable measures to improve the efficiency of traffic flow management

1. Evaluate the application of conditional routes at global and regional level
2. Review national special use airspace planning that may affect the efficiency of civil operations.
3. Identify the SUAs that may be appropriate for implementing the CDRs.
4. In coordination with parties involved in CDM, develop conditional routes (CDR) for dynamic rerouting of aircraft to avoid special use airspace.
5. Training ATC staff on the application of CDR routes and procedures for coordination and cooperation with the areas involved.
6. Publish CDR routes in the AIP
7. Insert CDR routes and all associated procedures in the operational manuals.
8. Set the date(s) for CDR implementation.
9. Perform risk management before CDR implementation
10. Track CDR application

9- Subtasks to establish regulations and procedures to communicate, negotiate, and determine priorities for civil-military coordination

1. Evaluate existing State regulations and procedures.
2. Analyze means of communication between ATC and military units.
3. Establish means of communication
4. Develop applicable procedures.
5. Define the criteria to be used for determining civil-military coordination priorities
6. Submit these criteria to the consideration of involved parties for approval.
7. Include primary and secondary means of communication in letters of operational agreement.
8. Include applicable procedures in the letters of operational agreement.
9. Train ATC and military personnel on the use of applicable means and procedures.
10. If necessary, publish all corresponding procedures in the AIP
11. Implement the means of communication and procedures.
12. Periodically check the operation of the means of communication.
13. Periodically check if procedures meet airspace user requirements, and if civil-military coordination is being carried out effectively.

10 – Subtasks to establish procedures to coordinate temporary reserved airspace (TRA)

1. Verify TRA coordination procedures at national level.
2. If there are no procedures, define such procedures, including real-time activation/release.
3. Check if temporary reservation is done through NOTAM or through real-time specific reservation activation/deactivation procedures.
4. Submit procedures to the consideration of the parties involved.
5. Following their approval, include TRA coordination procedures in the letters of operational agreement between ATC and military units.
6. Train ATC and military staff on the implementation of TRA coordination procedures.
7. If necessary, publish all corresponding procedures in the AIP

8. Implement procedures
9. Periodically check if procedures meet TRA coordination requirements and if coordination is carried out effectively.

11 – Subtasks to draft Letters of Operational Agreement between ATS units and military units or other users

1. Assess current procedures for the activation of restricted airspace when so required
2. Agreements and procedures for flexible use of airspace may be established in the Letters of Operational Agreement, which shall include the following items:
    a) horizontal and vertical limits of the airspace concerned;
    b) the classification of the airspace available for use by civil air traffic;
    c) units or authorities responsible for airspace handover;
    d) conditions for airspace handover to the ATC unit concerned;
    e) conditions for airspace handover from the ATC unit concerned;
    f) airspace availability periods
    g) any limitations on the use of the airspace concerned; and
    h) any other relevant procedures or information.
3. Train ATC and military personnel on the use of the LoA.
4. If necessary, publish all corresponding procedures in the AIP
5. Implement the LoA
6. Periodically review the LoA to verify that it effectively meets civil-military coordination requirements.

12- Subtasks for managing information in order to establish and publish CDR routes in the AIP, and procedures for activities requiring reserved and restricted airspace

1. Negotiate with the corresponding AIS office.
2. Check the time required for the relevant information to be duly published
3. Coordinate with the AIS office the establishment of a publication timetable and the dates in which information must be available in the AIS
4. Check information before publication to ensure its accuracy.
5. Check that information is being published in accordance with national regulations.
6. Verify that publication dates are effectively met

13- Subtasks to carry out the safety assessment and the risk analysis when FUA measures are introduced

1. Contact the local safety office
2. Verify the time required to perform the safety assessment of FUA procedures and measures to be implemented.
3. Coordinate with the local safety office who will perform the risk analysis
4. Supply all the information needed by the safety office
5. Participate as an observer during risk analysis sessions.
6. Verify that the outcome meets the level of safety agreed by the State.
7. Communicate the outcome to the corresponding State authorities
8. Verify that risk mitigation actions are executed before FUA measures and/or procedures become effective.
9. Track FUA measures and procedures implemented to ensure that safety is not affected.

14- Subtasks to establish a system to periodically review airspace requirements, organization and management

1. Create a strategy to periodically review airspace requirements, organization, and management.

2. Submit this strategy to the Civil- Military Cooperation and Coordination Committee.
3. Approve the strategy
4. Implement appropriate action to comply with the strategy approved.
5. Verify compliance with the objective established in the strategy.

15- Subtasks to assess training requirements for the application of FUA and to provide the necessary courses

1. Evaluate national regulations and other documentation related to personnel training.
2. Verify if current documentation contains adequate material for FUA to be successfully implemented.
3. Analyze the topics that shall be included in the courses concerning FUA
4. Coordinate with the corresponding Civil Aviation Training Centre (CATC) the inclusion in the curriculum of topics related to FUA.
5. Coordinate with CATC the specific training and seminars that would be required for FUA implementation.
6. Assist the CATC in all matters related to FUA.
7. Verify that training related to FUA is being provided effectively.

16- Subtasks to track progress during the implementation of FUA

1. Strictly monitor progress in the implementation of FUA in the State.
2. Verify the results of all processes related to FUA.
3. Inform the Civil-Military Cooperation and Coordination Committee of all aspects that might prevent the effective implementation of the FUA
4. Take appropriate measures to overcome obstacles for the implementation of the FUA.
5. Verify that measures taken will overcome the difficulties encountered.

REFERENCE DOCUMENTS

- Convention on International Civil Aviation (The Chicago Convention)
- Annex 2, - *Rules of the air,*
- Annex 11 –*Air Traffic Services,*
- PANS-ATM, Doc. 4444 - *Procedures for Air Navigation Services — Air Traffic Management*
- Doc. 9554 -*Manual concerning Safety Measures Related to Military Activities Potentially Hazardous to Civil Aircraft Operations*
- Doc. 9426 –*Air Traffic Services Planning Manual*
- Doc. 9750 –*Global Air Navigation Plan*
- Doc. 9854 – *ICAO Global Air Traffic Management Operational Concept*
- Doc. 8126 – *AIS Manual*
- Assembly Resolution A 37-15 - Consolidated statement of continuing ICAO policies and associated practices related specifically to air navigation.
- Reports of Air Navigation Regional Meetings for the CAR/SAM Regions (CAR/SAM RAN)
- Global Air Traffic Management Forum on Civil/Military Cooperation (2009)
- Circular 330-AN/189 – *Civil-Military Cooperation in Air Traffic Management*
- GREPECAS meetings– Caribbean and South American Regional Planning and Implementation Group
- Performance-Based Air Navigation System Implementation Plan for the South American Region (SAM-PBIP)
- CDM Manual for the SAM Region
- ATFM Manual for the CAR/SAM Regions
- SAMIG Meeting Reports
- RAAC Meeting Reports - Meeting of Civil Aviation Directors
- Report of the Seminar on Civil/Military Coordination and Cooperation and flexible use of airspace for the NAM, CAR, and SAM Regions (2011)

- Spain AIP
- Regulation 2150/2005 - Common Rules for the Flexible Use of Airspace European Commission
- Single European Sky -European Organization for the Safety of Air Navigation (EUROCONTROL)
- NextGen –Federal Aviation Administration (FAA)

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

Follow up of the en-route PBN action plan and definition of future PBN implementation activities in the SAM Region pursuant to ICAO Resolution A37-11

3.1 Amongst the activities related to the implementation of PBN procedures in the SAM Region that were approved by the Ninth Workshop/Meeting of the SAM Implementation Group (SAM/IG/9), the Meeting took note of the support provided by IATA to the "ICAO PBN Strategy Ad-Hoc Group" Workshop/Meeting, held at the ICAO SAM Office, in Lima, Peru, on 30 July-3 August 2012, for the purpose of sharing with the SAM ATM community the lessons learned at global level in terms of PBN implementation and also to contribute to the restructuring the SAM PBN Action Plan (Brazil, Colombia, Peru, IATA, and LAN).

3.2 The Meeting also noted that the concept known as **4 corners (Appendix A** to this part of the report**)** proposed by Brazil was not totally compatible with the whole Region due to specific geographical features and different operational working methods, which prevent its full application. However, since the concept is intrinsically flexible, it could be applied in some areas with some adjustments. Therefore, in order to explore the specifics of the concept as a whole, a theoretical module on the ***4 Corners*** concept will be presented at the "Airspace Planning Course" to be held next year for SAM States.

3.3 The Meeting also identified the need to improve the operational training of air traffic controllers with respect to the PBN concept, taking into account the impact this deficiency has on aircraft operations, mainly in the approach phase. Accordingly, the Meeting concluded that a practical guide should be developed with detailed information and its applications and operational procedures, with a view to harmonising the knowledge about the PBN concept amongst ATC service providers.

3.4 The ICAO South American Regional Office will consider hiring an ATM expert for a period of two weeks in January 2013, to develop the contents of the graphical-visual material for the harmonisation of the PBN concept, taking into account the support provided by Regional Project RLA/06/901.

3.5 Regarding a new PBN implementation stage, either RNP4 in oceanic areas or RNP2 in continental areas, the Group considered that the Region did not require such implementation for the time being until such time that an analysis is made of RNAV/5 capacity and optimisation. Likewise, a new assessment will be made at the SAM/IG/12 meeting to identify the need for future RNP2 and/or RNP4 implementations.

3.6 The Meeting noted that the use of the RNAV/5 ATS route network is not being optimised to its full capacity yet and that, in order to make a better performance, a follow-up must be done on the SAM ATS route network optimisation programme in order to meet the established objectives.

3.7 The Region identified the need to analyse all possible benefits of RNAV5 with respect to Version 1 of the SAM ATS route network of March 2011, taking into account the optimisation of the SAM route network. In addition, the Group highlighted that States must continue striving to analyse the navigation capacity of the fleet prior to such implementation.

3.8 Consequently, the Meeting urged the States that had data that could be used to analyse the benefits to submit an information paper to the next SAM/IG/11 meeting. For that purpose, the Secretariat will develop a guide.

Regional inventory of implementation of PBN procedures in SAM States

3.9 The Meeting reviewed the status of the Regional Inventory of PBN-based approach procedures and en-route operations that are already operational or under development that the SAM/IG/9 meeting had requested States to submit on 27 July 1012.

3.10 To date, only six States of the Region had sent their data to complete the information requested. Likewise, the Meeting identified some information that was missing and that had to be provided by the States in order to reflect the status of implementation of PBN in the States in accordance with Resolution A-37-11.

3.11 Accordingly, the Secretariat will update the ***Regional inventory of PBN-based approach procedures and terminal/en-route operations*** form that will be sent again to the States for completion with the new data that will be requested.

3.12 Finally, the Meeting highlighted the importance of preparing a table, ***Assessment of the PBN capacity of the aircraft fleet***, shown in Appendix B to this part of the report, in order to know the status of PBN approval of the aircraft fleet of SAM States. The information presented will serve to make decisions concerning a future implementation of PBN in its various stages.

3.13 Accordingly, the States are urged to keep the table Assessment of the PBN Capacity of the Aircraft Fleet updated, providing current data at each SAM/IG meeting. Likewise, the Secretariat will ask CARSAMMA about the possibility of handle the information provided today through Form F5 so that, in addition to having a list of approved aircraft, it may be possible to have a summary of the current status of the fleet, by State, indicating the total number of approved aircraft with respect to each PBN specification (similar to that proposed for the table ***Assessment of the PBN capacity of the aircraft fleet***).

Updated plan of Chile

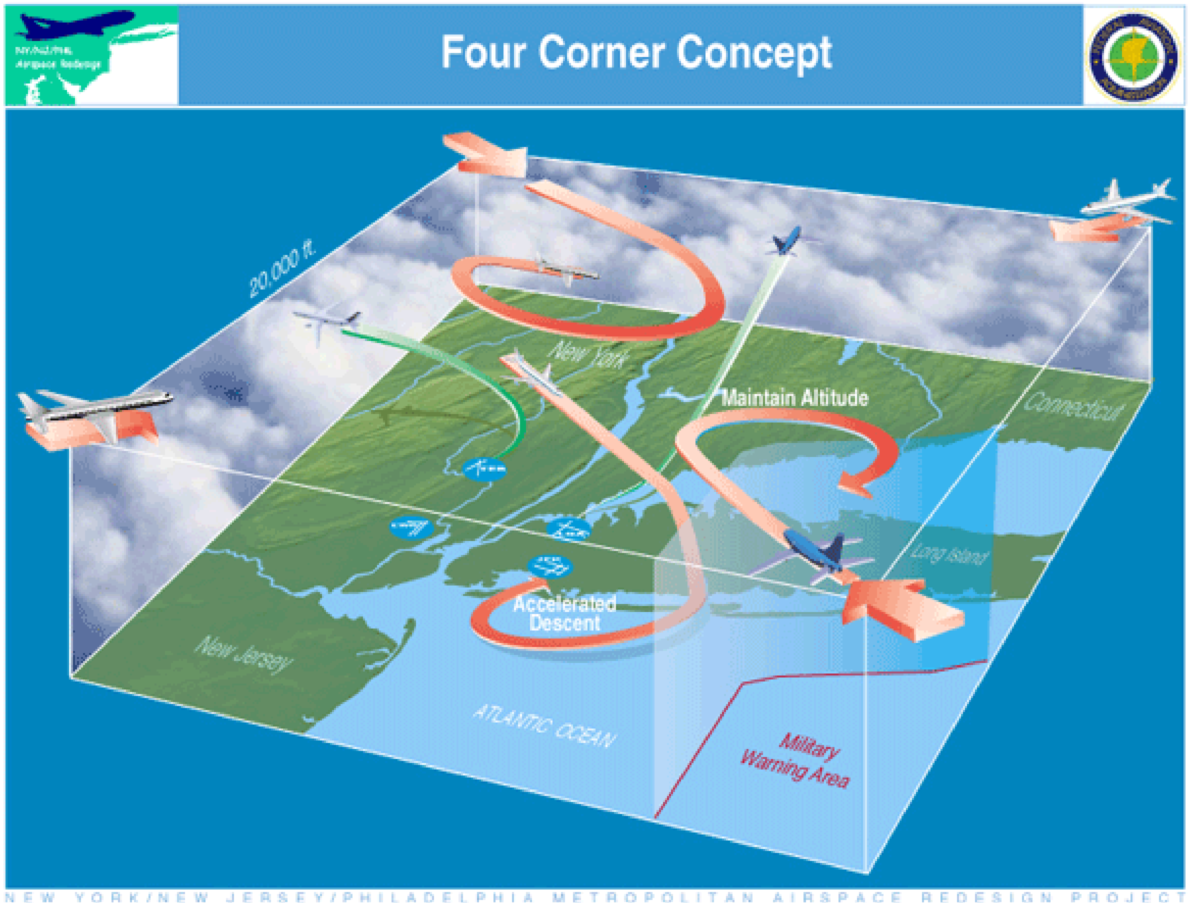
3.14 The Meeting took note that, pursuant to conclusion SAM/IG/9-3, **National PBN Implementation Plan**: *That the States update their National PBN Implementation Plans and submit them to the next SAM/IG/10 meeting*, Chile submitted its revised PBN implementation plan as Attachment A to IP/3 of this Meeting.

RAIM availability prediction service

3.15 The Meeting took note of the progress made in the implementation of the RAIM availability prediction service. In this regard, it was noted that the new document of Project RLA/06/901 with the inclusion of the RAIM prediction service, will be presented at the Sixth Coordination Meeting of Project RLA/06/901 to be held in Lima, Peru, on 21-23 November 2012, for approval. Subsequently, the bidding process will start through the Procurement Section of the Technical Cooperation Bureau of ICAO. It is expected that the bidding process will be completed by mid-2013 to then proceed with the implementation and operation. In this respect, the Secretariat will present the progress made in the implementation of the RAIM availability prediction service at the next SAM/IG/11 meeting.

APÉNDICE/APPENDIX A

DESCRIPCIÓN DEL CONCEPTO 4 CORNER
DESCRIPTION OF 4 CORNER CONCEPT



(Concepto de cuatro esquinas: aeronaves que llegan entran el espacio aéreo del APP en cualquiera de las 4 esquinas del cuadrado. Los vuelos que parten, saldrán de la caja por cualquiera de los lados. Este concepto permite a los controladores utilizar Procedimientos de Control en área Terminal a un grado mucho mayor. Dichos procedimientos maximizan el uso de todo el espacio aéreo disponible y pueden reducir los "cuellos de botella" existentes).

(Four corner concept: Arriving aircraft enter the APP airspace at any of the 4 corners of the square. Departing flights will exit the box on any of the sides. This concept allows controllers to utilize Terminal Control Procedures to a far greater extent. These procedures maximize the use of all available airspace and can reduce existent "bottle necks.")

APÉNDICE / APPENDIX B
Región SAM – Evaluación de La Capacidad PBN de La Flota de Aeronaves
SAM Region – Assessment of Fleet PBN Capacity

Estado / State	**Número Total de Aeronaves Aprobadas / Total Number of Approved Aircraft [1]**	**Especificación PBN / PBN Specification**	**Aeronaves Aprobadas por Especificación PBN / Approved Aircraft by PBN Specification [2]**	**Porcentaje de Aeronaves Aprobadas/ Percentage of Approved Aircraft [3]**
ARGENTINA	300	RNAV 10	100	33%
		RNAV 5	246	82%
		RNAV 1 & 2	188	63%
		RNP 4	61	20%
		RNP 1	133	44%
		RNP APCH	121	40%
		RNP APCH com baro-VNAV	89	30%
		RNP AR APCH	22	7%
BOLIVIA		RNAV 10		
		RNAV 5		
		RNAV 1 & 2		
		RNP 4		
		RNP 1		
		RNP APCH		
		RNP APCH com baro-VNAV		
		RNP AR APCH		
BRAZIL		RNAV 10		
		RNAV 5		
		RNAV 1 & 2		
		RNP 4		
		RNP 1		
		RNP APCH		
		RNP APCH com baro-VNAV		
		RNP AR APCH		

Instrucciones para llenar/instructions to fill-in:

1) Debe reflejar la cantidad de aeronaves para las cuales el Estado ha emitido al menos una aprobación PBN; / Should reflect amount of aircraft for which the State has issued at least one PBN approval.
2) Entre las aeronaves aprobadas, se debe indicar la cantidad que tiene cada una de las especificaciones PBN listadas. Se debe tener en cuenta que, en general, cada aeronave tiene más de una aprobación PBN. En los casos en que no hay ninguna aeronave aprobada para una determinada especificación llenar con 0 (cero). / among approved aircraft, the indicate the amount of each one of the listed PBN specifications. In cases where non-approved aircraft exists for a particular specification, fill in with 0 (zero).
3) El porcentaje de aeronaves aprobado debe ser el resultado de la razón entre el número de aeronaves aprobadas para cada especificación PBN particular y el número total de aeronaves aprobadas por un Estado específico. / the approved aircraft percentage must be the result of the reason between the number of approved aircraft for each PBN particular specification and the total amount of approved aircraft by a specific State.

Agenda Item 4: Air Traffic Flow Management Implementation (ATFM) in the SAM Region

Review of the ATFM action plan

4.1 The Meeting reviewed the Action Plan for the implementation of ATFM at airports and the airspace (ATC sectors) of the Region, which defines tasks, responsible parties, and target dates. The Action Plan was revised by the Meeting and is shown in **Appendix A** to this part of the report.

Structure of ATFM operational teleconferences

4.2 The meeting noted that, in order to follow up ATFM implementation activities in the SAM Region, and based on the results of task 5.5 “Train ATM community members in the CDM and ATFM concepts” of the Action Plan for the Implementation of AFTM in the SAM Region, the ICAO South American Regional Office organised the first ATFM Operational Teleconference (ATFM TOPS) for national ATFM units of the SAM Region, which was held on 15 August 2012.

4.3 Likewise, the Meeting ratified the need to conduct a representative study of the main air traffic flows in the Region (SAM/IG) and what national ATFM units would be directly involved in ATFM actions.

4.4 Accordingly, the Secretariat will send to the ATFM focal points identified in ***Appendix B*** to the report on Agenda Item 5 of the SAM/IG/8 meeting – ***List of contacts for ATFM teleconferences***, a form to be used by States to list their main airports and also the main destination airports, thus defining the main flows to be coordinated during the operational teleconferences (TO).

4.4.1 Example of information to be provided by the States:

State	MAIN AIRPORT	MAIN DESTINATION AIRPORT
BRAZIL	SBGR, SBGL,…	SAEZ, SPIM, SVMI,…
VENEZUELA	SVMI y SVMG	SBGR, SBGL, SAEZ, SPIM,…
PERU	SPIM,…	SBGL, SAEZ,…
COLOMBIA	SKBO	SBGR,…

4.5 The Meeting took note that, for future ATFM operational teleconferences amongst national ATFM units, use could be made of the REDDIG II, which envisaged an ATS speech sub-network under the IP protocol for the initial ATFM work, and that, in addition to this sub-network, 20 IP phones had been purchased.

4.6 The Meeting agreed that ICAO SAM Regional Office shall consult Brazil (DECEA), in order to verify the possibility that the CGNA makes a presentation on the strategic planning being developed for large events to be carried out between 2013 and 2016 in Brazil, to the ATFM Units Members of SAM Region States.

4.7 In view of the above, States that have not done it yet are urged to implement their ATFM units in order to effectively participate in future operational teleconferences. The Meeting noted that not all the States had implemented an ATFM unit or had assigned personnel to conduct the activities related to air traffic flow management.

4.8 In order to ensure that ATFM units have their personnel permanently trained, the Meeting felt important that the ICAO SAM Regional Office shall consult Brazil (DECEA) in order to study the possibility to hold at their premises, runway capacity estimation courses, runway capacity, ATC sector capacity estimation, as well as introductory courses on ATFM / CDM, on 2013, to all SAM Region States.

4.9 Finally, the meeting defined the form for data exchange, **Appendix B** to this part of the report, which shall be used in operational teleconferences (TO). In addition, the group highlighted that during the first Telcon to be carried out on 31 October 2012, at 18:30 UTC, the initial presentation of the format for operational TELCONS, with emphasis in collaborative-decision making, in order to harmonize participation of ATFM units.

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**		
1.9 Carry out Calculation of Airport and Airspace Capacity of main airports by States. 1. Identify main airports 2. Identify airports exceeding runway capacity 3. Carry out capacity and ATS sector calculation capacity. 4. Define airports capacity0	Sept 2009	SAM/IG/8	States	**Valid** Brazil, Paraguay and Peru presented the data. Venezuela presented its runway capacity calculation for the Maiquetía airport. Chile announces completion of estimates in its main airport, results to be provided mid-June. Valid in view of the lack of estimates in some airports. As a conclusion encourage States to accelerate publication of data, date to be determined by Secretariat, even though the tentative date would be SAM/IG/11.
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	**Permanent** Brazil, Paraguay and Peru presented the data. It is suggested to merge 1.9 with 1.12 and 1.20 with 1.11 in order to assure States that the aim of these tasks is to share information.

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
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				
3. Infrastructure and database		**Aug 2008**		
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** The meeting was informed that the Secretariat will follow-up on this matter.
3.3 Coordinate implementation activities with the Automation Group			ATFM/IG	**Permanent** Hire a group of experts to review the manual
4. Policy, standards, and procedures				
4.7 Keep updated AIP/AIC Supplements.		SAM/IG/10	States	**Permanent**
5. Training				
5.1 Draft ATFM training plans and submit them		TBD	States	**Permanent**
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/10	States	**Permanent**
6. Final implementation decision				
6.1 Identify and review factors that may affect the implementation decision		SAM/IG/10	States	**Valid**

A: AIRPORT				
Task description	**Start**	**End**	**Responsible party (designate individual or organisation in charge)**	**Remarks**
6.2 Declare the pre-operational implementation in the defined area		SAM/IG/10	States	**Valid** Declare definitive date for implementation**.**
6.3 Declare the final operational implementation in the defined area		SAM/IG/10	States	**Valid**
7. Monitor system performance				
7.1 Draft the ATFM post-implementation follow-up programme at airports	SAM/IG/6	SAM/IG/10	ATFM/IG	**Valid**
7.2 Implement the ATFM post-implementation follow-up programme at airports	SAM/IG/7	SAM/IG/10	States	**Valid**
Tentative pre-operational implementation date		SAM/IG/10	States	**Valid**
Tentative definitive implementation date		SAM/IG/10	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				
1.2 Prepare an airspace demand survey	TBD	TBD		**Valid**
1.4 Carry out the States estimate airspace ATC sector capacity at the major airports	**Sept. 2009**	SAM/IG/10	States	**Valid** States must submit their studies before the SAM/IG/10 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/10	States	**Permanent** States must submit their studies before the SAM/IG/10 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/10	States	**Permanent** States must submit their studies before the SAM/IG/10 Meeting. Brazil has presented their studies.
1.7 Present conclusions on the existing airspace capacity.	**TBD**	SAM/IG/10	States	**Valid** States must submit an information paper on the situation before the SAM/IG/10 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/10	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/10 Meeting. Submit for consideration of the Secretariat the new tasks form proposed by Colombia and discussed by all. Secretariat must issue a communication so that States define who may implement ATFM.
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**

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**
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 advisories	**2008**	**2012**	Regional Project RLA/06/901	**Permanent** Subject to evaluation of **SAM/IG/10 WP/12** States maintain web conferences for exchange of information.
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**	**TBD**		
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	**Permanent** In 2010 an ATFM/CDM course was held in Brazil with the participation of several States.
5.5 Conduct training of personnel involved.	**TBD**	**TBD**	States	**Valid**
			States	**Valid**
6. Final implementation decision	**N/A**	**Sep 2012**	States	**Valid** **Initial end date: SAM/IG/8**
6.1 Analyse factors affecting the implementation decision	**N/A**	**SAM/IG/11**	States	**Valid** **Initial end date: SAM/IG/8**
6.2 Declare pre-operational implementation in the area defined	**N/A**	**SAM/IG/12**	States	**Valid** **Initial end date: SAM/IG/8**
6.3 Declare definitive operational implementation in the area defined	**N/A**	**SAM/IG/12**	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	**Valid**
Tentative pre-operational implementation date	**N/A**	**Jul 2013**	States	**Valid**
Tentative definitive implementation date	**N/A**	**Dec 2013**	States	**Valid**

APÉNDICE/APPENDIX B

FORMULARIO DE INTERCAMBIO DE DATOS ENTRE UNIDADES ATFM

DATA EXCHANGE FORM AMONG ATFM UNITS

Impacto en la Unidad ATFM (nombre) / Impacts on ATFM Unit (name)

Fecha/Date:	**Responsables/Responsible**	1) Jose + (*name of ATFM unit*) / (nombre de la unidad ATFM)
		2) Carlos + (*name of ATFM unit*) / (nombre de la unidad ATFM)

Aeropuertos/Airports [*name + (IATA code)*]	**Impacto/Impact**	**Observaciones/Remarks**
Lima (LIM)	Yes ( )	NIL
La Paz (LPB)	Yes (X)	ISOLD TS/SH TODAY & TOMORROW
…	Yes ( )	…

Observaciones / Observations

NIL

Después de llenar el formulario, enviar para el correo siguiente: xxx@xxx
After fill the form, send it to the following email address: xxx@xxx

Guía para el Formulario de intercambio de datos entre Unidades ATFM /

Guidance for the data Exchange form among ATFM Units

<u>Saludos e introducción / Greetings and introductions</u>

18:00 UTC TELCON planificada / planning TELCON

Período de Tiempo considerado desde 20:00 UTC a 20:00 UTC (período de 24-horas para iniciar) / Covering timeframe from 20:00 UTC to 20:00 UTC (24-hour period, to start)

<u>Productos meteorológicos comunes / Common Weather Products</u>

http://www.redemet.aer.mil.br/img_sat/img_sat.php?ID_REDEMET=njnvvoklfs0p8p0s6ln2flg8e4

1- Sudamérica [fecha del *briefing*] 18:30 (UTC); / South America [date] 18:30 (UTC);
2- Sudamérica Realzada [fecha del *briefing*] 18:30 (UTC); y / South America highlighted [date] 18:30 (UTC); y
3- Sudamérica Visible [fecha del *briefing*] 18:30 (UTC). / South America visible [date] 18:30 (UTC)

<u>Discusión de planificación - trabajo de los flujos principales / Planning discussion – Work from main flows</u>

<u>Condiciones meteorológicas y atmosféricas significativas / Significant weather and atmospheric conditions</u>

Actividad de tormenta / Thunderstorm activity

Turbulencia / Turbulence

Nubes de ceniza volcánica / Volcanic ash clouds

<u>Discusión del área terminal / Terminal Area discussion</u>

Para aeródromos seleccionados definido por los Estados. / For selected aerodromes: Definido por los Estados

Tasa de aceptación de aeródromo (AAR) – utilizaremos la capacidad del aeródromo (llegadas + salidas)

Aerodrome Acceptance Rate (AAR) – We are going to use Aerodrome capacity (arrivals + departures)

Demanda proyectada en el área terminal / Projected terminal area demand

Restricciones del aeródromo tal como proyectos de construcciones o inoperabilidad de NAVAIDs / Aerodrome constraints, such as constructions projects or NAVAID outages

Iniciativas de gestión de tránsito aéreo anticipadas / Anticipated traffic management initiatives

Millas in-trail expandidas / Expanded miles-in-trail

Posibles esperas en los despegues / Potential airborne holdings

Posibles “ground stops” /Potential ground stops

Discusión de operaciones en ruta / En-route discussion

Restricciones de operaciones en ruta tales como interrupciones en frecuencias o NAVAIDS / En-route constraints, such as frequency outages or NAVAID outages

Discusión de operaciones en ruta y problemas relacionados/ Route discussion and issues

Iniciativas de gestión de tránsito aéreo anticipadas / Anticipated traffic management initiatives

Millas in-trail expandidas / Expanded miles-in-trail

Posibles esperas en los despegues / Potential airborne holdings

Adiciones al plan, incluyendo cualquier actualización táctica / Additions to the plan, including any pertinent tactical updates

Información de la parte interesada, comentarios y preguntas / Stakeholder input, comments and questions

Siguiente TELCON planificada - Next Planning TELCON – XX:XX UTC

Agenda Item 5: Assessment of operational requirements in order to determine the implementation of communications and surveillance (CNS) capabilities improvement for en-route and terminal area operations

5.1 Under this Agenda Item, the Meeting analyzed WP/09 (Secretariat) - *Follow up to the implementation of the new South American digital network – REDDIG II*, WP/10 (Secretariat) - *Follow-up to the implementation of the ground-ground and air-ground telecommunications infrastructure project for the SAM Region*, and WP/13 (Brazil) - *Modernization of REDDIG*.

5.2 The Meeting took note of the progress made in the implementation of the activities in Project D1 – *ATN architecture in the SAM Region* and Project D2 – *ATN ground-ground and air-ground applications in the SAM Region*, since SAM/IG/9 meeting.

Project D1 - ATN architecture in the SAM Region

5.3 The Meeting was informed on the main activities of Project D1: the implementation of the new regional digital network (REDDIG II) and the drafting of two guidelines (safety for the implementation of IP networks and IP router policy).

Implementation of REDDIG II

5.4 The Meeting recalled that in the Twelfth Meeting of Civil Aviation Authorities (RAAC/12) (Lima, 3-6 October 2011) the approval to start the process for the REDDIG II implementation was given which tender was issued through the Procurement Section of the ICAO Technical Cooperation Bureau .

5.5 With regard to REDDIG II implementation, the Meeting took note that the evaluation of the bids was carried out in the ICAO Technical Cooperation Bureau in Montreal, Canada, from 18 to 29 June 2012 with the presence of representatives of the following REDDIG member States Argentina, Brazil, France (on behalf of French Guiana), Paraguay and Peru, as well as the REDDIG Administration.

5.6 As a result of the evaluation to the winning bid, the evaluation group made some observations and additional requirements that the winning company should provide to complete the requirements established for REDDIG II.

5.7 The fifteenth meeting of the REDDIG Coordination Committee (RCC/15) (Lima, Peru, 15 to 17 August 2012), approved the results of REDDIG II's tender evaluation process through Conclusion 15/3, and examined the aspects that would be dealt with during the negotiation process.

5.8 The negotiation process was conducted at the ICAO Technical Cooperation Bureau in Montreal, Canada, from 27 to 31 August 2012. In it, representatives from the company recommended as the winner, from ICAO and, as observers, from Brazil and Trinidad & Tobago, participated. In the negotiation process, the proposed objectives were achieved upon, without exceeding the estimated cost approved for REDDIG at RAAC/12 meeting.

5.9 The Meeting was informed that during the negotiation phase, the contents in the REDDIG contract to be signed between the winning company and ICAO, were also reviewed. The contract would be carried out in two phases, in Phase 1, to be carried out in the last quarter of 2012, the winning company would present all design documents, the installation procedures, the training manuals, and the factory, on site and network acceptance documents, which would be examined by the REDDIG member States and ICAO and, in Phase 2, the contract would be signed, once all REDDIG II member States had cancelled their corresponding quotas (end of March 2013). As of the second semester of 2013, the purchasing, installation and operation of REDDIG II would start. **Appendix A** to this Agenda item presents the plan of activities of the implementation of REDDIG II.

5.10 The Meeting noted the need that REDDIG member States inform the ICAO South American Office and before 15 October 2012, the focal points to coordinate the local activities for the implementation of REDDIG II, as well as their participation in the provisional, network and final acceptance tests.

5.11 As a way of presenting to the global ATM community the of the REDDIG control management success under the project of Technical Cooperation RLA/03/901, the Meeting reviewed the WP that will be submitted by Brazil on behalf of all the REDDIG member States of the Twelfth Conference of Air Navigation, which will take place at the ICAO headquarters in Montreal from 19 to 30 November 2012.

Drafting of guideline

5.12 The Meeting took under consideration the importance of completing the guidelines on safety for the implementation of IP networks and the IP router policy, and of presenting them at SAM/IG/11 meeting. The guidelines would provide support in the implementation of REDDIG II, as well as of the national IP networks.

5.13 In this regard, the Meeting requested that the Sixth Meeting of the RLA/06/901 Coordination Committee Meeting take under consideration the services of a CNS expert for a 15-day period in March 2013, for the completion of the above mentioned guidelines.

Project D2 - ATN ground-ground and air-ground applications in the SAM Region

5.14 With respect to the activities in Project D2, the Meeting noted the progress made in the activities related with the operational integration of international AMHS, the operational integration of international AIDC, and the drafting of guidelines. **Appendix B** to this Agenda item presents updated information on Project D2.

AMHS operational integration

5.15 In reference to AMHS operational integration activities, the Meeting noted that AMHS interconnection between Ecuador-Peru had been implemented in the first week of July 2012 – the first interconnection between two AMHS from different manufacturers. The Meeting congratulated the Ecuadorian and Peruvian civil aviation administrations for the task undertaken.

5.16 The Meeting took note that, with the AMHS interconnection between Ecuador-Peru AMHS, Peru is currently the State in the Region with the greater number of AMHS interconnections, thus acquiring the necessary experience for completing other interconnections. In this regard, the Meeting deemed it convenient that States of the Region requiring support in completing AMHS interconnection works could consult with the Peruvian air navigation services provider.

5.17 In this sense, to support States of the Region in AMHS interconnection, two training events were conducted, thanks to the support of RLA/06/901 and RLA/03/901 technical cooperation projects: the *Course on ATS message handling system (COM-AMHS) and interconnection aspects* and the *ICAO seminar/workshop on the implementation of ground-ground and air-ground data links in the SAM Region*.

5.18 The *Course on ATS message handling system (COM-AMHS) and interconnection aspects* (Lima, Peru, 16-20 July 2012) was dictated by an expert with wide experience on AMHS and communications networks from the Eurocontrol Instilux institute, with the presence of 34 participants from 12 SAM States.

5.19 The *ICAO seminar/workshop on the implementation of ground-ground and air-ground data links in the SAM Region* (Lima, Peru, 10-12 September 2012) was held with the presence of 45 participants from 8 SAM States, United States and representatives from international communications companies and services providers.

5.20 The Meeting considered that these two events had helped the States of the Region in the implementation of AMHS (such as the Ecuador-Peru AMHS interconnection). In this respect, the Meeting considered the possibility of conducting another AMHS course in mid-2013, requesting that the next RLA/06/901 project coordination committee meeting approve the holding of this activity.

5.21 The Meeting updated the action plan for AMHS interconnection, presented in **Appendix C** to this Agenda Item. In addition, **Appendix D** shows a chart with updated information on the AMHS implemented in the Region.

5.22 Note was taken on the need of conducting teleconferences to support States in completing the drafting of MoU, as well as the trials and start-up of the AMHS interconnection. In this respect, it was deemed convenient that a teleconference be carried out on 10 October 2012 at 08:00 a.m. (Lima local time) between the Brazilian and Paraguayan technical and operational staff, with the aim of coordinating activities to complete the Brazil-Paraguay interconnection.

5.23 Likewise, the Meeting noted the information provided by Thales regarding the support it may provide to States having purchased their equipment (Bolivia, Chile) when interconnecting their AMHS. Thales informed they would be at disposal to participate in the teleconferences organized to this end.

5.24 The Meeting informed that network transport, connectivity and operational message exchange tests between the Brasilia (Brazil) and Lima (Peru) MTAs had been completed, expecting operational interconnection by December 2012. The Meeting considered that, with the Brazil-Peru MTA operational implementation, other AMHS interconnections would be easier.

5.25 Also, the Meeeting was informed that interconnection trials had started between the Lima (Perú) and Maiquetía (Venezuela) MTAs.

AIDC operational integration

5.26 The activities pertaining to the AIDC operational integration are described under Agenda Item 6.

Drafting of guidelines

5.27 The Meeting deemed important that the *Guideline on the use of AIDC* and the *Guideline on the implementation of air-ground data link applications* be completed. For the implementation of the *Guideline on the use of AIDC*, the Meeting considered that same be included in the revised ICD document approved by GREPECAS and for its drafting, it was considered convenient to require the support of RLA/06/901 in obtaining the help of one expert ATM and one CNS, for a one-week period in April 2013.

5.28 In reference to the *Guideline on the implementation of air-ground data link applications*, the Meeting considered that same should be completed by October 2013. In this respect, the Meeting deemed it convenient to submit to the consideration of the next RLA/06/901 project coordination committee meeting the approval for the services of a CNS expert for a one-week period in October.

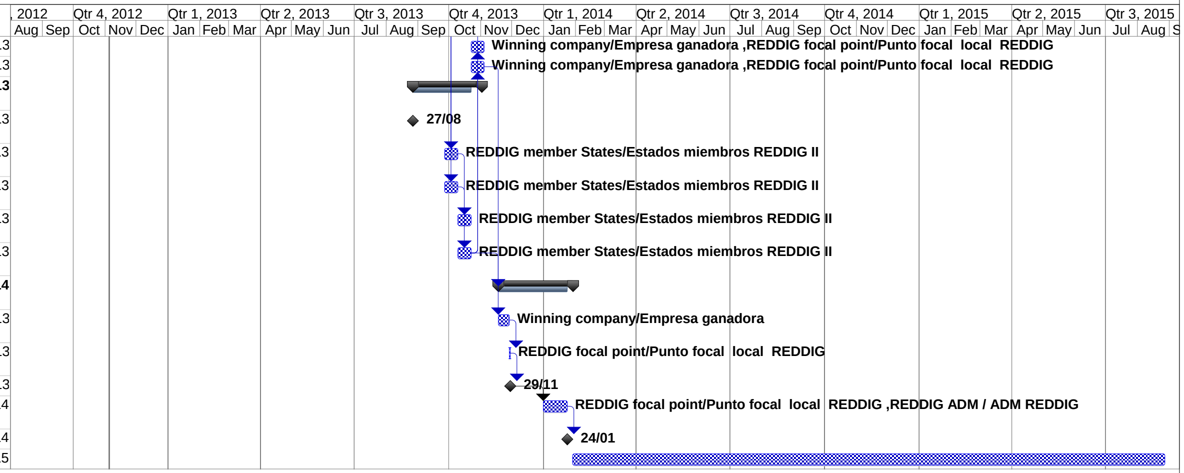
5.29 The Meeting took under consideration the need of revising the *Guideline for the operational interconnection of AMHS in the SAM Region*, found in the website http://www.lima.icao.int/eDocuments/CNS/AMHS/AMHS%20Guide.pdf, by taking into account the Eurocontrol updated document. The review of the task would be under the responsibility of the Peruvian aeronautical administration, and would be presented at SAM/IG/11 meeting. In this respect, the Meeting deemed it convenient that a new activity be included in Project D2 presented in Appendix B to this Agenda Item.

APPENDIX A / APENDICE A
TENTATIVE TIME SCHEDULE / PHASES (31 August 2012) / PROGRAMA TENTATIVO - FASES (31 agosto 2012)

ID	Nom de la tâche	Duration	Start	Finish	, 2012 Aug Sep; Qtr 4, 2012 Oct Nov Dec; Qtr 1, 2013 Jan Feb Mar; Qtr 2, 2013 Apr May Jun; Qtr 3, 2013 Jul Aug Sep; Qtr 4, 2013 Oct Nov Dec; Qtr 1, 2014 Jan Feb Mar; Qtr 2, 2014 Apr May Jun; Qtr 3, 2014 Jul Aug Sep; Qtr 4, 2014 Oct Nov Dec; Qtr 1, 2015 Jan Feb Mar; Qtr 2, 2015 Apr May Jun; Qtr 3, 2015 Jul Aug S
1	**Tentative REDDIG II implementation work programme / Programa tentativo de trabajo implantacion REDDIG II**	**108 days**	**Mon 01/10/12**	**Fri 08/02/13**	
2	**Phase 1 - Project / Fase 1 - Proyecto**	**108 days**	**Mon 01/10/12**	**Fri 08/02/13**	
3	**Documentation drafting and approval process / Proceso de elaboración y aprobación documentación**	**108 days**	**Mon 01/10/12**	**Fri 08/02/13**	
4	REDDIG II preliminary design installation / Preparación diseño preliminar instalación REDDIG II (SDD)	6 wks	Thu 04/10/12	Fri 09/11/12	**Winning company/Empresa ganadora**
5	Preparation of installation and training procedures documentation / Preparacion documentos de procedimiento de instalacion y capacitacion	3 wks	Mon 12/11/12	Thu 29/11/12	**Winning company/Empresa ganadora**
6	FAT protocol preparation / Preparacion protocolo FAT	2 wks	Thu 29/11/12	Tue 11/12/12	**Winning company/Empresa ganadora**
7	SAT protocol preparation / Preparacion protocolo SAT	1 wk	Tue 11/12/12	Tue 18/12/12	**Winning company/Empresa ganadora**
8	Documentation submittance (SDD, FAT/SAT protocol, on-site installation procedure, training manuals) to ICAO / Envio documentación (SDD, protocolo FAT/SAT, procedimiento instalacion sitio, manuales de capacitación) a OACI	0 days	Tue 18/12/12	Tue 18/12/12	**18/12**
9	Documentation review / Revision de la documentacion	5 wks	Thu 10/01/13	Fri 08/02/13	**REDDIG member States/Estados miembros REDDIG II ,REDDIG ADM / ADM REDDIG**
10	Technical-operational meeting / Reunión tecnico-operacional	5 days	Mon 11/02/13	Fri 15/02/13	**REDDIG ADM / ADM REDDIG ,REDDIG focal point/Punto focal local REDDIG ,Winning company/Empresa ganadora**
11	Documentation reviewed and approved / Documentos revisados y aprobados	10 days	Tue 19/02/13	Fri 01/03/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG ,REDDIG member States/Estados miembros REDDIG II**
12	**Phase 2 - REDDIG II implementation / Fase 2 - Implantación de la REDDIG II**	**250 days**	**Mon 01/04/13**	**Thu 30/01/14**	
13	**Purchasing and integration of VSAT equipment / Adquisición e itnegración equipos VSAT**	**40 days**	**Mon 01/04/13**	**Fri 17/05/13**	
14	Purchasing of equipment and remittance to company HQ for integration / Adquisición de equipos y envío a la sede de la empresa ganadora para su integración	7 wks	Mon 01/04/13	Mon 13/05/13	**Winning company/Empresa ganadora**
15	**Preparation of ground backbone network / Preparación red medular terrestre**	**40 days**	**Mon 01/04/13**	**Fri 17/05/13**	
16	Hiring of service for all nodes / Contratación de servicio para todos los nodos	1 wk	Mon 11/11/13	Fri 15/11/13	**Winning company/Empresa ganadora**
17	Equipment purchasing / Adquisición equipos	6 wks	Mon 01/04/13	Tue 07/05/13	**Winning company/Empresa ganadora**
18	**Integration at factory, training and FAT / Integracion en fábrica, entrenamiento y FAT**	**62 days**	**Mon 13/05/13**	**Fri 26/07/13**	
19	Equipment assembling at factory / Ensamblar equipos en fábrica	6 wks	Mon 13/05/13	Tue 18/06/13	**Winning company/Empresa ganadora**
20	Network configuration and pre-test / Configuracion y pre-test de la red	8 wks	Mon 13/05/13	Mon 01/07/13	**Winning company/Empresa ganadora**
21	Documentation submittance for on-factory-training / Envío documentación para entrenamiento en fábrica	0 wks	Tue 04/06/13	Tue 04/06/13	**04/06**
22	On-factory-training / Entrenamiento en fábrica	3 wks	Mon 01/07/13	Thu 18/07/13	**REDDIG ADM / ADM REDDIG ,Selected NCC staff/Personal de los NCC seleccionados**
23	FAT	5 days	Thu 18/07/13	Wed 24/07/13	**Representatives nominated member States/Representantes de Estados miembros nominados ,REDDIG ADM / ADM REDD**
24	SAT signature / Firma SAT	0 days	Wed 24/07/13	Wed 24/07/13	**24/07**
25	**Remittance of equipment to sites (customs clearance 1 month approx) / Envío de los equipos a los sitios (liberación equipos aduana 1 mes tiempo estimado)**	**92 days**	**Mon 29/07/13**	**Mon 18/11/13**	
26	Preparation of equipment remittance / Preparación para envio de equipos	2 wks	Mon 29/07/13	Thu 08/08/13	**Winning company/Empresa ganadora**
27	Ezeiza	8 wks	Thu 08/08/13	Thu 26/09/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
28	La Paz	10 wks	Thu 08/08/13	Wed 09/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
29	Rio de Janeiro	8 wks	Thu 08/08/13	Thu 26/09/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
30	Santiago	10 wks	Thu 08/08/13	Wed 09/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
31	Bogota	9 wks	Thu 08/08/13	Thu 03/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
32	Guayaquil	9 wks	Thu 08/08/13	Thu 03/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
33	Georgetown	8 wks	Thu 08/08/13	Thu 26/09/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
34	Cayenne	9 wks	Thu 08/08/13	Thu 03/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
35	Asuncion	10 wks	Thu 08/08/13	Wed 09/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
36	Lima	10 wks	Thu 08/08/13	Wed 09/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
37	Paramaribo	10 wks	Thu 08/08/13	Wed 09/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
38	Piarco	8 wks	Thu 08/08/13	Thu 26/09/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
39	Montevideo	9 wks	Thu 08/08/13	Thu 03/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
40	Maiquetia	9 wks	Thu 08/08/13	Thu 03/10/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**
41	Manaus	2 wks	Tue 22/10/13	Mon 04/11/13	**Winning company/Empresa ganadora ,REDDIG focal point/Punto focal local REDDIG**

APPENDIX A / APENDICE A
TENTATIVE TIME SCHEDULE / PHASES (31 August 2012) / PROGRAMA TENTATIVO - FASES (31 agosto 2012)

ID	Nom de la tâche	Duration	Start	Finish
42	Recife	2 wks	Tue 22/10/13	Mon 04/11/13
43	Curitiba	2 wks	Tue 22/10/13	Mon 04/11/13
44	**Theoretical-practical course in Rio de Janeiro / Curso teórico-práctico en Río de Janeiro**	**56 days**	**Tue 27/08/13**	**Fri 01/11/13**
45	Training documentation remittance / Envio documentos para entrenamiento	0 days	Tue 27/08/13	Tue 27/08/13
46	Session 1 (10 Spanish-speaking) / Sesión 1 (10 personas en español)	2 wks	Thu 26/09/13	Wed 09/10/13
47	Session 2 (10 Spanish-speaking) / Sesión 2 (10 persons en español)	2 wks	Thu 26/09/13	Wed 09/10/13
48	Session 3 (10 Spanish-speaking) / Sesión 3 (10 personas en español)	2 wks	Wed 09/10/13	Tue 22/10/13
49	Session 4 (10 English-speaking) / Sesión 4 (10 personas en inglés)	2 wks	Wed 09/10/13	Tue 22/10/13
50	**On-site installation activities / Actividades de instalación en el sitio**	**60 days**	**Mon 18/11/13**	**Wed 29/01/14**
51	Simultaneous on-site installation / Instalación todos los sitios en forma simultánea	2 wks	Mon 18/11/13	Thu 28/11/13
52	PSAT / NSAT (provisional and network acceptance test) / (Prueba de aceptacion provisional y de red)	1 day	Thu 28/11/13	Fri 29/11/13
53	PSAT / NSAT Signature / Firma	0 days	Fri 29/11/13	Fri 29/11/13
54	FSAT (Final acceptance test) / (Prueba de aceptacion final)	4 wks	Tue 31/12/13	Fri 24/01/14
55	FSAT signature / Firma FSAT	0 days	Fri 24/01/14	Fri 24/01/14
56	Two (2) years' guarantee / Dos (2) años de garantía	94 wks	Wed 29/01/14	Thu 27/08/15



APPENDIX B

PROJECT ATN GROUND-GROUND AND AIR GROUND APPLICATIONS IN THE SAM REGION

SAM Region	**PROJECT DESCRIPTION (PD)**	**PD N° D2**	
Programme	**Project Title**	**Starting Date**	**Ending Date**
Ground-ground and Air-ground Telecommunications Infrastructure (*Programme Coordinator:* *Onofrio Smarrelli)*	ATN Ground-ground and Air-ground Applications in the SAM Region *Project Coordinator: Omar Gouarnalusse (Argentina)* *Contributing experts: Javier Vittor (Argentina), Andres Jansen (Brazil)*	May 2010	June 2016
Objective	Develop the implementation of ATN ground-ground and air-ground applications in the SAM Region		
Scope	Implementation of SAM ATN ground-ground and air-ground applications, including, at least: • Operational integration of international AMHS connections in the SAM Region • Operational integration of international AIDC connections in the SAM Region • Guidelines for the implementation of DCL, DATIS, DVOLMET & CPDLC services through VDL in the SAM Region		
Metrics	• Number of AMHS interconnections as per CAR/SAM FASID Table 1Bb • Number of AIDC interconnections as per CAR/SAM FASID Table 1Bb • Drafting of following guidelines: Guideline for the use of AIDC / Guideline for the establishment of ground-air data links in terminal, approach and aerodrome areas / Guideline for the implementation of DCL, DATIS and DVOLMET systems / Guideline for the implementation of CPDLC through VDL in the SAM Region		
Strategy	• All tasks will be conducted by experts nominated by States and organizations of the SAM Region members of the project *ATN Ground-ground and Air-ground Applications in the SAM Region*, under management of the project coordinator, in coordination with the programme coordinator. Communications among Project members, as well as between the Project coordinator and programme coordinator, shall be carried out through teleconferences and the Internet. In addition, the programme coordinator, together with the project coordinator and the contributing experts, can convene at SAM/IG implementation meetings • Once studies are completed, the results will be submitted to the ICAO programme coordinator as a final consolidated document for its analysis, review, approval and presentation at the GREPECAS PPRC		

Goals	• Complete all AMHS interconnections by December 2015 • Complete the drafting of MoU for the interconnection of AMHS by mid-2013 • Complete the migration towards the implementation of AMHS interconnection through IP protocol by December 2015 • Complete AIDC installation between adjacent ACCs by mid-2016 • Complete the drafting of MoU for AIDS systems interconnection by the end of 2013 • Complete AIDC installation between adjacent FIRs by mid-2016 • Complete the drafting of guideline material for the use of AIDC; for the establishment of ground/air data links in terminal, approach and aerodrome areas; and for the implementation of DCL, DATS and DVOLMET.
Justification	• The implementation of ground-ground and air-ground data communications infrastructure will contribute to the reduction of air traffic control incidents, increasing the capacity of the transition of information with regard to the currently analogue based applications • This project contributes to the implementation of the SAM PFF SAM CNS 01, CNS 02, ATM 05, ATM 06, MET 03, MET04 and AIM 02 of the *Air Navigation System Performance-Based Implementation Plan for the SAM Region (SAM PBIP)*
Related Projects	• Automation (systems interconnection) • ATFM • Improve ATM Situational Awareness • Implementation of the ICAO New Flight Plan Format

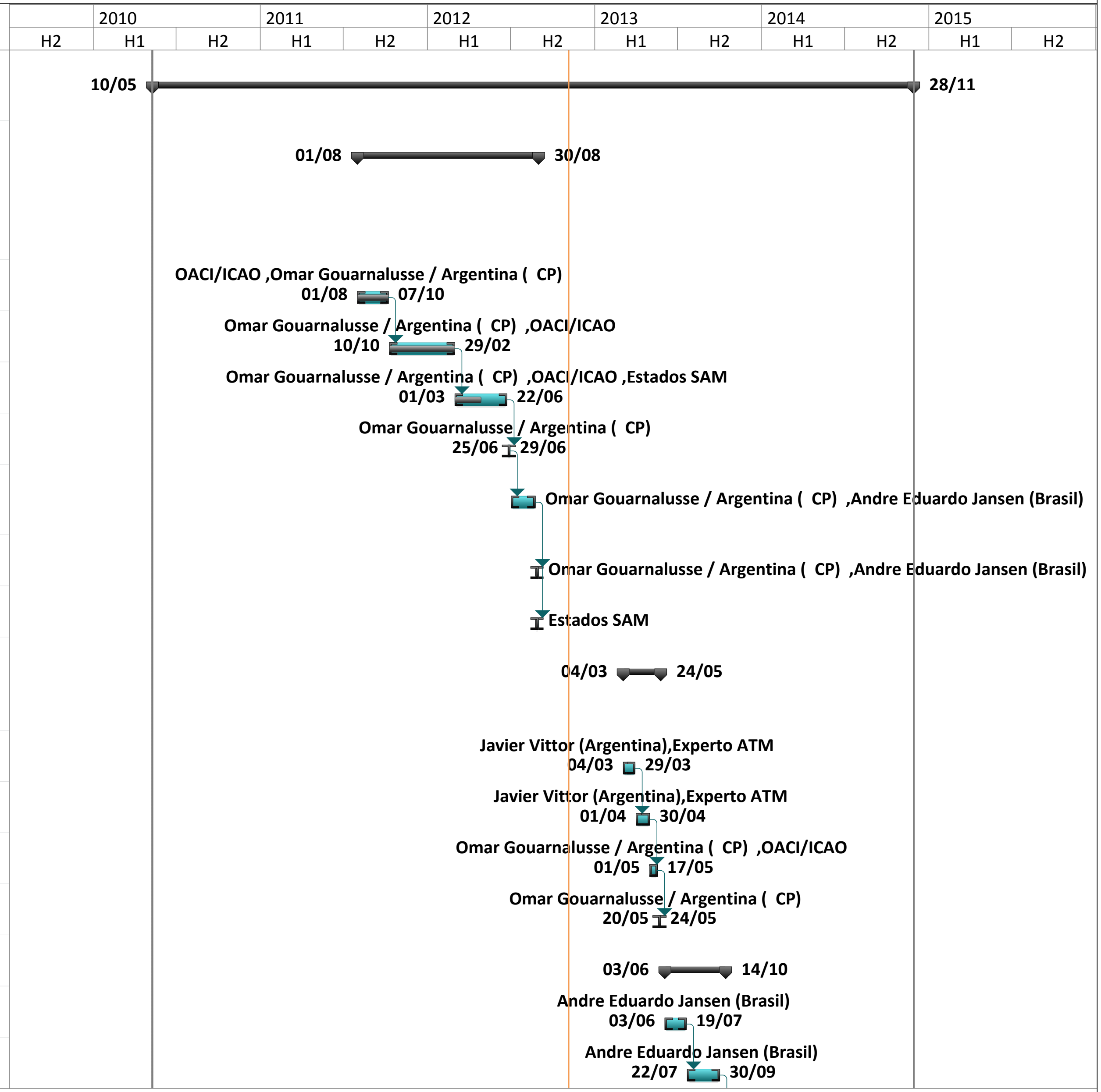
Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Document on regional strategy for the implementation of ground-ground and air-ground applications in the SAM Region	PFF SAM CNS 01 PFF SAM CNS 02	Omar Gouarnalusse (Argentina)		February 2013	SAM/IG/10meeting reviewed the guide presented as Appendix F to WP/10 and deemed that the guide be completed with the results from the Twelfth Air Navigation Conference (An-Conf/12) (Montreal, Canada, 19-30 November 2012).
Guideline for the use of AIDC with the aim of reducing coordination errors	PFF SAM CNS 01 PFF SAM ATM 06	Javier Vittor (Argentina) ATM Expert to be defined		April 2013	The guideline will be based on the Argentinean experience in the IP AIDC implementation between the Cordoba and Ezeiza ACCs. The GREPECAS-approved *Interface control document* (ICD) for data communications among ATS units in the Caribbean and South American Regions will be reviewed.
Guideline for the implementation ground-air data links in the SAM Region	PFF SAM CNS 02 PFF SAM ATM 06 PFFs SAM MET 03 y 04	Andrés Jansen (Brazil)		October 2013	The guideline will be based on the Brazilian experience in the implementation of ground-air data links. In same, DATIS, DVOLMET and DCL, among others, will be included.

[1] ***Gray***: *Activity has not started*
Green: *Activity has or will deliver planned milestone as scheduled*
Yellow: *Activity is behind schedule on milestone, but still within acceptable parameters to deliver milestone on time*
Red: *Activity has failed to deliver milestone on time, mitigation measures need to be identified and implemented*

Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Operational integration of AMHS among States	PFF SAM CNS 01 PFF SAM ATM 05 PFF SAM ATM 06 PFF SAM MET 03, PFF SAM MET 04 PFF SAM AIM 02	States / Project Coordinator / Programme Coordinator		December 2015	Of all the AMHS installed in the Region, the following are interconnected in AMHS (P1 Protocol) Argentina-Paraguay, Colombia-Peru, Ecuador-Peru and Guyana-Suriname Other States are in the process of implementation, having drafted and signed MoUs to this end Follow-up to the implementation of AMHS integration is carried out at SAM/IG meetings
Operational integration of AIDC service between adjacent ACCs	PFF SAM CNS 01 PFF SAM ATM 06	States / Project Coordinator / Programme Coordinator		June 2016	To date no AIDC interconnection trials have been held between the Ezeiza and Cordoba ACCs. The integration is still not being used operationally Many States of the Region have drafted and signed MoUs to carry out the integration
Monitor the implementation of ATN ground-ground and air-ground applications activities in the SAM Region		ICAO		March 2010-June 2016	
Resources necessary	Designation of experts for the conduct of some of the deliverables				

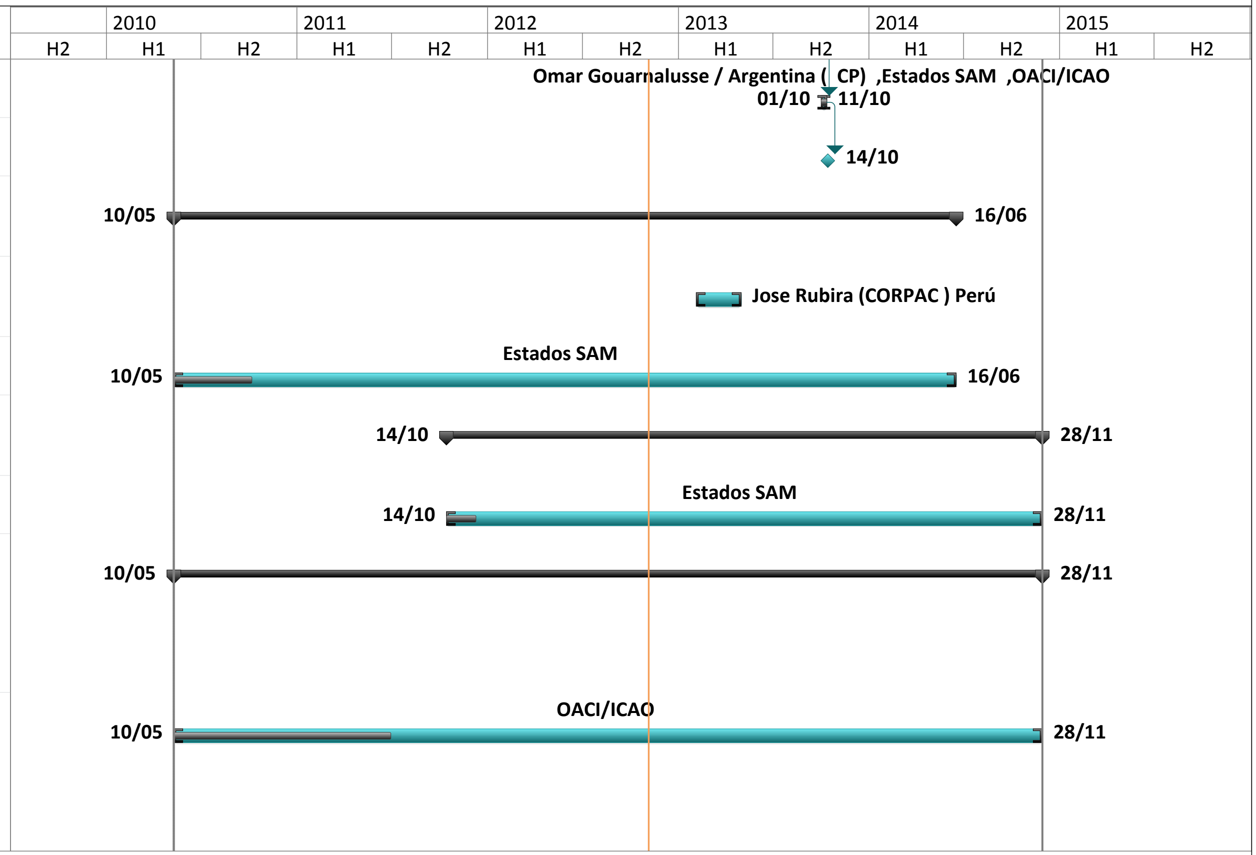
APLICACIONES TIERRA-TIERRA Y AIRE-TIERRA DE LA ATN EN LA REGION SAM / ATN GROUND-GROUND AND AIR-GROUND APPLICATIONS IN THE SAM REGION

ID	Task Name	Duration
1	Aplicaciones Tierra–tierra y Aire–tierra de la ATN en la Región SAM/ ATN Ground-ground and Air-ground Applications in the SAM Region	1190 days
2	Documento de estrategia regional para la implantación de aplicaciones tierra - tierra y aire – tierra de la Región SAM/ Regional strategy document for the implementation of ground-ground and air-ground applications in the SAM Region	284 days
3	Recolectar información /Collect information	50 days
4	Entrega de propuesta de borrador / Delivery of draft proposal	103 days
5	Revision de la propuesta borrador / Review of draft proposal	82 days
6	Entrega documento final / Delivery of final document	5 days
7	Actualiar documento con los resultados de la Duodecima Conferencia de Navegación Aerea	39 days
8	Presentación del documento enmendado a la SAM/IG/11	5 days
9	Revision y aprobación guia enmendada	5 days
10	Guía de orientación para el uso del AIDC con la finalidad de reducir errores de coordinación/Guideline for the use of AIDC with the aim of reducing coordination errors	60 days
11	Recolectar información /Collect information	20 days
12	Entrega de propuesta de borrador / Delivery of draft proposal	22 days
13	Revision de la propuesta borrador / Review of draft proposal	13 days
14	Entrega documento final / Delivery of final document	5 days
15	Guía de orientación para la implantación de datos tierra-aire en la Región SAM	95 days
16	Recolectar información / Collect information	35 days
17	Entrega de propuesta de borrador / Delivery of draft proposal	51 days



APLICACIONES TIERRA-TIERRA Y AIRE-TIERRA DE LA ATN EN LA REGION SAM / ATN GROUND-GROUND AND AIR-GROUND APPLICATIONS IN THE SAM REGION

ID	Task Name	Duration
18	Revision de la propuesta borrador / Review of draft proposal	9 days
19	Entrega documento final / Delivery of final document	0 days
20	Integración operacional del servicio AMHS entre Estados / Operational integration of AMHS among States	1071 days
21	Revision Guia de Orientación para la interconexión operativa de sistemas AMHS	62 days
22	Implantacion de la integración operacional de sistemas AMHS	1071 days
23	Integración operacional del servicio AIDC entre ACC´s adyacentes / Operational integration of AIDC service between adjacent ACCs	816 days
24	Implantación de la integración operacional del AIDC	816 days
25	Monitorear las actividades de implantación de las aplicaciones tierra–tierra y aire–tierra de la ATN en la Región SAM / Monitor the implementation of ATN ground-ground and air-ground applications activities in the SAM Region	1190 days
26	Monitorear las actividades de implantación de las aplicaciones tierra–tierra y aire–tierra de la ATN en la Región SAM / Monitor the implementation of ATN ground-ground and air-ground applications activities in the SAM Region	1190 days



APPENDIX C

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-Peru 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 s) Bolivia-Peru t) Bolivia-Brazil u) Bolivia-Argentina v) Ecuador-Peru w) Ecuador-Colombia x) Ecuador-Venezuela y) Bolivia-Paraguay The AMHS interconnection MoU in 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), l), q) & v) completed	h) TBD j) Oct 2013 k) Mar 2013 m) TBD n) TBD o) TBD p) TBD r) TBD s) TBD t) TBD u) TBD w) Mar 2013 x) Mar 2013 y) TBD

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 h) Guyana-Suriname i) Ecuador-Peru j) Brazil-Colombia k) Perú-Venezuela 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, Ecuador, Guyana, Paraguay, Peru, Suriname, Venezuela and REDDIG Administration	Interconnection trials between Argentina, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname and Venezuela MTAs	**Valid** a), f), g) message exchange trials were held between CIPE (Argentina)-Brasilia (Brazil) MTAs; the Manaos (Brazil)-Lima (Peru) MTAs, and the CIPE (Argentina)-Lima (Peru) MTAs. 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. b), d), h) and i) Operational interconnection trials completed c), e), j), and k) No tests carried out f) operational trial pending	a) Jun 2012 Completed b) Mar 2012 Completed c) Dec 2012 d) Oct 2010 Completed e) Mar 2013 f) Dec 2012 g) Dec 2012 h) Jun 2011 Completed i) Jul 2012 Completed j) Dec 2012 k) Feb 2013
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 h) Guyana-Suriname i) Ecuador-Peru j) Brazil-Colombia k) Peru-Venezuela **Note**: Inclusion has been made of only the AMHS interconnected between States having implemented and signed the MoU.	Argentina, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, and Venezuela	Operational implementation of AMHS systems	**Valid** AMHS interconnection completed between following MTA, using P1 protocol and operational: Colombia-Peru Guyana-Suriname Argentina-Paraguay Ecuador-Peru	a) Mar 2012 Operational b) Dec 2012 c) TBD d) Dec 2012 e) Dec 2012 f) Dec 2012 g) Nov 2010 Operational h) Jul 2011 Operational i) Jul 2012 Operational j) Mar 2013 k) Mar 2013

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	Dec 2005	Three MTAs installed: Ezeiza, Cordoba and Comodoro Rivadavia/ Se tienen instalados tres MTA: Ezeiza; Córdoba; y Comodoro Rivadavia Ezeiza MTA connected with MTA Asuncion using P1 protocol (March 2012) / MTA Ezeiza conectado con Protocolo P1 con el MTA de Asunción (Marzo 2012)
BOLIVIA	THALES	Dec 2011	Equipment installed at the end of 2011 / Equipos instalados a finales del 2011
BRASIL	ATECH	Jun 2009	Two MTAs installed: Brasilia; and Manaos / Se tienen instalados dos MTA: Brasilia; y Manaos
CHILE	THALES	Jun 2010	The AMHS system was completed by the end of 2010 / El sistema AMHS se completó a finales del 2010
COLOMBIA	COMSOFT	Dec 2009	AMHS interconnected with Peru. First AMHS interconnection in the CAR SAM Region / Está interconectado con el AMHS con Perú. Primera interconexión AMHS en las Regiones CAR/SAM
ECUADOR	THALES	Feb 2012	A new AMHS from Thales was installed and in operation since February 2012. In July 2012, The Ecuador AMHS interconnected with the Peru AMHS, the first interconnection between two different companies / Un nuevo sistema AMHS de la marca Thales fue instalado y está en operación desde febrero de 2012. En julio de 2012, el AMHS de Ecuador se interconecta con el AMHS de Perú, la primera interconexión con dos empresas diferentes.
GUYANA	SKYCOM	2011	Operational since May 2011. AMHS interconnected with Surinam, with P1 Protocol / En operación desde finales de mayo 2011. Está interconectado en AMHS con Surinam con protocolo P1
FRENCH GUIANA (FRANCE)	AFTN SIGMA	2009 2012	Version 17 will be installed in June 2012 / La versión 17 se realizará en junio de 2012
PANAMA	COCESNA THALES	End of 2013 / Finales de 2013	Panama approved the acquisition of a new AMHS system from THALES, the same it is expected to be in operation at the end of the first quarter 2013 / Panamá aprobó la adquisición de un Nuevo sistema AMHS de la marca Thales que estará operacionalmente en operación a finales del primer trimestre de 2013
PARAGUAY	RADIOCOM	2007	An update of its AMHS was made in March 2012 / Una actualización del sistema AMHS se realizó en marzo de 2012

STATE/ ESTADO	MANUFACTURER/ FABRICANTE	YEAR OF INSTALLATION/ AÑO DE INSTALACION	REMARKS/ OBSERVACIONES
PERU	COMSOFT	Jun 2009	AMHS interconnected with Colombia since November 2010. First AMHS interconnection in the CAR/SAM Regions. In July 2012, the Ecuador AMHS interconnected with Peru – first interconnection between two different manufacturers / Está interconectado con el AMHS con Colombia desde noviembre de 2010. Primera interconexión AMHS en las Regiones CAR/SAM. En julio de 2012, el AMHS de Ecuador se interconectó con Perú – primer interconexión entre dos empresas de diferentes marcas
SURINAME	SKYCOM	2011	Operational since the start of 2011. Interconnected with Guyana / En operación desde inicios de 2011. Interconectado con Guyana
URUGUAY	AFTN from Global Weather	End of 2013 / Finales de 2013	Currently in the purchasing process / Se encuentra en el proceso de adquisición
VENEZUELA	RADIOCOM	2010	AMHS installed since the end of 2010 / Sistema AMHS instalado desde finales del 2010

Agenda Item 6: Operational implementation of new ATM automated systems and integration of the existing ones

6.1 Under this agenda item, the Meeting analysed WP/16, discussing the following aspects:

a) Follow-up on the activities of Project C1 – Automation; and
b) Follow-up on the activities of Project C2 – Improvement of ATM situational awareness

Follow-up on the activities of Project C1 - Automation

6.2 The basic activities of this Project involve several guiding documents, which have been fully completed, and the implementation of the interconnection of automated systems between adjacent ACCs in the Region.

Implementation of interconnection of automated systems

6.3 The Meeting took note that five (5) memoranda of understanding (MoUs) have been signed since 2009 for the interconnection of radar data and automatic hand-off of flight plans between neighbouring countries, but no major progress has been made. Only some progress has been made for the exchange of radar data using the IP protocol between the radars of Durazno in Uruguay and Quilmes in Argentina, but no operational use has been established yet.

6.4 Regarding the interconnection of automated systems between the Maiquetía and Manaus ACCs, the Meeting noted that the configuration had been implemented in the REDDIG and in the radar data and flight plan display systems. It also noted that the tests for the automatic transfer of flight plans and radar data were still pending, their completion being expecting in late 2012.

6.5 Since the SICD (System Interface Control Document) was drafted in 2008 for the interconnection between CAR/SAM ACCs, describing the external interfaces and ATC messages of the countries, the ATC systems of several of these countries had undergone changes and new automated systems had been implemented. Therefore, the Meeting felt that the Secretariat should circulate the SICD to all the States of the Region for updating. In this regard, the Secretariat will send the SICD in late October 2012 in order to receive responses by 31 December 2012.

6.6 In order to assist States in finding solutions for the completion of the interconnection, the Meeting considered the following actions:

a) The Coordinator of Project C1 should prepare a questionnaire on the requirements for the interconnection of automated systems and send it to the SAM Regional Office by the end of February 2013.

b) The ICAO SAM Regional Office should circulate the questionnaire amongst all the States of the Region that have established MoUs for the interconnection of automated systems on the first week of March 2013, requesting their response by the end of March 2013.

c) Two experts in ATM and CNS automation, respectively, and experts from the industry that might be interested should conduct missions to the States that have signed MoUs for the interconnection of automated systems in order to identify the causes that prevent the completion of the interconnection and submit a detailed plan of all the design and installation considerations for the implementation of the interconnection. This activity would require the support of Regional Project RLA/06/901, through two experts in automated systems for a period of two weeks. Visits would take place in April 2013.

6.7 An MoU was signed during the Meeting between Brazil and Peru for the interconnection of radar data and flight plans between the Lima and Manaus ACCs, involving the radars of Iquitos and Pucallpa in Peru, and Tabatinga, Cruzeiro do Sul, and Rio Branco in Brazil. The dates set for the operational use of radar data and the hand-off using OLDI/AIDC were September and November 2013, respectively.

6.8 Paraguay and Brazil will start contacts for drafting an MoU for the interconnection of systems, which, in principle, will be signed at the SAM/IG/11 meeting.

6.9 **Appendix A** to this part of the report contains the updated description of Project C1.

Follow-up on the activities of Project C2 – Improvement of ATM Situational Awareness

6.10 The Meeting reviewed and updated Appendix B to WP/16, which appears as **Appendix B** to this part of the report. The description and current status of Project C2 are also presented. The activities under this Project include the drafting of guiding documents to assist States in the improvement of ATM situational awareness.

6.11 The Meeting reviewed the *Guide on technical and operational considerations for the implementation of ADS-B,* prepared by two ATM and CNS experts of the air navigation service provider of Peru (CORPAC), under the coordination of the Project and Programme Coordinator. The Group made some changes to this guide, which were incorporated in version 1.1 of the Guide, as shown in **Appendix C** to this part of the report.

6.12 When reviewing the Guide on technical and operational considerations for the implementation of ADS-B, the Group felt the need to develop guidelines to determine the recommended NIC, SIL, NAC values for their operational application. Following the respective analysis, the Peruvian State offered to conduct this study, which had been required for the implementation of its ADS-B system, describing its experience and a proposed model, which will be reflected in a working paper to be submitted at future SAMIG meetings.

6.13 The Meeting deemed it advisable to include an activity on automated monitoring of resolution advisories (RAs) from collision avoidance systems (TCAS) in the *Guide on technical and operational considerations for the implementation of ADS-B.* This functionality may be an additional benefit for States implementing ADS-B coverage in their areas of responsibility, mainly with respect to safety management systems (SMS), since these RA assessments are currently done manually, based on hazard reports sent to the State by the operators.

6.14 The States are requested to review the *Guide on technical and operational requirements for the implementation of ADS-B* and send their comments and/or contributions to the Secretariat for the continuous improvement of this Guide. In this sense, the Meeting formulated the following Conclusion:

Conclusion SAM/IG/10-3 Review of the Guide on technical and operational considerations for the implementation of ADS-B

That, in order to review the *Guide on technical and operational considerations for the implementation of ADS-B*:

a) the Secretariat circulate the Guide to SAM States on the last week of October 2012; and

b) SAM States send their comments by 31 December 2012.

APPENDIX A

PROJECT AUTOMATION

SAM Region	**PROJECT DESCRIPTION (DP)**	**PD N° C1**	
Programme	**Project Title**	**Starting Date**	**Ending Date**
Automation and ATM Situational Awareness *(Programme Coordinator: Onofrio Smarrelli)*	Automation *Project Coordinator: Alessander Santoro (Brazil)* *Contributing experts: SAM/IG ATM Automation Group*	May 2008	June 2016
Objective	Support States of the SAM Region in the implementation of automated systems, and in their regional interconnection		
Scope	The scope of the project includes the initial drafting of guidelines, trials for the identification of the automation level required at the Region's ATS units in the short and medium term, and the implementation of automation systems and their interconnection through the VSAT based South American digital network (REDDIG)		
Metrics	• Drafting of the following documents: ✓ Guidance document on automated systems requirements at ATS units (SSS) ✓ Guideline for the implementation of integrated automated systems ✓ Action plan for the interconnection of automated systems ✓ Preliminary interface control document (ICD) between systems for the interconnection of ACCs in the SAM Region ✓ Memorandum of Understanding (MoU) model for the interconnection of automated systems • Interconnection of automated systems between adjacent ACCs in the SAM Region: • Reduction in number of operational errors, including LHD in the SAM Region		
Strategy	• All tasks will be conducted by experts nominated by States and organizations of the SAM Region members of the Project *Automation*, under management of the project coordinator, in coordination with the programme coordinator. Communications among project members, as well as between the project coordinator and programme coordinator, shall be carried out through teleconferences and the Internet. In addition, the programme coordinator, together with the project coordinator and the contributing experts, can convene at SAM/IG implementation meetings • Once studies are completed, the results will be submitted to the ICAO programme coordinator as a final consolidated document for its analysis, review, approval and presentation at the GREPECAS PPRC		

Justification	• The CAR/SAM air traffic control centres have had difficulties in duly coordinating air traffic, an important factor contributing in air traffic incidents. The air traffic control automated centres' interconnection will permit a coordinated automated air traffic for the transfer of responsibilities between CAR/SAM adjacent area control centres, thus reducing the risk in aeronautical incidents generated by undue coordination activities and improving, at the same time, the planning phases for an efficient control of flights from/to corresponding Flight Information Regions (FIR). • The interconnection of automated systems would be facilitated, in view of REDDIG (SAM VSAT regional network), which has the necessary capability to transport automated systems applications • This project contributes towards the implementation of SAM PFF CNS 04, ATM 05 and ATM 06 of the *Air Navigation System Performance-Based Implementation Plan for the SAM Region (SAM PBIP)*
goals	• Initial drafting of five guideline documents in support of the implementation of automated systems interconnection for completion in the period (May 2008 – October 2012) • Initial drafting of 18 MoU for the interconnection of automated systems 5 MoU period 2009-2011 4 MoU for the end of 2012 9 MoU for the end of 2013 • Implementation of the interconnection of automated systems *Flight plan* 9 OLDI interconnections 2012-2014 1 interconnection considering Doc 44 for 2012 7 AIDC interconnections for period 2012-2013 *Asterix protocol radar data* 20 radar data exchanges using Asterix protocol period 2011-2014 1 owner exchange for 2012
Related Projects	• ATFM • Implementation of the New ICAO Flight Plan Model • Improve ATM Situational Awareness

Project Deliverables	**Relationship with Performance Based Regional Plan (PFF)**	**Responsible**	**Status of Implementation**[1]	**Delivery Date**	**Remarks**
Regional guideline document for the automation level required according to the ATM service provided in airspace and international aerodromes, assessing • operational architecture design, • characteristics and attributes for interoperability, • data bases and software FPL, CPL, CNL, RLA, etc, and • technical requirements.	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	Project Coordinator and ATM Automation Group		Completed June 2011	The System and Subsystem Specifications (SSS) document has been drafted for the identification of automated requirements necessary at ATS units (ACC), and a revision process has been conducted with the support of RLA/06/901 project and SAM/IG ATM Automation Group. Document published in site www.lima.icao.int.
Guideline for the integration of automated systems and corresponding action plan	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	Project Coordinator and ATM Automation Group		Completed October 2010 Completed May 2012	The following has been drafted: Guideline for the integration of automated systems and revision process. Action plan revision for the integration of automated systems and continuous revision. Both documents drafts with the support of RLA/06/901 project and the SAM/IG ATM Automation Group. Document published in site www.lima.icao.int.

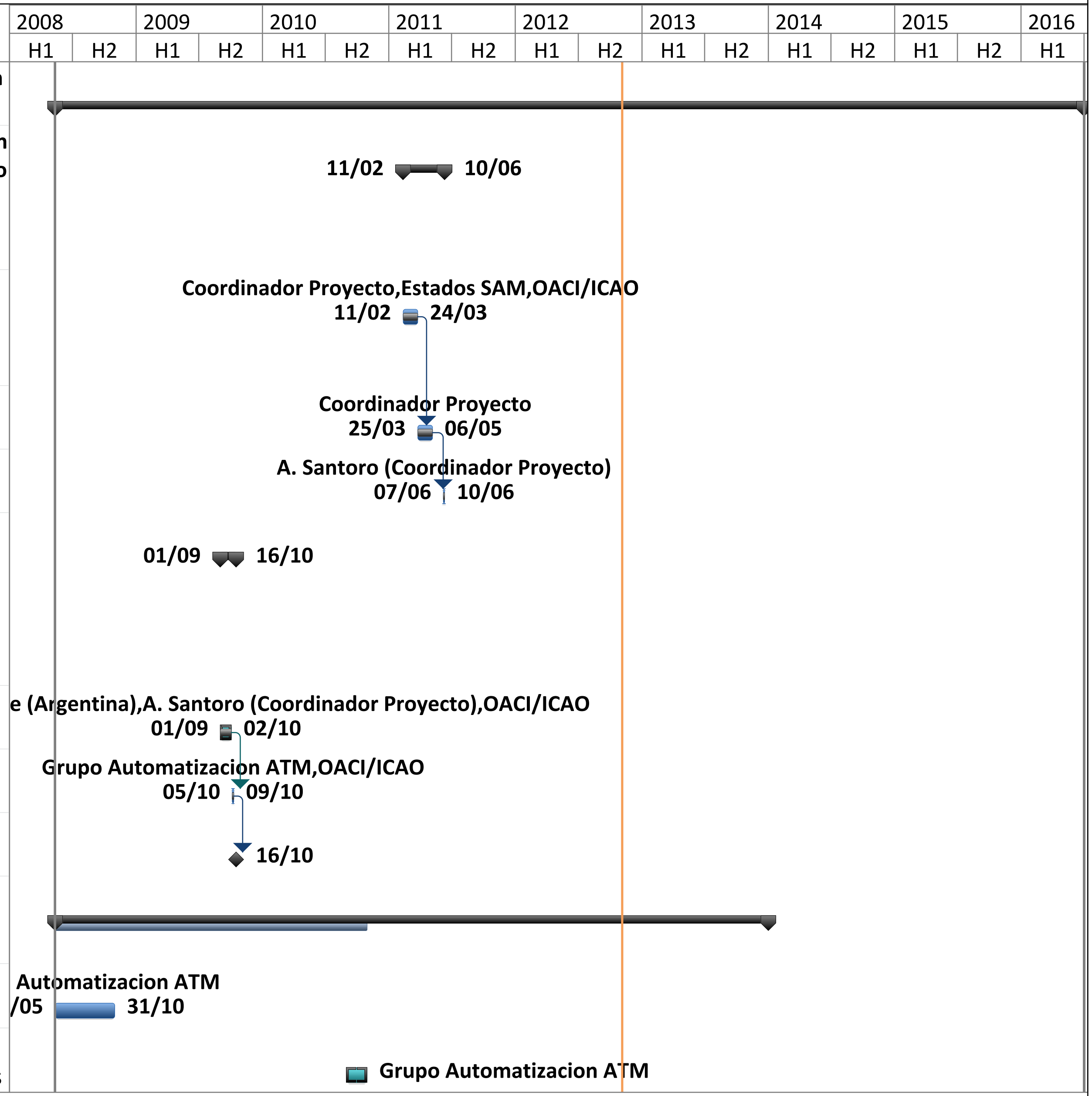
1 ***Gray***: *Activity has not started*
Green: *Activity has or will deliver planned milestone as scheduled*
Yellow: *Activity is behind schedule on milestone, but still within acceptable parameters to deliver milestone on time*
Red: *Activity has failed to deliver milestone on time, mitigation measures need to be identified and implemented*

Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Preliminary interface control document (ICD) between systems for the interconnection of ACCs in the SAM Region	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	Programme Coordinator, Project Coordinator and ATM Automation Group		Completed October 2008 October 2012	Document ICD drafted. Document elaborated with the support of RLA/98/003 and later, RLA/06/901. Document published in site www.lima.icao.int. The document requires updating in view of installation of new automated and surveillance systems in the Region
Guidelines for elaboration of Memorandum of Understanding (MoU) for the implementation of the automation system interconnection	PFF SAM CNS 04	Project Coordinator and ATM Automation Group		Completed October 2009	A model MoU for the interconnection of automated systems has been developed, with the support of RLA/06/901 project and SAM/IG ATM Automation Group. The MoU model is published in site www.lima.icao.int.
Drafting of Memorandum of Understanding (MoU) for the interconnection of automated systems between adjacent ACCs	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	SAM States, Project Coordinator and ATM Automation Group		October 2013	To date, six MoU have been drafted and signed between the following SAM States: Argentina-Brazil; Argentina-Chile; Argentina-Uruguay, Brazil-Uruguay; Brazil-Peru; and Brazil-Venezuela. 12 additional MoUs are planned to be drafted.

Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Interconnection of automated systems between adjacent ACCs	PFF SAM CNS 04 PFF SAM ATM 05 PFF SAM ATM 06	SAM States		June 2016	Radar data using IP protocol has been interconnected between Argentina-Uruguay, through REDDIG. Flight plan and radar data exchange tests have been conducted between Brazil-Venezuela, through REDDIG.
Monitor implementation progress of automation activities in the SAM Region		Programme Coordinator and Project Coordinator		September 2009-December 2014	
Resources necessary	Implement facilities required by SAM States permitting the interconnection of automated systems in accordance with the dates established in the MoUs drafted and signed to this end				

PROYECTO AUTOMATIZACION / AUTOMATION PROJECT

ID	Nombre de tarea
1	**Proyecto de automatizacion ATM / ATM Automation Project**
2	**Nivel de automatización requerido de acuerdo con el servicio ATM proporcionado en el espacio aéreo y los aeródromos internacionales / Automation level required according to ATM service provided in airspace and international aerodromes**
3	Revision documento de especificaciones de sistemas y subsistemas (SSS) / Review of System and Subsystem Specifications (SSS) document
4	Ajustes finales al documento / Final document adjustments
5	Entrega documento final / Delivery of final document
6	**Orientaciones para elaboración Memorándum de Entendimiento (MoU) para implantación de la interconexión de sistemas automatizados / Guidelines for elaboration of Memorandum of Understanding (MoU) for implementation of automation system interconnection**
7	Elaboracion de un modelo borrador de MoU / Elaboration of a draft MoU model
8	Revision del modelo de borrador de MoU / Review of draft MoU model
9	Entrega Modelo final de MoU / Delivery of final MoU model
10	**Guia de orientacion para la implantacion de la integracion de los sistemas automatizados y plan de accion correspondiente**
11	Guía de orientación para la implantación de la integración de los sistemas automatizados
12	Revision guia de orientacion para la implantacion de los sistemas automatizados



PROYECTO AUTOMATIZACION / AUTOMATION PROJECT

ID	Nombre de tarea	2008 H1 – 2016 H1
13	Plan acción regional para interconexión sistemas automatizados (planes de vuelo y datos radar) / Regional action plan for interconnection of automated systems (flight plan and radar	ordinador Proyecto),Grupo Automatizacion ATM,OACI/ICAO 01/09 02/10
14	**Recoleccion de informacion sobre sistemas automatizados instalados en los ACC de la Region SAM**	
15	Documento preliminar de control de interfaz (ICD) entre sistemas para la interconexión de los ACC en la Región SAM	Grupo Automatizacion ATM
16	Actualizacion Documento preliminar de control de interfaz (ICD) entre sistemas para la interconexión de los ACC en la Región	Grupo Automatizacion ATM
17	**Establecimiento de Modelo de Entendimiento (MoU) para la interconexion de sistemas automatizados en la Region SAM**	
18	Elaboracion de un modelo borrador de MoU / Elaboration of a draft MoU model	A. Santoro (Coordinador Proyecto),Grupo Automatizacion ATM
19	MoU revisados y firmados para interconexion de sistemas automatizados (plan de vuelo y datos radar) / Reviewed and signed MoUs for interconnection of automated ystems (flight plan and radar data)	Estados SAM,OACI/ICAO,A. Santoro (Coordinador Proyecto) 19/10 31/05
20	**Implantacion de la interconexion de sistemas automatizados**	
21	Implantacion de la interconexion de sistemas automatizados (Datos radar y datos de plan de vuelo)	Estados SAM,OACI/ICAO,Coordinador Proyecto 11/10
22	**Monitorear las actividades de implantación del proyecto Automatización ATM / Monitor implementation activities of ATM Automation project**	/05

PROYECTO AUTOMATIZACION / AUTOMATION PROJECT

ID	Nombre de tarea		2008 H1	2008 H2	2009 H1	2009 H2	2010 H1	2010 H2	2011 H1	2011 H2	2012 H1	2012 H2	2013 H1	2013 H2	2014 H1	2014 H2	2015 H1	2015 H2	2016 H1
23	Monitorear las actividades de implantación del Proyecto Automatizacion ATM / Monitor implementation activities of ATM Automation project	**/05**									**OACI/ICAO**								

APPENDIX B

PROJECT IMPROVE ATM SITUATIONAL AWARENESS IN THE SAM REGION

<table>
<tr><th>SAM Region</th><th>PROJECT DESCRIPTION (PD)</th><th colspan="2">PD N° C2</th></tr>
<tr><th>Programme</th><th>Project Title</th><th>Starting Date</th><th>Ending Date</th></tr>
<tr><td>ATM Automation and Situational Awareness
(Programme Coordinator:
Onofrio Smarrelli)</td><td>Improve ATM Situational Awareness in the SAM Region

Project Coordinator: Paulo Vila (Peru)
Contributing experts: José Rubira, Marcos Vidal and Jorge Otiniano (Peru); Javier Vittor (Argentina)</td><td>October 2011</td><td>November 2013</td></tr>
<tr><td>Objective</td><td colspan="3">Develop guidelines supporting the implementation of improvements in the situational awareness of ATS units in the South American Region</td></tr>
<tr><td>Scope</td><td colspan="3">Guidelines supporting the implementation of various applications, such as common traffic visualization, common meteorological conditions visualization and communications in general
• Analysis of the current surveillance infrastructure and identification of necessary improvements to support en route and terminal airspaces, airspace classification, PBN and ATFM
• Implementation of ADS-B, ADS-c and/or MLAT surveillance systems at selected airspaces
• Minimum common electronic information and data bases required in support of decision-making process and alert systems towards an interoperable situational awareness among centralized ATFM units
• Implement flight plan data process systems (new FPL format) and data communications tools among ACC´s
• Implement advanced automation support tools to contribute towards the sharing of aeronautical information</td></tr>
<tr><td>Metrics</td><td colspan="3">Drafting of following documents:
• Regional surveillance strategy for the implementation of systems in support of improvement of situational awareness – revised
• Evaluation of the surveillance systems coverage in the SAM Region - completed
• Guideline on technical/operational considerations for ADS-B implementation – completed
• Guideline for the presentation of MET products in graphic fomat
• Guideline on technical/operational considerations for MLAT implementation - completed
• Guideline on technical considerations in support of ATFM implementation - completed</td></tr>
</table>

Strategy	• All tasks will be conducted by experts nominated by States and organizations of the SAM Region members of the Project *Improve ATM situational awareness in the SAM Region*, under management of the project coordinator, in coordination with the programme coordinator. Communications among project members, as well as between the project coordinator and programme coordinator, shall be carried out through teleconferences and the Internet. In addition, the programme coordinator, together with the project coordinator and the contributing experts, can convene at SAM/IG implementation meetings • Once studies are completed, the results will be submitted to the ICAO programme coordinator as a final consolidated document for its analysis, review, approval and presentation at the GREPECAS PPRC
Goals	• Regional surveillance strategy for the implementation of systems in support to situational awareness improvement for July 2012. • Evaluation of SAM surveillance systems coverage for October 2012. • Guideline on technical/operational considerations for ADS-B implementation for June 2012 • Guideline for technical/operational considerations for MLAT implementation for June 2013 • Guideline for technical considerations in support of ATFM implementation for October 2013
Justification	• Improve situational awareness has been identified as a great support for ATM, contributing in the increase of safety and in flight efficiency • During the seventh meeting of the SAM Implementation Group (SAM/IG/7), a review was made to the project *Improve ATM situational awareness in the SAM* Region, considering the nomination of a coordinator for the SAM Region • In addition, a close relationship with the other programmes and their respective projects is necessary, with the aim of collecting the operational requirements demanded by the mentioned applications and their respective tentative implementation dates • This project contributes to the implementation of SAM PFF CNS 04, ATM 05, ATM 06 and MET 03 of the *Air Navigation System Performance-Based Implementation Plan for the SAM Region (SAM PBIP)*
Related Projects	• Air Navigation Systems in Support of PBN • Automation • ATFM • Implementation of the ICAO New Flight Plan Format • ATN Ground-ground and Air-ground Applications

Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Evaluation of surveillance infrastructure and identification of surveillance systems improvements					
Revision to regional surveillance strategy for the implementation of systems in support to improvement of situational awareness	PFF SAM CNS 04 PFF SAM ATM 06	Paulo Vila (Peru)		June 2012	An initial revision to the strategy was presented at SAM/IG/8 meeting (Lima, Peru, 10-14 October 2011)
Evaluation of current surveillance systems coverage in the SAM Region	PFF SAM CNS 04	Paulo Vila (Peru)		October 2012	Presented as Appendix 7 to the SAM guideline on technical/operational considerations for ADS-B implementation. Comments from States are being awaited for.
Drafting of regional plan for ADS-B and MLAT implementation					
Guideline on technical/ operational considerations for ADS-B implementation	PFF SAM CNS 04 PFF SAM ATM 06	José Rubira (Peru) Marco Vidal (Peru)		June 2012	The preliminary version is presented at SAM/IG/10 meeting for its review. Comments from States are being awaited for.
Guideline on technical/ operational considerations for MLAT implementation	PFF SAM CNS 04 PFF SAM ATM 06	Andre Jansen (Brazil)		November 2013	

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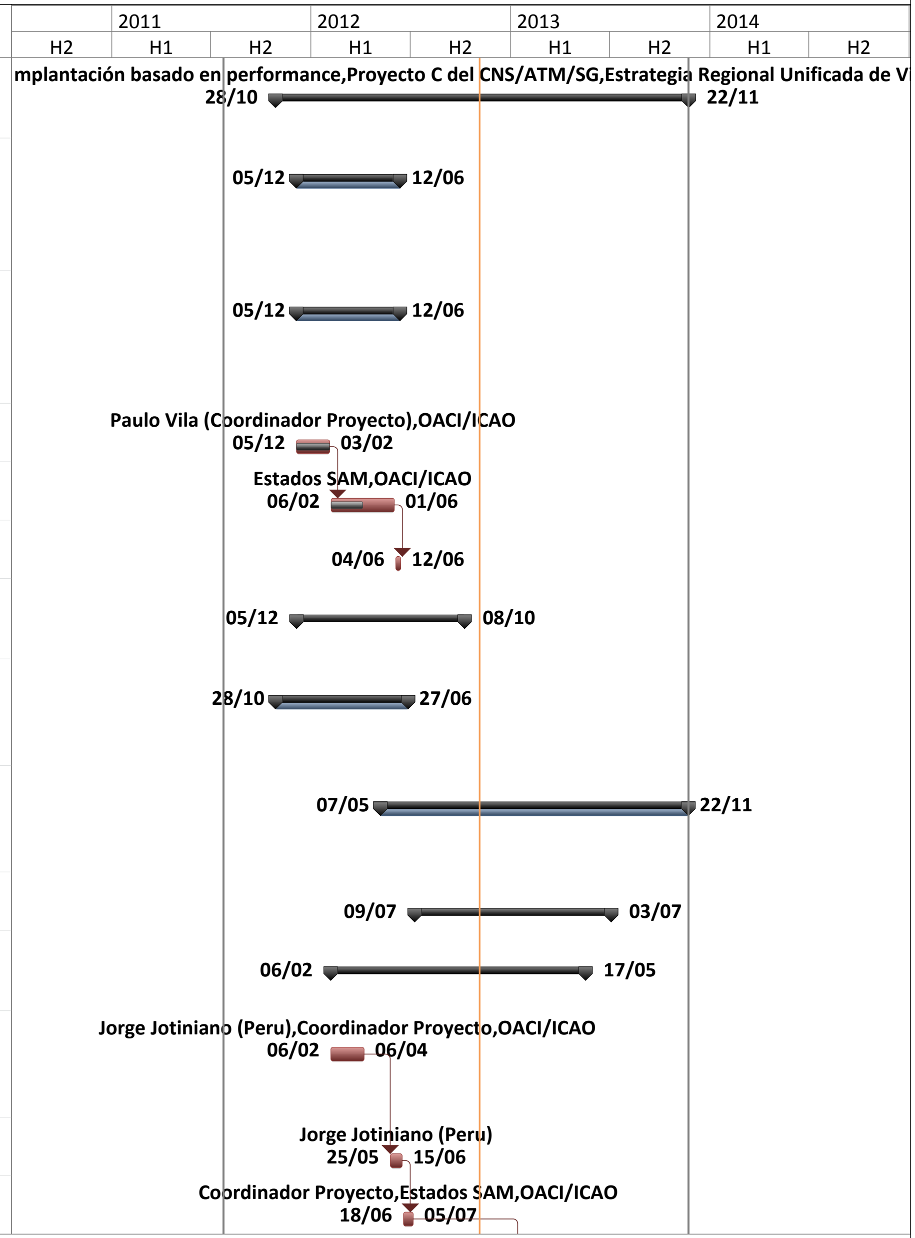
Project Deliverables	Relationship with Performance Based Regional Plan (PFF)	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Guideline on technical considerations in support of ATFM implementation	PFF SAM CNS 01 PFF SAM ATM 05	Javier Vittor (Argentina)		July 2013	The guideline will base itself on the CAR/SAM ATFM Manual approved through GREPECAS Conclusion 16/35
Guideline for the presentation of MET products in graphical format	PFF SAM CNS 04 PFF SAM ATM 06	Jorge Otiniano (Perú)		October 2012	SAM/IG/10 meeting was informed important progress has been made in the guide, having an initial document to be delivered at SAM/IG/11 meeting (May 2013)
Monitor the implementation of improving ATM situational awareness activities in the SAM Region		ICAO		October 2011-November 2013	
Resources necessary					

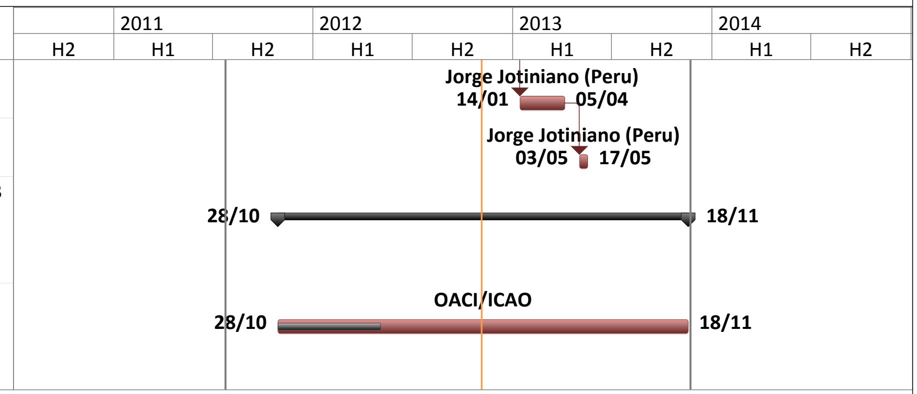
MEJORA A LA COMPRESION SITUACIONAL ATM EN LA REGION SAM / IMPROVE ATM SITUATIONAL AWARENESS IN THE SAM REGION

ID	Nombre de tarea	Duration	Start	Finish
1	**MEJORA A LA COMPRESION SITUACIONAL ATM EN LA REGION SAM / IMPROVE ATM SITUATIONAL AWARENESS IN THE SAM REGION**	**541 days**	**Fri 28/10/11**	**Fri 22/11/13**
2	**Evaluación de la infraestructura de vigilancia e identificación de mejoras a los sistemas de vigilancia / Develop guidelines supporting the implementaion of improvements in the situation awareness of ATS units in the South American Region**	**136 days**	**Mon 05/12/11**	**Tue 12/06/12**
3	**Revisión estrategia regional vigilancia para implantación sistemas en apoyo a mejora comprensión situacional/Revision to regional surveillance strategy for implementation of systems in support situational awareness improvement**	**136 days**	**Mon 05/12/11**	**Tue 12/06/12**
4	Recolectar información / Collect information	45 days	Mon 05/12/11	Fri 03/02/12
5	Proceso de revisión / Reviewing process	84 days	Mon 06/02/12	Fri 01/06/12
6	Entrega documento final / Delivery of final document	7 days	Mon 04/06/12	Tue 12/06/12
7	**Evaluacion de la cobertura actual en los sistemas de vigilancia / Evaluation of the current surveillance system coverage**	**219.94 days**	**Mon 05/12/11**	**Mon 08/10/12**
12	**Guía de orientación con consideraciones técnicas/operacionales para la implantación de la ADS-B / Guidelines on technical/operational considerations for ADS B implementaion**	**173 days**	**Fri 28/10/11**	**Wed 27/06/12**
19	**Guía de orientación con consideraciones técnicas/operacionales para la implantación MLAT / Guideline on technical/operational considerations for MLAT implementation**	**404.88 days**	**Mon 07/05/12**	**Fri 22/11/13**
25	**Guia de orientación en apoyo a la implantación ATFM / Guideline in support of ATFM implementation**	**258 days**	**Mon 09/07/12**	**Wed 03/07/13**
31	**Guía de orientación para la presentación de productos MET en formato gráfico /Guideline for the drafting of MET products in graphic format**	**335 days**	**Mon 06/02/12**	**Fri 17/05/13**
32	Analizar las diversas ventajas que ofrece el uso de la información MET en forma gráfica/Analyze advantages offered by the use of graphic MET information	45 days	Mon 06/02/12	Fri 06/04/12
33	Entrega de propuesta de borrador/Delivery of draft proposal	16 days	Fri 25/05/12	Fri 15/06/12
34	Supervisión o revisiones del plan borrador/Supervision or revisions to draft plan	14 days	Mon 18/06/12	Thu 05/07/12



MEJORA A LA COMPRESION SITUACIONAL ATM EN LA REGION SAM / IMPROVE ATM SITUATIONAL AWARENESS IN THE SAM REGION

ID	Nombre de tarea	Duration	Start	Finish
35	Ajustes finales al documento/Final document adjustments	60 days	Mon 14/01/13	Fri 05/04/13
36	Documento final de la Guía/Final document Guide	11 days	Fri 03/05/13	Fri 17/05/13
37	**Monitorear las actividades de implantación de la mejora a la comprensión situacional en la Región SAM/Monitor the implementation of improving ATM situational awareness activities in the SAM Region**	**536 days**	**Fri 28/10/11**	**Mon 18/11/13**
38	Monitorear las actividades de implantación de la mejora a la comprensión situacional en la Región SAM/Monitor the implementaion of improving ATM situational awareness activities in the SAM Region	536 days	Fri 28/10/11	Mon 18/11/13



APPENDIX C

INTERNATIONAL CIVIL AVIATION ORGANIZATION
SOUTH AMERICAN REGIONAL OFFICE

ASSISTANCE FOR THE IMPLEMENTATION OF A REGIONAL ATM SYSTEM TAKING INTO ACCOUNT THE ATM OPERATIONAL CONCEPT AND THE CORRESPONDING CNS TECHNOLOGICAL SUPPORT

SAM IMPLEMENTATION GROUP - SAMIG

GUIDE ON TECHNICAL AND OPERATIONAL CONSIDERATIONS FOR THE IMPLEMENTATION OF ADS-B IN THE SAM REGION

Lima, Peru

Version 1.1

2012

TABLE OF CONTENTS

LIST OF ACRONYMS

A/A	Air/air
ACAS	Airborne collision avoidance system
ACC	Area control centre
ACID	Aircraft identification
ADLP	Airborne data link processor
ADS-B	Automatic dependent surveillance — broadcast
ADS-C	Automatic dependent surveillance — contract
ADS-R	Automatic dependent surveillance — rebroadcast
AIP	Aeronautical information publication
AIRPROX	Aircraft proximity incidents
ANSP	Air navigation service provider
ASBU	Aviation system block upgrades
ASD	Aircraft situation display
ASTERIX	All-purpose structured Eurocontrol surveillance information exchange
ATC	Air traffic control
ATCO	Air traffic controller
ATM	Air traffic management
ATN	Aeronautical telecommunication network
ATS	Air traffic service
BW	Bandwidth
CDTI	Cockpit display of traffic information
CNS	Communications, navigation and surveillance
CPDLC	Controller-pilot data link communications
DME	Distance measuring equipment
ES	Extended squitter
FDP	Flight data processing
FIR	Flight information region
FMC	Flight management computer
FMS	Flight management system
GNSS	Global navigation satellite system
GPI	Global performance indicator
GPS	Global positioning system
GUI	Graphical user interface
IFR	Instrument flight rules
IMC	Instrument meteorological conditions
INS	Inertial navigation system
ISO	International Organization for Standardization
KVM	Keyboard, video and mouse
LAN	Local area network
MLAT	Multilateration
MSAW	Minimum safe altitude warning system
MSSR	Monopulse SSR
MTBF	Mean time between failures
NTP	Network time protocol
NAC	Navigation accuracy category
NIC	Navigation integrity category
NUC	Navigation uncertainty category
ICAO	International Civil Aviation Organization

PSR	Primary surveillance radar
RAIM	Receiver autonomous integrity monitoring
REDAP	Peruvian digital network
RF	Radio frequency
RNAV	Area navigation
RNP	Required navigation performance
RTCA	Radio Technical Commission for Aeronautics
SAM	South American Region
SARPs	ICAO standards and recommended practices
SDP	Surveillance data processing
SIC	System identification code
SIL	Surveillance integrity level
SLG	Local management system
SRG	Remote management system
SSR	Secondary surveillance radar
G/A	Ground/air
TCAS	Traffic alert and collision avoidance system
TGPS	All-purpose synchronization card
TIS	Traffic information service
TIS-B	Traffic information service — broadcast
TOA	Time of arrival
TPPG	All-purpose process card
TSO	United States FAA Technical Standard Order
TRPG	All-purpose reception card
TIS-B	Traffic information service — broadcast
UAT	Universal access transceiver
UDP	User datagram protocol
UPS	Uninterruptible power supply
URPA	ADS-B reception and processing unit
UTC	Coordinated universal time
VDL	VHF digital link
VHF	Very high frequency
VFR	Visual flight rules

DEFINITIONS

1. **ADS-B in**: Automatic Dependent Surveillance – Broadcast, is an airborne function that receives surveillance data transmitted by the ADS-B OUT functions installed in other aircraft. It could also receive, from the ground, additional data from other aircraft that do not transmit ADS-B OUT or whose ADS-B OUT systems transmit using a different ADS-B technology (see 6.4, ADS-B rebroadcast).

2. **ADS-R:** Automatic Dependent Surveillance – Rebroadcast, is a system that permits the interoperability among aircraft equipped with ADS-B systems that operate with different data links. The ADS-R ground station receives ADS-B messages from a link (*e.g.*, UAT), and processes and broadcasts them through a different data link (*e.g.*, 1 090 MHz ES). Docs 9861 and 9871 contain details of TIS-B and ADS-R.

3. **ADS-B out:** Automatic Dependent Surveillance – broadcast **-** transmission **-** A function of an aircraft or vehicle that is periodically broadcasting its status vector (position and speed) and other information obtained from airborne systems in a format suitable for ADS-B-IN receivers.

4. **Downlink**: Link associated to signals transmitted over the 1 090 MHz frequency response channel.

5. **Aircraft identification*:*** A group of letters, figures, or a combination thereof, which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground or air traffic services communications (*the aircraft identification is frequently known as flight identification).*

6. **Mode S**: Data link protocol in Mode S that permits selective addressing of aircraft using a 24-bit aircraft address that unequivocally identifies each aircraft and has a bidirectional data link between the ground station and the aircraft for the exchange of information.

7. **Mode S SS (Mode S short squitter):** Periodic unsolicited output of a Mode S transponder (nominally once per second) in a specific format to facilitate passive acquisition.

8. **Mode S ES (Mode S extended squitter):** Periodic unsolicited output in a 112-bit 1 090-MHz Mode S signal format containing 56 bits of additional information (*e.g.*, used for ADS-B, TIS-B and ADS-R).

9. **TIS-B:** Broadcast of aircraft surveillance data by ground stations using an ADS-B data link.

10. **TYPES OF ES MESSAGES:**

10.1 AIRBORNE POSITION: The airborne position message provides basic surveillance information, which includes 3-D position, in addition to time of validity and surveillance status information.

10.2 AIRBORNE VELOCITY: The airborne velocity message contains velocity information and other aircraft status data.

10.3 SURFACE POSITION: The surface position message provides the complete surface status vector in a single message.

10.4 AIRCRAFT IDENTIFICATION AND EMITTER CATEGORY: The identification and category squitter provides the aircraft type category as well as the aircraft identification, which corresponds to box 7 of the ICAO flight plan.

10.5 EVENT-DRIVEN: Event-driven squitter is a message transfer protocol for the transmission of additional information that might be occasionally needed.

11. **Uplink:** Link associated to signals transmitted by the 1 030 MHz frequency interrogation channel.

REFERENCE DOCUMENTS

- Doc 4444, Air Traffic Management (PANS-ATM)
- Doc 9924, Aeronautical Surveillance Manual
- Doc 9871, Technical Provisions for Mode S Services and Extended Squitter RTCA/DO-249, DEVELOPMENT AND IMPLEMENTATION PLANNING GUIDE FOR AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST (ADS-B) APPLICATIONS
- RTCA/DO-242, Minimum Aviation System Performance Standards for Automatic Dependent Surveillance – Broadcast (ADS-B)
- RTCA/D0-260 A, Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)
- RTCA/DO260, Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance – Broadcast (ADS-B)
- Annex 10, Aeronautical Telecommunications, Volumes 4 and v3,
- SAM Surveillance Strategy Document,
- SAM Performance-Based Air Navigation Implementation Plan (SAM PBIP),
- Global Air Navigation Plan for CNS/ATM Systems (Doc 9750), "Aviation System Block Upgrades (ASBU)" Initiative.
- FAA AC No: 20-165 of 2010.
- EASA Acceptable Means of Compliance - AMC 20-24

1. INTRODUCTION

1.1 Objective

1.1.1 Based on the ATM Operational Concept, the Global Plan, the Regional Plan, and the SAM Performance-Based Plan, it is foreseen that the implementation of the ADS-B system will begin in the medium term.

1.1.2 Likewise, following the guidelines of the Global Plan in its GPI 9, “Situational Awareness”, it was determined that one of the activities of Project “Enhancement of ATM situational awareness” would be the development of this guide, which is intended to serve as a reference for SAM States that need to start operating an ADS-B surveillance system. The guide lists the aspects that must be taken into account before deciding to test and then operate the system.

1.2 Scope of the Guide

1.2.1 This guide is addressed to navigation service providers, civil aviation authorities, and aircraft operators of the ICAO South American (SAM) Region that need introductory information on technical and operational concepts and issues that should be taken into account before planning and implementing ADS-B as an ATS surveillance sensor or as on-board traffic monitoring system to enhance the situational awareness of the crew. This guide does not replace or supplement the international standards specified by RTCA or ICAO, but rather provides a common starting point so that SAM States that are planning to acquire an ADS-B or a new control centre may know what are the performance and technical characteristics that will permit the interoperability of the systems involved.

2. OVERVIEW OF THE ADS-B

2.1 OPERATION OF THE ADS-B

2.1.1 According to Doc 9924 AN/474, Aeronautical Surveillance Manual, ADS-B involves the broadcasting by an aircraft of its position (latitude and longitude), altitude, velocity, identification, and other information obtained from on-board systems. All ADS-B position messages contain data quality indication that allows users to determine if data is good enough to support the function foreseen.

2.1.2 Quality indicators of aircraft position, velocity and other related aircraft data are normally obtained from the airborne GNSS system. Existing inertial sensors alone do not provide the required accuracy or integrity data, although future systems will probably solve this deficiency. Consequently, ADS-B position messages from an inertial system are normally transmitted with a statement of unknown accuracy or integrity. Some new aircraft installations use an integrated GNSS and inertial navigation system to provide position, velocity, and quality indicators for ADS-B transmission.

2.1.3 It is foreseen that these navigation systems will have a better performance than a system based only on GNSS, since inertial and GNSS sensors have supplementary features that mitigate the weaknesses of each system. Since ADS-B messages are broadcast, they may be received and processed in any suitable receiver. This receiver may be an “ADS-B ground station” processing ADS-B messages (extended squitter) and generating aircraft reports to be displayed on an ATCO work console.

2.1.4 Figure 1 below illustrates the operation of ADS-B.

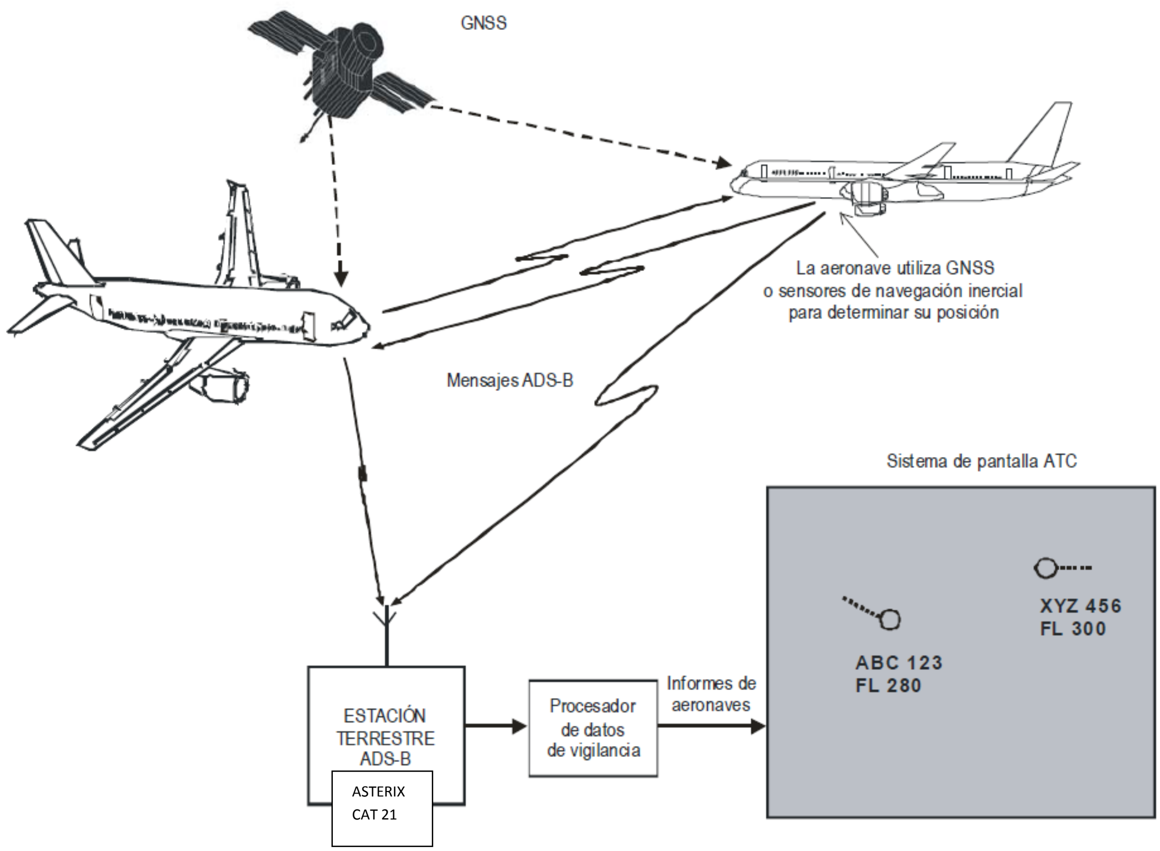


Figure 1: ADS-B schematic

2.1.5 Three ADS-B data links have been developed and standardised for the transport of messages, namely Mode S ES, also known as 1090 ES (Extended Squitter), UAT and VDL 4. Mode S ES has been chosen as the type of link to be used in the SAM Region (Conclusion 12/44 - *Regional CAR/SAM guidance for the introduction of ADS data link.* Doc 9871, Technical provisions for Mode S services and extended squitter, provides more details on Mode S ES.

2.1.6 Mode S extended squitter (1090 ES) contains an additional 56-bit data block compared to the conventional Mode S or short squitter (see Figure 2). ADS-B information is broadcast in separate messages, each containing a related data set (*e.g.*, airborne position and pressure altitude, surface position, velocity, aircraft identification and type, emergency information).

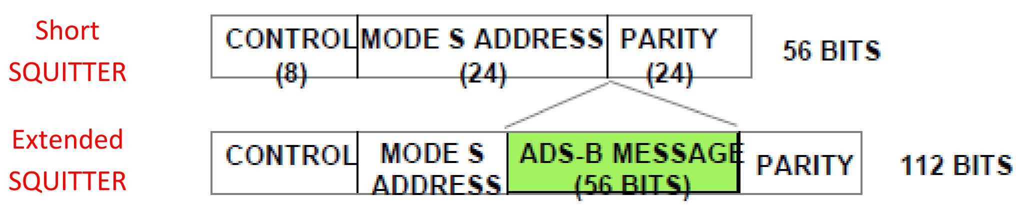


Figure 2. 1 090 ES datagram

2.1.7 The first datagram is the so-called 56-bit Short Squitter (SS), which is transmitted once per second. This short squitter is used for surveillance, where the 24-bit MODE S ADDRESS field embodies the selective interrogation of aircraft addresses consisting of 2 sub-fields, a 9-bit sub-field that identifies the country, and a 15-bit sub-field the identifies the aircraft. Each ES transmission contains the aircraft address, which permits an unequivocal association between the data in the various squitter formats and the originating aircraft.

2.1.8 The second datagram is the 112-bit Extended Squitter (1090 ES) that, in addition to the 56 bits of the SS, contains the 56-bit ADS-B message. There are two standards for the ES: RTCA/DO-260 and RTCA/DO-260A.

2.1.8.1 The ES provides five types of reports:

a) Airborne position;
b) Surface position;
c) Aircraft identification and emitter category; and
d) Event-driven.

2.1.8.2 Each of these types is described in Doc 9924 Appendix K item 5 “ADS-B ES messages”. Figures 2A and 2B show examples of ADS-B messages.

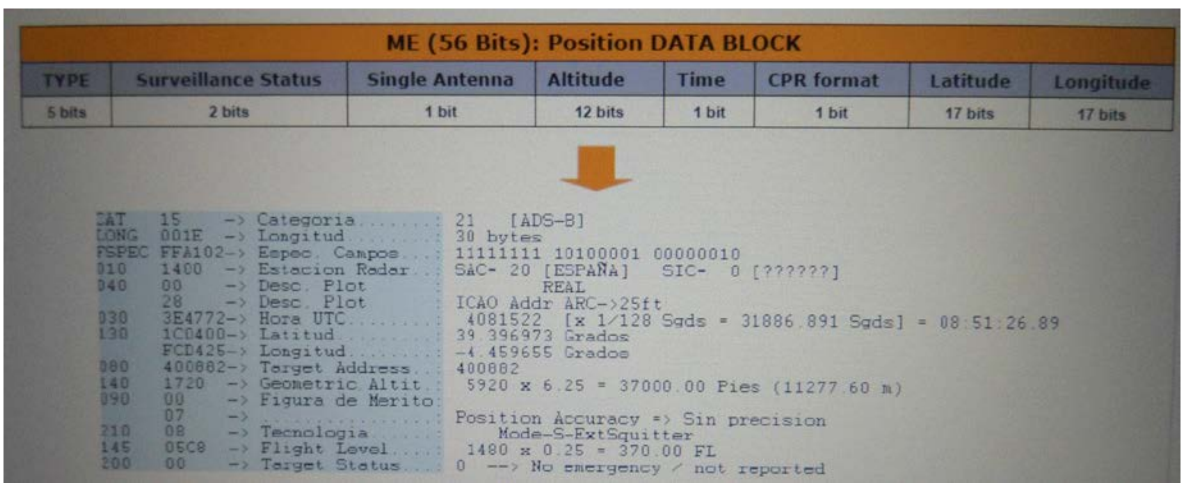


Figure 2A: ADS-B position message

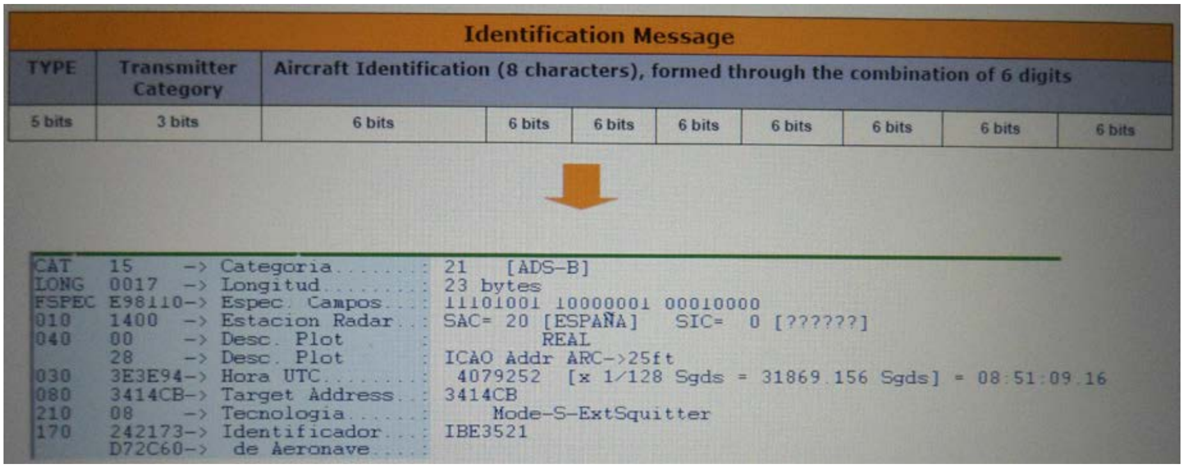


Figure 2B: ADS-B identification message

2.1.9 The initial versions of ES messages are defined in RTCA DO-260 and are known as version ZERO (0) formats. Complete definitions of message structures and data sources for version 0 formats are contained in Doc 9871, Appendix A.
In version 0 formats, the type codes of airborne position and surface position messages can be associated to a navigation uncertainty category (NUC). Version ZERO ES message formats and the associated requirements are suitable for the first implementation stages of extended squitter applications. Surveillance quality is reported in the navigation uncertainty category (NUC), which may be an indication of the accuracy or integrity of the navigation data used for ADS-B. However, it does not specify whether the NUC indicates integrity or accuracy.

2.1.10 The revised versions of ES messages are defined in RTCA DO-260A and are known as version ONE (1) formats. Complete definitions of the data structure and data sources for version 1 formats are contained in Doc 9871, Appendix B. Version 1 formats and the associated requirements correspond to more advanced ADS-B applications (see Appendix 1 to this document, “ADS-B operational application”).

2.1.11 In this version, the accuracy and integrity of navigation data are divided into 3 main components, namely NAC, NIC, and SIL (see Appendix 2 to this document, “Introduction of NAC, NIL, and SIL”).

2.1.12 Each ES transmission contains a 5-bit field that identifies a “TYPE CODE” specific to each message. Version 0 formats allow the TYPE CODES of airborne position and surface position messages to be associated to a NUC. Version 1 formats allow the TYPE CODES of airborne position and surface position messages to be associated to a NIC.

3. GENERAL CONSIDERATIONS ON ADS-B IMPLEMENTATION PLANNING IN THE SAM REGION

3.1 GENERAL CONSIDERATIONS

3.1.1 As stated in Doc 9924, Aeronautical Surveillance Manual, the following list shows the recommended stages for the planning and implementation of surveillance systems--in this case, of an ADS-B system.

a) *Define the operational requirements*:
- Select the applications to be supported: This will help determine the required performance.
- Define the area of coverage: The definition of the volume where the operational service will be supported is very important since it will serve as a basis for system costing. In particular, the correct identification of lower altitude boundaries is very important sincen it will have significant consequences on the number of sensors to be introduced.
- Define the type of traffic: for example, IFR flights, VFR flights, local or international flights, civil or military flights.

b) *Define the local environment (current and future)*:
- Current and expected traffic densities, including a description of likely peak hours.
- Route structure.
- Type of on-board equipment currently mandatory for the different types of flights (mandatory carriage and actual proportion of equipage).
- Type of aircraft: commercial, general aviation, helicopters, gliders, ultra-light aircraft, VLJ, military aircraft, and their dynamic characteristics (maximum speed, climb speed, turn rate, etc.).
- Segregation of the different types of traffic, possible traffic mix, and likelihood of intrusion of aircraft not equipped with means of cooperative surveillance.
- Specific local RF environment.

c) *Analyse design options and determine the techniques that may be used*:
- Verify existing surveillance sensors that may be reused.
- Verify the new sensors and surveillance techniques that may be introduced at a low cost.
- Determine the number of locations and investigate their availability. Check on-board equipment.
- Determine the required level of redundancy and fall back operating mode.
- Determine whether it will be necessary to carry new equipment on board.
- Determine the impact on operating procedures.
- Conduct cost-benefit and feasibility studies of the different options, if necessary.

d) *Conduct a safety analysis of the new proposed system*:
- To demonstrate that the system will provide the necessary performance in its nominal operating mode.
- To demonstrate that the different failures have been analysed.
- To demonstrate that it was determined that failures were acceptable or could be mitigated.

e) *Implement:*
- If new equipment is required on board, prepare the mandate for on-board carriage;
- The acquisition and installation of the new system.
- The performance assessment of the new system.

f) *Establish the operational service:*
- Transition from the existing to the new system.

g) *Provide the operational service*:
- Periodically verify the performance of the new system.
- Perform regular and preventive maintenance.

3.1.1.1 The following proposals provide practical examples of analyses proposed for the Region, taking into account the participants involved.

3.1.2 **Joint work of the CAA and ANSPs**

3.1.2.1 States should consider the following activities prior to the implementation of an ADS-B surveillance service:

a) Define the operational objective of the implementation.

b) Define the objectives and goals to be achieved in accordance with the national air navigation plan, the ASBU surveillance roadmap and the SAM regional surveillance strategy, for the development of the ADS-B implementation plan, with the participation of aircraft operators and other users involved.

c) Services or areas or flight phases that would be under the planning scope.

d) Analysis of the avionics of the fleet, both Mode-S-equipped and non-equipped, in the airspace concerned; at least the following data should be taken into account:

- Number of operations or aircraft involved in general aviation, commercial, and military flights. It is recommended that the ratio between the number of aircraft and the operations they conduct be analysed, since, in some cases, commercial aircraft with 1090ES transmission capabilities conduct several operations per day, thus increasing the feasibility of an implementation with a low final cost for aircraft operators.
- Message standard used for transmission by aircraft (DO-260/DO-260A).

e) ADS-B message standard to be used in the State.

f) Type of application in which ADS-B is to be used in accordance with the requirements and the operational concept (ADS-B-RAD, ADS-B-NRA, ADS-B-APT, ADS-B-ADD, etc.) and the types of transponder that they will require (see Appendix 1).

g) The integration of ES with the SSR system at the existing control centre (if applicable).

h) Advantages, disadvantages, and limitations of the planned implementation.

i) Type of data merging (multi-tracker) of the existing and future SDP serving the ATM automated system.

j) Training of ATCOs and crews on ADS-B, its use, advantages, operational procedures to be used, applicable separation minima, delegation of functions, responsibility limits, etc. Specifically in the case of ATCOs, they shall be warned and trained with respect to the possibility of FLP correlation failures in on-board interfaces due to ACID input errors.

k) Operational risk assessment (in case of failures, navigation data quality degradation, etc.) and ADS-B message performance trials (Doc 4444, 2.6.1.1; 2.6.1.2)

l) Testing and establishment of procedures in case of:

- Contingencies, especially in case of interruption of the receiver autonomous integrity monitoring (RAIM) in accordance with Annex 11, 2.30, and Doc 4444, 8.8.5 and 8.8.5.
- Validation of risk mitigation.
- Independent and joint simulations with pilots.

3.1.3 **Civil aviation authorities (regulatory bodies)**

a) Define the minimum performance and technical/operational characteristics of on-board navigation equipment that will feed ADS-B out.

b) Analysis, selection, and validation of quality and integrity parameters in ADS-B message formats in the State.

- Chapters 1, 2, 3 of DO-260A and 2, 3 and 4 of DO242A describe in detail the technical and operational tests and aspects to be taken into account for these processes.

c) Once the testing and parameter selection have been completed, they could be validated as follows:

- The integration of ES with SSR data in a control centre may be a direct way of obtaining ADS-B benefits while maintaining the independence of SSR surveillance. This is based on the use of active interrogation to validate ES surveillance.
- The technique may be used in ground ATC and ACAS surveillance applications. Active surveillance is used for validating the surveillance reported by ADS-B and replacing it if an aircraft loses its navigation capability.
- If the validity check at the beginning of tracking turns out positive, the aircraft may continue in ADS-B with periodic monitoring to ensure the proper continuous operation of the navigation system. If the check turns out negative at any given point in time, tracking can be maintained through active surveillance.

- Another method of validating ADS-B data consists of installing ADS-B with multilateration. The advantage of this option is that it maximises the use of ground infrastructure since multilateration receivers can receive and decode ADS-B messages. This option has the advantage of being completely passive.
- Publication of the respective technical standard as the authority may deem appropriate, highlighting to the ATM community those aspects that crews and aircraft operators (including technical crews on the ground) must take into account when entering data in the on-board interface. (See Appendix 3 – “Proposed publication of a national technical standard.”)
- Drafting of advisory circulars (CA) establishing ADS-B approval requirements for aircraft and operations in the corresponding airspace.

3.1.4 **For Operators**

a) Equipment with ADS-B message generation and transmission functions. Additionally, for CDTI (Cockpit Display Traffic Information) applications, ADS-B message reception, assembly, and processing functions should be available (in both cases, the data link mode will be ES Mode-S), as well as an appropriate number of interfaces, depending on operational applications, approved by the appropriate ATS authority (see Figure 3).

b) On-board transponders should have the transmission/reception capabilities for the class of transponder (see Appendix 4 “Tables of classes of ADS-B transmitters and receivers”) that corresponds to the ADS-B application to be used, approved by the appropriate ATS authority.

c) The equipment associated to on-board ADS-B may include:

- Secondary sources for navigation data backup and interfaces (for example, redundant GNSS, Loran, FMS / RNAV or INS)
- GNSS augmentation processing
- Interface with applications that support CDTI for visualising other aircraft
- Interface for entering data in the cockpit.

d) Training of crews on ADS-B concepts, the interaction of flight data in ATC applications, the use and procedures of the applications to be used, as well as the contingency plan.

e) Checklists for ADS-B applications to be used, taking into account the importance of correct entry of flight identification in the on-board interface, to be considered for drafting the corresponding technical regulation. Appendix 5, “Aspects to be taken into account by operators when operating an ADS-B transponder”, highlights the importance of this requirement.

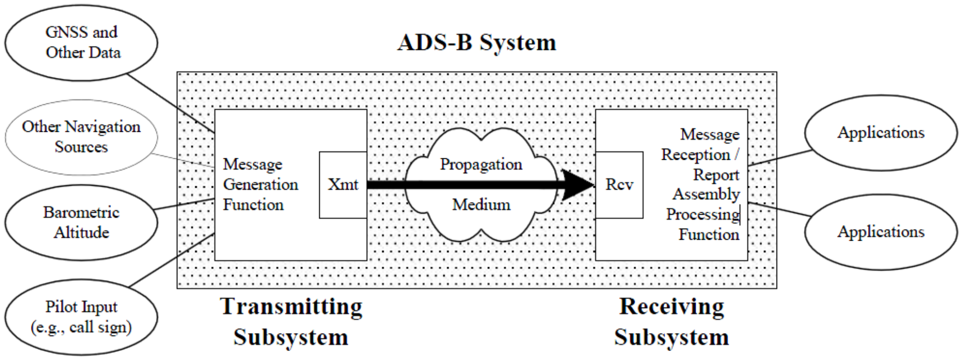


Figure 3: Schematic of ADS-B for operational applications

3.2 ADVANTAGES OF ADS-B

3.2.1 In addition to local, governmental, regional, or global ATM and CNS implementation guides, it is important that the parties responsible for ADS-B implementation planning clearly establish the objectives, advantages, disadvantages, and considerations that this surveillance system entails for the ATM community as a whole, in accordance with it own reality.

3.2.2 In general terms, significant short-, medium-, and long-term safety improvements are achieved (see Appendix 6, “ASBU surveillance methodology roadmap”) both on the ground and on board:

a) Enhanced situational awareness in airspaces with radar surveillance or multilateration, through the provision of more information, between IFR, IFR and VFR flights, between VFR flights with electronic VFR IMC function, between uncontrolled flights, to ATC, etc.
b) Enhanced warning (prediction and resolution) systems both in flight as well as on the ground (between aircraft and between aircraft and ground airport operation vehicles), reducing runway incursions, AIRPROX, ATC safety net warnings, long-term warnings for conflict management, etc.
c) Shorter airborne segments.
d) Reduced ATC workload, enabling the delegation of separation responsibilities to certain flights.
e) Different operational applications and functions using a single system
f) Increased airspace capacity, etc.

3.2.3 Regarding economic benefits, savings can be obtained for:

a) ANSPs: lower cost of installing, maintaining and acquiring an ADS-B antenna *vs* PSR or MSSR, less logistic problems and architecture complexity if compared to multilateration, for example, for broad area; permits the expansion of ATS surveillance service in low traffic density areas where the installation of radar may not be justified, etc.
b) Air users: cost and fuel savings because it enables more direct and optimum routes, less delays and restrictions (with procedures for delegation of responsibilities and tracking, sequencing, and separation functions), etc.

3.2.4 With respect to safety, ADS-B data may be used also for automated monitoring of resolution advisories (RAs) received from collision avoidance systems (TCAS). This functionality may be an additional benefit for States that implement ADS-B coverage in their areas of responsibility, mainly with respect to safety management systems (SMS), since at present RA assessments are normally done using manual processes based on hazard reports sent to the State by the operators.

3.3 **DISADVANTAGES OF ADS-B**

3.3.1 ADS-B performance and operation standards are still under development. GPS continues to be the main positioning source, still lacking official backup. The additional use of sensors such as DME-DME, INS, etc. as positioning sources is foreseen.

3.3.1.1 The avionics of the fleet that operates in the SAM Region is not homogeneous, and thus some ES-capable flights transmit messages in version 0 and others in version 1.

3.3.1.2 The cost of acquisition of the equipment required for ADS-B is still high, especially for general aviation, which, in many cases, still lacks the necessary FMC/FMS for data processing. The same happens for the ADS-B IN function.

3.3.1.3 Accordingly, it is likely that exclusive airspaces will need to be implemented in the Region.

3.3.1.4 Most control centres lack the capacity to receive ASTERIX category 21ed. 1.8 data or to process and merge data in accordance with the recommendations proposed in this document for the SAM Region.

3.4 **SURVEILLANCE STATUS IN THE SAM REGION**

The intentions of the States of the Region regarding ADS-B implementation in each country are summarised below, based on CNS plans submitted by each SAM State to the SAMIG.

3.4.1 **Argentina**

3.4.1.1 Regarding services under the ICAO CNS/ATM concept, Argentina is planning to borrow one or two ADS-B receiver stations to conduct initial trials in this field.

3.4.1.2 Amongst the improvements to be made to surveillance systems for conventional services, Argentina has foreseen the installation in the short and medium term of MSSR radar systems (INKAN from provider INVAP) as conventional services. Plans concerning the new radars are contained in the guide for the implementation of surveillance systems presented at the sixth meeting of the CNS ATM Subgroup (ATM/CNS/SG/6).

3.4.1.3 Regarding services under the ICAO CNS/ATM concept and, specifically, ADS-B plans for the medium term, Argentina contemplates having a sufficient number of ADS-B receivers, which, in addition to the radars foreseen, would ensure the absence of ¨coverage gaps¨. Information obtained from the receivers and from RSMA radars will be carried over the ATN to the corresponding ACCs.

3.4.2 **Bolivia**

3.4.2.1 Bolivia has an MSSR located in the Kuturipa hill, within the Cochabamba terminal area.

3.4.2.2 Regarding services under the ICAO CNS/ATM concept, Bolivia has no ADS-B stations and its implementation is under study.

3.4.2.3 Amongst the improvements to be introduced in surveillance systems for conventional services and based on an operational requirement, Bolivia has plans to implement an integrated 4-radar (MSSR) system in the medium term to achieve 80% coverage of the La Paz FIR airspace. Regarding services under the ICAO CNS/ATM concept, Bolivia has plans to continue performing cooperative surveillance, noting that SSR Mode A/C and SSR Mode S will continue to be the main surveillance elements for approach, en route and terminal areas.

3.4.3 **Brazil**

3.4.3.1 Surveillance system implementation plans are contained in FASID Table CNS 4A. The plans for the new surveillance systems are contained in the guide for the implementation of surveillance systems submitted to the sixth meeting of the CNS ATM Subgroup (ATM/CNS/SG/6).

3.4.3.2 Regarding improvements to be introduced in surveillance systems, it may be noted that Brazil is contemplating the replacement of radar sensors of conventional surveillance systems for other radars in the short and medium term. Actions foreseen are contained in Annex J to its Plan.

3.4.3.3 Regarding services under the ICAO CNS/ATM concept, ADS-C service was implemented in the Atlantico FIR in 2009.

3.4.3.4 In the short term (2013), ADS-B will be introduced for offshore operations at Bacía de Campos. Likewise, a wide area mutilateration (WAM) system will be implemented at the TMA- VT by 2014.

3.4.3.5 In the medium term, ADS-B implementation all over Brazilian continental airspace will be completed in 2018, followed by the elimination of secondary radar coverage overlaps for en-route operations (this requires users to be duly equipped with ADS-B).

3.4.4 **Chile**

3.4.4.1 Regarding the services under the ICAO CNS/ATM concept, Chile has implemented an ADS-C system at the Oceánico control centre, which is used for flight surveillance in areas under its jurisdiction in the South Pacific.

3.4.4.2 Amongst the improvements to be introduced in surveillance systems for conventional services, Chile has plans to renew its equipment, reinforcing the southern area of the country. Regarding services under the ICAO CNS/ATM concept, and with respect to ADS-B, there are plans to study the possibility of implementing an ADS-B system at some airports of the country.

3.4.5 **Colombia**

3.4.5.1 Regarding services under the ICAO CNS/ATM concept, Colombia has not implemented any ADS-B system.

3.4.5.2 Amongst the improvements to be introduced in surveillance systems for conventional services, Colombia has plans to update its PSR/SSR radar systems and to install a new MSSR radar system at San Andrés in the short term. Regarding services under the ICAO CNS/ATM concept, and with respect to ADS-B, there are plans to expand the MLAT in the medium term to achieve WAM for both terminal area and en route.

3.4.6 **Ecuador**

3.4.6.1 There are 3 radars located in Guayaquil, Quito and Galápagos. Regarding services under the ICAO CNS/ATM concept, Ecuador has no ADS-B or ADS-C system.

3.4.6.2 Amongst the improvements to be introduced in surveillance systems for conventional services, Ecuador has plans to install PSR and MSSR radar systems in the short and medium term, as well as MLAT. The plans for the new radars are contained in the guide for the implementation of surveillance systems submitted to the sixth meeting of the CNS/ATM Subgroup (ATM/CNS/SG/6). Regarding services under the ICAO CNS/ATM concept, and with respect to ADS-B, Ecuador has no implementation project.

3.4.7 **Guyana**

3.4.7.1 Guyana has no radar systems. Its CNS Plan specifies that they will "seek the necessary information for radar data sharing".

3.4.7.2 Amongst the improvements to be introduced in surveillance systems for conventional services, Guyana is envisaging the implementation of ADS-B in the medium term, without specifying the region and/or application.

3.4.8 **Paraguay**

3.4.8.1 At national level, Paraguay currently has only one secondary radar Mode S operating in Asunción.

3.4.8.2 Likewise, regarding services under the ICAO CNS/ATM concept, Paraguay foresees that the use of ADS-B in continental area will gradually increase in the air navigation system.

3.4.9 **Peru**

3.4.9.1 At present, Peru has 7 Mode S radar systems at national level, 1 Mode S radar in Lima, and 1 PSR/MSSR radar system in the city of Lima.

3.4.9.2 In 2009, Peru tested an ADS-B station manufactured by THALES. In the medium term, (2011-2015), there are plans to conduct tests with the ADS-B system, and the first ADS-B stations based on Mode S ES receivers will be implemented at national level. Currently, an ADS-B system has been implemented in Pisco (210 km south of Lima) but has not been commissioned yet. This system would initially be on trial and then integrated into the Lima ACC.

3.4.9.3 In the long term (2015-2025), the existing Mode S SSR radars will not be renewed and will be replaced at the end of their useful life (around 2020) by ADS-B ES systems.

3.4.10 Suriname

3.4.10.1 Suriname has no air surveillance systems. Amongst the improvements to be introduced in surveillance systems for conventional services, Suriname is planning to introduce PSR and SSR soon at the Zanderij/J.A.Pengel international airport.

3.4.10.2 Regarding services under the ICAO CNS/ATM concept, Suriname has no plans for their implementation and, thus, does not foresee the implementation of ADS-B.

3.4.11 Uruguay

3.4.11.1 Currently, there are 2 radar locations: Carrasco and Durazno.

3.4.11.2 For the time being, there are no plans to implement ADS-B, only ADS-C for the oceanic sector in the next five years. Regarding services under the ICAO CNS/ATM concept, Uruguay has no ADS-B systems.

3.4.11.3 Amongst the improvements to be introduced in surveillance systems for conventional services, Uruguay has plans to replace the system in Carrasco for a new ASR.

3.4.11.4 Regarding services under the ICAO CNS/ATM concept, Uruguay has no plans to implement ADS-B for the time being, only ADS-C for the oceanic sector in the next five years.

3.4.12 Venezuela

3.4.12.1 Venezuela has radars, whose location and characteristics are described in the FASID table.

3.4.12.2 Regarding services under the ICAO CNS/ATM concept, and with respect to ADS-B, Venezuela has foreseen its implementation after 2015.

3.4.13 Summary of the current status in the SAM Region

Country	No. of radars	Plans to install ADS-B (*)	Defined area
Argentina	12	YES	Radar coverage gaps.
Bolivia	1	NO	N/A
Brazil	71	YES	Bacia de Campos (oil producing area)
Chile	11	YES	Some airports of the country
Colombia	15	YES	Multilateration (MLAT) to obtain wide area coverage (WAM) with ADS-B functionality at selected airports.
Ecuador	3	NO	N/A
Guyana	0	NO	N/A

Paraguay	1	YES	N/A
Peru	9	YES	Pisco. Radar coverage gaps.
Country	No. of radars	Plans to install ADS-B (*)	Defined area
Suriname	0	NO	N/A
Uruguay	2	NO	N/A
Venezuela	10	YES	After 2015. Not yet defined.

(*) Information obtained from CNS improvement action plans of the States and provided by the States at the SAM/IG/10 meeting. When the State has not specified its plans to implement ADS-B, it is assumed that it has no plans.

3.4.14 **Radar coverage diagrams**

3.4.14.1 Appendix 7, "SAM radar coverage diagrams" shows the estimated line of sight of the various radar systems in the SAM Region, at 25,000 feet.

3.4.14.2 To calculate coverage, use was made of software that automatically calculates coverage, using NASA SRTM (Shuttle Radar Topography Mission) data as terrain data, considering a radar tower height of 15 m, and also taking into account the curvature of the earth for a flight level of 25,000 feet. Brazil and Colombia provided their respective coverage diagrams.

3.4.14.3 The diagrams show that the area with the least radar surveillance coverage is located in Bolivia, Paraguay and along their boundaries with Argentina, areas in which implementation could start at regional level.

4. **CONSIDERATIONS FOR THE INSTALLATION OF AN ADS-B SYSTEM AND THE TRANSFER OF ITS SIGNAL TO AN AUTOMATED CONTROL CENTRE**

4.1 **General**

4.1.1 Although an ADS-B system can be considered as a technology easy to install, it requires consideration of aspects related to electric facilities, air conditioning, and security, just like any other aeronautical facility, except that its requirements will be minimal.

4.1.2 Consequently, it is important to conduct a site study of the facilities before defining where the ADS-B will be installed.

4.1.2.1 This study must cover:

a) Electric supply
b) Civil infrastructure
c) Environmental conditions. Suitable environment in terms of temperature and humidity
d) Security
e) Assessment of electric power characteristics at the site
f) Connectivity platform
g) Analysis of the site, clearway, and cone of silence

h) Radio electric study of the site to avoid possible interference

4.1.3 If all this were available (installed capacity for integrating ADS-B Indoor and Outdoor to the locations), cost savings would be obtained in terms of UPS, power generator, lightning rod, grounding, castle or mast, security system sensors, the security system itself, etc. Likewise, a connectivity platform with the electric characteristics required to link the physical interface of the ADS-B radar data processor with both the system GUI and the control centre to which it is to be integrated will avoid the need to contract media for only the ADS-B service.

4.1.4 System reliability and availability depends on its quality and structure. Consequently, it is advisable to request dual and/or redundant systems. Redundancy is normally provided at the level of processing channels, data transmission networks, etc.

4.1.5 In the specific case of the Peruvian experience with the ADS-B provided by INDRA and installed in Pisco, a series of adaptations have been required. To this end, CORPAC (Peru's ANSP) has made available 2 rooms for ADS-B equipment (one for the sensor and the other for the test equipment).

4.1.6 These premises already had in place all the facilities cited in the previous paragraph, except for the means of transportation and management of the ADS-B radar signal up to the Lima ACC, which is its final destination. To that end, CORPAC personnel used the existing REDAP platform, from which 2 terminals from other services had to be withdrawn in order to have sufficient bandwidth to carry the ADS-B signal from Pisco to Lima. We mention this experience as a reference so as not to neglect any aspect when implementing an ADS-B system.

4.2 Typical equipment in an ADS-B station

4.2.1 Typically, an ADS-B system consists of the following equipment, materials, and accessories:

a) Antenna array
b) RF receiving equipment (radio frequency)
c) Radar data processor
d) Communications unit
e) Networking units
f) GUI and ACC interface unit (or, in general, the ATS destination unit)
g) Radar data display system
h) ADS-B and processed data maintenance, configuration, and administration management system
i) ADS-B test transponder
j) GPS synchronisation unit
k) RF and electric cabling
l) Trays, ducts, conduits, and accessories
m) Grounding points
n) Lightning arrester
o) Uninterruptible power supply - UPS
p) Electric generating set
q) Security system, involving intrusion, overheating, smoke, and fire sensors; video cameras to record indoor and outdoor environment
r) Air-conditioning system (at least air conditioning, humidity control, and dust filters)

s) Static charge prevention or elimination system or materials. Currently, disposable shoe straps are commonly used in electronic environments subject to static damage.

4.3 Required infrastructure

4.3.1 Typical ground infrastructure

a) Normally, 2 cabinets are required (of a type suited to the physical characteristics of the manufacturer`s equipment) and a castle or mast to install the ADS-B antenna and the lightning arrester system.

Indoors:
Cabinet 1: Contains:
- Radar data processor
- Communications unit
- Networking units
- GUI and ACC interface unit (or, in general, the ATS destination unit)

Cabinet 2: Contains:
- Display unit.
- ADS-B and processed data maintenance, configuration, and administration management unit.

Outdoors:
Mast or castle: Contains:
- Antenna
- RF cabling
- Lightning rod, on top of the castle or mast
- Lightning rod power lines

b) The location, at a distance previously determined by the provider of the installation in such a way as to avoid losses from excessive cabling, shall have:

- Lightning rod grounding with resistance values not to exceed 30 ohms
- ADS –B system grounding with resistance values not to exceed 5 ohms

c) Aerial trays are recommended for placing the data cables to connect indoor equipment and to connect indoor to outdoor equipment. Data and electric cabling trays must be different in order to avoid electromagnetic interference that will affect data cabling and thus the ADS-B system.

d) Environmental considerations: Cleaning. Dust is extremely detrimental for the proper operation of equipment; consequently, normal cleaning and general maintenance of the room are essential to avoid problems, especially in connectors and disc units.

e) Interference and disturbances: Different sources may generate interference and/or disturbances. To solve that, there are some products that may be considered.

- Electric discharges: Rugs and low humidity are two main static generators. The equipment should not be installed in rooms with rugs or similar materials, and the humidity range in the room must be controlled. Low humidity is equivalent to static, thus the importance of maintaining humidity within certain ranges. Accordingly, consideration must be given to installing antistatic floors suitable for technical rooms.
- Electromagnetic radiation: Data and electric power cables must run on different trays, maintaining the necessary separation to avoid radiation and interference (needless to say, in case of interference, the data cabling will be the most affected).
- Site assessment: The area to be selected must be as free as possible of obstacles or it must be assured that the terrain model will not be modified in a way that will affect the line of sight of the ADS-B receiver with respect to the air fleet to be served. Likewise, the cone of silence concept must be kept in mind. It is better to foresee a value for the cone of silence than not have any, since, under actual operating conditions, there will be a coverage blind area. Accordingly, a theoretical value between 30 and 90 degrees may be assumed to avoid subsequent surprises.
- Interference to/from other stations: In the ATC environment, SSR, ADS-B, ACAS and military IFF systems use the same frequencies (1 030 MHz and 1 090 MHz) (see Figure 4). Technical and operational changes in one of the aforementioned systems has consequences on the system itself, on the system involved, on other systems operating on the same frequencies, and even on systems that operate on neighbouring frequencies (*e.g.*, DME). The following figure shows 1 030/1 090 MHz systems as part of the 960 MHz–1 215 MHz aeronautical frequency band. Interference may lead to degradation of system performance, with loss of information or erroneous information. Thus, when selecting the site to install ADS-B antennae, consideration must be given to physical and frequency proximity to other navigation systems at the airport, especially DME systems and surveillance radars.

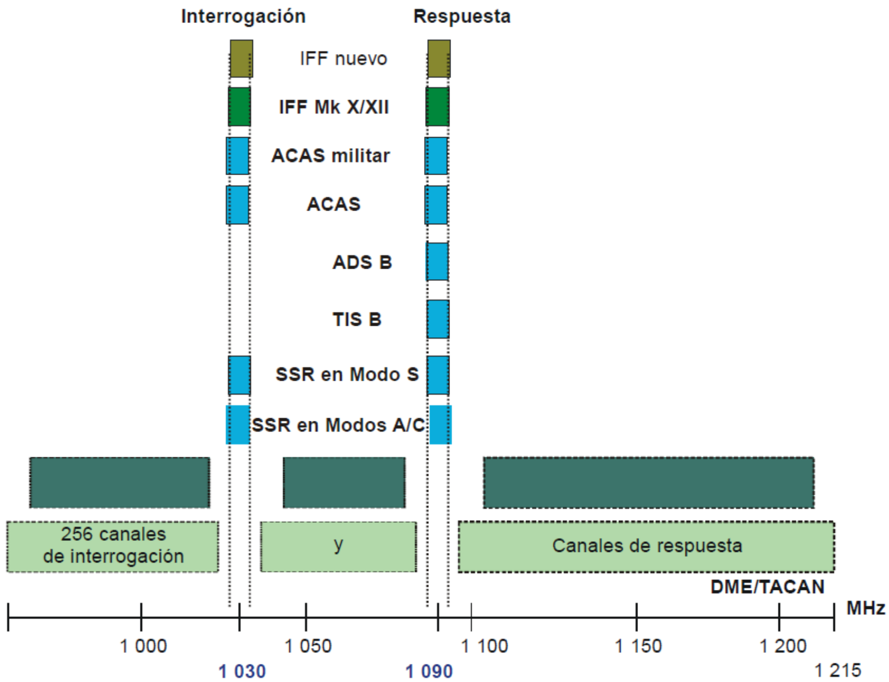


Figure 4. Channels and frequencies in the 960 MHz – 1 215 MHz aeronautical frequency band

f) Temperature: System operation will be more reliable if temperature is kept within a stable range (more conservative than that specified in the manufacturer's manual), the recommendation being between 20º and 25º C. High and unstable work temperatures increase the frequency of circuit failure. However, systems can work for short periods of time at higher or lower temperatures, and it is recommended that ADS-B equipment suppliers be requested to provide the values of the following parameters:

- Operating temperature:
- Minimum temperature:
- Maximum temperature:
- Temperature variations: expressed in T°/ time (° C / hour)
- Instantaneous variations: expressed in T°/ time (° C / minute).

g) Humidity**:** It is recommended that the relative humidity in the rooms selected for the installation be kept between 40% and 60%, with no condensation. Low humidity levels can produce static electricity, while high humidity levels can cause problems in paper feed to printers, as well as fungi problems in magnetic tapes and discs.

The following humidity specifications are recommended:

- Relative air humidity: 40 - 60%, with no condensation.
- Maximum relative humidity: 80%.
- Minimum relative humidity: 30%.

h) Air conditioning: The air conditioning system shall maintain the temperature and humidity of the room within the indicated specifications.

4.3.2 **Installation design structure**

a) Identification of rooms and sites

Order is important in any facility, even more so in critical systems such as those related to the aeronautical service. Therefore, the establishment of an identification system is the most relevant activity towards the attainment of such order. This will facilitate the task of maintaining and assessing the behaviour of this type of system. It is recommended that system positions be numbered for purposes of identification, giving each system component an identifier, with different prefixes to indicate location, floor, environment, rack, rack level, and the corresponding numbering. Similarly, structured cabling recommendations must be unrestricted. The system supplier must be requested to provide general diagrams of ADS-B connections under the established identification system, as well as of ADS-B LAN cable connections, antennae-rack connections, and connections to the GPS, NTP servers and remote clocks.

b) Identification cabling

- A checklist must be produced with information on point-to-point cable connections.
- Each rack must have a physical list of the cables associated to that rack.
- Likewise, cable labels must contain all the information associated to the rack.
- Each cable contained in the list is identified by a reference number, which is linked to a list of cable suppliers, with manufacturing details concerning signal/names/functions.
- Each label must precisely indicate the beginning and the end of the cable, as well as where should it be connected within the cabling array.

The types of cables normally installed are:

- Radar cabling between the antennae and the filters, between the filters and radar data processors, between processors and the KVM (keyboard, video and mouse), between GPS antennae and processors. To this end, coaxial cables, such as RG-58, RG-214, RG-179, are normally used. Cable gauges will depend on the distance and the technical details of each manufacturer.
- For indoor cables that connect processors to information output interfaces for radar or data display or management, RJ45 Cat 5E is used as a minimum. It would be even better if a superior category of structured cable is used in accordance with standard T568B.

c) Required capacity of the national aeronautical network

- The means of transportation of the signal must take into account the protocols and formats of the radar data provided by the ADS-B.

- Due to the nature of the service, ADS-B data must have an IP medium compatible with the Multicast UDP-type transport level protocol. This usually complicates the link between the ADS-B sensor and the ACC, since public service providers normally use the TCP transport layer protocol for their networks and for providing IP services.
- CORPAC has a frame relay network that has been used to link the ADS-B from Pisco to Lima.

4.4 **Receiver autonomous integrity monitoring (RAIM)**

4.4.1 It is expected that the first ADS-B implementations will use GNSS for positioning. In this regard, since the availability of GNSS data has a direct impact on the provision of surveillance services, ATS service providers can choose to use a GNSS integrity prediction service to help determine the future availability of usable ADS-B data.

4.4.2 The service integrity prediction alerts users to a possible future loss or degradation of the ADS-B service in defined areas. With these alerts, the system is warning users that at some point in the future, ADS-B position data may be insufficient to support the ADS-B separation application.

4.4.3 It is advisable that the prediction service be made available to each ATS unit that uses ADS-B for the provision of separation services, to make sure that air controllers are warned before any foreseen degradation of the GNSS service and the resulting reduced ability to provide flight separation ADS-B within the affected area. This is similar to having advanced warning of a planned interruption of the radar system due to maintenance.

4.4.4 ADS-B must not be used to provide separation between aircraft during the period in which it is expected that the integrity of position reports will not be adequate.

4.4.5 If an unexpected loss of integrity occurs (including a crew RAIM alert report), then:

a) ADS-B separation must not be used by ATC for aircraft until integrity is assured, and

b) The controller must check if other nearby aircraft have filed RAIM alert reports to see if they have been affected and to establish alternative means of separation if necessary.

4.4.6 More information about RAIM can be found in Appendix 8 to this document.

4.5 **Operational tests**

4.5.1 Once the ADS-B system has been installed, a cabling installation certificate must be requested from the manufacturer or responsible company.

4.5.2 The ADS-B transponder testing system will permit the necessary target adjustment in order to achieve optimum signal integrity. This system is referential.

4.5.3 Regarding operational tests, these must start with a physical level link tests and, if successful, continue with UDP multicast traffic transmission tests from the sensor location to the ATS destination unit. For Peru, the test was conduct from Pisco to Lima (REDAP room node-Lima).

4.5.4 If successful, the next tests are to check if the data received is compatible with the application of the air traffic management system provider, which must be capable of processing data in the ASTERIX CAT 21 ed 1.8 protocol.

4.5.5 Regarding the bandwidth of the means of transportation for Lima, the peak is 18 kbps, but this will depend on the number of aircraft with ADS-B avionics that circulate through the airspace to be controlled. The recommended bandwidth for the means of transportation is no less than 64 Kbps.

4.5.6 Flight check tests are an integral part of ground-based ADS-B system testing. The aircraft to be contracted must be properly equipped with 1090 MHz Extended Squitter (1090ES) transponders and recording equipment. Flight routes must be established to test both uplink and downlink services within the defined airspace. More information on flight check testing can be found in Appendix P to Doc 9924 - *Aeronautical Surveillance Manual*.

4.5.7 The information required for assessing the ADS-B system through flight tests must include performance parameters, including minimum ADS-B information update interval, volume of coverage over the geographical area where the ADS-B service is to be provided, radar data accuracy, identification data, maximum data latency, and data validation functions.

4.5.8 An important aspect that must be tested is ADS-B interoperability in the surveillance setting of each State, to ensure that ADS_B will not degrade systems already operating in 1090 MHz. This interoperability with other systems in RF frequencies must be one of the objectives of operational tests.

4.5.9 The flight test methodology can be found in WP ASP12-05-Doc-9924 “Change Proposal for Guidance Material on Flight Testing of New Surveillance Systems”.

4.5.10 Another important aspect is the sharing of the means of transportation. Although service integration is what is recommended today, it is important to note that the means should prioritise services. That is, if it is decided that the means of transportation carrying the ADS-B signal will also carry essential services like G/G or G/A speech communications, bandwidth segmentation or assignment techniques should be used to prevent surveillance data information from interfering with speech communications, causing mini voice interruptions (on-line service that admits no delays).

4.6 Training of technical personnel

4.6.1 The technical personnel at the sensor site and at the management site of the network that carries the ADS-B signal must be involved in the installation and testing from the beginning. Likewise, they must receive training on the structure of the system, operating characteristics and conditions, radar signal flow, and every technical detail that allows the system to operate under the foreseen nominal conditions.

4.6.2 At the network management site, the bandwidth used for the ADS-B system multicast traffic must be monitored, and the respective changes of processing channels must be coordinated, if applicable, with the resident technician in case remote management or other type of activity is not available.

4.6.3 A final recommendation is that personnel in charge must at all times remember that if the ranges and data specified by the system manufacturer are disregarded, the useful life of the equipment will be degraded and, consequently, reliability will be lost.

4.6.4 The INDRA ADS-B system model presented below (Figure 5) may serve as a reference. Its main characteristics are: it has 3 antennae, each covering a minimum of 120 degrees, totalling 360 degrees, 3 processing channels, redundant LANs, range in excess of 200 NM, reliability expressed in MTBF of 60000 hours, availability of 0.99999, short repair times (half an hour). These types of data must be demonstrated in the test protocols that the ANSP and the provider agree to conduct, whether through direct testing or through official commitment documents.

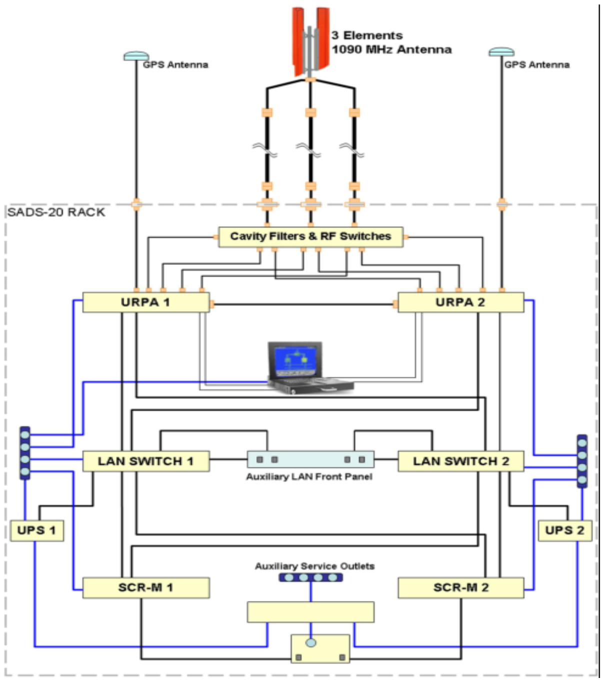


Figure 5: Architecture (model INDRA SADS20)

<u>Basic elements:</u>

- Antenna set:
    - Three independent sectors

- Distribution of RF signals:
    - Set of radio frequency filters and relays

- ADS-B processing receiver unit (APRU):
    - 3 1090-MHz receiver cards
    - 3 processing cards
    - 1 GPS synchronisation card
    - 1 software card (Linux OS)

- Local management system (local control and monitoring))
    - Based on the Unix system
    - System capable of integration with the APRU or any other equipment.

- Communication system:
    - Two (2) redundant LAN networks
    - Routers

5. FUNCTIONAL RECOMMENDATIONS FOR AUTOMATED AIR TRAFFIC MANAGEMENT SYSTEMS TO BE USED WITH ADS-B IN THE SAM REGION

5.1 In order to achieve a common interoperability standard for the use of ADS-B in the SAM Region, in addition to that provided for in Chapter 8.2 of Doc 4444, automated air traffic management systems used by ANSPs should have at least the following technical and operational characteristics:

a) If navigation information is degraded according to the appropriate State ATS authority, the control centre should be able to determine when the reported accuracy and integrity values are sufficient to support a given application (*e.g.*, control with ATC surveillance for 5NM separation). Consequently, it should be capable of entering the allowable information quality and integration (NUC, NIC/NAC/SIL) threshold values that correspond to the ADS-B message version. States should be able to configure these parameters without the intervention of the provider.

Note: Reference: Doc 4444 Chapter 8.1.10 and, for more details about these concepts and ES performance, see document DO-260A Chapters 2, 3 and 4.

b) Appropriate visual alarm display at the ASD in case of deterioration of the minimum value(s) entered as per paragraph a) above, so that ATS units may distinguish between a radar blip, a multilateration blip, and an ADS-B blip (or a combination of these) beyond the limits established for providing separation in the airspace concerned (ref. Doc 4444 Chapter 8.2.5).

c) For the purpose of analysis and study by the States, it is recommended that automated systems maintain ADS-B plot generation capability, even beyond the established limits mentioned in paragraph “a” above, for non-operational display (technical monitoring). However, these out-of-limit plots should not be taken into account by the multi-tracker for merging with data from other sensors.

d) Information displayed on the ASD about the type of surveillance sensor used (whether one or several sensors), so as to identify each combination.

e) Performance of the information on the corresponding parameters received in ADS-B messages (ADS-B-ADD) concerning the safety nets processed by the surveillance system SDP or FDP, as appropriate (see Appendix 1, “ADS-B operational applications”).

f) Processing of ASTERIX Category 21 edition 1.8 messages (Appendix 9 “Asterix Category 21 Ed. 1.8”)

g) Capability of processing “version 0” and “version 1” ADS-B messages simultaneously (ICAO Annex 10, Volume 4, item 5.2.4).

APPENDIX 1 - ADS-B OPERATIONAL APPLICATIONS

In general terms, in order to take advantage of the amount and types of data provided by ADS-B, the following are considered as possible operational applications:

1. CDTI (Cockpit Display of Traffic Information)
2. Airborne collision avoidance
    a. Enhancements to existing airborne collision avoidance systems
    b. ACAS based on ADS-B
3. Conflict management and airspace conflict resolution
    a. Airborne conflict management and airspace conflict resolution
    b. ATS surveillance and conflict management
4. ATS conformity monitoring
    a. Successive approaches
    b. Incursion processes (special use airspace, restricted airspace, bad weather area hazardous for flights, runways and taxiways, controlled lighting area (under ATS control), areas with weight and wing span limitations, and other operational control areas, such as noise-sensitive areas.
5. Enhanced search and rescue
6. Enhanced tracking between flights
7. Light operations and control
8. Operational requirements of airport ground vehicles and aircraft rescue and fire fighting vehicles (ARFF)
9. Performance measurements for maintaining altitude/height
10. Control of general aviation operations

    Note: For more details about these recommended applications and requirements, see Appendix D and E to document DO-242A.

The SAM surveillance strategy includes the implementation of ADS-B Package I, consisting of a set of ground-based surveillance applications, improved situational awareness of traffic, and on-board delegation of spacing.

ADS-B Package I ground surveillance applications seek to improve ATC surveillance en route, in the TMA, and on the airport surface, and to improve ATC tools through the provision of aircraft-derived data *via* ADS-B. These applications are:

- ADS-B-RAD ATC surveillance of TMA and en-route airspace in areas already covered by radar systems
- ADS-B-NRA ATC surveillance of non radar areas
- ADS-B-APT surveillance of the airport surface
- ADS-B-ADD data derived from the aircraft for ATC tools

ADS-B Package I on-board surveillance applications seek to improve on-board surveillance (cockpit) of en-route and TMA airspace and airport surface.

These applications are:

- ATSA-SURF Improved situational awareness of traffic on the airport surface
- ATSA-VSA Improved visual separation during approach
- ATSA-ITP Wake procedure in oceanic airspace
- ATSA-AIRB Improved situational awareness of traffic during flight operations

Note: States that will implement these functions should take into account Chapter 5 of Annex 10 v4, as well as DO-260A, Chapter 2.1.11 and 2.1.12 (for quick reference, Annex A with the tables of these 2 chapters is attached to this document)

ADS-B Package I on-board spacing applications seek to use on-board surveillance capabilities (cockpit) to run applications whereby the crew can maintain a given time and distance from designated aircraft. These applications are:

- ASPA-S&M Improved sequencing and merging operations
- ASPA-C&P Improved crossing and passing operations

APPENDIX 2 – INTRODUCTION OF NAC, NIL, SIL

2.2.1 Surveillance accuracy and integrity are reported separately as navigation accuracy category (NAC), navigation integrity category (NIC) and surveillance integrity level (SIL).

2.2.2 ES version 1 formats also include provisions on improved status information reporting. Amongst other aircraft parameters, the operational status message contains the version number of the ADS-B transmitter equipment, the SIL parameter, and the navigation accuracy category for position (NAC_P).

2.2.3 Version 1 formats allow type codes of flight position messages and surface position messages to be associated with a NIC.

2.2.4 The NIC is reported in such a way that surveillance applications can determine if the reported geometric position has an acceptable level of integrity for the use foreseen. The NIC parameter specifies an integrity containment radius (Rc). In this regard, document DO242A describes the close relationship between the NIC value and the SIL and the Rc.

2.2.5 The SIL parameter acts together with the NIC parameter, and specifies the probability of the actual position being outside of the containment radius without any alerts being activated.

2.2.6 The NAC_P parameter is reported in such a way that surveillance applications can determine if the reported geometric position has an acceptable level of accuracy for the use foreseen.

2.2.7 Document DO-242A, amongst other notes contained in table 2-3, specifies that:

2.2.7.1 The EPU – (Estimated Position Uncertainty) corresponds to a 95% accuracy bound on horizontal position. The EPU is defined as the radius of a circle, centred on the reported position, such that the probability of the actual position being outside the circle is 0,05. When reported by a GPS or GNSS system, the EPU is commonly called HFOM (horizontal figure of merit).

2.2.7.2 The NIC and NAC_p currently used in DO242A replaced the NUC_p of the previous version of the MASPS.

2.2.7.3 RNP accuracy includes other sources of error aside from the sensor, while the horizontal error for NAC_P only refers to the certainty of the horizontal position error.

Table 2-3: Navigation Accuracy Categories for Position (NAC_P).

NAC_P	95% Horizontal and Vertical Accuracy Bounds (EPU and VEPU)	Comment	Notes
0	EPU ≥ 18.52 km (10 NM)	Unknown accuracy	
1	EPU < 18.52 km (10 NM)	RNP-10 accuracy	1
2	EPU < 7.408 km (4 NM)	RNP-4 accuracy	1
3	EPU < 3.704 km (2 NM)	RNP-2 accuracy	1
4	EPU < 1852 m (1NM)	RNP-1 accuracy	1
5	EPU < 926 m (0.5 NM)	RNP-0.5 accuracy	1
6	EPU < 555.6 m (0.3 NM)	RNP-0.3 accuracy	1
7	EPU < 185.2 m (0.1 NM)	RNP-0.1 accuracy	1
8	EPU < 92.6 m (0.05 NM)	e.g., GPS (with SA)	1
9	EPU < 30 m and VEPU < 45 m	e.g., GPS (SA off)	2
10	EPU < 10 m and VEPU < 15 m	e.g., WAAS	2
11	EPU < 3 m and VEPU < 4 m	e.g., LAAS	2

2.2.8 SIL information will be even more important when the position of the aircraft is determined by an on-board system that combines GNSS and INS and other navigation sources, such as DME-DME, to which end the aircraft should transmit the highest SIL that position sensors can support, so that it can be used in more demanding applications.

Note: DO-242A elaborates on this point with a note on SIL and the following table: *"It is assumed that SIL is a static (unchanging) value that depends on the position sensor being used. Thus, for example, if an ADS-B participant reports a NIC code of 0 because four or fewer satellites are available for a GPS fix, there would be no need to change the SIL code until a different navigation source were selected for the positions being reported in the SV report."*

SIL	Probability of Exceeding the R_C Integrity Containment Radius Without Detection	Comment
0	Unknown	"No Hazard Level" Navigation Source
1	1×10^{-3} per flight hour or per operation	"Minor Hazard Level" Navigation Source
2	1×10^{-5} per flight hour or per operation	"Major Hazard Level" Navigation Source
3	1×10^{-7} per flight hour or per operation	"Severe Major Hazard Level" Navigation Source

Note: It is important that, for final implementation reference, States use the values in this table, together with the appropriate NAC and NIC values, as specified in the MASPS, MOPS and Annex 10.

2.2.9 If a State is planning to use the TIS-B (Traffic Information System - Broadcast) based on SSR/MSSR for relaying information, the SIL could change depending on different considerations, such as the individual characteristics of the sensors used, whether the targets are captured by one sensor or a combination of sensors, coverage, the multi-track system used, etc. (see Chapter 5 of Annex 10 v.4, Appendix 1 to this document, and DO-260A)

2.2.10 States shall take into account that DO-260A, in Chapter 2.2.3.2.7.2.6, specifies that the NIC reported in "status reports" or SV is not explicitly transmitted in the ADS-B message, since it is 1 bit of the sub-field ("ME" bit 44, Message bit 76), but rather must be determined from "TYPE CODES". The NIC supplement could be used to distinguish between 2 very close Rc values. Table 2-70 of that same document, shown below, lists NIC code types.

Table 2-70: Navigation Integrity Category (NIC) Encoding.

NIC Value	Containment Radius (R_C) and Vertical Protection Limit (VPL)	Airborne		Surface	
		Airborne Position TYPE Code	NIC Supplement Code	Surface Position TYPE Code	NIC Supplement Code
0	R_C unknown	0, 18 or 22	0	0, 8	0
1	$R_C < 20$ NM (37.04 km)	17	0	N/A	N/A
2	$R_C < 8$ NM (14.816 km)	16	0	N/A	N/A
3	$R_C < 4$ NM (7.408 km)	16	1	N/A	N/A
4	$R_C < 2$ NM (3.704 km)	15	0	N/A	N/A
5	$R_C < 1$ NM (1852 m)	14	0	N/A	N/A
6	$R_C < 0.6$ NM (1111.2 m)	13	1	N/A	N/A
	$R_C < 0.5$ NM (926 m)	13	0		
7	$R_C < 0.2$ NM (370.4 m)	12	0	N/A	N/A
8	$R_C < 0.1$ NM (185.2 m)	11	0	7	0
9	$R_C < 75$m *and* VPL < 112 m	11	1	7	1
10	$R_C < 25$m *and* VPL < 37.5 m	10 or 21	0	6	0
11	$R_C < 7.5$m *and* VPL < 11 m	9 or 20	0	5	0

Note: *"N/A" means "This NIC value is not available in the ADS-B Surface Position Message formats."*

2.2.11 Following the analysis that States must conduct of the NIC, NAC, SIL, it is expected that official values will be published in accordance with the ADS-B applications being considered. The following table shows an example of these values, which by no means should be considered as the actual values.

Application	NAC	NIC	SIL
ATC service with 5NM separation	6	8	2
ATC service with 3NM separation	5	7	2
FIS – without separation service	3	5	1

Note: FAA AC No: 20-165 of 2010 contains a sample guide for airworthiness approval of airborne ADS-B OUT equipment.
EASA documentation (AMC 20-24) can also be used as a reference for an NRA environment.

APPENDIX 3 - "PROPOSAL OF PUBLICATION OF A NATIONAL TECHNICAL STANDARD"

Example of a technical standard on the use of ADS-B for crews and technical personnel:

1. For aircraft with MODE-S transponders (1090/1090ES)

1.1 At present, ATS surveillance systems used in the State have 2 ways of automatically associating the FPLs to the aircraft identified by MSSR and ADS-B sensors, namely:

i. Mode A transponders
ii. Mode S transponders (1090/1090ES)

1.2 Crews using aircraft with Mode A transponders shall continue activating them, in accordance with the regulations and norms in force.

1.3 Crews using aircraft with Mode S/ADS-B OUT transponders (1090/1090ES) shall take into account the following:

1.3.1 The flight identification shall be correctly entered in the airborne data entry interface (CDTI, FMS, etc.), just as it was entered in box 7 of the FPL. Some airborne interfaces do not permit the change of flight ID after take-off, so it is recommended that special care be taken when using and entering information on this equipment.

1.3.2 The flight identification shall consist of the 3-letter designator of the company according to ICAO Doc 8585 and the flight number. In no case shall the IATA coding be used. If the flight number is not available (*e.g.,* private aircraft, general aviation, or aircraft to be moving only on the ground), the aircraft registration number shall be entered or, if an FPL has been filed, the identification specified in box 7 thereof.

1.3.3 Aircraft within ADS-B coverage (250 NM around the SCO VOR) shall keep the GNSS receiver on at all times; otherwise, the flight information in the ATC surveillance systems will be lost. If any contingency arises that forces the crew to turn off the GNSS receiver, the crew shall immediately report the occurrence to the corresponding ATC unit.

APPENDIX 4 – TABLES OF AIRBORNE AND GROUND ADS-B TRANSMITTER AND RECEIVER CLASSES

Table 2-1: ADS-B Aircraft System Classes
(adapted from RTCA DO-242A, Table 3-1)

Class	Subsystem	Example Applications	Features	Comments
Interactive Aircraft/Vehicle Participant Systems (Class A)				
A0	Minimum Interactive Aircraft/Vehicle	Enhanced Visual Acquisition, conflict detection	Lower transmit power and less sensitive receive than Class A1.	Minimum interactive capability with CDTI.
A1	Basic Interactive Aircraft	A0 Plus Airborne Conflict Management, station keeping	Standard transmit power and more sensitive receiver. Antenna Diversity (Note)	Provides ADS-B based conflict avoidance and interface to current TCAS surveillance algorithms/displays.
A2	Enhanced Interactive Aircraft	A1 Plus merging, conflict management, in-trail climb	Standard transmit power and more sensitive receiver. Interface with avionics source required for aircraft trajectory intent data. Antenna Diversity (Note)	Baseline for separation management employing intent information.
A3	Extended Interactive Aircraft	A2 Plus long range conflict management	More sensitive receiver. Interface with avionics source required for aircraft trajectory intent data. Antenna Diversity (Note)	Extends planning horizon for strategic separation employing intent information.
Broadcast-Only Participant Systems (Class B)				
B0	Aircraft Broadcast Only	Supports enhanced visual acquisition and conflict detection.	Transmit power may be matched to coverage needs. Nav data input required.	Enables aircraft to be seen by Class A and Class C users.
B1	Aircraft Broadcast Only	Supports B0 applications plus airborne conflict management and station keeping.	Transmit power may be matched to coverage needs. Nav data input required. Antenna Diversity (Note)	Enables aircraft to be seen by Class A and Class C users.
B2	Ground Vehicle Broadcast Only	Supports visual acquisition and conflict avoidance on airport surface.	Transmit power matched to surface coverage needs. High accuracy Nav data input required.	Enables vehicle to be seen by Class A and Class C users.
B3	Fixed Obstacle	Supports visual acquisition and conflict avoidance.	Fixed coordinates. No Nav data input required. Collocation with obstacle not required with appropriate broadcast coverage.	Enables Nav hazard to be detected by Class A users.
Ground Receive Systems (Class C)				
C1	ATS En Route and Terminal Area Operations	Supports ATS cooperative surveillance.	Requires ATS certification and interface to ATS sensor fusion system.	En Route coverage out to 200 NM. Terminal coverage out to 60 NM
C2	ATS Parallel Runway and Surface Operation	Supports ATS cooperative surveillance.	Requires ATS certification and interface to ATS sensor fusion system.	Expected approach coverage out to 30 NM, or the point where the aircraft intercepts the final approach course. Surface coverage out to 5 NM
C3	Flight Following Surveillance	Supports private user operations planning and flight following.	Does not require ATS interface. Certification requirements determined by user application.	Coverage determined by application.

Notes:

1. *See §3.3.1 for Antenna Diversity.*
2. *All ADS-B Class A, B0 and B1 systems are also intended to support the Air-to-Ground ATC Surveillance applications.*

Table 2-3: ADS-B Class A Transmitter Equipment To Message Coverage

Transmitter Class	Minimum Transmit Power (at Antenna Port)	Example Operation	MASPS Requirement (RTCA DO-242A)	Minimum Message Capability Required (From Table 2-2)
A0 (Minimum)	70 W	• Aid to Visual Acquisition • Conflict Avoidance	SV MS	Airborne Position A/C Identification & Type Airborne Velocity A/C Operational Status Extended Squitter A/C Status
		• Airport Surface	SV MS	Surface Position A/C Identification & Type A/C Operational Status Extended Squitter A/C Status
A1 (Basic)	125 W	• Aid to Visual Acquisition • Conflict Avoidance • Simultaneous Approaches	SV MS	Airborne Position A/C Identification & Type Airborne Velocity A/C Operational Status Extended Squitter A/C Status
		• Airport Surface	SV MS	Surface Position A/C Identification & Type A/C Operational Status Extended Squitter A/C Status
A2 (Enhanced)	125 W	• Aid to Visual Acquisition • Conflict Avoidance • Separation Assurance and Sequencing • Flight Path Deconfliction Planning • Simultaneous Approaches	SV MS TS TC+0	Airborne Position A/C Identification & Type Airborne Velocity A/C Operational Status Extended Squitter A/C Status Target State and Status Reserved for TC Message
		• Airport Surface	SV MS	Surface Position A/C Identification & Type A/C Operational Status Extended Squitter A/C Status
A3 (Extended)	125 W	• Aid to Visual Acquisition • Conflict Avoidance • Separation Assurance and Sequencing • Flight Path Deconfliction Planning • Simultaneous Approaches	SV MS TS TC+n	Airborne Position A/C Identification & Type Airborne Velocity A/C Operational Status Extended Squitter A/C Status Target State and Status Reserved for TC Message
		• Airport Surface	SV MS	Surface Position A/C Identification & Type A/C Operational Status Extended Squitter A/C Status

Table 2-4: ADS-B Class B Transmitter Equipment To Message Coverage

Transmitter Class	Minimum Transmit Power (at Antenna Port)	Example Operation	MASPS Requirement (RTCA DO-242A)	Minimum Message Capability Required (From Table 2-2)
B0 (Aircraft)	70 W [1]	• Aid to Visual Acquisition • Conflict Avoidance	SV MS	Airborne Position A/C Identification & Type Airborne Velocity A/C Operational Status Extended Squitter A/C Status
		• Airport Surface		Surface Position A/C ID and Type A/C Operational Status Extended Squitter A/C Status
B1 (Aircraft)	125 W [1]	• Aid to Visual Acquisition • Conflict Avoidance	SV MS	Airborne Position A/C Identification & Type Airborne Velocity A/C Operational Status Extended Squitter A/C Status
		• Airport Surface		Surface Position A/C Identification and Type A/C Operational Status Extended Squitter A/C Status
B2 (Ground Vehicle)	70 W [1]	• Aid to Visual Acquisition • Conflict Avoidance • Airport Surface	SV MS	Surface Position A/C Identification & Type A/C Operational Status
B3 (Fixed Obstacle)	70 W [1]	• Aid to Visual Acquisition • Conflict Avoidance • Airport Surface	SV MS	Airborne Position A/C Identification & Type A/C Operational Status

[1] – May be increased based upon application specific needs.

Notes: *(Table 2-3 and Table 2-4):*

1. *SV = State Vector, MS = Mode Status, TS = Target State, TC = Trajectory Change*
2. *SV elements are specified in Table 2-81.*
3. *MS elements are specified in Table 2-88.*

Table 2-5: ADS-B Class A Receiver Equipment To Report Coverage

Receiver Class	Minimum Trigger Threshold Level (MTL)	Reception Technique	Example Operation	MASPS Requirement [RTCA DO-242A Table 3-3(a)]	Minimum Report Required
A0 (Basic VFR)	-72 dBm	Standard	• Aid to Visual Acquisition • Airport Surface	SV MS	ADS-B State Vector Report (§2.2.8.1) AND ADS-B Mode Status Report (§2.2.8.2)
A1 (Basic IFR)	-79 dBm	Enhanced (§2.2.4.4)	• Aid to Visual Acquisition • Conflict Avoidance • Simultaneous Approaches • Airport Surface	SV MS ARV	ADS-B State Vector Report (§2.2.8.1) AND ADS-B Mode Status Report (§2.2.8.2) AND ADS-B Air Referenced Velocity Report (ARV) (§2.2.8.3.2)
A2 (Enhanced IFR)	-79 dBm	Enhanced (§2.2.4.4)	• Aid to Visual Acquisition • Conflict Avoidance • Separation Assurance and Sequencing • Simultaneous Approaches • Airport Surface	SV MS TS ARV TC+0	ADS-B State Vector Report (§2.2.8.1) AND ADS-B Mode Status Report (§2.2.8.2) AND ADS-B Target State Report (§2.2.8.3.1) AND ADS-B ARV Report (§2.2.8.3.2) AND Reserved for ADS-B Trajectory Change Reports
A3 (Extended Capability)	-84 dBm	Enhanced (§2.2.4.4)	• Aid to Visual Acquisition • Conflict Avoidance • Separation Assurance and Sequencing • Flight Path Deconfliction Planning • Simultaneous Approaches • Airport Surface	SV MS TS ARV TC+n	ADS-B State Vector Report (§2.2.8.1) AND ADS-B Mode Status Report (§2.2.8.2) AND ADS-B Target State Report (§2.2.8.3.1) AND ADS-B ARV Report (§2.2.8.3.2) AND Reserved for ADS-B Trajectory Change Reports

Table 2-6: ADS-B Class C Receiver Equipment To Report Coverage

Receiver Class	Minimum Trigger Threshold Level (MTL)	Operation	MASPS Requirement [RTCA DO-242A Table 3-3(b)]	Minimum Report Required
C1 (ATS En Route and Terminal)	Not Specified in these MOPS	• Aid to Visual Acquisition • Conflict Avoidance • Separation Assurance and Sequencing • Flight Path Deconfliction Planning	SV MS TS ARV TC+n	ADS-B State Vector Report (§2.2.8.1) AND ADS-B Mode Status Report (§2.2.8.2) AND ADS-B Target State Report (§2.2.8.3) AND ADS-B ARV Report (§2.2.8.3.2) AND Reserved for ADS-B Trajectory Change Report(s)
C2 (Approach and Surface)	Not Specified in these MOPS	• Aid to Visual Acquisition • Conflict Avoidance • Separation Assurance and Sequencing • Simultaneous Approaches • Airport Surface	SV MS TS ARV TC+n	ADS-B State Vector Report (§2.2.8.1) AND ADS-B Mode Status Report (§2.2.8.2) AND ADS-B Target State Report (§2.2.8.3.1) AND ADS-B ARV Report (§2.2.8.3.2) AND Reserved for ADS-B Trajectory Change Report(s)
C3 (Flight Following)	Not Specified in these MOPS	• Aid to Visual Acquisition • Separation Assurance and Sequencing • Airport Surface	SV MS	ADS-B State Vector Report (§2.2.8.1) AND ADS-B Mode Status Report (§2.2.8.2)

Note: *(Table 2-5 and Table 2-6):*

SV = State Vector, MS = Mode Status, OC = On-Condition TS = Target State, ARV = Air Referenced Velocity, TC = Trajectory Change

APPENDIX 5 – ASPECTS THAT OPERATORS SHOULD TAKE INTO ACCOUNT WHEN OPERATING AN ADS-B TRANSPONDER

- o In the early stages of these implementations, crews normally incur in frequent errors when entering the flight/aircraft identification or ACID (aircraft ID) in the airborne interface. Both the ELS and ES (1090 ES) functions of the Mode S transponder emit the flight identification information entered on board. This identification should be the same as the one shown in box 7 of the ICAO flight plan. This same data, when transmitted, is called "target identification" (or "tid") with the data reference number of I021/170 of the ASTERIX protocol, category 21, in the message formats processed by the control centre.

- o For aircraft privately operated, the flight ACID should reflect the aircraft registration (*e.g.*, OB123G). In this case, consideration should be given to physical coding of the flight identification (on the same transponder, for example, during initial installation), with the corresponding registration number, to avoid the need for an input interface in the cockpit and to ensure the integrity of the information. The coding of the flight identification should be checked during installation and initial testing.

- o When the flight ACID changes (*e.g.*, airline operations), an interface to enter the flight ACID will be required in the cockpit. In this case, the flight identification should be the ICAO 3-letter airline designator, followed by the flight number. The input interface should be checked to ensure proper flight ACID coding during installation and initial testing.

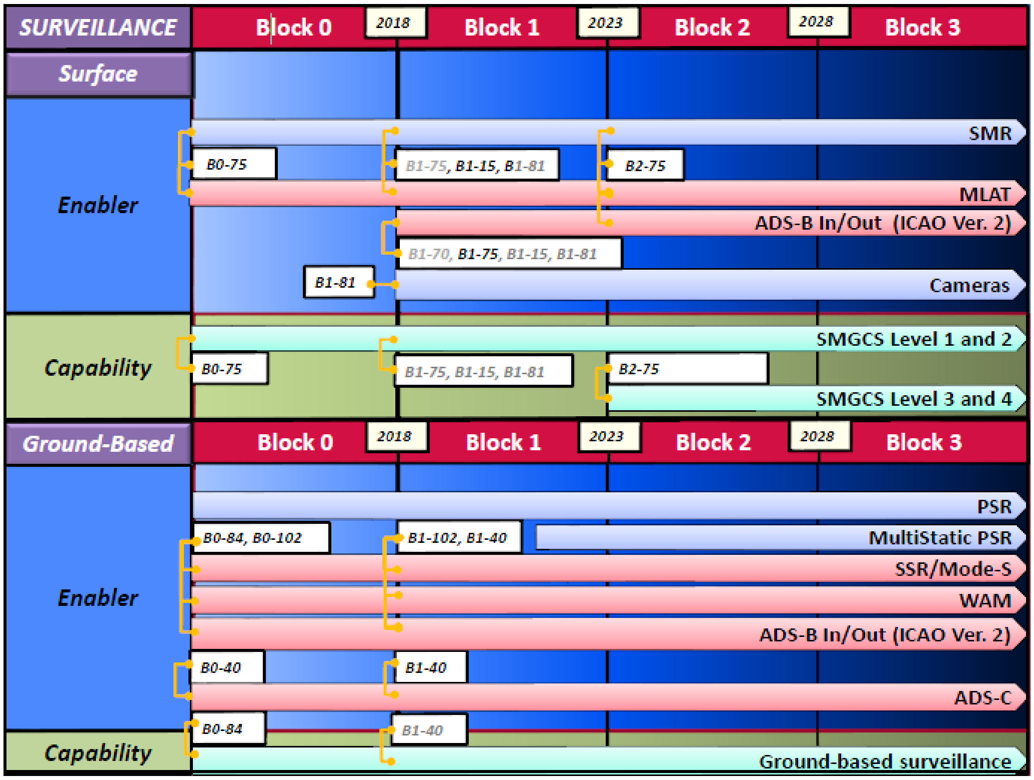
- o It has been noted that some aircraft models have an ACID blocking system in the airborne interface to avoid changes to the flight identification.

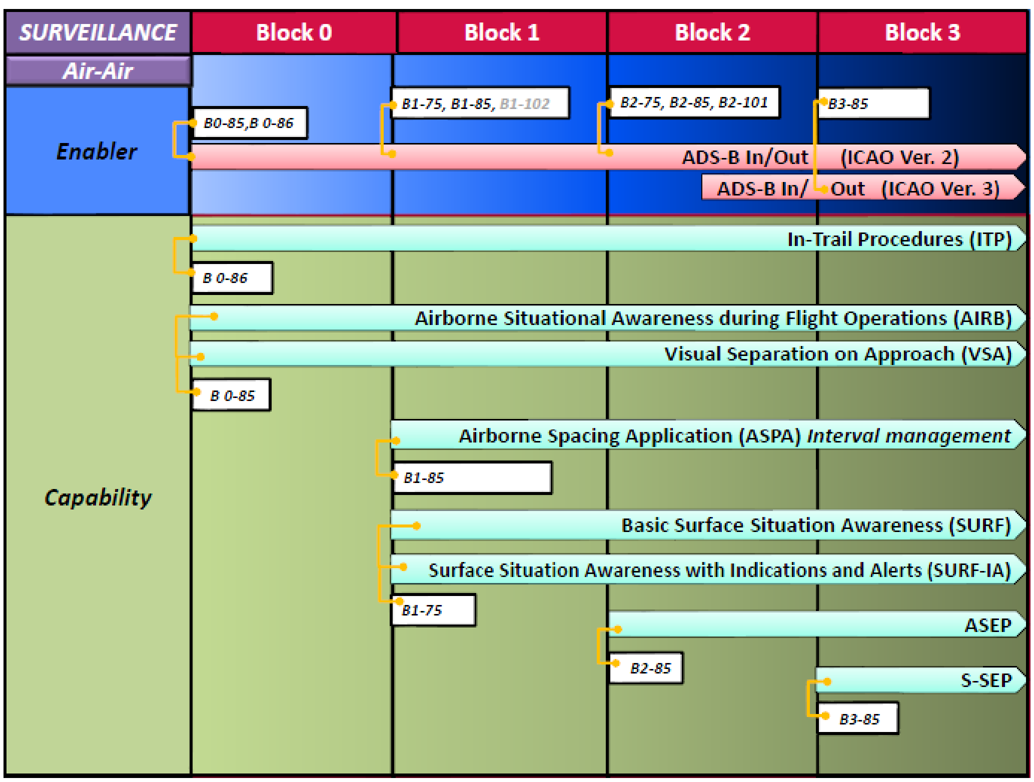
- o This setup, sometimes known as WOW (Weight On Wheels), shall be taken into account by operators and ANSPs to alert crews about on-board interface operation, so as to reduce the problems they cause to the ATC system. It is recommended that straightforward operation manuals and checklists be produced on this topic, especially during implementation phases.

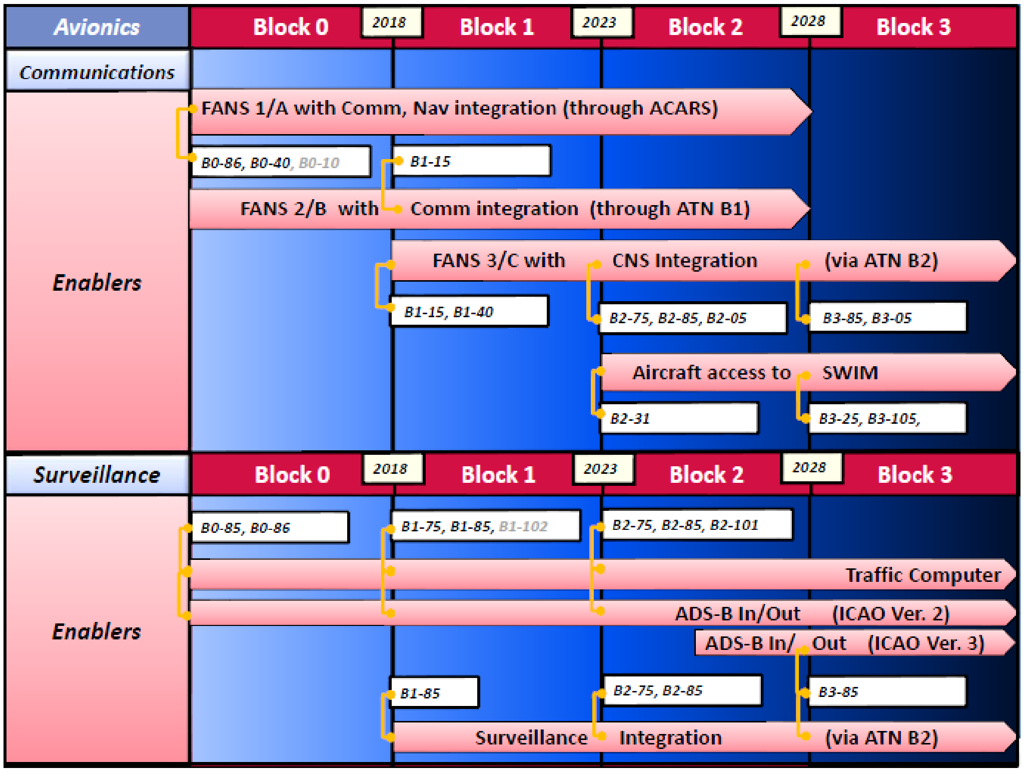
- o Some problems caused by flights with incorrect ACIDs are: inability to automatically correlate flight plans with ADS-B blips, correlation with an incorrect FPL, increased controller workload and thus reduced ATC capacity, unforeseen delays, frequency saturation, failure to process prediction or MTCD alerts, etc.

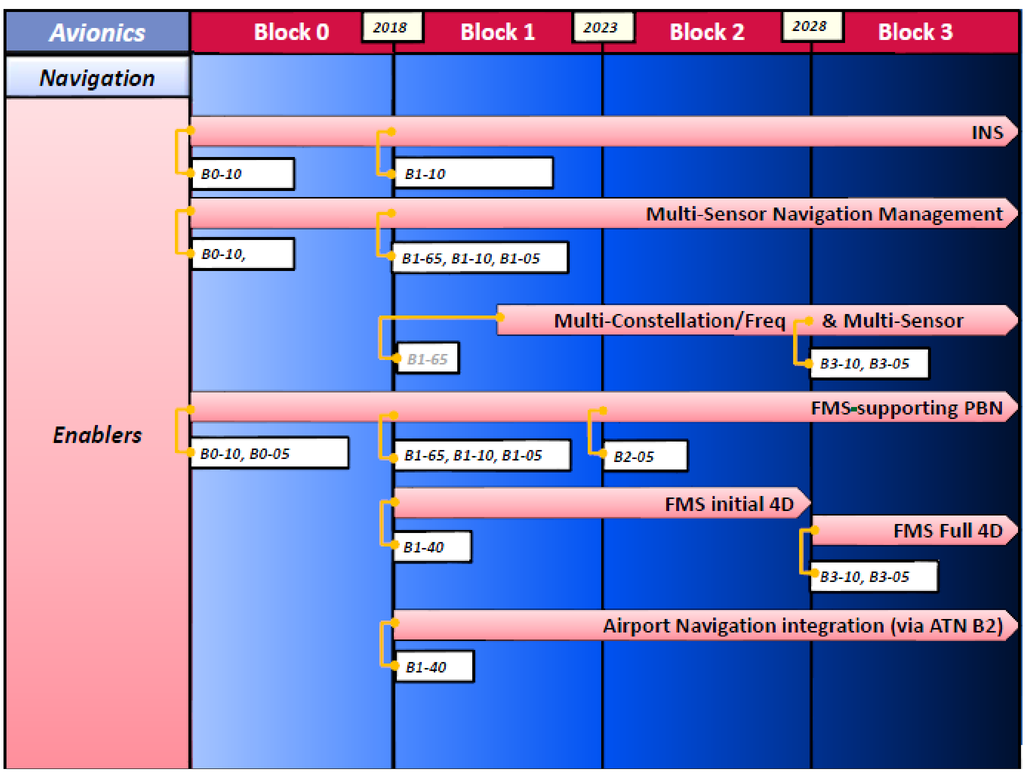
- o It is expected that, during the initial ADS-B implementation phases, crew workload will increase upon ensuring entry of the right data, since they will be using different identifications (*e.g.*, ICAO-IATA) at different points in time.

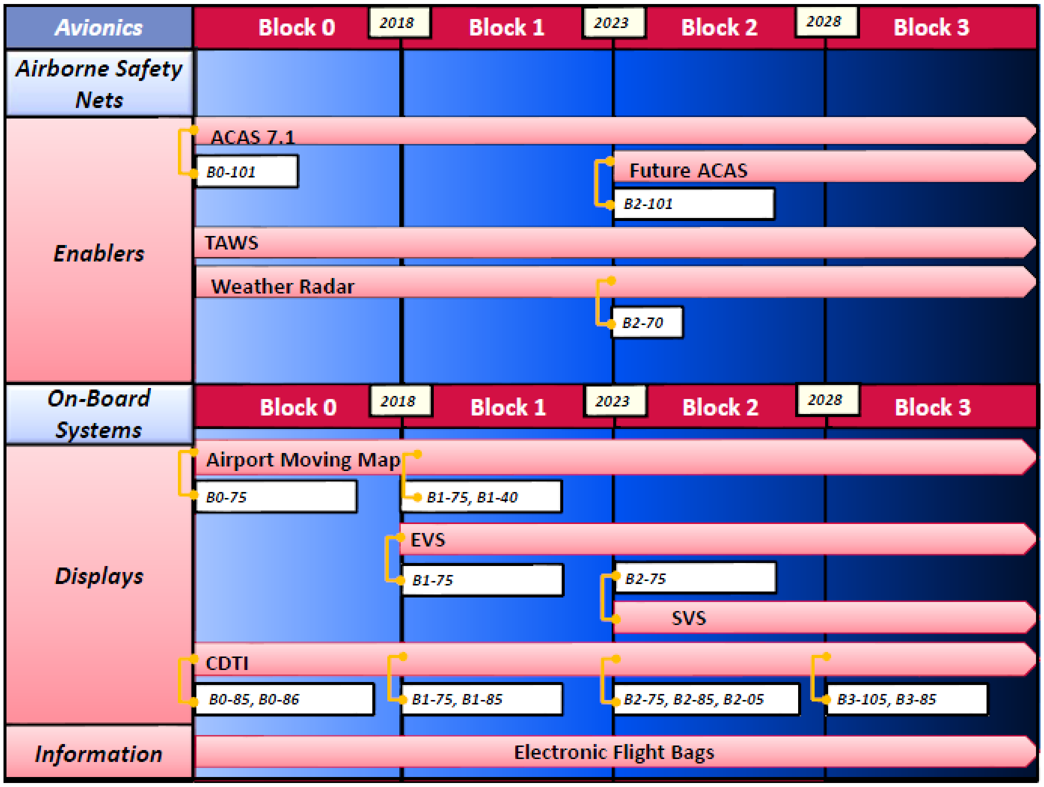
APPENDIX 6 – ASBU METHODOLOGY SURVEILLANCE "ROADMAP"






Avionics
Block 0
2018
Block 1
2023
Block 2
2028
Block 3
Communications
Enablers
FANS 1/A with Comm, Nav integration (through ACARS)
B0-86, B0-40, B0-10
B1-15
FANS 2/B with Comm integration (through ATN B1)
FANS 3/C with CNS Integration (via ATN B2)
B1-15, B1-40
B2-75, B2-85, B2-05
B3-85, B3-05
Aircraft access to SWIM
B2-31
B3-25, B3-105,
Surveillance
Block 0
2018
Block 1
2023
Block 2
2028
Block 3
Enablers
B0-85, B0-86
B1-75, B1-85, B1-102
B2-75, B2-85, B2-101
Traffic Computer
ADS-B In/Out (ICAO Ver. 2)
ADS-B In/ Out (ICAO Ver. 3)
B1-85
B2-75, B2-85
B3-85
Surveillance Integration (via ATN B2)


Avionics
Block 0
2018
Block 1
2023
Block 2
2028
Block 3
Navigation
Enablers
INS
B0-10
B1-10
Multi-Sensor Navigation Management
B0-10,
B1-65, B1-10, B1-05
Multi-Constellation/Freq & Multi-Sensor
B1-65
B3-10, B3-05
FMS-supporting PBN
B0-10, B0-05
B1-65, B1-10, B1-05
B2-05
FMS initial 4D
B1-40
FMS Full 4D
B3-10, B3-05
Airport Navigation integration (via ATN B2)
B1-40


Avionics
Block 0
2018
Block 1
2023
Block 2
2028
Block 3
Airborne Safety Nets
Enablers
ACAS 7.1
B0-101
Future ACAS
B2-101
TAWS
Weather Radar
B2-70
On-Board Systems
Block 0
2018
Block 1
2023
Block 2
2028
Block 3
Displays
Airport Moving Map
B0-75
B1-75, B1-40
EVS
B1-75
B2-75
SVS
CDTI
B0-85, B0-86
B1-75, B1-85
B2-75, B2-85, B2-05
B3-105, B3-85
Information
Electronic Flight Bags

APPENDIX 7 – SAM RADAR COVERAGE DIAGRAMS

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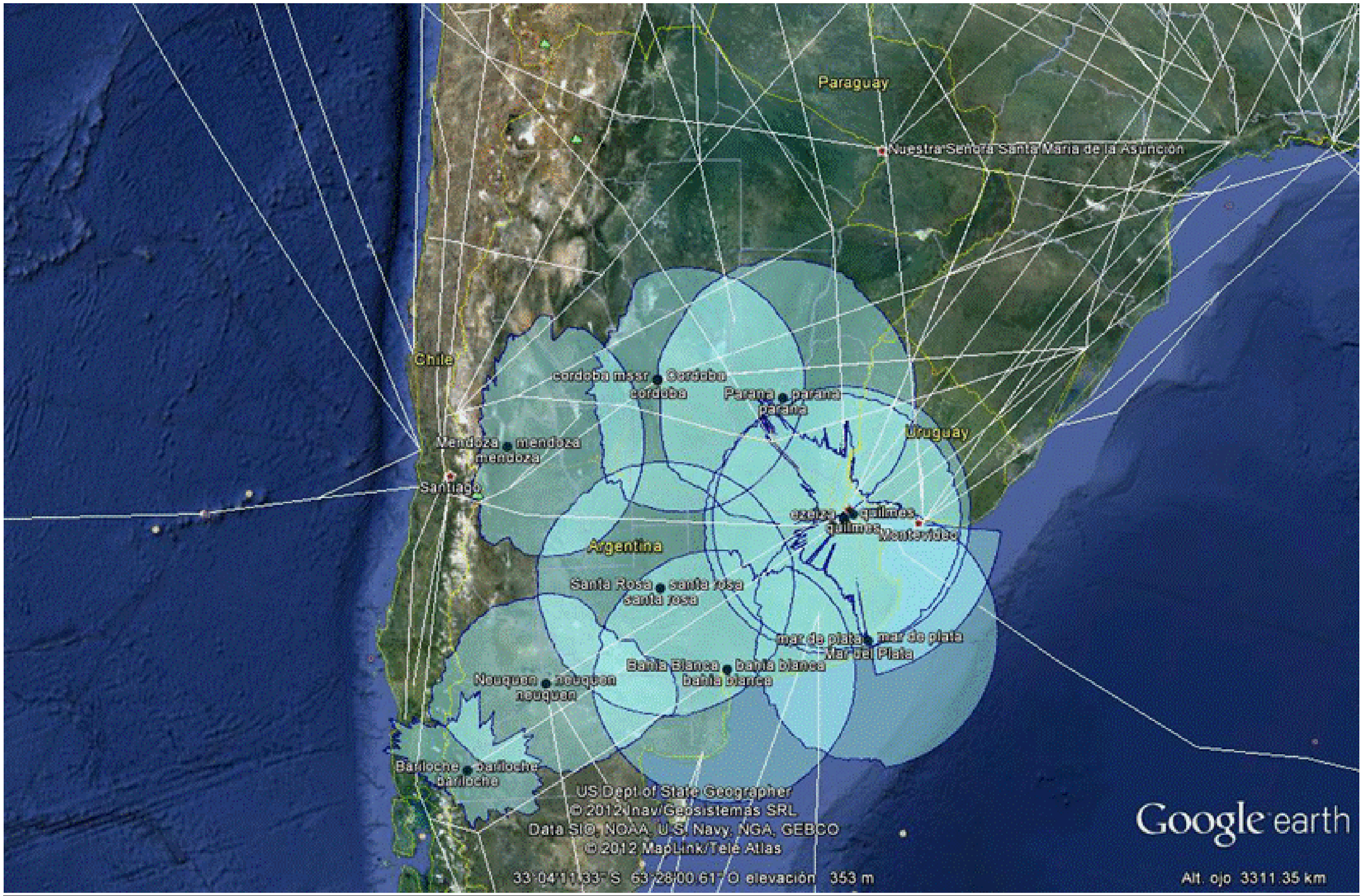

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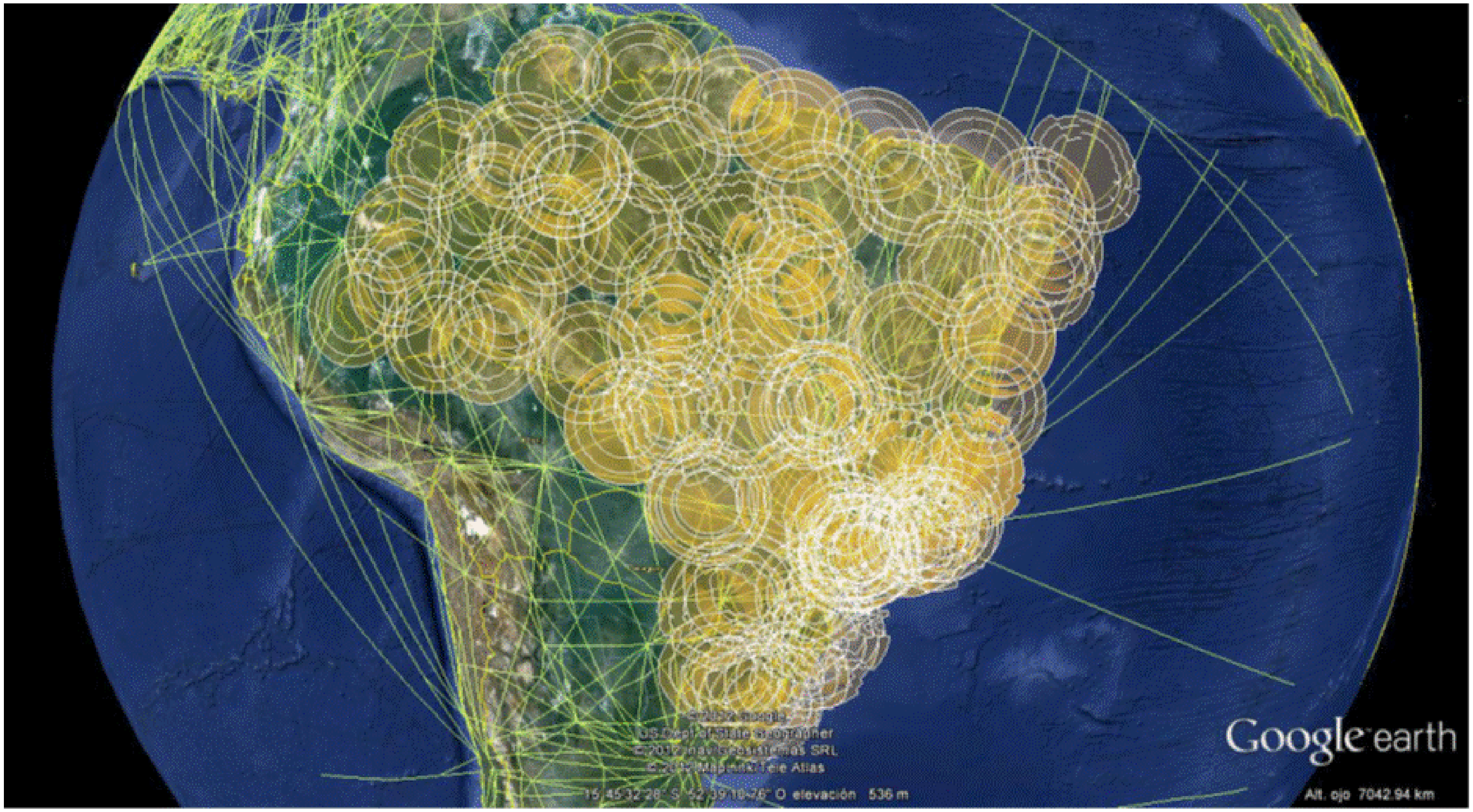

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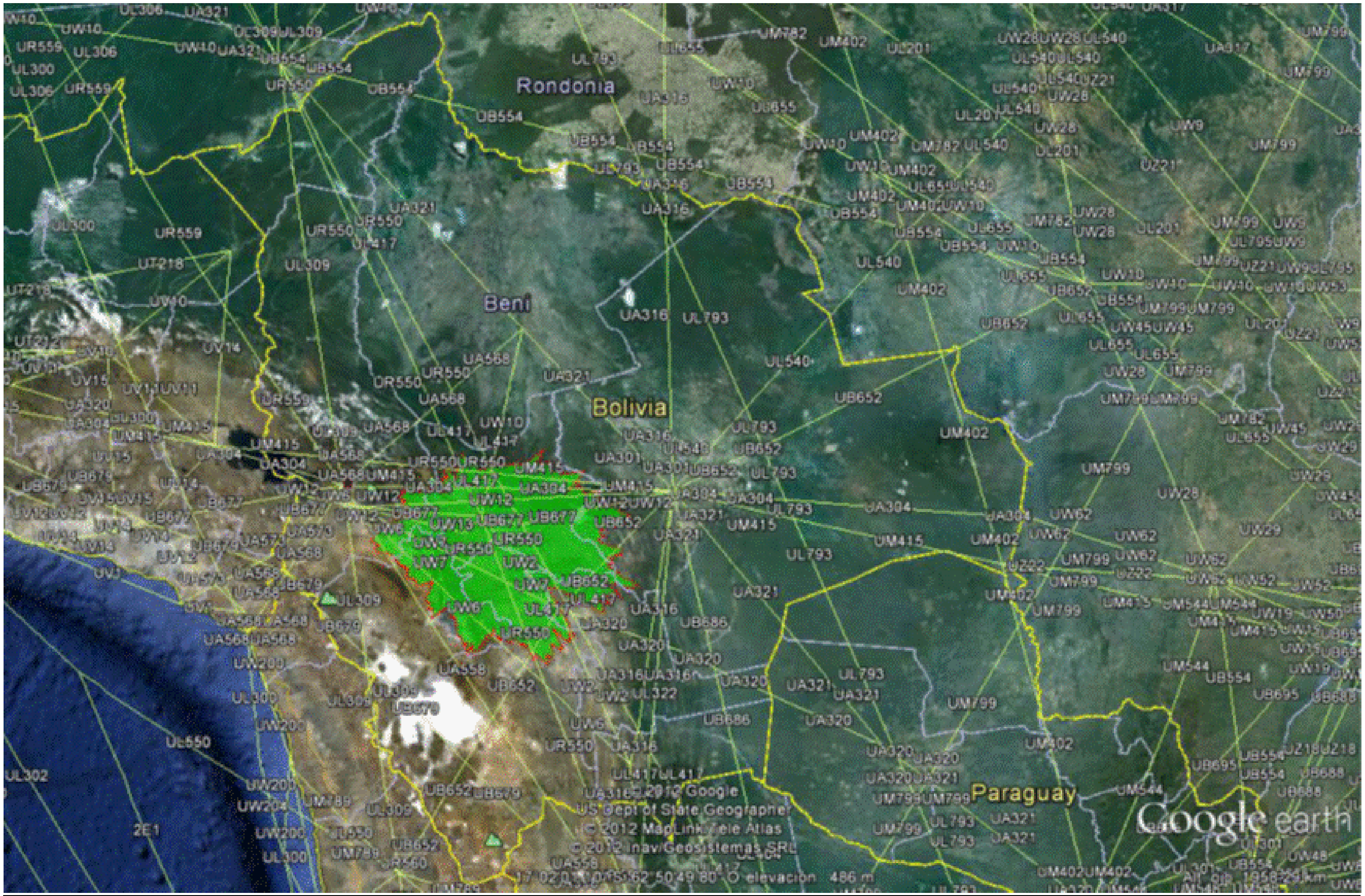

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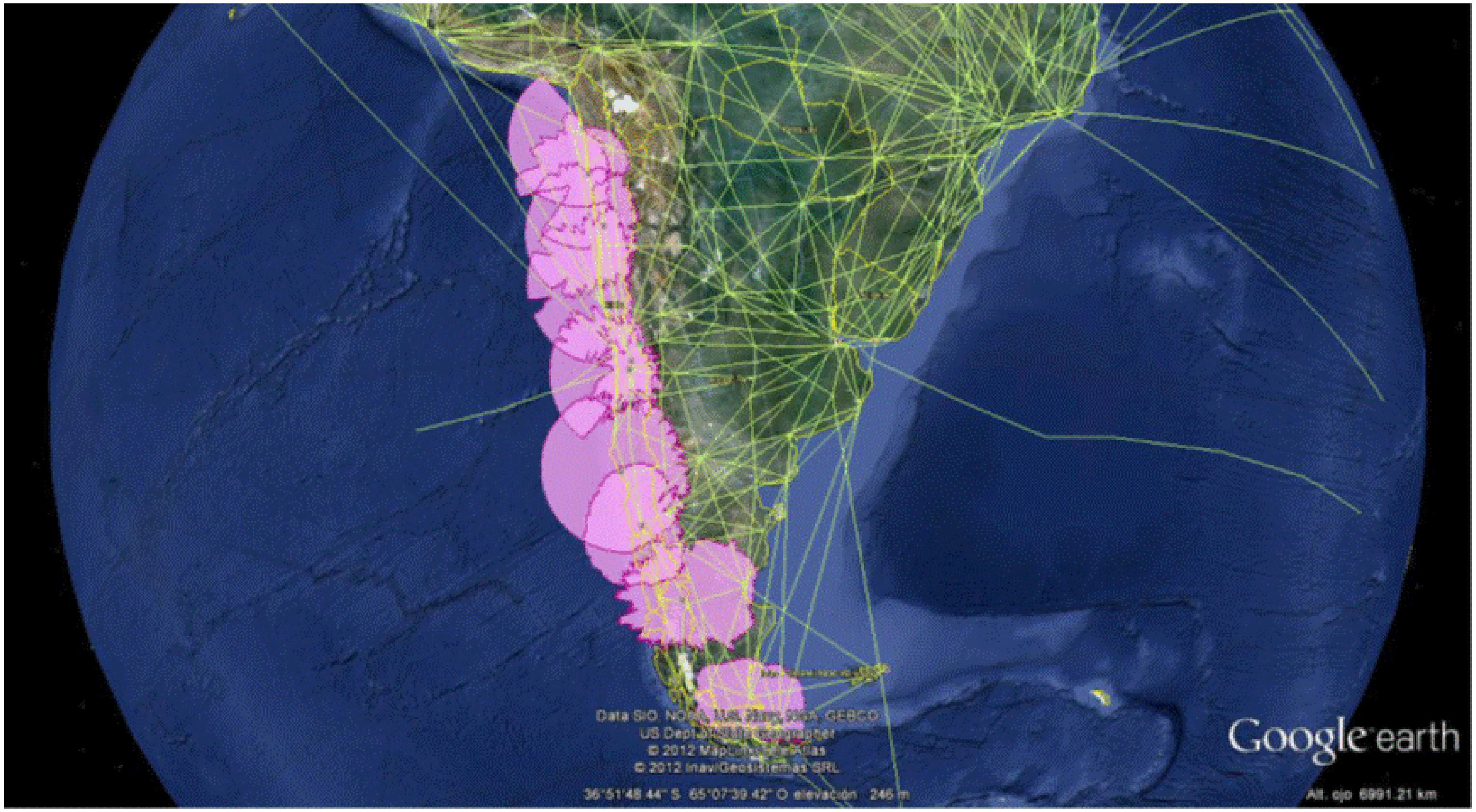

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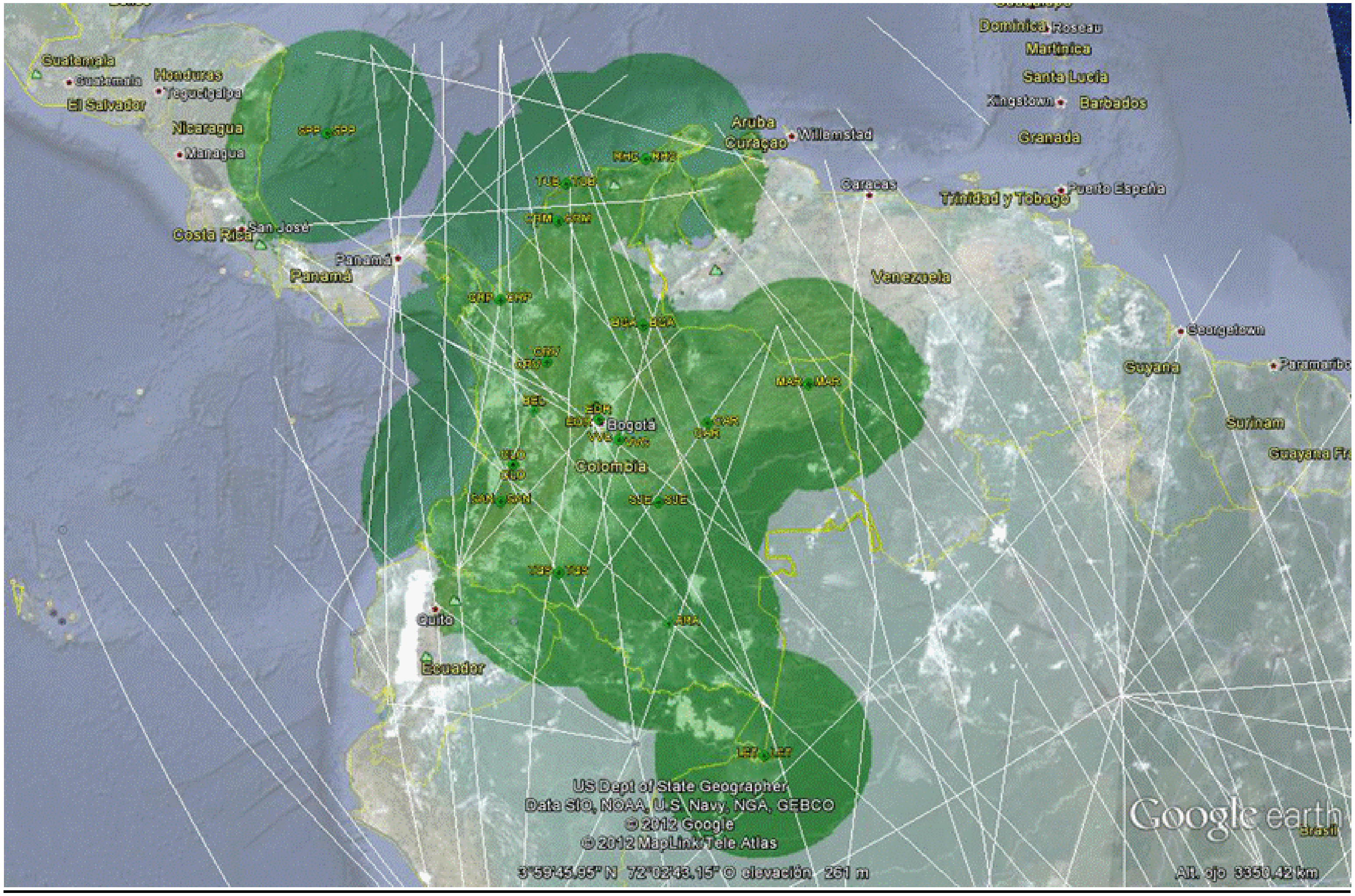

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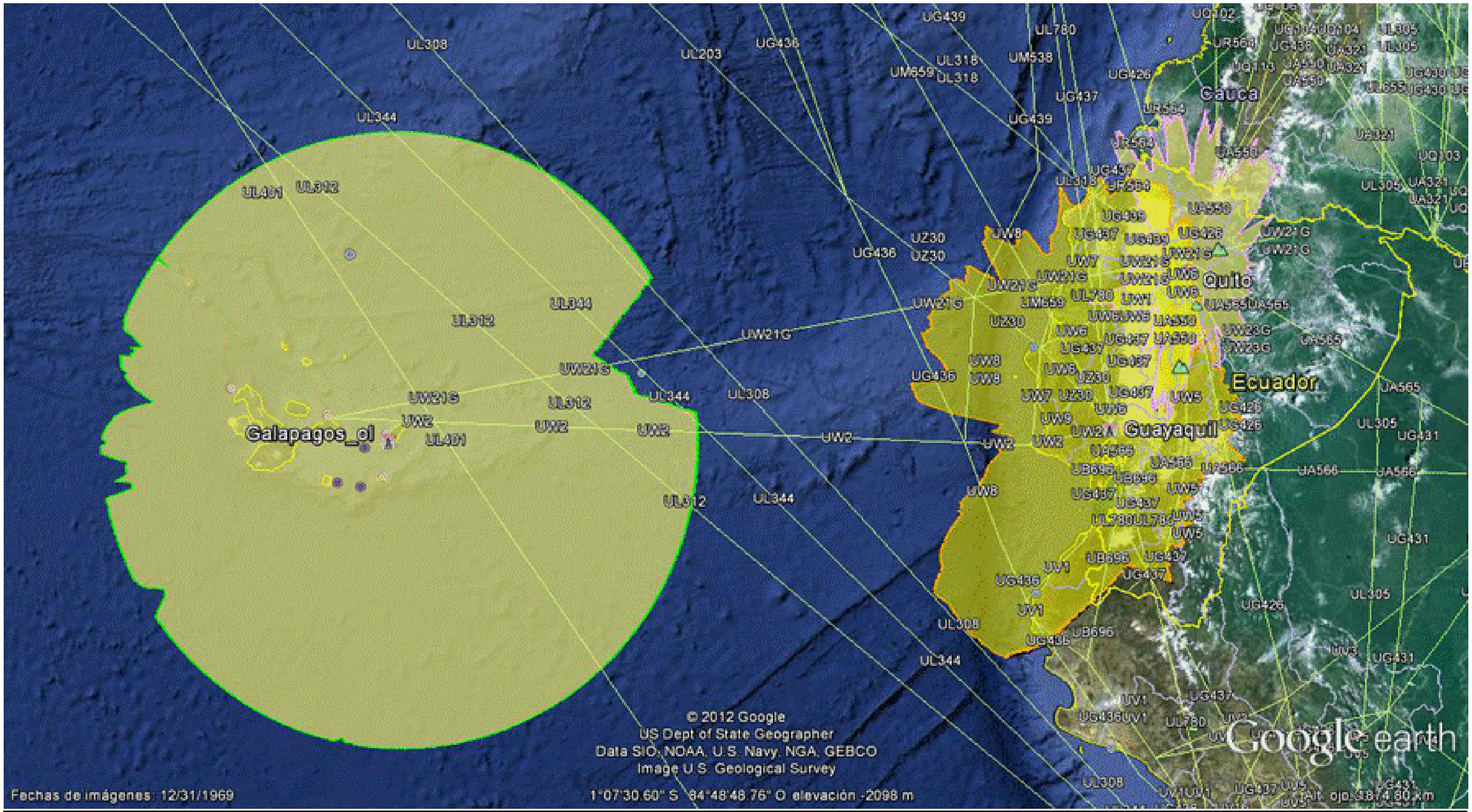

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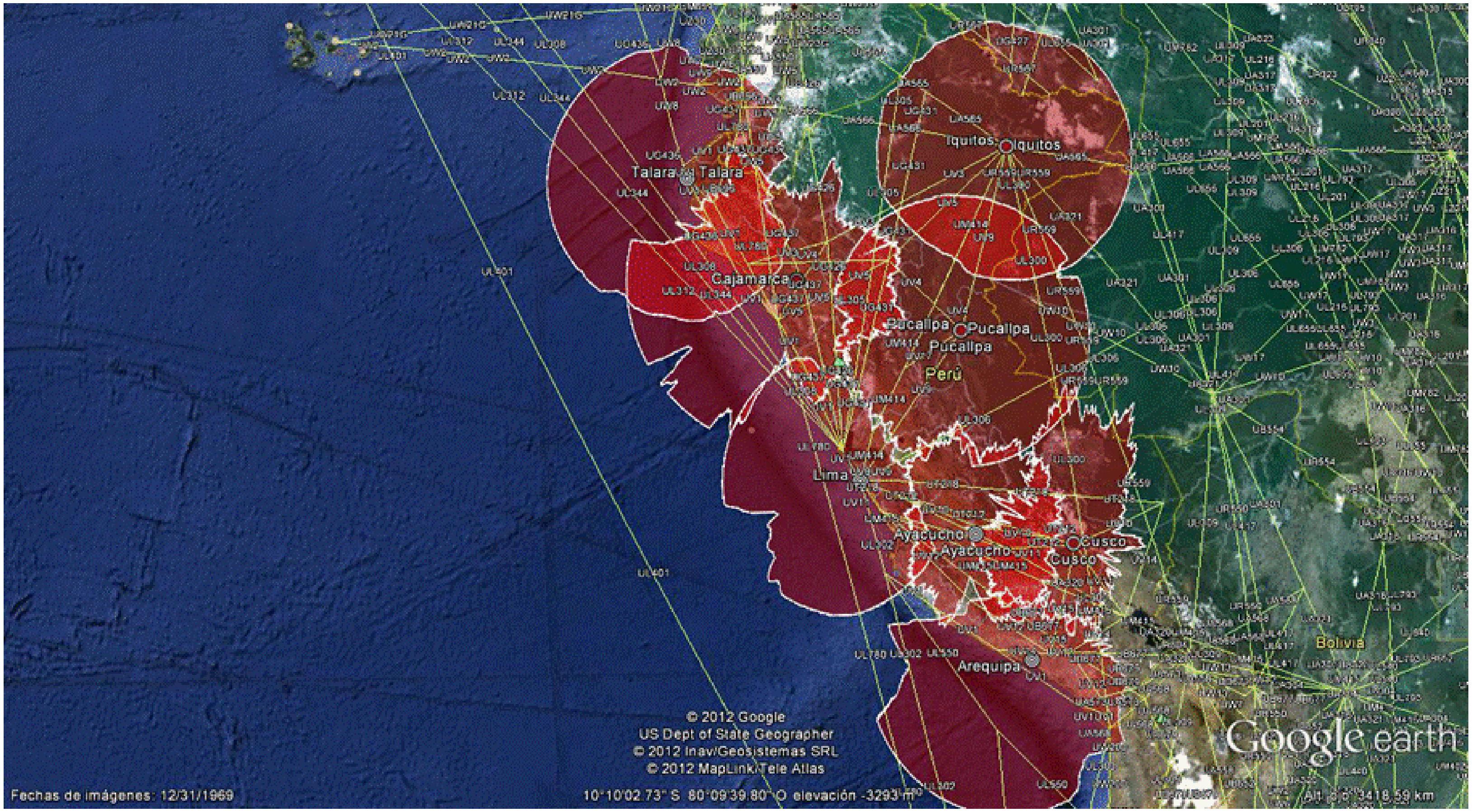
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Talara
Cajamarca
Pucallpa
Perú
Lima
Ayacucho
Cusco
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Bolivia
© 2012 Google
US Dept of State Geographer
© 2012 Inav/Geosistemas SRL
© 2012 MapLink/Tele Atlas
Google earth
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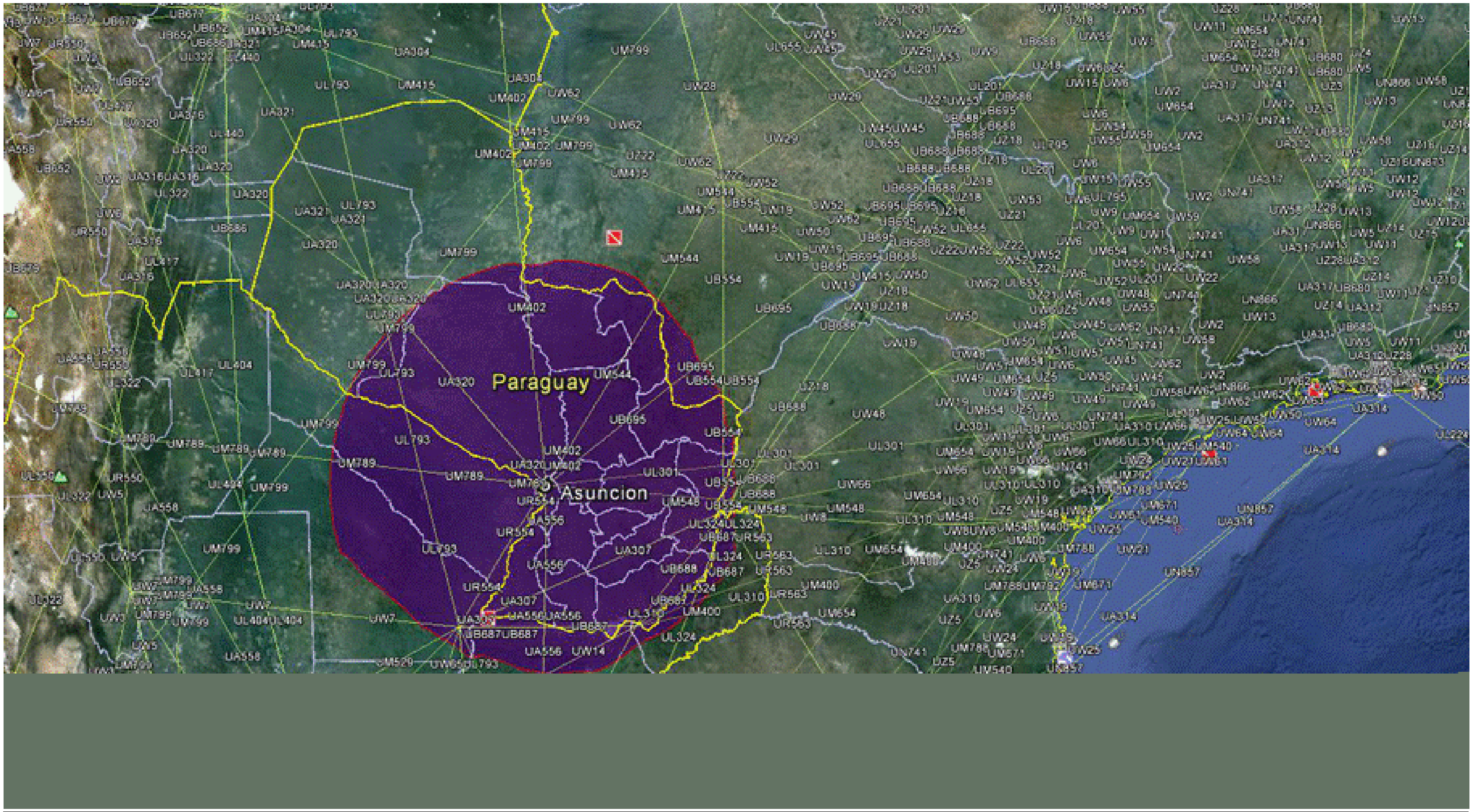
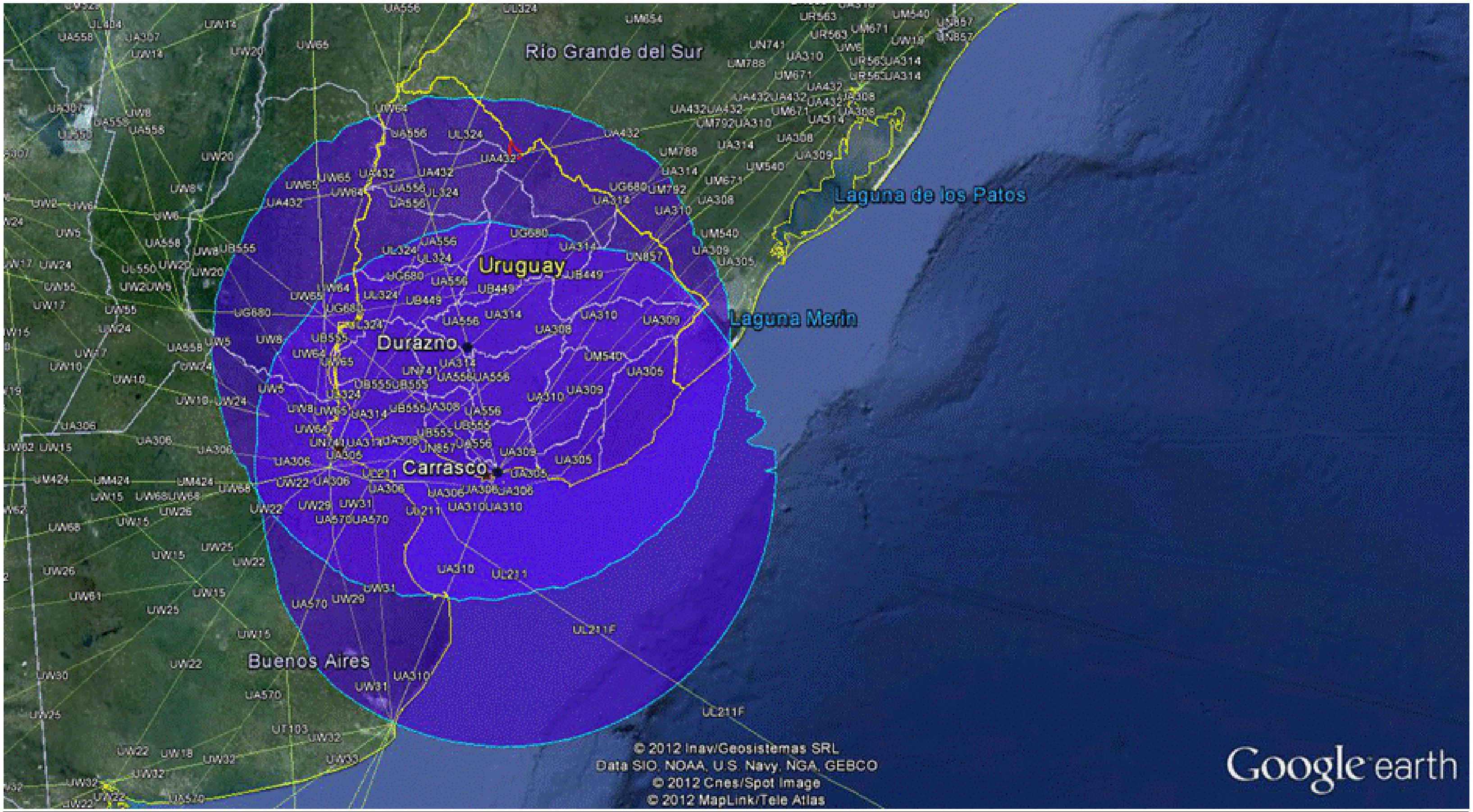
PARAGUAY (FL250)



URUGUAY (FL250)



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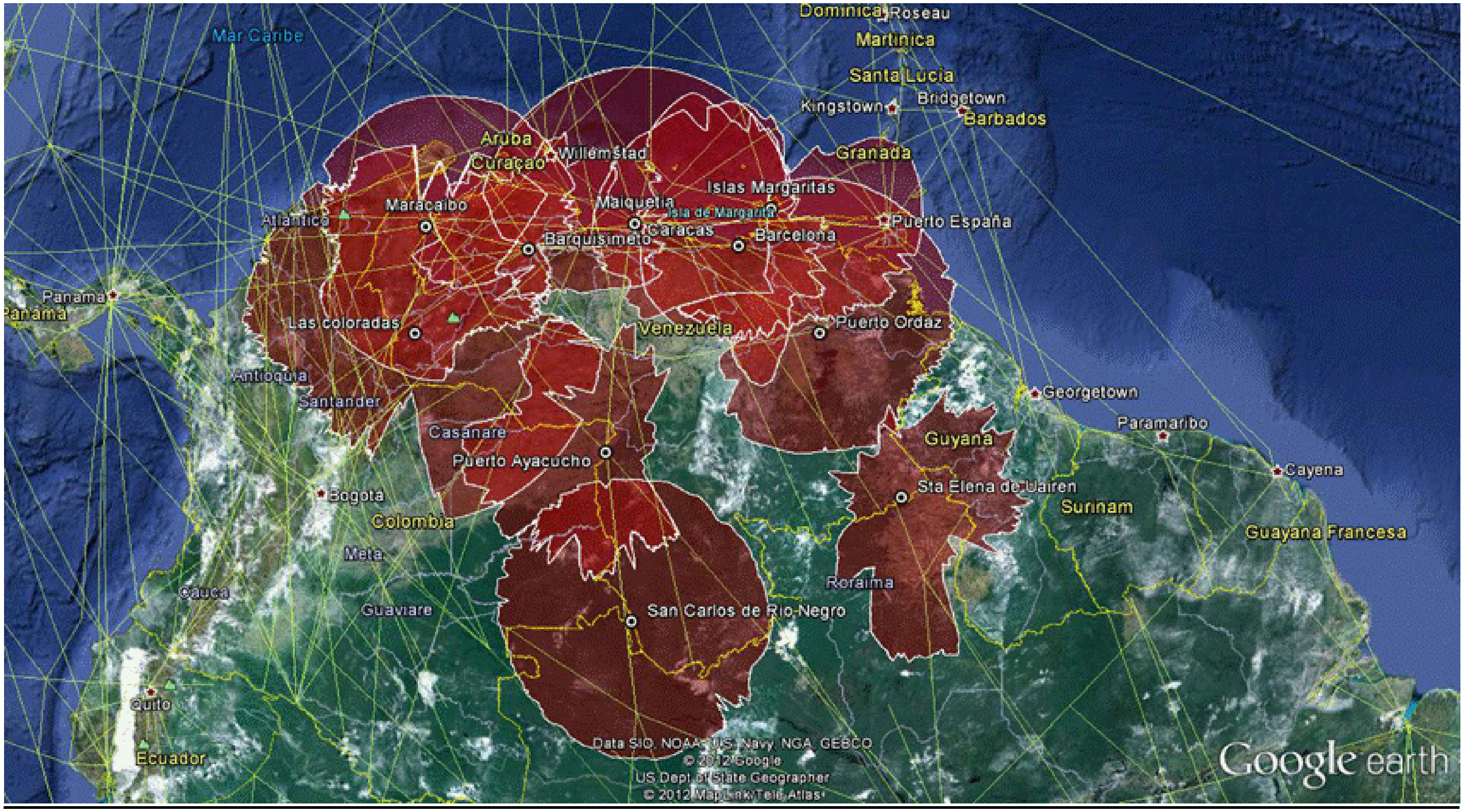
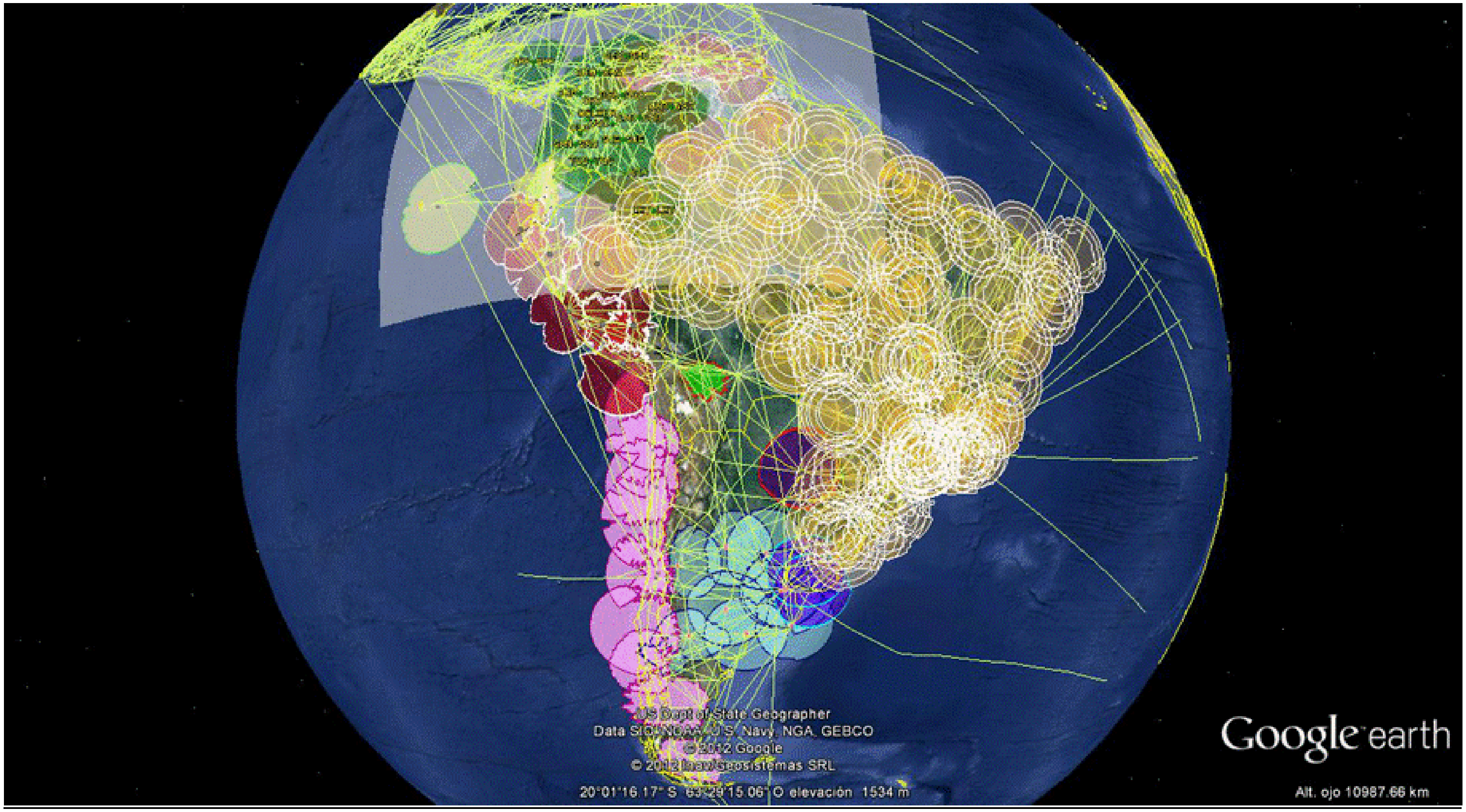


TOTAL SAM REGION



APPENDIX 8 – RECEIVER AUTONOMOUS INTEGRITY MONITORING SYSTEM - RAIM

Definitions and technical considerations

RAIM is a technology developed for assessing the integrity of the global positioning system (GPS) in a GPS receiver system. It is of special importance for critical GPS security applications, such as in aviation or maritime navigation.

In accordance with Doc 9849 AN/457 "GNSS Manual", the most common ABAS (AIRCRAFT-BASED AUGMENTATION SYSTEM) technique is the so-called RAIM (RECEIVER AUTONOMOUS INTEGRITY MONITORING).

For air navigation operations based on the global navigation satellite system (GNSS), Annex 10, Vol. I, Table 3.7.2.4.1 – Signal-in-space performance requirements for en-route, non-precision approach (NPA), approach with vertical guidance (APV), and terminal area operations supported by an aircraft-based augmentation system (ABAS), specifies that aircraft equipped with GPS receivers must have certified RAIM systems that meet the specified accuracy, integrity, and continuity parameter monitoring requirements.

Before starting its flight, every aircraft should check if RAIM is available throughout the route, and the corresponding ATS unit should also know what is the RAIM availability in its area of responsibility. RAIM operation is checked using a software application called RAIM availability prediction, which indicates the operating condition of the GPS constellation through messages called NANU (Notice Advisory to Navstar User).

States should be aware that RAIM algorithms require a minimum of five satellites on sight for fault detection (FD) and for detecting the presence of a position error that is unacceptably significant for a given flight mode. For fault detection and exclusion (FDE), a minimum of 6 satellites is used not only for detecting a defective satellite, but also for excluding it from the navigation solution so that the navigation function may proceed without interruption.

Likewise, operating limitations and conditions that will have an impact on RAIM availability values must be known. The RAIM system requires redundant satellite distance measurements to detect defective signals and alert the pilot, which means that the integrity navigation guide provided by RAIM cannot be available 100% of the time.

For receivers that cannot take advantage of selective availability (SA) interruption, the average RAIM availability is 99,99 % for en-route operations, and 99,7 % for non-precision approach operations with a constellation of 24 GPS satellites. FDE availability ranges from 99.8 % for en-route operations to 89.5 % for non-precision approach operations. For receivers that can take advantage of SA interruption (*e.g.*, SBAS receivers), RAIM availability increases to 100% for en-route operations and to 99.998 % for non-precision approach operations. FDE availability ranges from 99.92 % for en-route operations to 99.1% for non-precision approach operations.

RAIM and FDE availability will be slightly lower for medium latitude operations and slightly higher for equatorial and high latitude regions due to the nature of the orbits. The use of satellites from multiple GNSS constellations or SBAS satellites as additional sources of spacing can improve RAIM and FDE availability.

RAIM Prediction

GNSS differs from traditional navigation systems in that satellites and areas of degraded coverage are in constant change.

In this sense, if the satellite fails or is put out of service for maintenance, it is not immediately clear what areas of airspace will be affected, if any. The location and duration of these interruptions can be predicted with the help of computer analysis and reported to pilots during the pre-flight planning process. However, this prediction process is not fully representative of all RAIM implementations in the different receiver models. Prediction instruments are generally conservative and thus predict a lower availability than what is actually encountered in flight for protecting lower-level receiver models.

Since RAIM operates in an autonomous manner, that is, without the help of external signals, it requires redundant pseudorange measurements. In order to obtain a 3D position solution, at least four measurements are necessary. In order to detect a fault, at least 5 measurements are necessary, and to isolate and exclude a fault (FDE), at least 6 measurements are necessary. Nevertheless, more measurements are frequently needed based upon satellite geometry. Normally, there are between 7 and 12 satellites on sight.

Test statistics used are based on the residual pseudorange measurement (the difference between the expected measure and the observed measure) and the level of redundancy. Test statistics are compared with a threshold value, which is determined based on the required probability of false alarm (PFA) and the expected measurement noise. In aviation systems, the action platform is set to 1/15000.

The horizontal integrity limit (HIL) or horizontal protection limit (HPL) is a figure that represents the radius of a circle centred on the GPS position solution, and which is assured to contain the true position of the receiver within RAIM specifications (*i.e.*, it meets the Pfa and the Pmd). The HPL is calculated as a function of the RAIM threshold and satellite geometry at the time of the measurements. The HPL is compared to the horizontal alarm limit (HAL) to determine if RAIM is available.

Regional actions concerning RAIM implementation

The SAM Region has been considering the need to have a RAIM prediction system, mainly in the SAM implementation group (SAMIG). Within this context, the Lima Regional Office circulated a letter asking SAM States about their willingness to have a regional RAIM system; most States responded their agreement.

As to the development of a RAIM availability prediction system for the SAM Region, a technical and financial solution was presented at the seventh workshop/meeting of the SAM Implementation Group (SAM/IG/7).

The SAM RAIM availability prediction programme would be placed in dual servers and would be accessed by users through the web, at an address to be determined. The application would be available 24/7 with availability in the order of 99.5%.

Two modalities have been considered for the implementation of RAIM availability prediction: one in which the programme would be installed and managed at the manufacturer´s premises, and the other in which the programme as well as the required software would be installed at a location in the Region under the supervision of the manufacturer or the service provider. In both modalities, the user would access the information through an Internet website hosting the RAIM availability prediction programme.

The implementation of a regional RAIM prediction programme would allow all the States of the Region to have a single programme where all operators could consult en-route, terminal, and approach PBN procedures.

APPENDIX 9 - ASTERIX CATEGORY 21 ED 1.8

Table 1 - Data Items of Category 021

Data Item Reference Number	Description	Resolution
I021/008	Aircraft Operational Status	N.A.
I021/010	Data Source Identification	N.A.
I021/015	Service Identification	N.A.
I021/016	Service Management	N.A.
I021/020	Emitter Category	N.A.
I021/040	Target Report Descriptor	N.A.
I021/070	Mode 3/A Code	N.A.
I021/071	Time of Applicability for Position	1/128 s
I021/072	Time of Applicability for Velocity	1/128 s
I021/073	Time of Message Reception for Position	1/128 s
I021/074	Time of Message Reception for Position – High Precision	2^{-30} s
I021/075	Time of Message Reception for Velocity	1/128 s
I021/076	Time of Message Reception for Velocity – High Precision	2^{-30} s
I021/077	Time of Report Transmission	1/128 s
I021/080	Target Address	N.A.
I021/090	Quality Indicators	N.A.
I021/110	Trajectory Intent	N.A.
I021/130	Position in WGS-84 co-ordinates	$180/2^{23}$ °
I021/131	Position in WGS-84 co-ordinates, high resolution	$180/2^{30}$ °
I021/132	Message Amplitude	1 dBm
I021/140	Geometric Height	6.25 ft
I021/145	Flight Level	¼ FL
I021/146	Intermediate State Selected Altitude	25 ft
I021/148	Final State Selected Altitude	25 ft
I021/150	Air Speed	N.A.
I021/151	True Air Speed	N.A.
I021/152	Magnetic Heading	$360/2^{16}$ °
I021/155	Barometric Vertical Rate	6.25 ft / min
I021/157	Geometric Vertical Rate	6.25 ft / min
I021/160	Ground Vector	N.A.
I021/161	Track Number	N.A.
I021/165	Track Angle Rate	1/32 °/s
I021/170	Target Identification	N.A.
I021/200	Target Status	N.A.
I021/210	MOPS Version	N.A.
I021/220	Met Information	N.A.
I021/230	Roll Angle	0.01 deg
I021/250	Mode S MB Data	N.A.
I021/260	ACAS Resolution Advisory Report	N.A.
I021/271	Surface Capabilities and Characteristics	N.A.
I021/295	Data Ages	N.A.
I021/400	Receiver ID	N.A.

Agenda Item 7: Implementation of the new flight plan format

7.1 The Meeting, in follow-up to the implementation of the new flight plan format, analysed the following topics:

a) List of focal points;
b) Update of FITS website;
c) Status of implementation of changes to FDP and AMHS systems;
d) Scheduling of regional and inter-regional tests;
e) Guideline for NOTAM for new FPL format; and
f) Video of awareness Amendment 1 of the 15th Edition Doc.4444 provided by Colombia

List of focal points

7.2 The Meeting examined the list of focal points of SAM States responsible for coordinating activities for the implementation of the Amendment. The list of focal points is shown as **Appendix A** to this Agenda Item. The Meeting recalled the importance that the States of the Region advise the ICAO SAM Regional Office of any changes to that list, since the focal point has the important task of supporting the regional and inter-regional coordination required during the transition period (1 July 2012 - 14 November 2012) when the NEW and CURRENT flight plan format will operate.

Update of FITS website

7.3 The Meeting deemed it important that the States inform as soon as practicable the date in they would be ready to operate with the NEW flight plan format given that to date, only two States in the Region have done it.

7.4 The Meeting considered that in order to foresee the impact of the implementation of the new flight plan format on the established date, and considering that:

a) air traffic flow will increase due to the high season,
b) the workload will increase in the services that use free text, preventing data validation, and thus generating safety risks,
c) several States are in the process of installing and/or updating their AMHS and/or FDP systems necessary for the implementation,
d) there are States that lack the human resources and/or equipment to face this increase in workload.
e) the Contingency Plan procedure will be applied during extended periods of time until implementation is achieved with the required safety standard,

formulated the following conclusion:

Conclusion SAM/IG/10-4 - Updating of the ICAO FITS website

That, SAM States that have not done it yet, are urged to inform the ICAO South American Regional Office, by 17 October 2012, the date in which they will start accepting the NEW flight plan format, so that ICAO may update the FITS website (http://www2.icao.int/en/FITS/Pages/home.aspx) for display to all the global aeronautical community.

Web-based teleconferences

7.5 The Meeting noted that, in follow-up to the implementation of the Amendment, since SAM/IG/9 meeting, many teleconferences had been conducted.

7.6 The Meeting was informed that in the teleconferences all focal points should have participated and, in the event of absence, should have sent via e-mail the information on their activities on the basis of the teleconferences agendas, but regrettably very few focal points had participated in the teleconferences. In this regard, it should be recalled that the Twelfth Meeting of Civil Aviation Authorities of the SAM Region formulated Conclusion RAAC/12-2 – *Implementation of Amendment 1 to the 15th. Edition of ICAO Doc. 4444 (New flight plan format) in the SAM Region*, which urges, among other aspects, the participation of States in all events programmed in reference to the implementation of the Amendment.

7.7 The Meeting deemed it important to continue conducting web-based teleconferences and presented the following schedule: 9 October, 2, 14, and 16 November 2012, inviting all focal points to actively participate. The reports of the teleconferences conducted in 2012 appear in the ICAO SAM Regional Office website, at the following link: http://www.lima.icao.int/eDocuments/eDoc_Contents.asp?wLanguage=E&wArea=CNS#.

Status of implementation of changes to FDP and AMHS systems

7.8 The Meeting noted the status of implementation of the changes to the FDP and AMHS systems (templates with the NEW FPL at the users' terminals), shown in **Appendix B** to this part of the Report. Brazil presented IP/04 related to the status of implementation of changes to its systems.

7.9 From the aforementioned Appendix, it may be noted that most of the States in the Region that have installed the cited equipment have taken actions for the implementation of the changes, but very few States have completed them to date. There are States that are not in a position to make the changes in automated systems by 15 November 2012, in view that their implementation requires more time, but those States are taking the necessary contingency measures in this regard.

Follow-up on the Review on the status of compliance of SAM/IG conclusions

7.10 The SAM Implementation Group workshops/meetings have duly produced a series of agreements, translated into conclusions indicating actions to be taken by States, and permitting the Region to sustainably evolve towards the application of the global ATM Operational Concept.

7.11 The Meeting analyzed every identified task, commented upon the resulting tasks, assessing the status of each in particular, completing the chart shown in SAM/IG/10-WP/2, which presents the tasks in charge of States with the aim of following them up.

Scheduling of regional and inter-regional tests

7.12 With the aim of continuing with the trials between States of the Region and of other Regions, as well as with the users, the Meeting coordinated a number of tests among Colombia, Paraguay, Peru, Uruguay, Venezuela, as well as users such as TACA, also present at the Meeting. It is recommended to add to these FPL messages tests, trials with standard ATS messages associated to the same FPL, as DEP, ARR, CHG, CPL, CNL, DLA, RQP and RQS.

Guide for the issuance of NOTAMs.

7.13 The Meeting evaluated the need to issue NOTAM informing the starting date for the transmission and reception of the New FPL Format and standard ATS messages, proposing the following guiding text:

*Reference: AIC XXX, effective 15 November 2012 for the implementation of the New ICAO Flight Plan and Amendment **XXX to AIP XXX** for updating the information Part ENR 1.10 on Flight Plan and RPL System Management.*

Raising Awareness on Amendment 1 to the ICAO Fifteenth Edition Doc.4444 FPL New Format

7.14 The Colombian State presented to the Meeting a video to raise awareness on the new ICAO FPL to be circulated in the CARSAM Regions to further promote this topic among aeronautical community in general.

APPENDIX A / APENDICE A

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	CNS	Moira Lidia Callegare Departamento CNS ANAC	mcallegare@anac.gov.ar	T: + 5411 5941 3000, Ext. 69716
	AIM	Pablo Collazo Dirección Nacional de los Servicios de Navegación Aérea y Aeródromos ANAC	pcollazo@anac.gov.ar	T: +5411 5941 3000/10, Ext 69741
Bolivia	ATM	Miguel Castillo Ochoa Jefe Unidad ATM/SAR, DGAC	mcastillo@dgac.gob.bo	T: +591 2 2444450/2114465 C: + 591 72046745 F: +591 2 2114465
Brasil	CNS	Alessander de Andrade Santoro Oficial CNS Departamento de Control del Espacio Aéreo, DECEA	ddte7@decea.gov.br	T: +5521 2101 6209
Chile	ATM	Marcial Vidal Arriagada Controlador de Tránsito Aéreo, DGAC	mvidal@dgac.cl	T: +56 2 290 4709
Colombia	AIM	Oscar Arturo Alfonso Bravo Secretaría de Sistemas Operacionales, UAEAC	oscar.alfonso@aerocivil.gov.co	T: +57 1 296 3065
Ecuador	AIM	Carlos Delgado Toledo, DGAC	carlos_delgado@dgac.gob.ec karlyn_1966@yahoo.com	T: +593 2 223 1008
French Guiana		Jean Jacques Deschamps Head, Technical Department for the ANSP in French Antilles and Guyana, DIRAC	jean-jacques.deschamps@aviation-civile.gouv.fr	T: +33 6 9696 1107
Guyana	ATM	Chaitrani Heeralall Director Air Navigation Services, CAD	dans@gcaa-gy.org	T: +592 261 2217 F: +592 261 2293
	ATM	Rickford Samaroo Manager ATS Operations, CAD	satcori@hotmail.com	T: +592 261 2564 F: +592 261 2279
Panamá	AIM	Hector Gonzalez Chief of Aeronautical Telecommunication	hgonzalez@aeronautica.gob.pa	T: +507 501 9825/501 9826 F: +507 501 9848
Paraguay	ATM	Liz Rocío Portillo Castellanos Sección Normas y Reglamentos, DINAC	atm-gna@dinac.gov.py lizroportillo@gmail.com	T: +595 21 205 365
	CNS	David Ricardo Torres Sección Terminales AMHS/GTE, DINAC	dr.torres33@gmail.com	T: +595 21 7585208/9 F: +595 21 758 5292
Perú	AIM	Victor Martinez Serna Gerente de Operaciones Aeronáuticas, CORPAC	amartinez@corpac.gob.pe	T: +511 630-1150/630-1151

Estado/State Organization	**Autoridad / Authority**		**E-mail**	**T / F**
	Area	**Nombre y título / Name and Title**		
1	**2**	**3**	**5**	**6**
Suriname	AIM	Lunette Rinelda Edam AIS/Maps and Charts and Communication, CAD	ais@cadsur.sr; edamlunette@hotmail.com	T: +597 498-898 F: +597 498-901
	AIM	Sharitadevi A. Radjie AIS/Maps and Charts and Communication, CAD	ais@cadsur.sr; sha12rad@live.com	T: +597 498-898 F: +597 498-901
Uruguay	ATM	Rosanna Barú Banchieri Encargada Departamento de Servicios Aeronáuticos, DINACIA	rbaru@dinacia.gub.uy rocbb17@gmail.com	T: +5982 604 0408, Ext. 4461
Venezuela	ATM	Wilfredo Gil Sánchez Jefe ACC Maiquetía	w.gil@inac.gob.ve	T: +58 426 517 1599 F: +58 212 355 2216
	CNS	Vicente Fiore Jefe de MMTO Radar Maiquetía, INAC	v.fiore@inac.gob.ve	T: +58 416 623 5643
	AIM	Benjamín Uquillas Jefe Subcentro Comunicaciones Maiquetía, INAC	buquillas@gmail.com	T: +58 412 721 5068

APPENDIX B

STATUS OF IMPLEMENTATION OF THE NEW FLIGHT PLAN FORMAT IN THE SAM REGION

State	ACC	**Flight Plan Transmission** (Use of the NEW format at AFTN/AMHS terminals	**Processing of the NEW Flight Plan Format** (FDP)	**Acceptance Date of the NEW Flight Plan Format**	**National, Regional and Interregional Tests** (Trial programming for the implementation of the NEW flight plan format in the SAM Region **(**SAM/IG/9, Item 8, Appendix E)	**Updating of ATS LOAs between Adjacent ACCs**
Argentina	Comodoro Rivadavia	Implemented (AMHS terminal)	Manual	**1 September 2012** NOTAM mentioning AIC issued on 19 April 2012	Carried out	Pending
	Cordoba	Implemented (AMHS terminal)	Automated FDP updating			
	Ezeiza	Implemented (AMHS terminal)	Automated FDP updating			
	Mendoza	Implemented (AMHS terminal)	Manual			
	Resistencia	Implemented (AMHS terminal)	Manual			
Bolivia	La Paz	Implemented (AMHS terminal)	Manual	Undefined	Partially carried out	Pending
Brazil	Amazonico	Implemented (AMHS terminal)	Automated (Use of converter)	**30 June 2012**	Carried out	Pending
	Atlántico	Implemented (AMHS terminal)	Automated (Use of converter)			
	Brasilia	Implemented (AMHS terminal)	Automated (Use of converter)			
	Curitiba	Implemented (AMHS terminal)	Automated (Use of converter)			
	Recife	Implemented (AMHS terminal)	Automated (Use of converter)			

State	**ACC**	**Flight Plan Transmission** (Use of the NEW format at AFTN/AMHS terminals	**Processing of the NEW Flight Plan Format** (FDP)	**Acceptance Date of the NEW Flight Plan Format**	**National, Regional and Interregional Tests** (Trial programming for the implementation of the NEW flight plan format in the SAM Region **(**SAM/IG/9, Item 8, Appendix E)	**Updating of ATS LOAs between Adjacent ACCs**
Chile	Antofogasta	Implemented (AMHS terminal)	Manual	1 October	Partially carried out	Pending
	Punta Arena	Implemented (AMHS terminal)	Manual			
	Puerto Montt	Implemented (AMHS terminal)	Manual			
	Santiago	Implemented (AMHS terminal)	Manual or automated (converter to be defined)			
Colombia	Barranquilla	Not implemented (AMHS terminal)	Manual or automated (converter to be defined)	Undefined	Carried out	Pending
	Bogotá	Not implemented (AMHS terminal)	Manual or automated (converter to be defined)			
Ecuador	Guayaquil	Implemented (AMHS terminal)	Automated Use of converter	Undefined	Partially carried out	Pending
Guyana Francesa	Rochambeau	Implantada terminal AFTN	Automated FDP updating	Undefined	Partially carried out	Pending
Guyana	Timehri	Implemented (AMHS terminal)	Automated FDP updating	Undefined, but ready to receive NEW FPL	Partially carried out	Pending
Panama	Panama	Not implemented	Manual	Undefined	Carried out	Pending
Paraguay	Asunción	Implemented (AMHS terminal)	Manual or updated FDP (undefined)	1 November	Carried out	Pending
Peru	Lima	Implemented (AMHS terminal)	Automated FDP updating	5 November	Carried out	Pending
Surinam	Paramaribo	Implemented (AMHS terminal)	Automated FDP updating	Undefined, but ready to receive the NEW FPL	Carried out	Pending

State	**ACC**	**Flight Plan Transmission** (Use of the NEW format at AFTN/AMHS terminals	**Processing of the NEW Flight Plan Format** (FDP)	**Acceptance Date of the NEW Flight Plan Format**	**National, Regional and Interregional Tests** (Trial programming for the implementation of the NEW flight plan format in the SAM Region **(**SAM/IG/9, Item 8, Appendix E)	**Updating of ATS LOAs between Adjacent ACCs**
Uruguay	Montevideo	Not implemented	FDP updating in process	1 November	Partially carried out	Pending
Venezuela	Maiquetia	Implemented (AMHS terminal)	Manual	1 November	Carried out	Pending

Agenda Item 8: Other business

Study on the Implementation of the Safety Management Systems (SMS) Methodology for the Collection, Preparation, and Analysis of Large Height Deviation (LHD) Reports

8.1 The meeting recalled that the CAR/SAM Regional Planning and Implementation Group (GREPECAS) entrusted the Caribbean and South American Monitoring Agency (CARSAMMA) the implementation of the SMS methodology for the analysis of LHDs. CARSAMMA is an administrative agency under the *DEPARTAMENTO DE CONTROLE DO ESPAÇO AÉREO* (DECEA), a body that belongs to the Airspace Control System of Brazil (SISCEAB).

8.2 In order to apply the SMS methodology for the analysis of LHDs, CARSAMMA has prepared an "LHD SMS Guide", which appears in **Appendix A** to this part of the report, describing step by step the stages to be followed in this analysis. The SMS is used to estimate the system risk value.

8.3 An important addition to the methodology for LHD SMS analysis is the risk assessment and quick identification of trends and critical points where risks occur, which reduces the time required to do the safety analysis of the system.

8.4 With regard to the above, the meeting noted that the objective of this work is to present a summary of the study on the application of SMS analysis to LHD reports received by CARSAMMA, and document and present safety management as a valid tool for safety assessment in RVSM airspace.

8.5 The meeting recognizes the importance of CARSAMMA Information and consider it very useful and States could use it domestically in order to reduce the number of LHD in the region y that way contributes to the safety enhancing.

Cost of collecting flight data

8.6 The Meeting took note that Chile had display systems covering more than 90% of the routes established in the upper airspace under its jurisdiction. However, those display systems did not contemplate sub-systems for retrieving flight data, reason why this information must be extracted manually, one by one, from flight progress strips.

8.7 The number of data records collected in August 2011 from the Antofagasta and Santiago FIRs was 10,103, that is, almost 326 records per day.

8.8 The new data collection conducted between 1 and 31 August 2012 involved again the manual extraction, one by one, of an average of 320 data per day of the sample, amounting to approximately 10,000 records.

8.9 Air traffic controllers should conduct these measurements, since they do not need any specific training to do so as opposed to those who are not experts in this field.

8.10 Whenever a data collection has been done for this purpose or for any other type of sample, a team of 3 air traffic controllers has been required, devoted full time to processing the information and putting it in the required format, for which they have had to leave their control duties in detriment of the remaining ATCOs who had to increase their workload.

8.11 In the case of Chile, the exclusion of 3 controllers from the control functions to take care of data collection has increased the extra hours for the rest of the controllers. This results in an increase of about US $9,600 in the cost of providing the service every time there is a need for this or other type of data collection.

8.12 The Meeting decided to meet the request of Chile to consider a longer period between the data collection and the delivery of this type of information to States when so required, in order to reduce the impact on the activities of those who must process the sample. In this sense, the Meeting agreed that, in the future, a period of 120 working days would be considered for the collection of traffic data as of the date the State is notified.

Update of documentation as a result of ASBU

8.13 The Meeting took note that as a result of the new ASBU (aviation system block upgrade) methodology of ICAO, which is expected to be approved at the ICAO Twelfth Air Navigation Conference (AN CONF 12, Montreal, Canada, from 19 to 30 November 2012), many of the guiding documents developed by the SAM IG to support the implementation of route optimization, the implementation of PBN, ATFM, the improvement of CNS systems, and automation, will require updates to adjust to this new methodology. Changes to these guidelines would be submitted to the SAM/IG meetings to be held in 2013.

8.14 Likewise, the Meeting was informed that the “Plan for the implementation of the performance-based air navigation system for the SAM Region” approved by the Twentieth Meeting of Civil Aviation Authorities (Lima, Peru, from 3 to 6 October 2011) through conclusion RAAC/12-1, shall also be updated in order to align it with the ASBU methodology. In this regard, a workshop/meeting for presenting and reviewing the new Plan for the implementation of the performance-based air navigation system for the SAM Region, is foreseen for the second quarter of 2013.

APPENDIX A

Risk Management Guide for the Analysis of Large Height Deviations (LHDs) in the CAR/SAM Regions, using the SMS Methodology

PREAMBLE

This guide may be used for SMS safety analysis, applying the methodology recommended by ICAO and endorsed by GREPECAS for application by CARSAMMA in the CAR/SAM Regions. CARSAMMA experts, together with the members of the Scrutiny Working Group (ICAO GTE), used this methodology to analyse the large height deviation (LHD) forms generated in the CAR/SAM Regions.

Since safety management has to be developed and applied in different areas of civil aviation, it was decided that the first part of this guide would contain the principles of the SMS methodology and, in the second part, this methodology would be applied to LHD analysis and the adjustment of tables and documents to the specific characteristics of RVSM airspace.

FIRST PART

SAFETY MANAGEMENT PROCESS

In general, the risk management process has five phases:

- Description of the system;
- Identification and coding of hazards - CARSAMMA;
- Risk analysis - GTE (teleconference);
- Risk assessment – GTE; and
- Risk treatment (mitigation) - State.

DESCRIPTION OF THE SMS

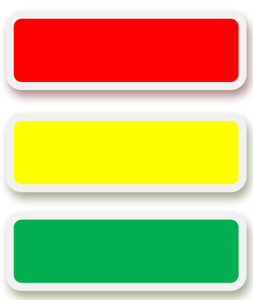
The manual defines a system as "an integrated set of components that combine, or the support given to an operational environment to achieve a given objective. These components include individuals, culture, equipment, information, procedures, facilities, services, and others."

Not all States participating in the system assign the same weight to each threat identified (*e.g.*, loss of power in one engine). For example, the loss of an engine (for multi-engine aircraft) at high speed and altitude does not always result in a catastrophic accident. Many multi-engined aircraft are designed to fly with a single engine in a restricted flight. However, in some States, the loss of a power-unit (at low speed, low height, gross height weight) may result in loss of control or loss of lift. Under these system conditions, the hazard can be catastrophic. The manual requires that consideration be given in the SMS to the worst reasonable case scenario in the system. If so desired, other conditions of the system may be considered, but only as a supplement to the worst-case scenario.

RISK ASSESSMENT

The risk assessment must follow the guidelines of the ICAO SMS Manual.

The SMS Risk Matrix classifies risks at three levels: high, medium, and low. These levels define the SMS as the process to mitigate the risk for each hazard identified, as shown in Figure 1.



HIGH RISK – The risk proposal is unacceptable, cannot be applied until the hazard is mitigated and the risk reduced to a medium or low level.

MEDIUM RISK – The risk proposal is acceptable. It may be implemented, but follow-up and management are required.

LOW RISK – Acceptable, without restrictions or limitations. Hazards do not require active management, but must be documented.

Figure 1 – Risk Acceptance Criteria

SECOND PART

LHD FLOW ANALYSIS (SMS)

Application of the SMS Methodology to Risk Identification

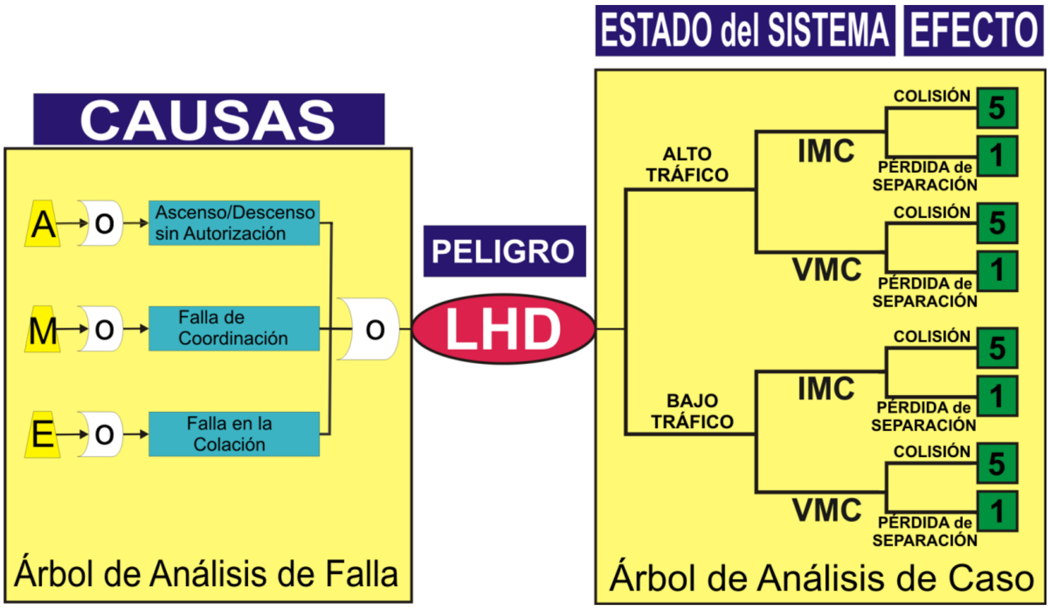


Figure 2 – LHD SMS Flow Analysis

CAUSES		CONDITION OF THE SYSTEM	EFFECT
Climb/descent with no clearance	HAZARD	High traffic	Loss of separation
			Collision Loss of separation
Coordination error		Low traffic	Collision Loss of separation
Readback error			Collision Loss of separation
Failure analysis tree		Case analysis tree	

In this example, the hazard identified is a large height deviation (LHD), the occurrences of which will be listed and coded by CARSAMMA.

Some of the causes of LHDs are identified on the left side of the previous figure. After coding, work starts with the GTE (teleconference). Figure 3 shows, to the right of the hazard, the condition of the system, initially identified as high or low traffic. This condition was later divided into adverse or non-adverse weather conditions.

Each of these conditions results in one of the effects described (mid-air collision or loss of separation). These effects are classified by severity, where 5 is a catastrophic event and 1 is an insignificant effect on safety. The worst case is when an LHD occurs in adverse weather, in both high or low traffic conditions.

Analysis by the GTE (teleconference)

a) The GTE Risk Management Team (teleconference) met to identify the hazards/causes (LHD code)/condition of the system. We are currently using the web-based **GO-TO-MEETING** tool with satisfactory results, in which the risks identified are analysed.

b) Accordingly, Table 1, Hazard Analysis, has been adopted, where fields 1 and 2 are the LHDs, field 3 is to be coded by CARSAMMA, fields 4, 5, and 6 will be the result of the GTE analysis (teleconference), and field 7 is unique to the State of the FIR involved. Field 8 is completed subsequently at the GTE meeting.

LHD N° (1)	**Description (2)**	**Causes LHD code (3)**	**Severity (4)**	**Probability (5)**	**Level of risk (6)**	**Mitigation measures (7)**	**Residual risk foreseen (8)**

Table 1 – Hazard analysis

LHD RISK ANALYSIS AND ASSESSMENT

Once the causes have been identified (LHD code) by CARSAMMA, the GTE must analyse the risk associated to each LHD code identified, assessing the severity and probability of occurrence. Each code must have an LHD severity associated to it, for example:

5	**4**	**3**	**2**	**1**
F	B, D, E, G, M, N	A, C, I, J, K, L	H	O, P

Table 2 – Severity/Codes

For the **Severity Analysis**, the experience of the GRSO/GTE team members is taken into account, using Table 3, Severity Analysis, as follows:

Effects	**Hazard Severity (LHD)**				
	Catastrophic 5	**Hazardous 4**	**Major 3**	**Minor 2**	**Insignificant 1**
ATC	Collision with an aircraft, terrain, or obstacle, TCAS alert (TA/RA)	Reduction of separation or total loss of ATC capability (zero ATC)	Significant reduction of separation or ATC capability	Slight reduction of ATC capability or significant increase of ATC workload	Slight increase of ATC workload

Table 3 – Severity analysis

After determining the severity, the **Probability** of occurrence of a hazard is defined, taking into account the worst-case scenario. Once again, based on the knowledge and experience of GRSO/GTE staff, the qualitative method for classifying probability must be applied, using the following table:

Probability	Level of ATC services/system	Operational
Frequent 5	Occurring constantly in the system	Expected to occur every 1-2 days
Occasional 4	Expected to occur frequently in the system	Expected to occur several times per month
Remote 3	Expected to occur several times throughout the life of the system	Occur about once every few months
Improbable 2	Improbable, but may be reasonably expected to occur during the life of the system	Expected to occur about once every 3 years
Extremely Improbable 1	Improbable but possible during the life of the system	Expected to occur at least once every 30 years

Table 5 - Probability

To this end, Table 6 below may be used, together with the risk value expression:

PROBABILITY	DURATION	SEVERITY
5 FREQUENT		5 CATASTROPHIC
4 PROBABLE		4 HAZARDOUS
3 OCCASIONAL	3 LONG (d > 6 min)	3 MAJOR
2 IMPROBABLE	2 MEDIUM (2 < d ≤ 6 min)	2 MINOR
1 EXTREMELY IMPROBABLE	1 SHORT (d ≤ 2 min)	1 INSIGNIFICANT

Table 6 – Analysis of parameters

VR = risk value

VR=(PxDxG)+R+W+T, where:

P = probability R=with/without ATS surveillance (with=5, without=10)
D =duration W = weather conditions (IMC=5 or VMC=0)
G =severity T = other traffic (0-10)

Once each LHD has been assigned a **VR** by the GTE, use Table 7 to classify the level of risk. And report the level of risk to the DGSO.

VR	LEVEL OF RISK	CONTROL
76-100	**HIGH**	Unacceptable risk, RVSM airspace must be cancelled until the hazard is mitigated and the risk reduced to a medium or low level
21-75	**MEDIUM**	Acceptable risk, but follow-up and management are mandatory.
01-20	**LOW**	Acceptable without restrictions or limitations, hazards do not require active management, but must be documented.

Table 7 – Level of risk

SUMMARY:

Responsibility	Issuance phase	Assessment phase	Analysis phase I	Mitigation phase	Analysis phase II
FIRs involved					
ICAO Office					
CARSAMMA					
TELECON team					
States and International Organisations					
GTE					

Notes:

1. The implementation of the Safety Management System is the responsibility of the States, and GTE/ CARSAMMA play the role of facilitators in this process.

2. The LHD-SMD will be sent to the ICAO Lima and Mexico Offices, and subsequently to each State (FIR) involved in the LHDs analysed for implementation of applicable mitigation measures.

To try the LHD (SMS) analysis methodology, CARSAMMA followed all the steps of this process in 2010 and 2011, the final result of which was a qualitative safety assessment of RVSM airspace.