SAM/IG/21

INTERNATIONAL CIVIL AVIATION ORGANIZATION
South American Office

Regional Project RLA/06/901

TWENTY FIRST WORKSHOP/MEETING OF THE SAM IMPLEMENTATION GROUP

(SAM/IG/21)

FINAL REPORT

Lima, Peru, 21 to 25 May 2018

INDEX

ii-1 PLACE AND DURATION OF THE MEETING

The Twenty First Workshop/Meeting of the SAM Implementation Group (SAM/IG/21) was held at the premises of the ICAO South American Regional Office in Lima, Peru, from 21 to 25 May 2018, under the auspices of Regional Project RLA/06/901.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Fabio Faizi Rahnemay Rabbani, Regional Director of the ICAO South American Office, Lima, greeted the participants for the continuous support provided to activities developed at regional scale by the South American Office, as well as 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. Likewise, he highlighted the achievements made by the SAM/IG group in its 10 years of existence, regarding the implementation of systems, services and procedures in the SAM Region.

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

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

Mr. Roque Diaz Estigarribia, delegate from Paraguay and Mr. Ivan de Leon, delegate from Panama, were elected as Chairman and Vice-Chairman of the Meeting.

Mr. Fernando Hermoza, RO/ATM/SAR acted as Secretary assisted by Mr. Roberto Sosa, RO/ANS/SFTY and Mr. Onofrio Smarrelli, CNS Consultant.

In addition, the Secretariat counted with the support of Mr. Julio Pereira of PBN group and Mr. Jorge Merino of Automation and Situational Awareness group.

ii-4 WORKING LANGUAGES

The working language of the Meeting was Spanish.

ii-5 AGENDA

The following agenda was adopted:

Agenda Item 1: Follow-up to conclusions and decisions adopted by SAM/IG meetings and presentation of air navigation results at a global, interregional and intraregional level

Agenda Item 2: Optimization of the SAM airspace

a) PBN regional implementation progress
b) Actions to standardize the longitudinal separations of *en-route* aircraft
c) Coordination of the SAM route network - Version 4
d) ATS contingency plans progress

Agenda Item 3: Implementation of Air Traffic Flow Management (ATFM) and improvement of procedures for coordination between agencies.

Agenda Item 4: Assessment of operational requirements to determine the implementation of improvements in communications, navigation and surveillance (CNS) capabilities for operations in route and terminal area

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

Agenda Item 6: Other business

ii-6 **ATTENDANCE**

The Meeting was attended by 59 participants of 10 States of the SAM Region (Argentina, Bolivia, Brazil, Chile, Ecuador, Panama, Paraguay, Peru, Uruguay and Venezuela), as Observer 1 State from CAR Region (United States), 1 International Organization (IATA) and 4 Observers from the aeronautical industry (AIREON, ATECH, IACIT and SITA). The list of participants is shown in page iii-1.

ii-7 **LIST OF CONCLUSIONS [1]**

No.	Title of the Conclusion	Page
Conclusion SAM/IG/21-1	REGIONAL AND INTERREGIONAL HARMONISED PBN IMPLEMENTATION GOALS	2-4
Conclusion SAM/IG/21-2	CONSOLIDATION OF THE IMPLEMENTATION OF 40NM LONGITUDINAL SEPARATION MINIMA BETWEEN ADJACENT FIRs IN THE SAM REGION AND PROMOTION OF THE ACTION PLAN FOR THE IMPLEMENTATION OF A 20NM SEPARATION	2-5

[1] The Conclusions are presented in the format requested by the Air Navigation Commission (ANC) through Study Note 8993 (6/11/2015) Progress report of the ad hoc working group in the PIRG and RASG reports (item No. 20036).

LISTA DE PARTICIPANTES / LIST OF PARTICIPANTS

ARGENTINA
1. Jorge Roberto Cornelio
2. Julia Edith Alegre
3. Mario Cristian Correa
4. María Estela Leban

BOLIVIA
5. Jaime Yuri Álvarez
6. Walter Olivera

BRASIL / BRAZIL
7. José Carneiro Afonso
8. Murilo Albuquerque Loureiro
9. José Izidro Apolinário
10. James Souza Short
11. Juares Franklin Gouvea
12. Eduardo Cardim Neves
13. Rochelly De Miranda Correa

CHILE
14. Alfonso De La Vega
15. Lucio López

ECUADOR
16. Miguel Ángel Miranda
17. Juan Francisco Soto

PANAMÁ
18. Iván De León
19. Gilda Espinosa

PARAGUAY
20. Roque Díaz Estigarribia
21. Liz Portillo Castellanos
22. Tomás Yentzch
23. Sindulfo Ibarrola
24. Víctor Morán
25. Alejandro Amarilla

PERÚ
26. Jorge Merino Rodríguez
27. Raúl Anastacio Granda
28. Guillermo Belevan
29. Mario Matos
30. Federico Vasquez
31. Juan Pablo Portilla
32. Dante Samaniego Bilbao
33. César Rebaza Benites
34. Sara Siles La Rosa
35. Sady Beaumont Valdez.
36. Joel Cordero Sanchez
37. Libio Benites Condori
38. Diana Montoya Castro
39. Brenda Céspedes Rojas
40. Giuliano Guzman Vera

URUGUAY
41. Pedro Cardeillac
42. Gabriel Falco
43. Ricardo Clavijo
44. Rosana Barú

VENEZUELA
45. Rafael E. Briceño
46. Omar E. Linares

AIREON
47. Ana Blanco-Persiani
48. Francisco Almeida da Silva

ATECH
49. Walter Nogueira Pizzo
50. Cristian Seiji Gushi

FAA
51. Leandro Friedman
52. Raúl G. Chong

IACIT
53. Luiz Antonio Castro

IATA
54. Julio de Souza Pereira
55. Mariela Valdés Piña (LATAM)

SITA
56. Mansour Rezaei Mazinani

OACI / ICAO
57. Fernando Hermoza
58. Roberto Sosa
59. Onofrio Smarrelli

Agenda Item1: Follow-up to conclusions and decisions adopted by SAM/IG meetings and presentation of air navigation results at a global, interregional and intraregional level

1.1 Under this agenda item, the following papers were analysed:

a) WP/02 – *Follow-up to valid conclusions formulated by SAM/IG meetings and pending activities* (presented by the Secretariat);
b) WP/03 – *Results of the GREPECAS/18 meeting* (presented by the Secretariat);
c) WP/04 – *Follow-up to the work of the GREPECAS Scrutiny working group* (presented by the Secretariat);
d) IP/05 – *Follow-up to GREPECAS aerodrome project activities* (presented by the Secretariat); and
e) IP/07 - *Draft GREPECAS Project on airport planning for the SAM Region* (presented by the Secretariat).

Conclusions and decisions formulated by SAM/IG meetings

1.2 The Meeting reviewed the conclusions and decisions still valid, as well as the activities pending from the workshops/meetings of the SAM Implementation Group (SAM/IG), as shown in **Appendix A** to this agenda item. The list of conclusions and activities include:

a) tasks to be performed and/or the corresponding conclusion in the area concerned;
b) specific tasks leading to accomplishment of the main task;
c) results expected from each task;
d) completion dates;
e) parties responsible for implementation;
f) members supporting the task; and
g) status of implementation of the task, and, if needed for better understanding, an explanatory comment on the status of implementation.

1.3 Likewise, the Meeting completed the table shown in **Appendix B** to this agenda item, containing the tasks to be performed by the States for the purpose of their follow-up.

Results of the GREPECAS/18 meeting

1.4 The Meeting took note of the results of the Eighteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/18) held in Punta Cana, Dominican Republic, in April 2018, which reviewed, *inter alia,* the regional air navigation planning and implementation performance framework, and the programmes and projects, including the projects under the PBN and ATFM Programmes for the SAM and CAR Regions.

1.5 The GREPECAS/18 meeting was presented with high-level information on the transition plan being developed by ICAO for feedback by the Regions, and both Regions were requested to consider the transition from RNAV to RNP nomenclature in the regional plans and to make sure that sufficient time is assigned to this task for successful implementation of the new charts.

1.6 The Meeting took note of the working paper presented at GREPECAS/18 on cyber security and cyber resilience, including the agreements reached at the Cyber Security Workshop held in

Montego Bay, Jamaica, in March 2018, whereby State authorities were requested to become aware of this issue, and to assign the necessary resources to personnel training at all levels of civil aviation, establish cyber security incident response teams (CSIRT) for civil aviation, and develop procedures, based on national criteria, to be implemented by cyber security emergency response teams (CSERT), in order to address and counteract potential attacks against civil aviation.

1.7 The Meeting was informed of the discussions concerning Volume III of the CAR/SAM ANP, and took note that, regarding Volume III of the electronic regional air navigation plan (e-ANP), ICAO recommended a performance-based approach for proper selection and implementation of ASBU. Furthermore, it was noted that there were two performance-based plans that were not harmonised, one for the NAM/CAR Regions and the other for the SAM Region. In this regard, it was recalled that Decision PPRC/4-3 postponed the issuance of Volume III of the e-ANP in order to align it to the Sixth Edition of the GANP, to be released in 2019, and which would describe performance-based implementation in more detail.

1.8 Finally, the Meeting was informed that GREPECAS/18 had highlighted that the commitments assumed under the Declaration of Bogota and the Declaration of Port-of-Spain had been an effective element of integration and commitment towards air navigation implementation in the CAR and SAM Regions, without forgetting that these Declarations had to be seen as a political guide signed by the States in consensus. An appeal was made to continue working towards a harmonised implementation within a new project management scheme, emphasising the identification of State and regional requirements.

Follow-up to the work of the GREPECAS Scrutiny Working Group

1.9 The Meeting took note that since the implementation of reduced vertical separation (RVSM), the Scrutiny Working Group (GTE), together with the Caribbean and South American Monitoring Agency (CARSAMMA), had been continuously monitoring the performance of the system. The assessments made by CARSAMMA using the CRM methodology showed that operations in RVSM airspace remained within the acceptable level of safety, as shown in Appendix 1 to WP/04 of this Meeting.

1.10 The Meeting was informed that the analysis of LHD occurrences has shown a continuing trend of 94% of events attributable to coordination errors between adjacent ATC units. Although an average 13% downward trend had been observed in the total number of occurrences in the last two years, States/international organisations still needed to take concrete action to mitigate these occurrences definitively, including the implementation of AIDC and RADAR data sharing. Statistical data showed that those FIRs that had implemented AIDC and RADAR data sharing had reduced the number of LHDs practically to zero.

1.11 In the SAM Region, the Bogota, Barranquilla, Guayaquil and Lima FIRs accounted for more than 50% of occurrences in this Region. It is important to note that the analysis of causes leading to LHDs revealed that flight plan duplication in ATS systems had resulted in aircraft being coordinated on one route and the aircraft entering the airspace on a different route. Likewise, concern was expressed over the delay of States/international organisations in sending LHD reports.

1.12 Finally, the Meeting took note that the GTE had expressed concern over the number of State aircraft operations in RVSM airspace that inserted the letter W in box 10, without being RVSM-approved, instead of inserting STS in box 18, which identified them as State aircraft. Furthermore, non-RVSM aircraft continued to operate in said airspace, which was a latent hazard that needed to be mitigated.

Follow-up to GREPECAS AGA project activities

1.13 The Meeting took note of the changes to Aerodrome Programme F proposed and approved at the GREPECAS/18 meeting through Decision GREPECAS18/18, as a result of joint efforts made by CAR/SAM Programme coordinators to reassess the strategy of Programme F projects, in order to achieve the proposed objectives based on the CAR/SAM Regional Planning and Implementation Group (GREPECAS) methodology, including support offered by the United States and *Airports Council International – Latin America – Caribbean* (ACI-LAC), pursuant to *Conclusion PPRC/4-5*.

Proposed project on airport planning for the SAM Region

1.14 The Meeting took note of the information presented at GREPECAS/18 on the work being carried out on a new project proposed under Aerodrome Programme F for analysing and validating possible root cause(s) of aerodrome capacity limitations in the SAM Region derived from increased airspace capacity, traffic growth and failure to deploy specific infrastructure. The new project was also aimed at proposing a plan with recommendations to States on how to establish mechanisms for assessing and monitoring capacity/demand based on data and a collaborative approach among all stakeholders, and draft national airport plans aimed at the establishment of a high-level approach to support and guiding the development and updating of master plans for local airports, taking into account State and regional needs.

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
3. Implementation of Performance Based Navigation (PBN) in the SAM Region							
3-31	**Conclusion SAM/IG/14-6 Projects and/or action plans for PBN redesign of the main South American TMAs** That SAM States: a) send the **Project and/or Action Plans for PBN redesign of the main TMA(s)** selected by their Administration, in order to complete the SAM PBN Project that is contained in **Appendix J** to this part of the Report, to the SAM Regional Office by 31 December 2014; b) send the corresponding updates to the aforementioned Project and/or Plans to the SAM Regional Office as soon as possible, so as to ensure harmonisation of activities under the SAM PBN Project.	Determination of the selected air spaces to be optimized with the implementation of PBN	Inform selected airspace for its redesign or optimization Report updates	SAM/IG/18	STATES	RO/ATM	**VALID** ARG, BOL, PAN, PER, URU and VEN need to update their plans and define execution.
4. Standards and procedures for performance based navigation operations approval							
4-12	**Conclusion SAM/IG/14-9 Aircraft and operator PBN capacity database** That the ICAO SAM Office send to SAM States information on the use of the aircraft and operator PBN capacity database, requesting that the aforementioned database be completed by 15 March 2015.	Complete the implementation of the capacity of aircraft and operators PBN database; and circulate a letter to States requesting to complete the data.	a) Application accessible from web b) Data base updated	SAM/IG/18	RO/TC	RO/FLS	**VALID** Application developed. At present under reviewed by ICAO HQ in order to be included in iSTARS.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5- ATFM implementation							
5-11	**Conclusion SAM/IG/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 teleconferences	Coordination between FMU/FMP carried out.	Permanent	States	RO/ATM	**VALID** Chile, Panama, Paraguay, Peru and Venezuela, will start tests on November 2017 in CADENA-CANSO ATFM teleconferences. Argentina and Brazil are already participating. Results will be reported on the 2018 ATFM Workshop.
5-24	**Conclusion SAM/IG/14-10 ATFM preparatory activities** That SAM States do their utmost to: a) increase the number of ATFM-trained personnel to the extent required to fulfil ATFM functions; and b) provide ATFM training to their personnel through national courses conducted by instructors trained in courses provided within the framework of Project RLA/06/901, with a view to multiplying training.	Establish the minimum staff to provide the ATFM system Deliver at national level the ATFM training courses	Sufficient human resources Trained national staff	SAM/IG/18	STATES	RO/ATM	**VALID paragraph (b)** Task described in paragraph (a) is finalized
5-26	**Conclusion SAM/IG/15-4: Reduction of the longitudinal separation between aircraft in the SAM airspace** That, taking into account the operational benefits to be gained from reducing the longitudinal separation of aircraft in the SAM airspace, States: a) investigate the possibility of reducing the						**REPLACED** **REPLACED BY CONCLUSION SAMIG/21-02**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	longitudinal separation of aircraft at 40 NM between adjacent FIRs using the Mach number technique; b) their application be included in the Letters of Operational Agreement; and c) the Secretariat include this implementation in the GREPECAS ATFM Project and its Action Plan.						
5-27	**Conclusion SAM/IG/19-1: Application of flow management initiatives (TMIs) in situations that Temporarily affect ATS capacity in a designated Airspace or airport used by international aviation** That SAM States make utmost efforts to: a) Strengthen the functions of Flow Management Positions (FMPs) or Units (FMUs) with resources and trained personnel empowered to coordinate with ATS services the application of ATFM initiatives (TMIs) in situations that generate air traffic capacity/demand imbalances caused by scheduled or unforeseen events; b) Issue instructions and/or directives that ensure that any ATFM initiative (TMI) to be coordinated is taken from ICAO Doc 9971, using the least restrictive methods available to minimise the impact on international flights, in coordination with ATFM units or those replacing them in adjacent SAM States; c) Refrain from using NOTAMs to establish flow	a) Strengthen the functions of Flow Management Positions (FMPs) or Units (FMUs); b) Issue instructions and/or directives that ensure that any ATFM initiative (TMI) to be coordinated is taken from ICAO Doc 9971; c) Refrain from using NOTAMs to establish flow control measures; and d) Submit the actions carried out for implementation to the SAM/IG/20,	FMP/FMU units equipped with manuals, procedures and personnel.	SAM/IG/22	STATES	RO/ATM	**VALID**

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	control measures, with the only exception when they are required as part of ATS mitigation actions for a period not to exceed twenty-four (24) hours, during which period NOTAMs should be replaced with ATFM initiatives generated and agreed by FMPs/FMUs, and which should be managed through ATFM messages; and d) Submit the actions carried out in accordance with the paragraphs above to the ATFM workshop/meeting and the SAM/IG/20 meeting, scheduled for the second semester of 2017.						
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							
6-25	**Conclusion SAM/IG/18/02: Nomination and registration of SAM candidates for EUROCONTROL AMC** That SAM States that have installed AMHS systems and have not yet registered, by nominated candidates for external operators of the Eurocontrol ATS messaging management centre (AMC) do so as soon as possible by submitting to the ICAO South American Office the names of the nominees, so that the States may keep an updated version of the adopted AMHS addresses for all AMHS users worldwide.	Registry of external operators to AMC EUROCONROL	External operators nominated by States from SAM Region that are registered	December 2017	States	RO/CNS	**VALID** To date, the following States have not registered external operators to AMC: Bolivia, Chile, Guyana, French Guyana, Suriname and Uruguay.

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							
7-14	**Conclusion SAM/IG/15-07 - Activities to migrate from the AIDC pre-operational to the operational phase between ACCs Colombia, Ecuador and Peru** That, Colombia, Ecuador and Peru carry out the activities referred to in paragraph 5.12 of this agenda item for the migration from the AIDC pre-operational phase to the operational, between the ACC Bogota and the ACC Guayaquil, the ACC Bogota with the ACC Lima and the ACC Lima with the ACC Guayaquil, in order to begin with the operational phase on 3 August 2015.	Migration phase from the AIDC pre-operational between ACC Lima – ACC Guayaquil ACC Lima – ACC Bogota ACC Bogota - ACC Guayaquil	AIDC pre-operational phase	3 August 2015	Concerned States: Colombia Ecuador Peru	Secretariat ICAO	**VALID** On 3 August 2015, the AIDC between ACC Lima and ACC Guayaquil started on pre operational phase. Operational phase began on 31 March 2016 and was interrupted in July 2016 returning to pre-operational phase- Pending operational phase between Lima ACC-Bogota ACC and Guayaquil ACC – Bogota ACC which are in pre-operational phase since August 2015.
7-15	**Conclusion SAM/IG/15-08 - Provision of facilities for the staff in charge of the operational implementation of the AIDC by the aeronautical authorities of the States** That the Aeronautical Authorities of the SAM Region States involved in the implementation of the AIDC systems interconnection, in order to comply with the requirements of the Bogota Declaration in this regard, provide the necessary facilities for the staff designated for the implementation of this activity, especially the focal points, could carry out the work within the time specified in the schedules of activities listed in Appendix C of this agenda item.	Provision of facilities for the staff in charge of the operational implementation of the AIDC by the aeronautical authorities of the States	Facilities for the staff in charge of the operational implementation of the AIDC by the aeronautical authorities of the States	December 2016	States	Secretariat ICAO	**VALID** The lack of support to the AIDC focal points in the implementation process, by the aeronautical authorities is still evident.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
7-17	**Conclusion SAM/IG/18-3: Designation of ADS B focal points** That, in order to coordinate regional ADS B planning and implementation activities in the SAM Region, the States designate focal points and send the information to the ICAO South American Office no later than 30 December 2016**.**	Designate ADS B focal points	ADS B nominated focal points	30 December 2016	States	RO/CNS	**VALID** To date, the following States have designated focal points: Argentina, Bolivia, Brazil, Chile, Colombia, Uruguay and Venezuela.
7-18	**Conclusion SAMIG/19-02: Implementation of procedures to mitigate the duplication/multiplicity of scheduled commercial flight plans** In order to implement procedures to mitigate the duplication/multiplicity of scheduled commercial flight plans, the States: a) should establish AFTN address XXXXZPZX, corresponding to the ARO/AIS Offices, as the only address for receiving flight plans. b) could use as a reference the AIC model developed by Peru, shown in Appendix G to this agenda item, when filing the flight plan directly to the ACC FDP	a) establish AFTN address XXXXZPZX as the only address for receiving flight plans. b) Elaboration of AIC	Only address implemented AIC elaborated	December 2018	States	RO/CNS and RO/ATM	**VALID** To date, only Peru has implemented the procedure. Brazil, Ecuador and Venezuela has begun the procedure.
8. Follow up to conclusions and decisions adopted by SAM/IG meetings, results of the thirty-eighth session of the ICAO Assembly (A38) and thirteenth meeting of Civil Aviation Authorities of the SAM Region (RAAC/13) and progress made in the development of the new electronic Air Navigation Plan (e-ANP)							
8-1	**Conclusion SAM/IG/13-1 Alignment of the national air navigation plans with the ICAO Global Air Navigation Plan (GANP) and SAM Performance-Based Air Navigation Implementation Plan (PBIP)**	Amend the air navigation national plans to have them aligned with the new ICAO Global Air Navigation Plan.	National air navigation plans aligned with ASBU	SAM/IG/16	States	ICAO SAM Office	**VALID** Brazil, Chile, Colombia, France and Venezuela have reported the completion of their national plans aligned with the ASBU.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	That SAM States amend their national air navigation plans, with the aim of aligning them with the new ICAO Global Air Navigation Plan (GANP, 4th Edition) and SAM Performance-Based Air Navigation Implementation Plan (PBIP) approved at the thirteenth meeting of Civil Aviation Authorities of the SAM Region (RAAC/13), and present any progress made in October 2014, at SAM/IG/14 meeting.						The PNAI of Chile is presented as a reference document of the SAMIG/21 Meeting.
8-3	**Conclusion SAM/IG/13-3: Designation of a national focal point for the drafting of the new regional e-ANP** That, with the aim that SAM States can coordinate with the ICAO SAM Regional Office the provision of the data necessary for the drafting of the new regional electronic air navigation plan (e-ANP): a) The ICAQ SAM Regional Office will send a State letter in early June 2014, requesting the nomination of a national focal point; and b) SAM States will officially inform by 1 August 2014 the name of the designated focal point, and provide a brief resumé, telephone number and electronic mail of the incumbent.	Designate focal points	Focal point	1 Aug 2014	States	RO/ATM	**VALID** Secretariat sent letter SA280 on 12 June 2014. Information of Panama, and Suriname is still pending.

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
Conclusion SAM/IG/13-1 – Alignment of the national air navigation plans with the ICAO Global Air Navigation Plan (GANP) and SAM Performance-Based Air Navigation Implementation Plan (PBIP) That SAM States amend their national air navigation plans, with the aim of aligning them with the new ICAO Global Air Navigation Plan (GANP, 4th Edition) and SAM Performance-Based Air Navigation Implementation Plan (PBIP) approved at the thirteenth meeting of Civil Aviation Authorities of the SAM Region (RAAC/13), and present any progress made in October 2014, at SAM/IG/14 meeting.	O/G	O/G	YES	YES	YES	O/G	YES	NO	O/G	O/G	O/G	NO	O/G	YES	Peru foresees completion by August 2018. Orientation was provided by the Secretariat to Suriname to carry out activities Note: The States must take a reference from the Global Air Navigation Plan (GANP, 5th Edition) and the Performance Based Air Navigation System Implementation Plan for the SAM Region (ISPS) version 1.5 approved at the Thirteenth Meeting of Aviation Authorities Civil (RAAC / 15)
Conclusion SAM/IG/13-3 – Designation of a national focal point for the drafting of the new regional e-ANP That, with the aim that SAM States can coordinate with the ICAO SAM Regional Office the provision of the data necessary for the drafting of the new regional electronic air navigation plan (e-ANP): a) The ICAO SAM Regional Office will send a State letter in early June 2014, requesting the nomination of a national focal point; and SAM States will officially inform by 1 August 2014 the name of the	YES	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	Pending information from Guyana and Panama

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
designated focal point, and provide a brief resumé, telephone number and electronic mail of the incumbent.															
Conclusion SAM/IG/13-9 **IATA safety events indicators for SAM States** Encourage States to develop, jointly with operators, Secretariat and other ATM community stakeholders deemed relevant, the methodology allowing the use of the data on safety events and indicators registered by airlines through IATA, in order to identify and mitigate any potential risk to operations, setting goals, priority areas and action plan.	**YES**	NO	**YES**	**YES**		**YES**	**YES**		NO	**NO**	NO			**YES**	
Conclusion SAM/IG/14-9 **Aircraft and operator PBN capacity database** That the ICAO SAM Office send to SAM States information on the use of the aircraft and operator PBN capacity database, requesting that the aforementioned database be completed by 15 March 2015.															The Secretariat coordinated (August 2017) with ICAO HQ in Montreal so that personnel of iSTAR develop a PBN capacity database. On this respect iSTAR personnel paid a one-month mission to ICAO SAM Office to begin the activity which continues in progress. The application will allow States to fill remotely and keep the database updated.
Conclusion SAM/IG/14-10 **ATFM preparatory activities** That SAM States do their utmost to: a) increase the number of ATFM-trained personnel to the extent required to fulfil ATFM functions; and	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**			**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	Paragraph a) concluded Paragraph b) **VALID**

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
b) provide ATFM training to their personnel through national courses conducted by instructors trained in courses provided within the framework of Project RLA/06/901, with a view to multiplying training.	**YES**	**YES**	**YES**	**YES**						**YES**	**YES**	**NO**	**YES**	**YES**	
Conclusion SAM/IG/14-13 - AMHS interconnection trial procedures That SAM States, when conducting AMHS interconnection trials, use as a reference the list of procedures aligned with the SAM AMHS interconnection guide shown in **Appendix B** to this agenda item.	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**O/G**	**YES**	**YES**	**YES**	**YES**	**YES**	Procedure implemented.
Conclusion SAM/IG/14-17 - Updating of FASID Table CNS4 That SAM States send to the Secretariat at the ICAO SAM Office the updated FASID Table CNS4 by 15 December 2014.	**YES**	**NO**	**O/G**	**YES**	**YES**	**YES**	**NO**	**NO**	**YES**	**YES**	**YES**	**NO**	**YES**	**YES**	FASID Table CNS4 information is at present the CAR/SAM 5 Table CNS II from eANP Volume II
Conclusion SAM IG/14-18 - Exception in the insertion of alternate aerodromes **That:** a) Airlines operating to the United States that will apply exceptions to the insertion of the alternate aerodrome, insert "ZZZZ" in box 16 of the FPL and specify ALTN//NIL in box 18. b) States include such procedures in the respective AIPs.	**b)YES**	**b)O/G**	**YES**	**b)NO**	**b)O/G**	**b)O/G**	**b)O/G**	**b)O/G**	**b)O/G**	**b)O/G**	**b)YES**	**b)O/G**	**b)O/G**	**b)NO**	The recommendation of the AIDC / 4 NAM / CAR / SAM Meeting of April 2018, also promotes the implementation of the exception. LAR 121.2585 of the SRVSOP and ANX 6 of ICAO stipulate the exception of filling the ALTN DEST Argentina is publishing the application in its AIP, as reported in SAMIG / 21.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Conclusion SAM/IG/15-07 - Activities to migrate from the AIDC pre-operational to the operational phase between ACCs Colombia, Ecuador and Peru That, Colombia, Ecuador and Peru carry out the activities referred to in paragraph 5.12 of this agenda item for the migration from the AIDC pre-operational phase to the operational, between the ACC Bogota and the ACC Guayaquil, the ACC Bogota with the ACC Lima and the ACC Lima with the ACC Guayaquil, in order to begin with the operational phase on 3 August 2015.	**N/A**	**N/A**	**N/A**	**N/A**	**O/G**	**O/G**	**N/A**	**N/A**	**O/G**	**N/A**	**O/G**	**N/A**	**N/A**	**O/G**	**VALID** AIDC in pre-operational phase remains
Conclusion SAM/IG/15-08: Provision of facilities for the staff in charge of the operational implementation of the AIDC by the aeronautical authorities of the States That the Aeronautical Authorities of the SAM Region States involved in the implementation of the AIDC systems interconnection, in order to comply with the requirements of the Bogota Declaration in this regard, provide the necessary facilities for the staff designated for the implementation of this activity, especially the focal points, could carry out the work within the time specified in the schedules of activities listed in Appendix C of this agenda item.	**O/G**	**N/A**	**O/G**	**O/G**	**O/G**	**O/G**	**N/A**	**N/A**	**O/G**	**O/G**	**O/G**	**N/A**	**O/G**	**O/G**	**VALID**

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
Conclusion SAM/IG/16-01: Model amendment to the letter of operational agreement on AIDC between two centres That SAM States, when implementing AIDC between adjacent ATS units, make the corresponding amendments to the letters of operational agreement using as a model the amendment to the letter of operational agreement between the Lima ACC and the Guayaquil ACC for the operation of AIDC, shown in Appendix A to this agenda item.	**O/G**	**N/A**	**O/G**	**O/G**	**YES**	**YES**	**O/G**	**NA**	**YES**	**O/G**	**YES**	**N/A**	**O/G**	**NA**	At present, the model amendment to the letter of operational agreement on AIDC is being used by Colombia, Ecuador, Panama and Peru The remaining States will use it when amend their operational letters of agreement to include AIDC.
Conclusion SAM/IG/18-01: PANS-OPS recommendations for harmonising instrument procedures in the SAM Region That SAM States implement and apply, as soon as possible, the recommendations of the PANS-OPS group, shown in Appendix B to this part of the report, with a view to harmonizing instrument procedures and the associated processes, and enhance safety.	**O/G**	**O/G**	**O/G**	**O/G**		**O/G**			**O/G**	**O/G**			**O/G**	**YES**	The States report about the application of SAM/IG/19 Conclusions Objectives of conclusions are being achieved. Follow-up is being made on SAM/IG/19 Table. Table was updated during SAMIG/21
Conclusion SAM/IG/18/02: Nomination and registration of SAM candidates for EUROCONTROL AMC That SAM States that have installed AMHS systems and have not yet registered, by nominated candidates for external operators of the Eurocontrol ATS messaging management centre (AMC) do so as soon as possible by submitting to the ICAO South American Office the names of the nominees, so that the States may keep an updated version of the adopted AMHS addresses for all AMHS users worldwide.	**YES**	**YES**	**YES**	**O/G**	**YES**	**YES**	**N/A**	**NO**	**YES**	**YES**	**YES**	**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/18/03: Designation of ADS B focal points That, in order to coordinate regional ADS B planning and implementation activities in the SAM Region, the States designate focal points and send the information to the ICAO South American Office no later than 30 December 2016.	YES	YES	YES	YES	YES	NO	NO	NO	YES	NO	NO	NO	YES	YES	
Conclusion SAM/IG/19-1: Application of flow management initiatives (TMIs) in situations that Temporarily affect ATS capacity in a designated Airspace or airport used by international aviation That SAM States make utmost efforts to: a) Strengthen the functions of Flow Management Positions (FMPs) or Units (FMUs) with resources and trained personnel empowered to coordinate with ATS services the application of ATFM initiatives (TMIs) in situations that generate air traffic capacity/demand imbalances caused by scheduled or unforeseen events; b) Issue instructions and/or directives that ensure that any ATFM initiative (TMI) to be coordinated is taken from ICAO Doc 9971, using the least restrictive methods available to minimise the impact on international flights, in coordination with ATFM units or those replacing them in adjacent SAM States; c) Refrain from using NOTAMs to establish flow control measures, with the only exception when they are required as part of ATS mitigation actions for a period not to exceed twenty-four (24)	YES	NO	YES	YES	O/G	O/G	NO	NO	O/G	YES	YES	NO	YES	YES	Argentina implemented the FMU in Ezeiza on May 2018. Pending FMP/FMU implementation in Bolivia, French Guiana, Guyana and Suriname. Pending information from Colombia and Ecuador.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
hours, during which period NOTAMs should be replaced with ATFM initiatives generated and agreed by FMPs/FMUs, and which should be managed through ATFM messages; and d) Submit the actions carried out in accordance with the paragraphs above to the ATFM workshop/meeting and the SAM/IG/20 meeting, scheduled for the second semester of 2017.															
Conclusion SAMIG/19-02 –Implementation of procedures to mitigate the duplication/multiplicity of scheduled commercial flight plans **Implementation of procedures to mitigate the duplication/multiplicity of scheduled commercial flight plans** In order to implement procedures to mitigate the duplication/multiplicity of scheduled commercial flight plans, the States: a) should establish AFTN address XXXXZPZX, corresponding to the ARO/AIS Offices, as the only address for receiving flight plans. b) could use as a reference the AIC model developed by Peru, shown in Appendix G to this agenda item, when filing the flight plan directly to the ACC FDP.	**a) O/G b) O/G**	**NO**	**a)O/G b)O/G**	**a)O/G b)O/G**	**a)O/G b)O/G**	**a)O/G b)O/G**	**NO**	**NO**	**a)O/G b)O/G**	**a)O/G b)O/G**	**a)YES b)YES**	**NO**	**a)O/G b)O/G**	**a)O/G b)O/G**	

Agenda Item 2: Optimisation of SAM airspace

a) Progress made in regional PBN implementation
b) Actions to standardise longitudinal separation of aircraft en route
c) Coordination of the SAM route network – Version 4
d) Progress made in ATS contingency plans

2.1 Under this agenda item, the following papers were analysed:

a) WP/05 – *GREPECAS PBN project update* (presented by the Secretariat);
b) WP/06 – *Follow-up to PBN implementation* (presented by the Secretariat);
c) WP/07 – *Coordination of the SAM route network – Version 4* (presented by the Secretariat);
d) WP/08 – *PBN approach charts – Transition from RNAV to RPN* (presented by the Secretariat);
e) WP/15 – *Advisory circular on flight procedure design* (presented by Uruguay);
f) WP/16 – *Actions to increase efficiency in en-route airspace in Argentina and measurement of its performance* (presented by Argentina).
g) WP/18 – *SAM ATS contingency plans* (presented by the Secretariat);
h) WP/23 – *Addressing outdated AIP obstacle charts of the SAM Region* (presented by the Secretariat on behalf of RASG-PA); and
i) NI/06 – *Plan de contingencia por ceniza volcánica de los servicios de navegación aérea del Uruguay* (presented by Uruguay).

2.2 The list of PBN points of contact of the regulator and the air navigation service provider (ANSP) for coordination and teleconferencing purposes was updated, as shown in **Appendix A** to this agenda item.

Progress made in regional PBN implementation

PBN en route; Coordination of the SAM route network – Version 4

2.3 Regarding the progress made in coordination activities since the ATSRO/8 meeting held in September 2017, a review was made of the set of 32 route optimisation proposals that had been defined following the teleconferences held with the States, and which included initiatives that required coordination with Colombia.

2.4 The Meeting reviewed the contents of **Appendix B** to this part of the report, noting that some initiatives required further definition of some details, such as the final acceptance of coordinates and the name of the FIR common boundary point being coordinated between States.

2.5 Likewise, there was consensus among the delegates regarding the possibility of publishing the optimised routes on AIRAC date 16 August 2018 effective 11 October 2018, and agreed that the ATSRO/9 meeting to be held on 16-20 July 2018 should seek to confirm the completion of tasks, resolve inconsistencies in the publications, and start Version 5 of the route network, which was being planned within the framework of the PBN project update.

2.6 Regarding the risk assessment for the proposed routes, as foreseen in the ATSRO Action Plan for Version 4, it focused on tasks to be performed by each State, with the assistance of the Secretariat, in accordance with paragraph 2.24 of ICAO Annex 11, since implementation represented an airspace modification that affected the ATS. The Secretariat informed that it would coordinate the assistance to the States and would provide as soon as possible a form to facilitate the aforementioned assessment, which should be presented at the ATSRO/9 meeting.

2.7 In order to provide more information for the safety assessment, it was noted that when ATSRO activities started in 2010, a Safety plan for the optimisation of routes in the SAM Region was developed and subsequently approved at the SAM/IG/6 meeting. The plan allowed for the elimination of situations with risk levels that were unacceptable for the implementation of optimised RNAV routes with navigation specification RNAV-5, and the formulation of the respective mitigation measures. This plan is available at:

https://www.icao.int/SAM/Documents/2010/SAMIG6/SAMIG6_INFORME%20FINAL%20rev3.pdf

PBN in TMAs

2.8 SAM States continued striving to meet the implementation dates specified in their Action plans for PBN redesign in selected TMAs. The status of planning is shown in **Appendix C** to this part of the report.

2.9 The second workshop on PANS-OPS design in the SAM Region (PANS-OPS/2) was held in Lima, Peru, on 18-22 September 2017. These events were part of the strategy for PBN implementation in the Region, and strengthened collaboration with design experts and airline pilots.

2.10 A Third PANS OPS workshop was tentatively scheduled for 27 August 2018, mainly to focus on the transition from RNAV to RNP charts, in accordance with ICAO Circular 353/AN/209 recently issued. The Meeting requested that already designated PBN contact points be tasked with coordinating subsequent steps. Argentina provided the Secretariat with information on the person in charge of its design department, who would be the contact on this issue. Detailed information on the transition from RNAV to RNP nomenclature is provided in WP/08 and its appendix.

2.11 Uruguay informed that it had issued an advisory circular using a circular of Peru as a reference, through which they were implementing oversight at their PANS OPS flight procedure design office in order to ensure, *inter alia,* the implementation of design processes and compliance with personnel competence and registration and documentary requirements. Details of the advisory circular of Uruguay are shown in WP/15.

2.12 The Meeting felt that the Third PANS OPS workshop should include an analysis of the regulatory framework required in several SAM States for the operation of flight procedure design (IFPD) units or organisations. The Secretariat took note of this request and would seek feedback from the meeting of experts on LAR 211 "Air traffic services" that started on 28 May 2018, which would review this matter.

2.13 **Appendix D** contains the table of the recommendations formulated by PANS-OPS/1, which was updated by the States based on their status of implementation.

2.14 Through WP/23, the Meeting took note of the results of a study conducted by IATA's RCG, which revealed that ICAO Obstacle Charts – Type A for various airports of the Region lacked accurate information or were outdated. The Meeting noted that this showed the need to bolster activities to keep approach charts current and to periodically review the designs based on data on obstacles around the airport. States were requested to analyse within their administrations, AIM offices, ATM planning bodies, and IFPD units, the need to take action to address this issue that constituted a safety issue.

GREPECAS PBN project update

2.15 The Meeting took note that GREPECAS/18 had emphasised the need for better coordination of efforts and projects between the CAR and SAM Regions, and, based on a recommendation of the Secretariat, had agreed that both groups (RASG-PA and GREPECAS) should implement a common and mutually recognised project management approach. Based on the guidance provided by GREPECAS/18, project management techniques should be applied to all CAR and SAM projects. Accordingly, the Meeting was presented with a proposal for updating the SAM PBN project, aimed at applying said management techniques and incorporating performance indicators.

2.16 The draft of the new project was based on the previous project, which had three main axes: the national PBN implementation plans, the implementation of route network versions, and PBN implementation at the main SAM TMAs, including SID/STAR routes as needed, based on the projects/action plans established by SAM States, and the lessons learned at PBN workshops delivered under the auspices of Project RLA 06/901.

2.17 In addition to the three aforementioned axes, the proposed draft project included the following enhancing elements (initiatives): Coordination between CAR and SAM projects, performance indicators, and longitudinal separation optimisation.

2.18 Regarding national PBN implementation plans, the model plan had been approved through Conclusion SAM/IG/14-5 adopted in November 2014. Given the time elapsed, it would be advisable for the Meeting to review the model plan shown in Appendix B to WP/05 in order to identify any changes that might be required. The new model should be used for submitting national PBN implementation plans to SAM/IG/22, including, if applicable, initial proposals for performance indicators.

2.19 In this regard, the Meeting agreed that national PBN plans should be aimed at identifying and addressing the actual needs of States, based on collaborative decisions with the users, and at defining implementation priorities. The value of these plans was stressed taking into account that several SAM States had not completed or updated their national air navigation plan (ANP), where the national PBN plan could represent the PBN chapter of the national ANP.

2.20 Chile stated that it had an air navigation plan, PNAI 2017 -2020, which could be used by SAM States as a reference, since it was aligned with the GANP, the ASBU modules and the SAM-PBIP. The aforementioned document can be found at:

https://www.icao.int/SAM/Documents/2018-SAMIG21/CHI%20PNAI_2017-2020_3ra_Edicion.pdf

2.21 The draft SAM PBN project included the holding of teleconferences to address PBN issues on the last Thursday of each month, starting on 28 June 2018. For CAR/SAM interregional coordination issues, teleconferences had been scheduled for the first Tuesday of each month.

2.22 The project also proposed to start assessing and applying performance indicators to measure progress in PBN implementation, based on concrete performance benefits (KPIs). To this end, Appendix C to WP/05 contained a preliminary proposal of IATA on possible performance indicators to be applied to the PBN project. The Meeting reviewed the indicators to analyse the degree of complexity in the acquisition of data required for their implementation. Accordingly, the Meeting established a task force with delegates of Argentina, Brazil, Paraguay and Peru to assist the Secretariat in the drafting of the KPIs.

2.23 Based on this preliminary assessment and the analysis conducted by the Meeting, the Secretariat and the project coordinator would submit a more concrete proposal to the SAM/IG/22 meeting, with the support of teleconferences with the members of the SAM/IG PBN section.

2.24 In view of the above, the Meeting formulated the following conclusion:

<table>
<tr><td colspan="2">CONCLUSION
SAM/IG/21-01 REGIONAL AND INTERREGIONAL HARMONISED PBN IMPLEMENTATION GOALS</td></tr>
<tr><td>That:

SAM States, organisations, users, and stakeholders double efforts to meet regional and interregional performance-based air navigation implementation goals, based on GREPECAS projects, and contemplating the strengthening of national PBN implementation plans so that they include performance indicators and the use of recognised project management tools and methods.</td><td>Expected impact:

☐ Political / Global

☒ Inter-regional

☒ Financial

☒ Environmental

☒ Technical/Operational</td></tr>
<tr><td colspan="2">Why: To complete the implementation of the GANP PBN components selected for the SAM Region, taking into account interoperability in the boundaries with the CAR Region.</td></tr>
<tr><td>When: Before 2021</td><td>Status: Adopted by SAM/IG/21</td></tr>
<tr><td colspan="2">Who: ☒ Coordinators ☒ States ☒ ICAO Secretariat ☐ ICAO HQ ☒ Other: Users/Industry</td></tr>
</table>

Note: ***Conclusions are presented in the format requested by the Air Navigation Commission (ANC) in working paper 8993 (6/11/2015) Progress report of the ad hoc working group in PIRG and RASG reports (item No. 20036).***

Actions to standardise longitudinal separation of aircraft en route

2.25 Appendix C to WP/06 shows the agreements (MOU/LOA) reached between adjacent FIRs of the SAM Region, as well as with adjacent FIRs of the CAR Region, for the implementation of a 40NM longitudinal separation, based on which the optimisation of the aforementioned separation was being monitored.

2.26 A workshop on longitudinal separation between aircraft was conducted on 6-10 November 2017, where an action plan was proposed to promote the reduction from 40NM to 20 NM, and the signing and effective implementation of letters of agreement between States was coordinated to consolidate the 40NM separation. The results of this workshop may be seen at:

https://www.icao.int/SAM/Pages/ES/MeetingsDocumentation_ES.aspx?m=2017-OPTSEPLONG

2.27 The Meeting considered that the implementation of a 40NM separation between FIRs in the SAM Region was nearly completed, with the exception of a few cases in FIR boundaries that had VHF communication issues. Likewise, Brazil had started the implementation of a 20NM separation for aircraft entering its FIRs. To date, this initiative had been effectively implemented between Colombia and Brazil.

2.28 In view of the foregoing, the Meeting formulated the following conclusion:

CONCLUSION SAM/IG/21-02	**CONSOLIDATION OF THE IMPLEMENTATION OF 40NM LONGITUDINAL SEPARATION MINIMA BETWEEN ADJACENT FIRs IN THE SAM REGION AND PROMOTION OF THE ACTION PLAN FOR THE IMPLEMENTATION OF A 20NM SEPARATION**
That: SAM States take action and apply procedures in the ACCs to consolidate the implementation of 40NM longitudinal separation minima and give priority to the execution of the action plan for the implementation of standard 20NM separation minima between adjacent FIRs in SAM continental airspace.	**Expected impact:** ☐ Political / Global ☒ Inter-regional ☒ Financial ☒ Environmental ☒ Technical/Operational
Why: To complete the implementation of 20NM longitudinal separation minima between adjacent FIRs to favour ATS airspace efficiency and capacity.	
When: Before SAM/IG/24	**Status:** Adopted by SAM/IG/21
Who: ☒ Coordinators ☒ States ☒ ICAO Secretariat ☐ ICAO HQ ☒ Other: Users/Industry	

Progress made in ATS contingency plans

2.29 Information was provided on the results of the Workshop/meeting on ATS contingency plans for the SAM Region (ATS/CONT/PLAN), held on 19-23 March 2018. The final report of the workshop/meeting is posted on:

https://www.icao.int/SAM/Documents/2018-ATS/ATSCONTPLAN_InformeFinal.pdf

2.30 The ATS/CONT/PLAN workshop/meeting recognised that there were currently no cases of severe degradation of ATS services or risks to air navigation in the FIRs of the SAM Region. It also considered that the SAM Region should be prepared to respond to various contingencies and decided to establish a Contingency Coordination Team for the South American Region (CCT-SAM) led by the Officers of the SAM Regional Office.

2.31 The Meeting took note that Argentina, Brazil, Chile, Colombia and Uruguay, in addition to representatives of IATA and IFALPA, had joined the CCT with the purpose of fostering the development and dissemination of regional guidance material on ATS contingencies and volcanic ash contingencies; supporting the development and implementation of the contingency plan on natural disasters and/or catastrophic events for the Region; and conducting periodic communication drills between the CCT and the States.

2.32 Uruguay presented information on its national plan, the VACP. Argentina informed that it had started the development of a plan on volcanic ash, using as a reference the plan of Uruguay. Ecuador noted that thermal sensors had been installed in its volcanoes to obtain early warnings of volcanological events.

Activities and resources needed for the execution of the Action Plan for SAM airspace optimisation with the support of Project RLA/06/901

Activities and resources approved with the support of Project RLA/06/901 for 2018

2.33 The eleventh meeting of the Coordination Committee of Project RLA/06/901 (RCC/11) approved activities to support SAM airspace optimisation in 2018, which had been scheduled/executed as follows:

- Meeting on ATS contingency plans and letters of operational agreement – Updating and harmonisation of contingency plans in accordance with ICAO Annex 11 and signing of ATS letters of agreement, held on 19-23 March 2018, as discussed in WP/18 of this Meeting.

- ATSRO/9 – Follow-up to the implementation of the SAM route network – Version 4 (final version).

- Third PANS-OPS implementation workshop – To continue harmonising and coordinating PBN instrument procedures, advanced RNP, and CDO/CCO in the SAM Region. It would impact the transition from RNAV to RNP charting.

- Development of draft Version 5 of the SAM route network – Deliverable: Document containing SAM route network – Version 5.

- SAM/IG/21 and SAM/IG/22 – All air navigation implementation priorities in order to continue with the activities for the implementation and execution of action plans.

Strategy for PBN implementation in the SAM Region

2.34 SAM/IG meetings promote a strategy for PBN implementation in TMA and en-route airspace, with the approval of various activities. These activities, such as aircraft separation workshops and the PANS-OPS workshop were included in the airspace optimisation work plan.

2.35 Taking into account that SAM/IG meetings would not be enough for such follow-up, it is advisable to participate in the monthly teleconferences. In summary, PBN implementation would be based on the following activities/events:

a) ATSRO/9 meeting, with activities for the follow-up and adjustment of the implementation of the ATS route network – Version 4.

b) Development of draft Version 5 of the ATS route network.

c) PBN implementation in TMAs - SAM/IG meetings and monthly teleconferences (last Thursday of each month).

d) Transition from RNAV to RNP charting and harmonisation and coordination of PBN instrument procedures in the SAM Region - PANS-OPS workshops.

e) Optimisation of longitudinal separation – multilateral and bilateral meetings.

f) Meetings to update ATS contingency plans and letters of agreement in such a way as to ensure safety and consolidate PBN implementations and improvements, and to guarantee their benefits.

g) Coordination and harmonisation of the route network and longitudinal separation between the CAR/SAM Regions - NAM/CAR/SAM interregional implementation meetings and teleconferences (first Tuesday of each month).

APPENDIX A / APÉNDICE A

LIST OF CONTACTS FOR OPERATIONAL PBN FOCAL POINTS

LISTA DE CONTACTOS PARA PUNTOS FOCALES PBN

State/ Estado	PBN FOCAL POINTS PUNTOS FOCALES PBN
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BOLIVIA* (Plurinational State of) / BOLIVIA (Estado Plurinacional de)	Luis Benjamín Rojas Santa Cruz Dirección General de Aeronáutica Civil (DGAC-BOLIVIA) Especialista Planificación de Espacios Aéreos y Procedimientos de Vuelo Tel.: +591 4 422 1696 Cel.: +591 7203 5429 E-mail: lrojas@dgac.gob.bo

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State/ Estado	PBN FOCAL POINTS PUNTOS FOCALES PBN
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State/ Estado	PBN FOCAL POINTS PUNTOS FOCALES PBN
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- *Updated SAM/IG/21 / Actualizados en la SAM/IG/21*

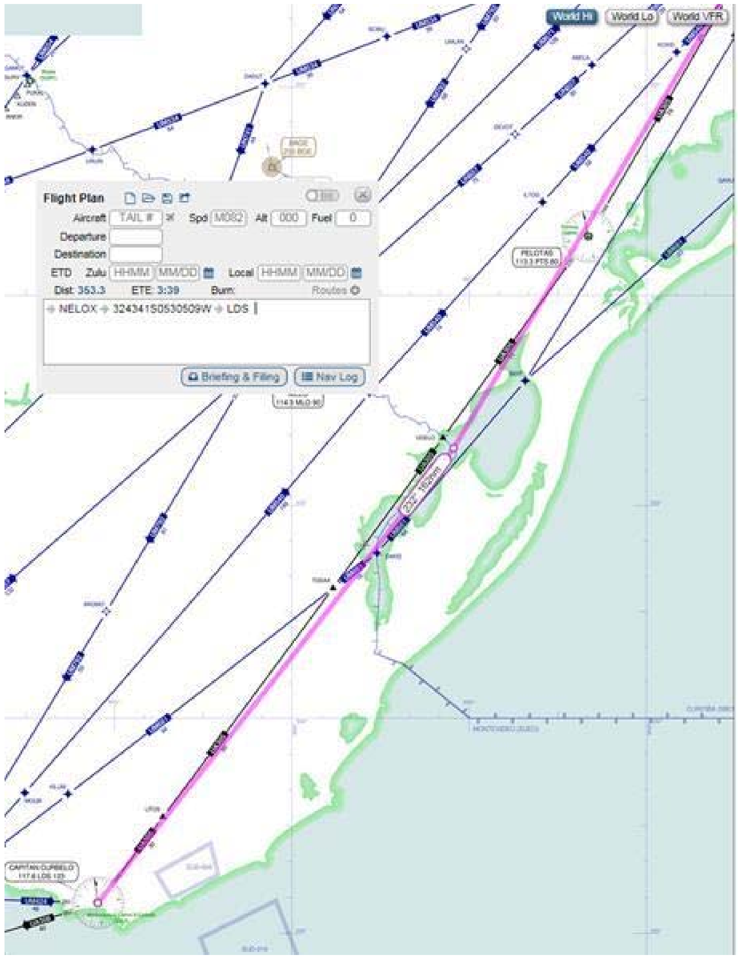
APPENDIX B

COORDINATION OF SAM ROUTES VERSION 04

RESULTS OF TELECONFERENCES ATS/RO 08

Updated 30 APRIL 2018

4-02 (~~UA305~~ – UM424 ->) ..see next UM661 (4-79)



States	*Description*	*Results*
Brazil Uruguay	UA305 eliminated between NELOX and LDS. RNAV UM xxx is created between NELOX and LDS. 0.4 NM. are being saved.	Uruguay through WP/07, would agree to extend the UM424 and from the NELOX position to LDS * Uruguay agrees publication in June. Brazil agrees on the extension from the NELOX position to LDS. Brazil proposes publication in June 2018. ACTIONS: NOTE. - SEE ALSO ROUTE 4-79 BRA-URU: DELETE UA305 BRA-URU: EXTEND UM424 NELOX TO LDS VOR BRA / URU: THE FIR LIMIT POINT SERIES TOLEP. AGREE COORDINATES. 324340.72S 0530509.40W BRA - URU AIP PUBLISH 16 AGO valid on 11 OCT <u>ACTIONS:</u> NOTE. - SEE ALSO ROUTE 4-79 BRA-URU: ELIMINATE UA305 BRA-URU: EXTEND UM424 NELOX A LDS VOR BRA/URU: THE FIR LIMIT POINT LIMITE WOULD BE **TOLEP**. AGREE COORDINATES. 324340.72S	0530509.40W BRA – URU AIP PUBLISH 16 AGO VALIDITY 11 OCT

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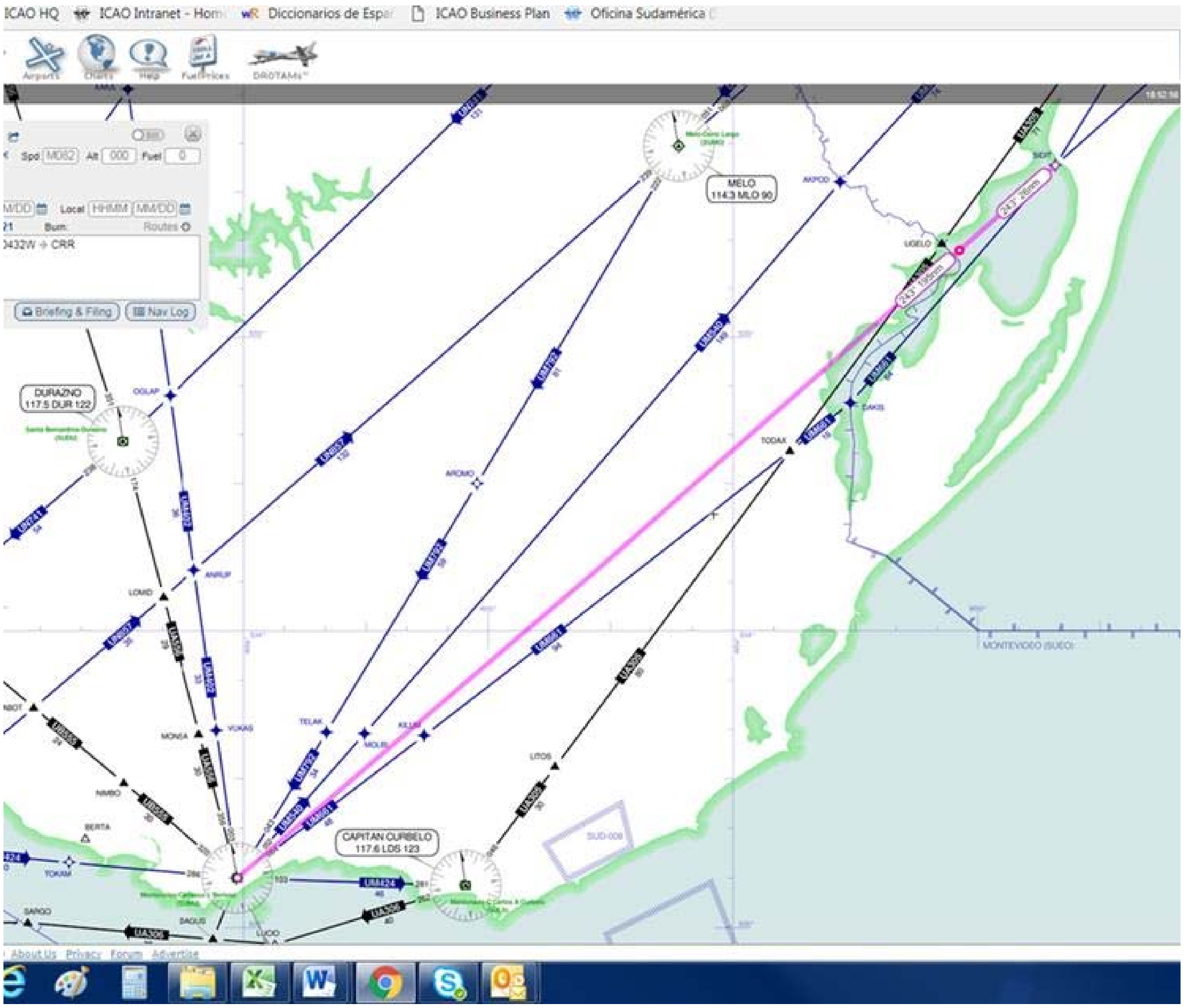
4-79 (<- UM 661 ->)



States	*Description*	*Results*
Brazil Uruguay	Realign UM661.	Brazil: Agree and offers publication date August 2018 with publication on October. Uruguay: Agree according to WP/07 and agree publication August 2018. NOTE. - SEE ALSO ROUTE 4-02 ACTIONS: BRA- URU: REALIGN DIRECT UM661 SIDIT –**TOLEP**- CRR BRA/URU: FIR LIMIT POINT WOULD BE TOLEP. AGREE COORDINATES.
		324340.72S | 0530509.40W BRA-URU AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

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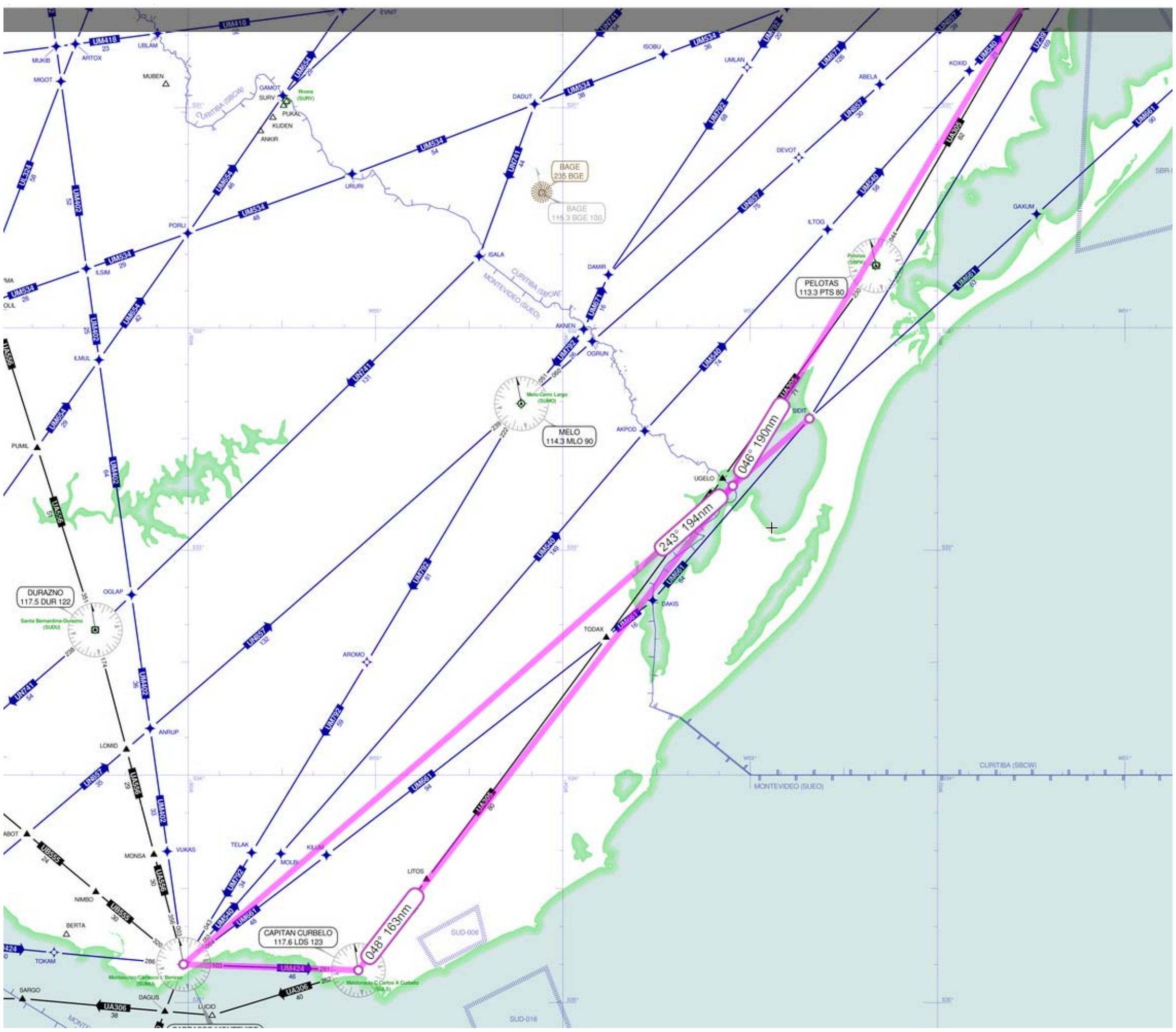
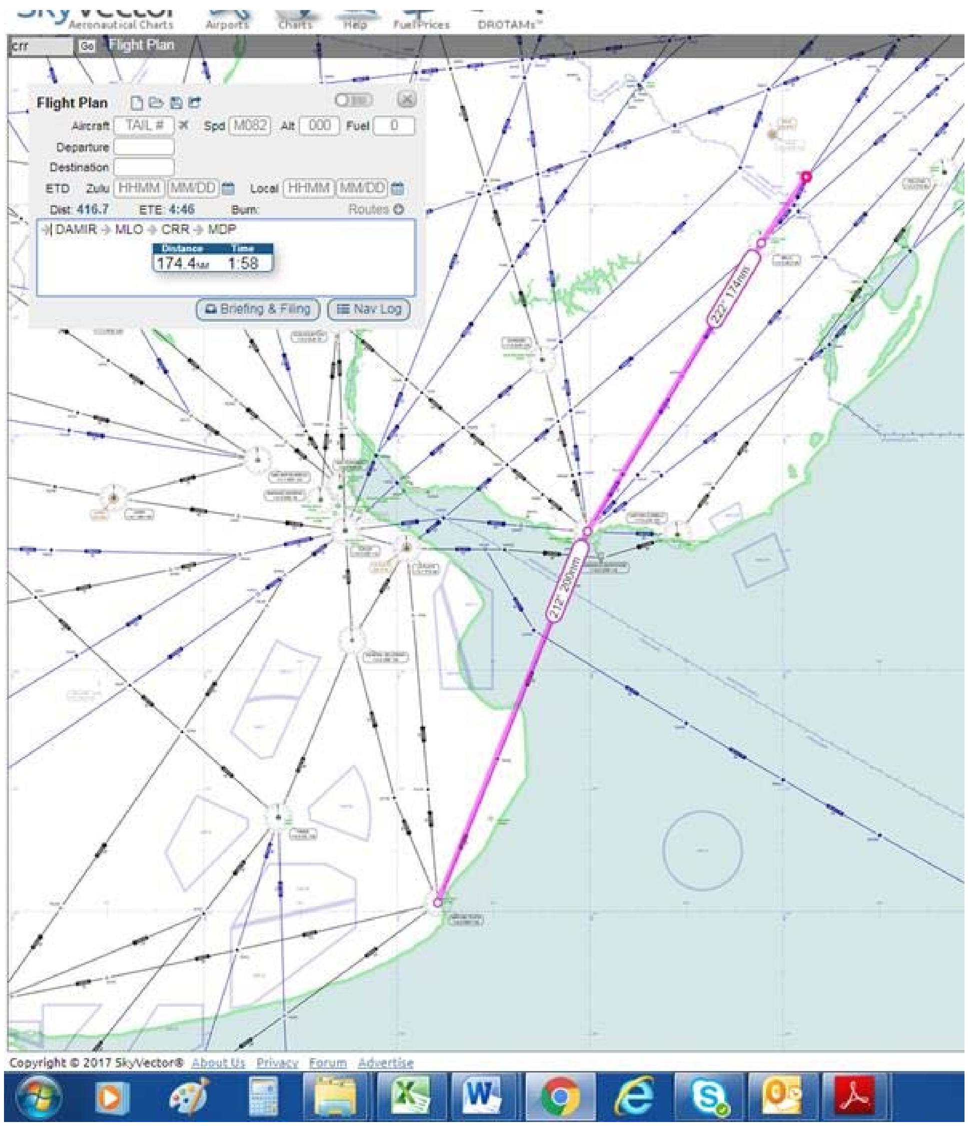
ADDITIONAL GRAPHIC UM 424 AND UM 661.



4-03 (~~UA310~~ - UM 792->)



States	Description	Results
Brazil Uruguay Argentina	ROUTE suppression UA310. Extender UM792.	Brazil: Implemented. It is proposed publication in April and June validity. Uruguay: Agree according to WP/07. Argentina: Agree. ACTIONS: BRA – URU: REALIGN UM792: DAMIR – LIMIT FIR – MELO. AGREE POINT 5LNC. URU – ARG: **EXTEND** UM792 CRR MDP URU – ARG: **ELIMINATE** UA310 CRR - MDP. BRA-ARG-URU AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

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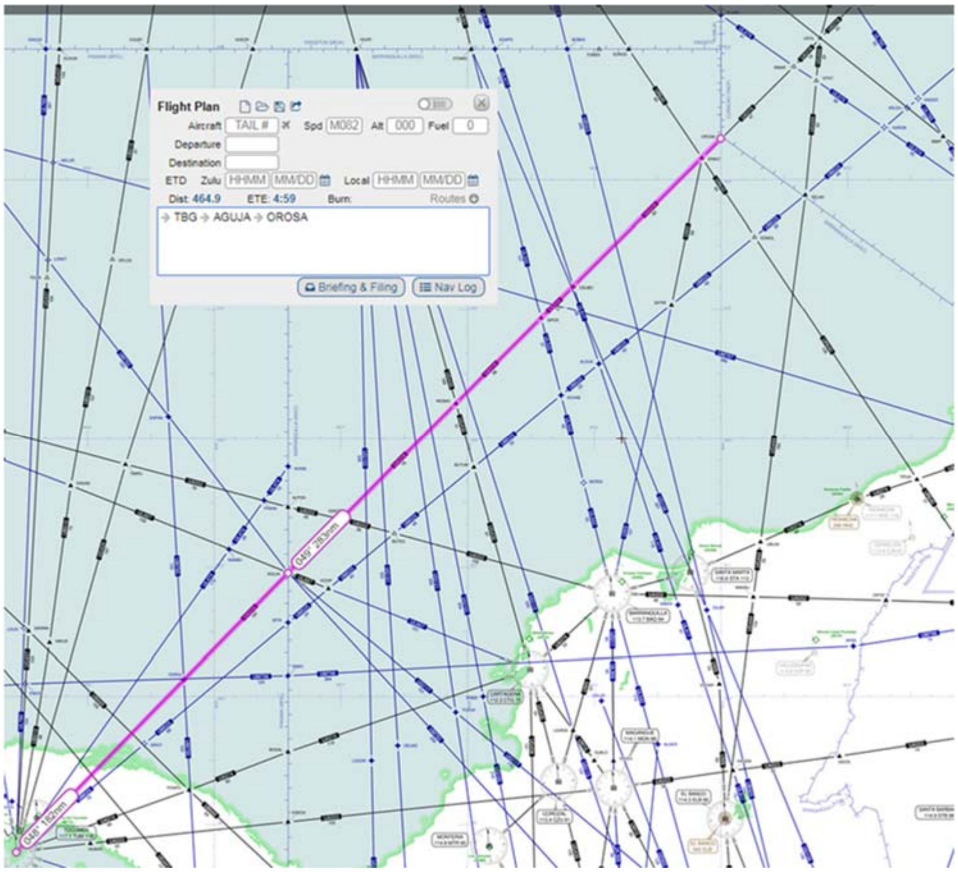
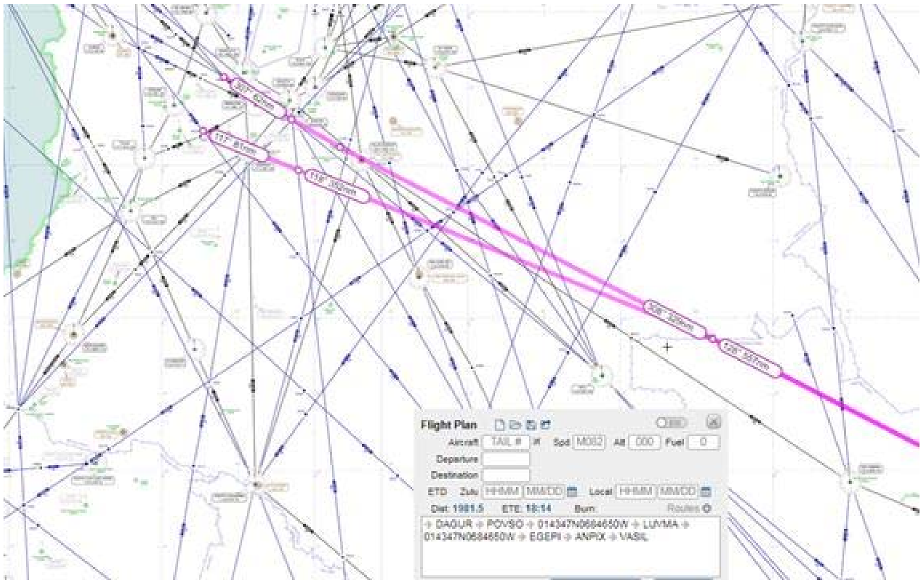
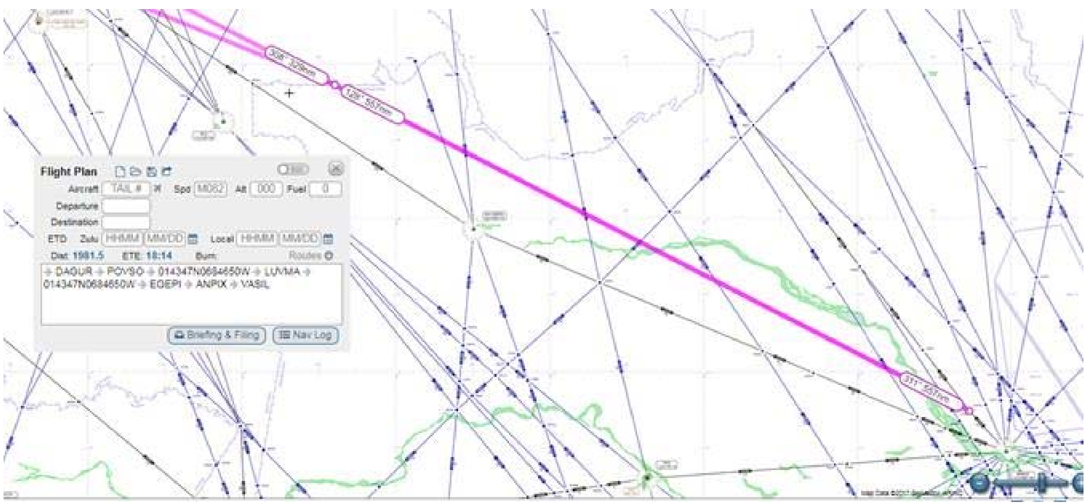
4-04 (~~UA319~~ – NEW UP407)



States	*Description*	*Results*
Panama **Colombia** **Curacao**	Eliminate route UA319 TABOGA (TBG) - BETIR. Create bidirectional RNAV route between TABOGA (TBG) - AGUJA - OROSA conserving previous trajectory and Coordinate with CAR Region the creation of the RNAV route section OROSA - PALAS.	Colombia accepts. Pending confirmation from Panama. In order to coordinate with Curacao and RD proposal is delivered to III PBN México. <u>ACTIONS:</u> RO SAM; Assign number new ROUTE UNnnn COL- PAN: ELIMINATE UA319 and publish new route. CURAZAO and R.D.: CONFIRM ROUTE between OROSA and PALAS **DEFINE IN JULY 2018, III PBN – MEXICO** **TBD PUBLICATION**
	DISCUSS ON MX III PBN	

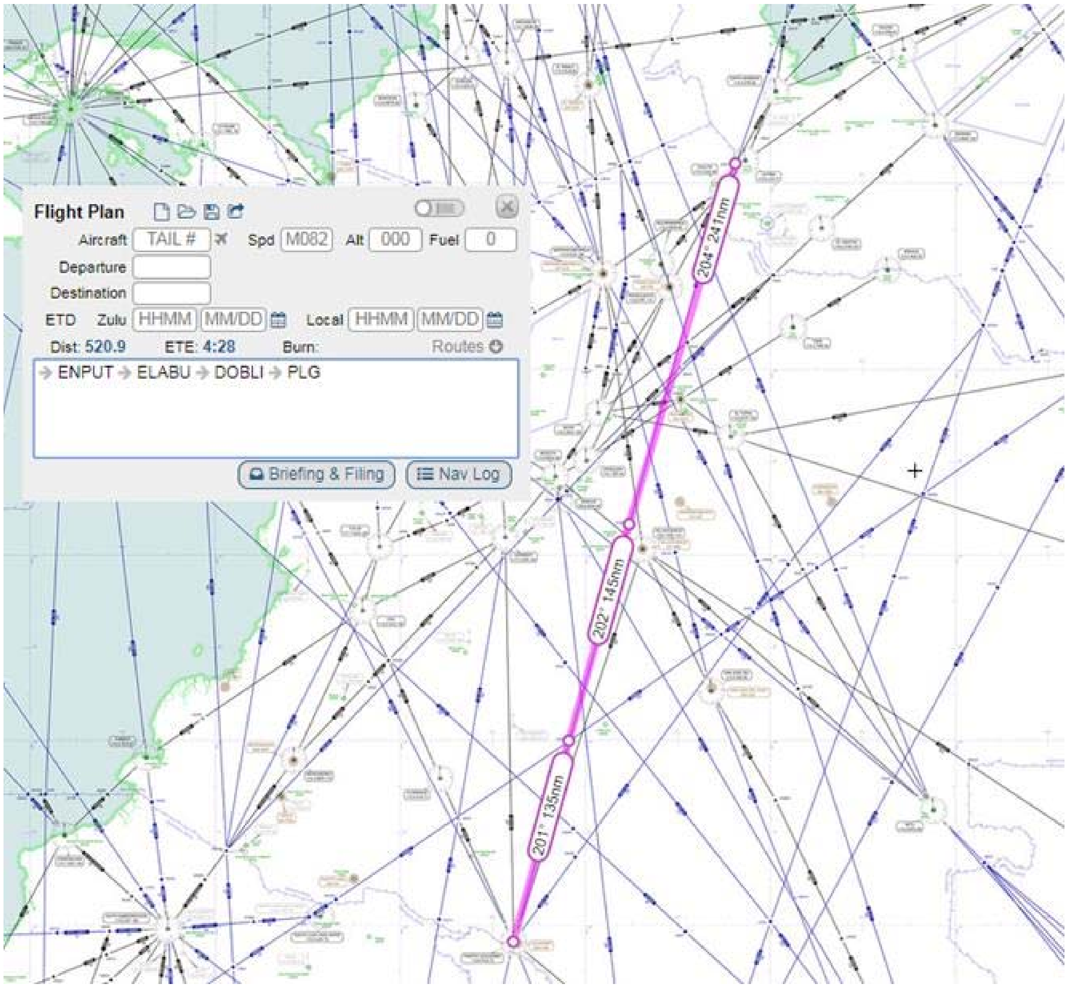
4-06 (~~UA323~~)





States	*Description*	*Results*
Panama **Colombia** **Brazil**	Eliminate route UA323 from TABOGA (TBG) to MANAUS (MNS). Extend route UL423 bidirectional) from AMBALEMA (ABL) - ANPIX – LUVMA – SIGEP – KOKBO – RECIFE (REC). Segment TABOGA (TBG) – ANPIX currently covered for route UM459.	Colombia makes a proposal, complemented by a domestic DAGUR - BRACO. Brazil accepted and also implements a domestic route MNS VOR - SGC VOR. Confirm x limit Panama ACTIONS: PAN – COL: AGREE FLOWS → ← BY DAKMO - →ARORO and RNG - TBG BRA – PAN- COL: Eliminate UA323 BRA – COL: AGREE BRACO 2 X NEW FIR POINT. BRAZIL CREATES DOMESTIC MANAOS – SAO GABRIEL. COLOMBIA CREATES ONE DOMESTIC DAGUR – POVSO – BRACO2 (N01 43 53 W 068 47 58) **TBD**

4-09 (UQ103 – UL342 ->) ……SEE ALSO 4-21



States	*Description*	*Results*
Colombia **Venezuela** **Curazao** **Dominican Republic**	Segment NOREX - MENE MAUROA (MAU) - ENPUT is currently eliminated. UL342 is currently implemented from PUNTA CANA (PNA) – KARUM – CHAVE – ENPUT. Pending coordination Colombia segment ENPUT – PUERTO LEGUIZAMO (PLG) and elimination of route UQ103. Peru accepts proposal.	COL ACCEPTS TO EXTEND UL 342 ENPUT – **ELABU** – DOBLI – PLG. See proposal 4-21. ELIMINATE UQ 103 BUT KEEP THEIR POINTS **ELABU** DOBLI ACTIONS: COL: ELIMINATE UQ 103 COL: EXTEND UL 342 from ENPUT-ELABU-DOBLI-PLG Publish together 4-09, 4-21, and 4-95 **COL: AIP PUBLISH TBD**

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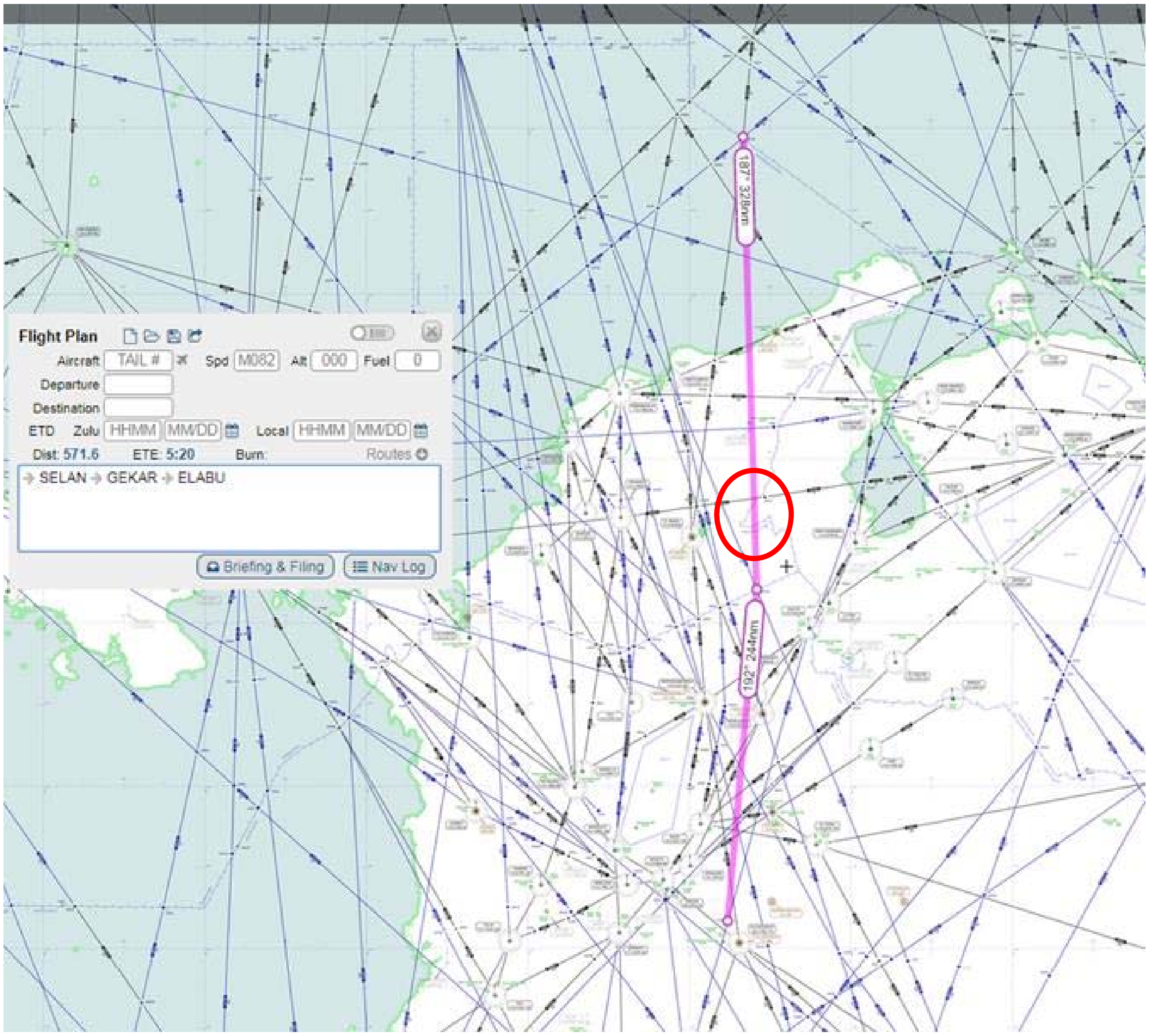
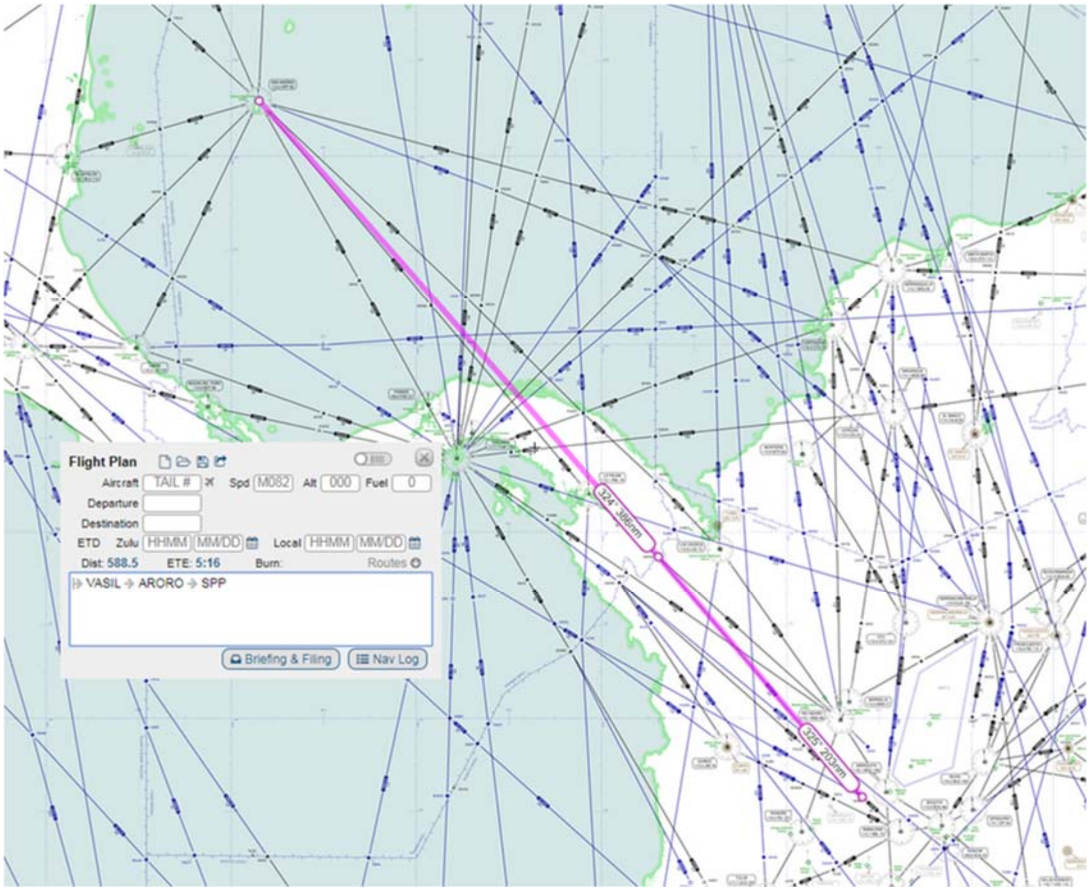
4-21 (NEW UN xxx) …SEE ALSO 4-09 and 4-95



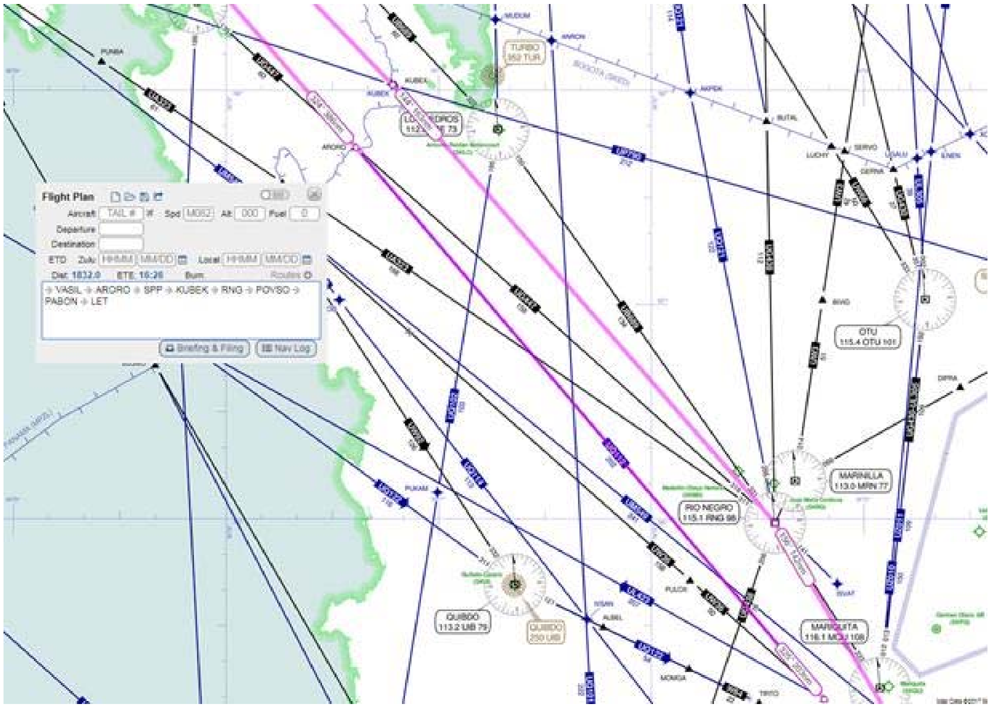
States	*Description*	*Results*
Curacao **Colombia** **+** **Venezuela**	Eliminate route UG444 segment LIDOL – PUERTO LEGUIZAMO. Create route RNAV segment LIDOL– BARRANCABERMEJA (EJA) – LOBUL - PUERTO LEGUIZAMO (PLG). >>>>>>>>>>> FIR MAIQUETIA not involved. Pending coordination CAR Region Segment LIDOL – FIR LIM – BARRANCABERMEJA (EJA). Pending coordination Colombia.	COL: NOT ACCEPT ELIMINATE UG4444. COL propose new segment: SELAN – GEKAR – ELABU. NOTE; In ELABU is integrated to proposal 4-09 / UL342. See proposal 4-95 / route UP549 TIM – TBG in **point SIDOS.** VEN; Cross 20 NM space of Maiquetia near the SIDOS. Possible delegation ATS ??. ACTIONS: COORDINTE WITH VENEZUELA south segment of SIDOS – 20NM in FIR Maiquetia (SEE CIRCLE) **TBD… PUBLISH together 4-09, 4-21 and 4-95**

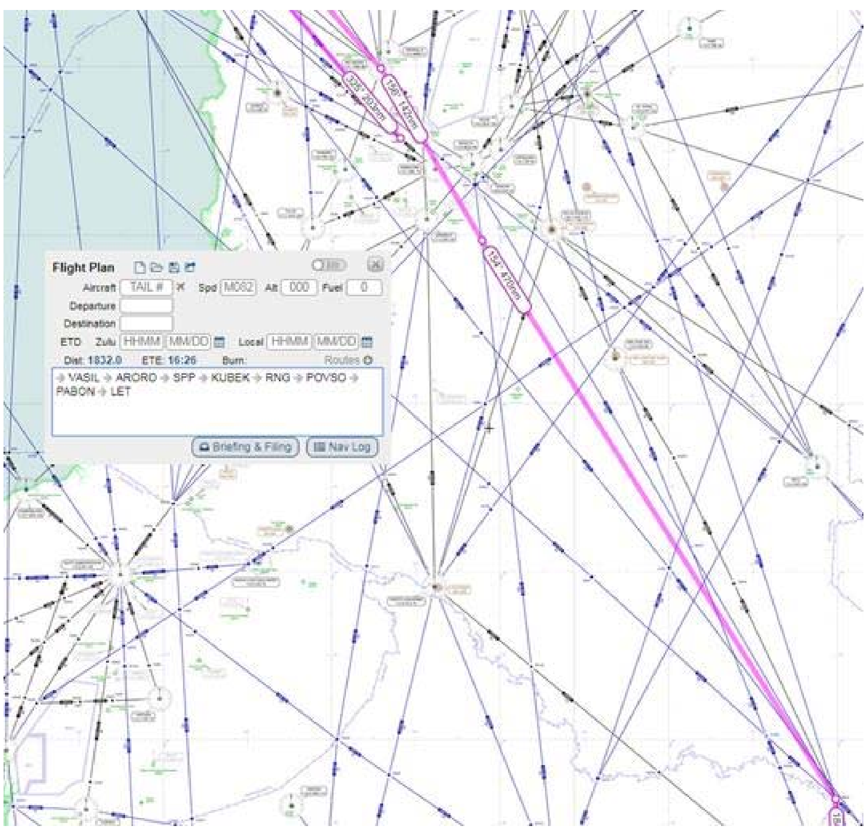
4-23 …..see also the 4-24



States	*Description*	*Results*
Panama Colombia	Eliminate route UG447 segment BOGOTA (BOG) – SAN ANDRÉS (SPP). Create RNAV route segment SAN ANDRÉS (SPP) – ARORO – VASIL. Eliminate domestic route UQ112 Segment ARORO – VASIL. >>>>>> Panama accepts the proposed SAN ANDRES (SPP) – ARORO. Pending coordination Colombia Segment ARORO – VASIL and Eliminate route UQ112.	1. COLOMBIA ACCEPTS ELIMINATE UG447 2. IT´S BEEN ACCEPTED TO CREATE REGIONAL ROUTE VASIL – ARORO – SPP (WITH ONE WAY DIRECTION SE - NW) 3. ELIMINATE RNAV LOCAL ROUTE UQ112. 4. REVIEW PROCS STAR OF SKSP WHICH CONNECT THE NEWA RNAV ROUTE THAT REPLACE UG447 TO SKSP. 5. COL WILL CREATE SID AND/OR FLOW FROM SKRG TO ARORO. ACTIONS: ALL; Coordinate with PANAMA Teleconf. One-way Routes ARORO →and ← DAKMO and KUBEK(¿?) RO SAM; Assign new RNAV route UN XXX **TBD**

4-24 (nueva UN XXX)

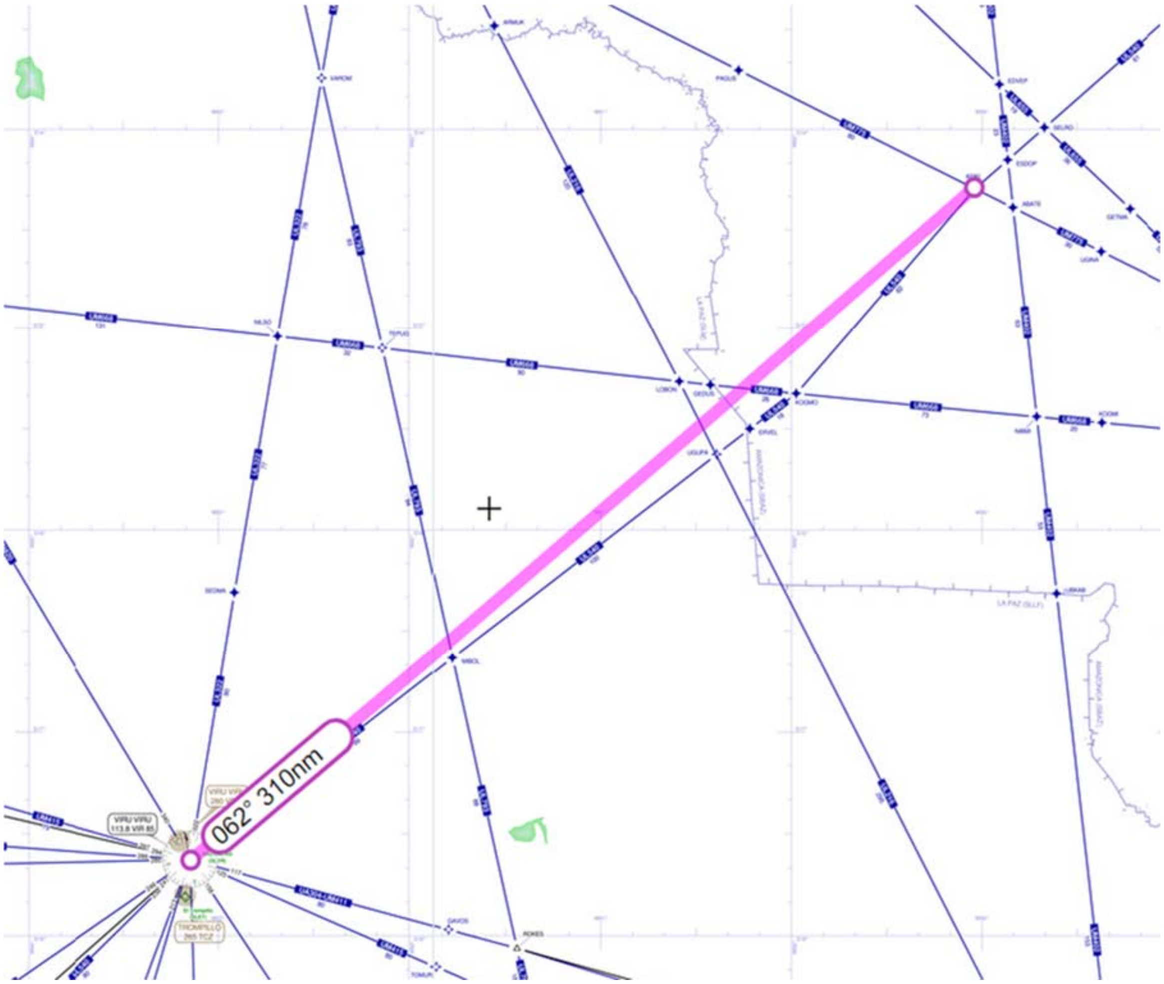




Continue…….

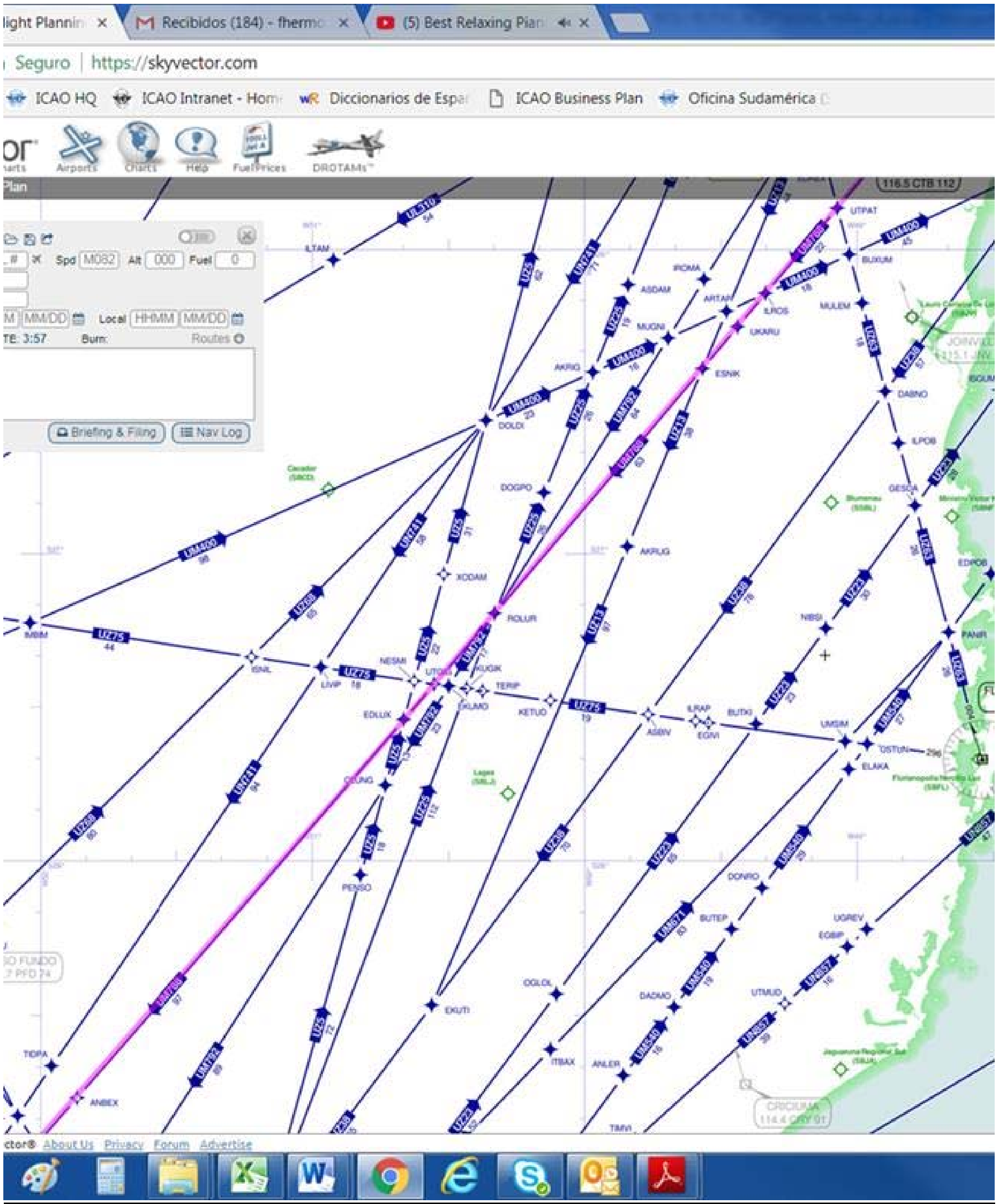
Continue…..		
States	*Description*	*Results*
Panama Colombia	Eliminate route UB689 segment SAN ANDRÉS (SPP) – LETICIA (LET). Create route RNAV segment SAN ANDRÉS (SPP) – RIO NEGRO (RNG) – MARIQUITA (MQU) – SOACHA (SOA) – MARTU. Eliminate domestic route UQ111 Segment SOACHA (SOA) – PABON. Panama accepts the proposal SAN ANDRÉS (SPP) – LIM FIR. Pending coordination Colombia segment LIM FIR – MARTU and eliminate route UQ112.	COLOMBIA: 1. ELIMINATE UB689 SPP – LET: SE ACCEPTS 2. ELIMINATE UQ111 (SOA – PABON): SE ACCEPTS 3. ROUTE RNAV SPP – KUBEK – RNG – **POVSO** (N03 56 20 W074 12 54 now in TMA BOGOTA) – PABON – LET IS PROPOSED ACTIONS: ALL; Coordinate with PANAMA Teleconf. One-way routes ARORO → and ← DAKMO and KUBEK (¿direction?) Note in the case of KUBEK also cross the UP 790. RO SAM; Assign new RNAV route UN XXX **TBD**

4-26 (<- UL540 ->)



States	*Description*	*Results*
Bolivia Brazil	Realign UL540.	Bolivia: Propose to realign UL540 between Viru Viru and ASIKI with a common point of transfer in the intersection of the UM668 (15°17’54.34’’; 060°15’01.7’’). Brazil: Agree with proposal of Bolivia. ACTIONS: BRA – URU: REALIGN UL540. CONFIRM LIMIT POINT **FIR XXXXX**. 15°17’54.34’’S; 060°15’01.7’’W BOL – BRA: AIP PUBLISH TBD
	COORDINATE IN SAMIG/21	

4-27 (~~UM788~~)



States	*Description*	*Results*
Brazil	Eliminate UM788.	Brazil: Will be eliminated - Publish April 2018. ACTIONS: ELIMINATE UM788. BRA: AIP PUBLISH **TBD**

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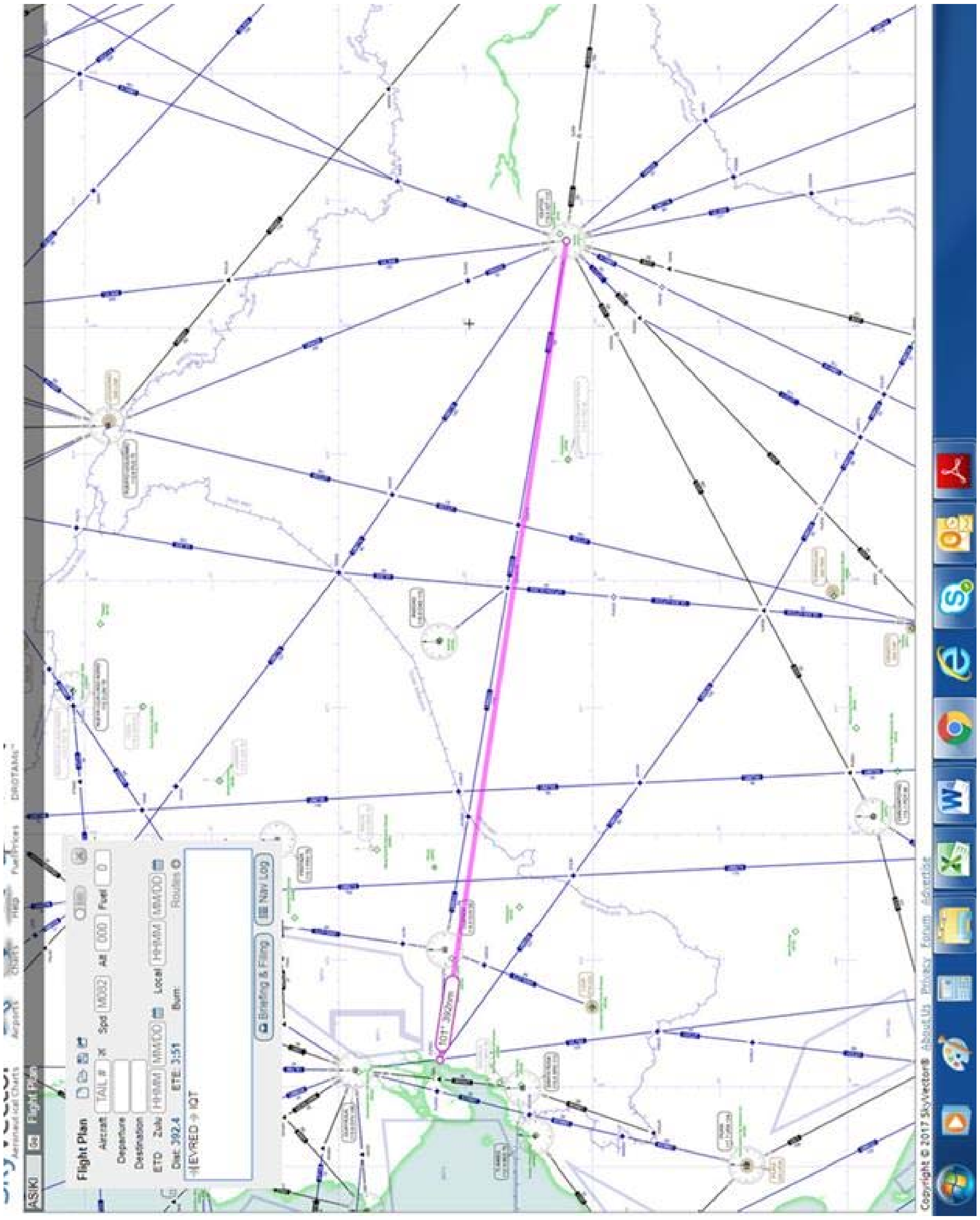
4-31 (<- UM 665 ->)		
		
States	*Description*	*Results*
Ecuador Peru	Realign route UM665 segment EVRED – IQUITOS (IQT).	Ecuador accepts the proposal Peru accepts the proposal. Pending creation of LIM FIR. ACTIONS: REALIGN UM665 LIMIT FIR AGREED **KUMET (**03 04 58.80S /077 56 12 W) PER - ECU: AIP PUBLISH TBD

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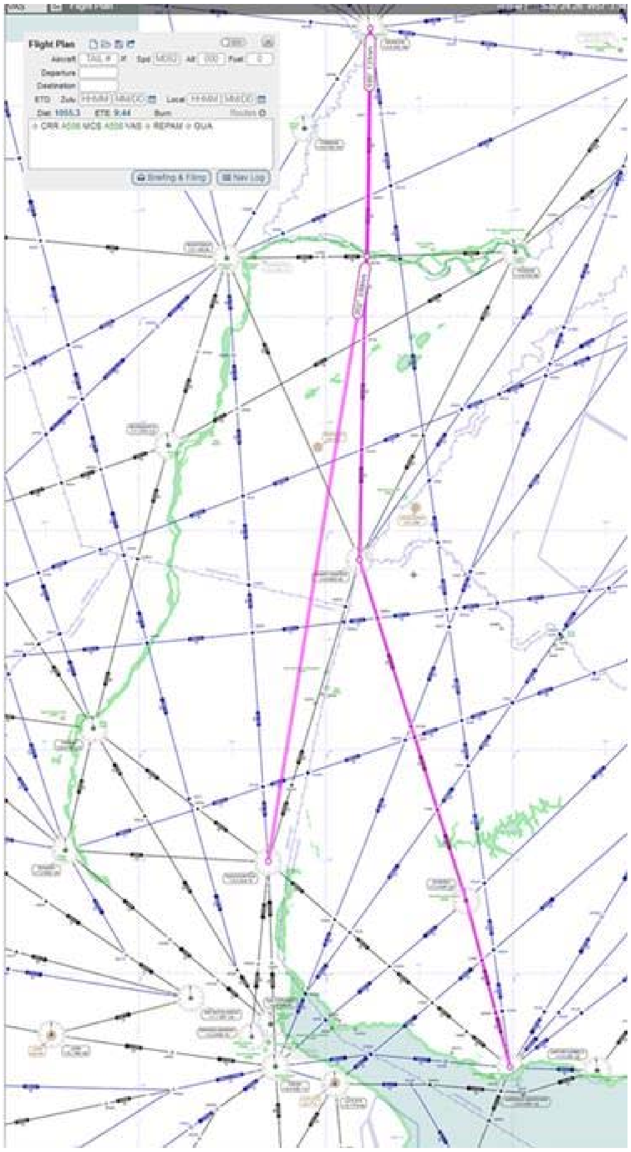
4-33 (~~UA556~~ - NEW UP526 – ~~UM402~~)		
		
States	*Description*	*Results*
Argentina, Paraguay Uruguay	Eliminate UA556.	Argentina: Propose to eliminate UA556 and create UMXXX from REPAM to GUA. Paraguay: Propose to eliminate the UA556 entirely and create a UMXXX. Propose publication date April enter to validation June. Uruguay: Propose to eliminate the UA556 entirely and create a new RNAV in the same direction. Propose date of publication April enter to validation June. ACTIONS: CONSIDER SAMIG20 REPORT 6.9, IN RESPECT TO ROUTE UM402
	COORDINATE SAMIG/21	ARGENTINA; EVALUATION SEGMENT REPAM - GUA VOR AND ARGENTINA ANALIZE ELIMINATION OF UM402 PARAGUAY WILL REVIEW FLIGHT STATISTIC FOR THIS PROPOSAL IATA; Inform that there are no operations in UM 402 south of VAS. **PUBLICATION T B D**

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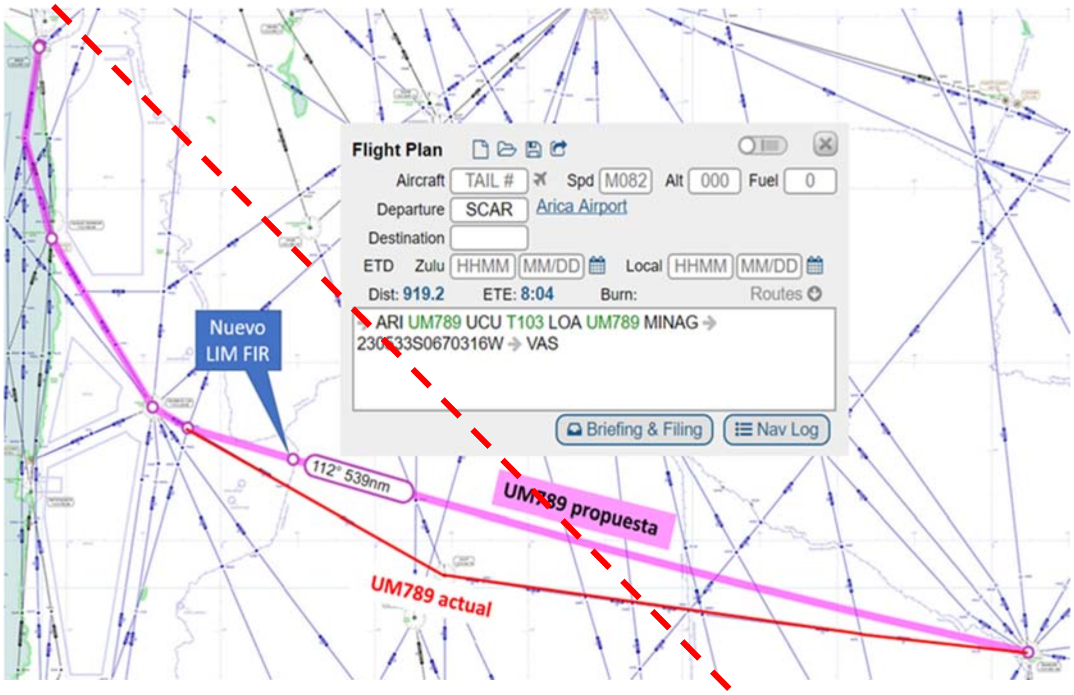
4-34 PROPOSAL ELIMINADA



States	*Description*	*Results*
Argentina Chile Paraguay Bolivia	REALIGN UM789. ARGENTINA REQUEST TO CANCEL THE PROPOSAL.	Argentina: Agree. Chile: Agree. Bolivia: no option for the route (with no coordination required between Bolivia and Chile). Coordinates of transfer point are proposed Argentina - Chile (26 06 03 S / 067 01 22 W). Paraguay: No objection. ARGENTINA REQUEST TO CANCEL THE PROPOSAL.

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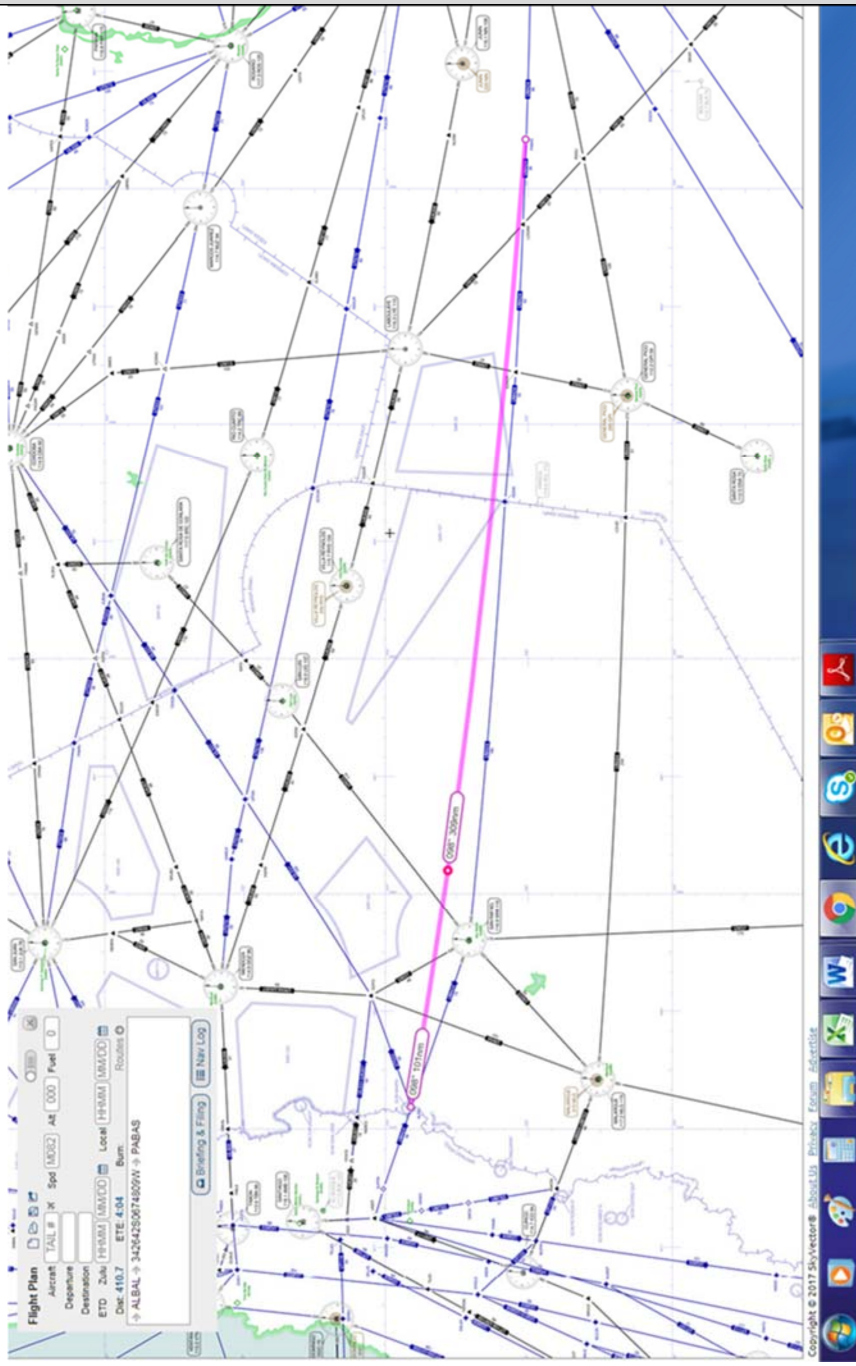
4-35 (<- UM424 - >)		
		
States	*Description*	*Results*
Argentina Chile	REALIGN UM424	Argentina: Agree. Chile: Agree. ACTIONS: REALIGN UM424. ALBAL – BOBAP (IS IN 5LNC) - ARG: AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

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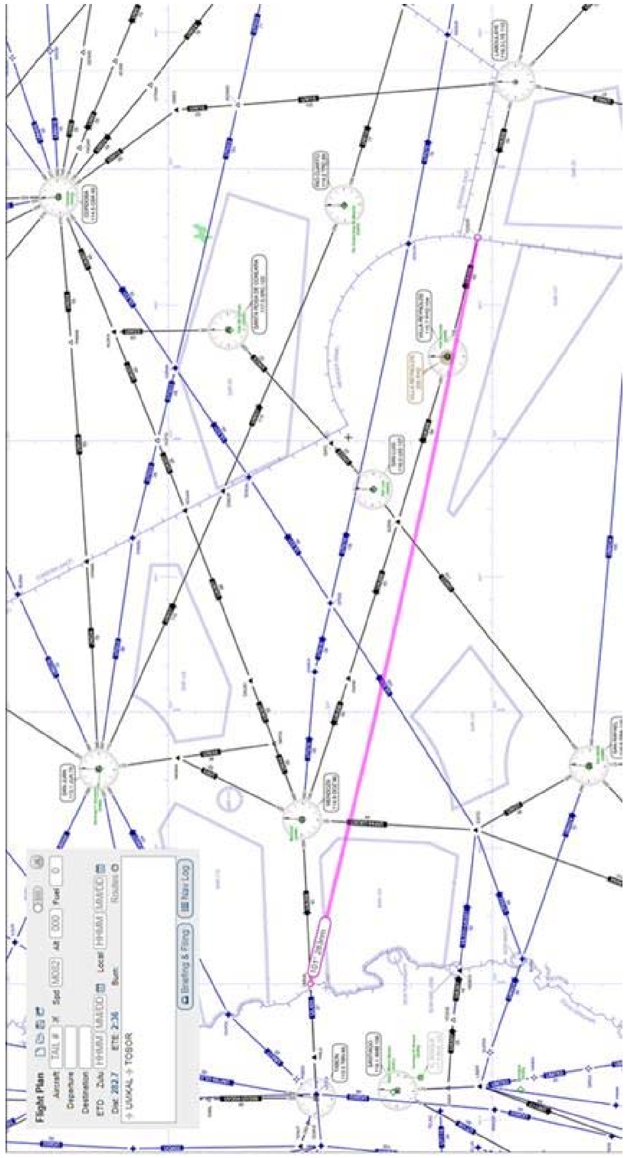
4-36 (new UT687 domestic route Argentina , does NOT goes to e-ANP)



States	*Description*	*Results*
Argentina Chile Uruguay	Eliminate the UA306. Realign UL405.	Argentina: Agree without eliminate UA306 by flow to Mendoza. Chile: Agree. Uruguay: Agree. ACTIONS: ARGENTINA OPTIMIZE FLOW TOSOR – UMKAL WITH RNAV DOMESTIC ROUTE UT XXX IN ARGENTINA. ALREADY DESIGNED. **NO CHANGES IN UL306 NI UL405.** ARG: AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

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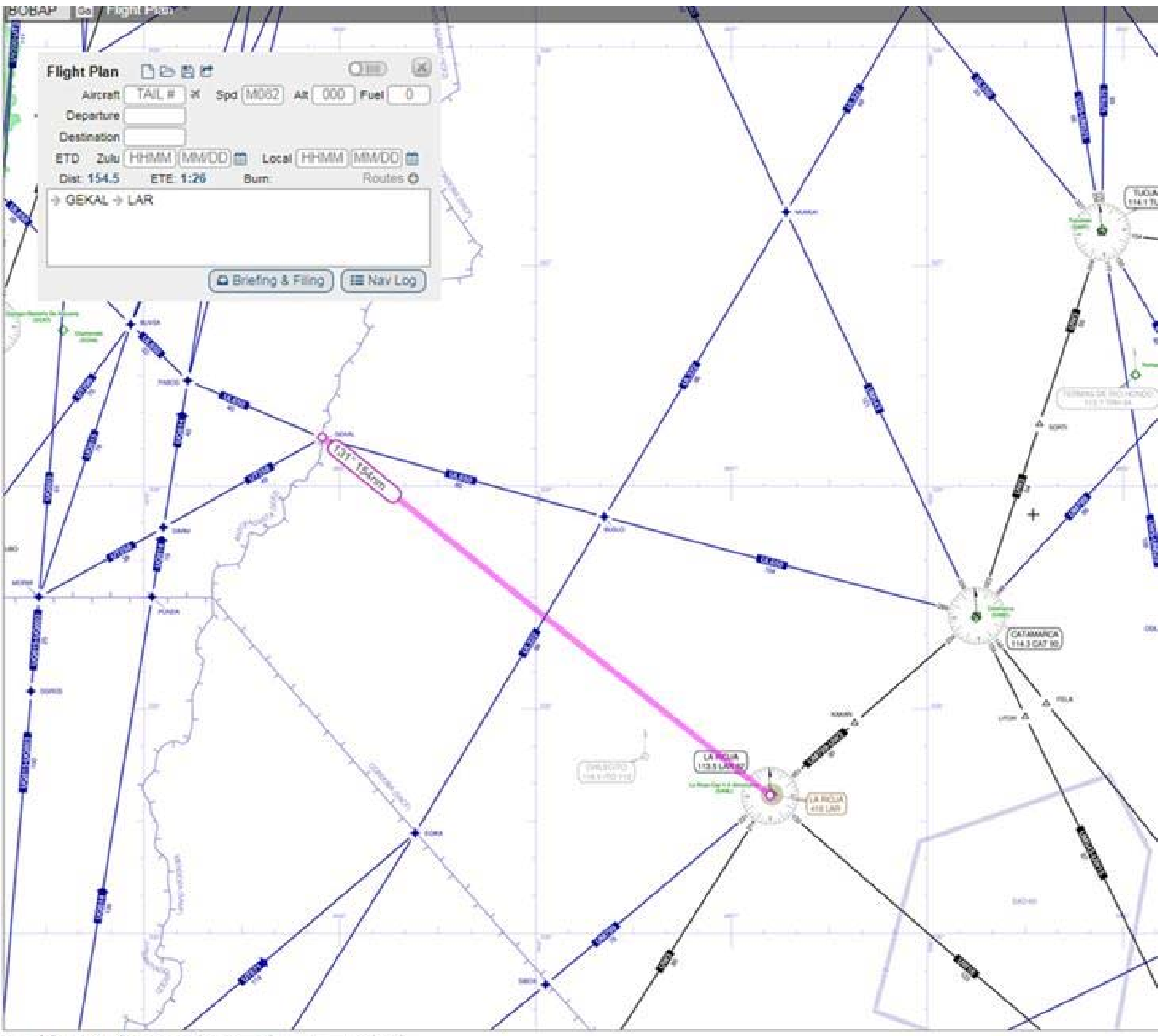
4-38 (New UT691 domestic route to Argentina , does NOT goes to e-ANP)		



States	*Description*	*Results*
Argentina Chile	Realign UL650.	Argentina: Agree to realign to LAR. Chile: Agree and is proposed as a transfer coordinate (**24 55 28 S / 069 08 46 W).**
		<u>ACTIONS:</u> ARGENTINA IMPLEMENTS WITH DOMESTIC RNAV UT 691 GEKAL – LAR VOR. DESIGNED. ARG: AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

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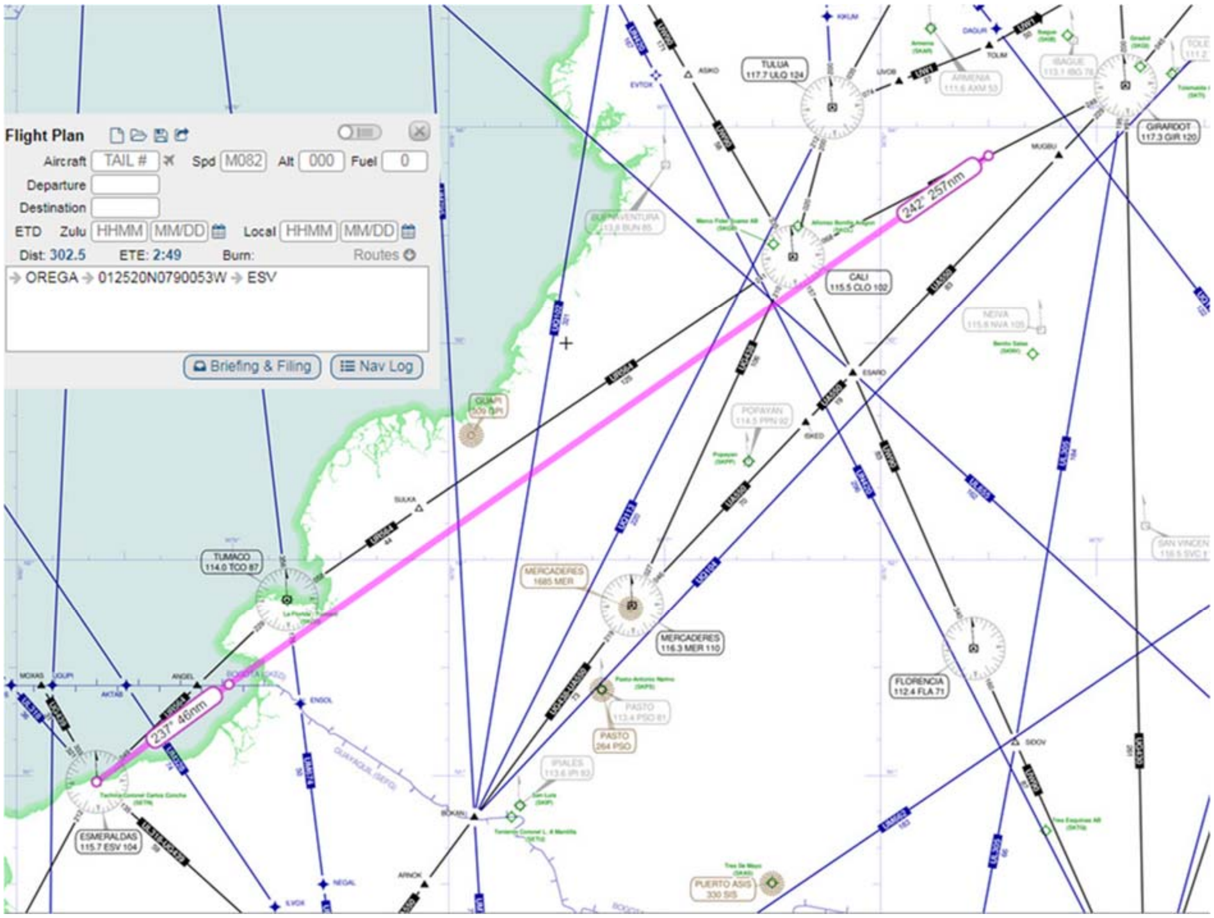
4-39 (New UN 776)



States	Description	Results
Colombia Ecuador	Eliminate route UR564 segment GIRARDOT (GIR) – ANGEL - ESMERALDAS (ESV). Create route RNAV GIRARDOT (GIR) – ESMERALDAS (ESV). Ecuador accepts the proposal. Pending coordination Colombia segment LIM FIR – GIRARDOT (GIR).	COLOMBIA 1. ACCEPTS TO ELIMINATE UR564 2. PROPOSE RNAV ROUTE OREGA – **GAVUT** (N01 25 07 W078 59 58) – ESV ECUADOR: RE - confirm ACCTIONS **ECU –COL: CREATE UN776 with GAVUT Point** (N01 25 07/ W078 59 58) **ECU and COL: AIP PUBLISH TBD**

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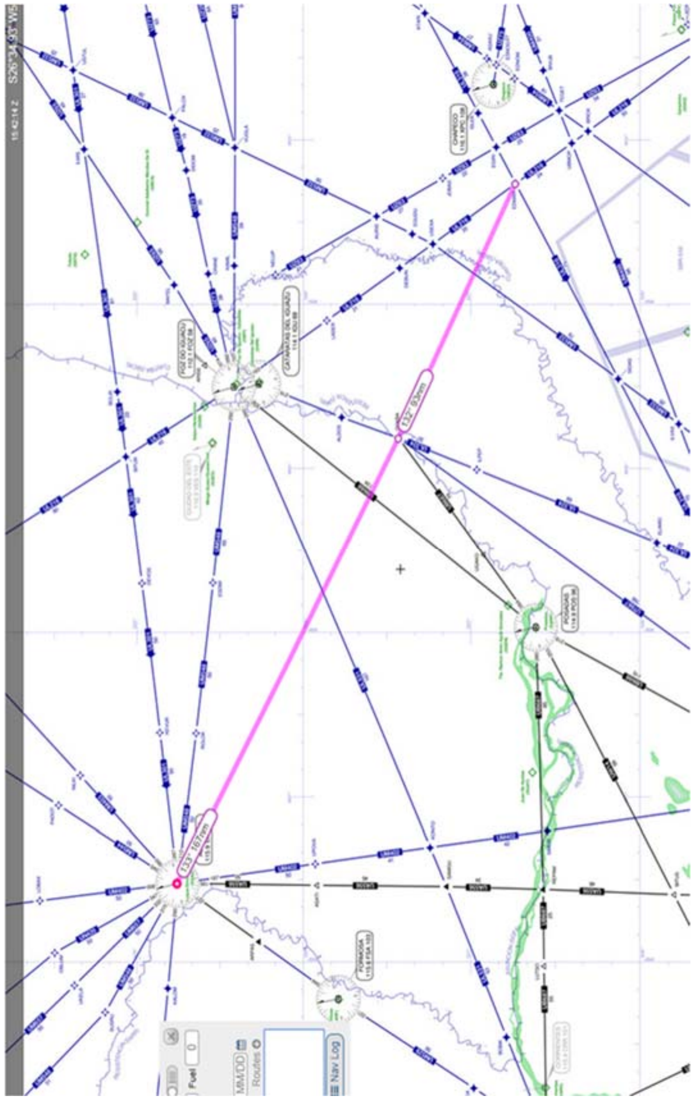
4-44 (UM 657 ->)



States	*Description*	*Results*
Argentina Bolivia Brazil Paraguay	Realign UM657	Is proposed to extend UM657 in segment VAS - DOKBA – XXXX - EDMAR Argentina: Agree. Bolivia: Agree. Brazil: Not agree with realignment, but agrees with route extension. Is proposed to publish on April - Valid on June. Paraguay: Agree. ACTIONS: EXTEND **UM657** SOUTHEAST OF VAS VOR - DOKBA – *XXXXX* - EDMAR *BRAZIL*: CALCULATE COORDINATES CURITIBA/RESISTENCIA FOR POINT XXXXX FOR AGREEMENT ARGENTINA. PAR-ARG-BRA: AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER
	Coordinate SAMIG/21	

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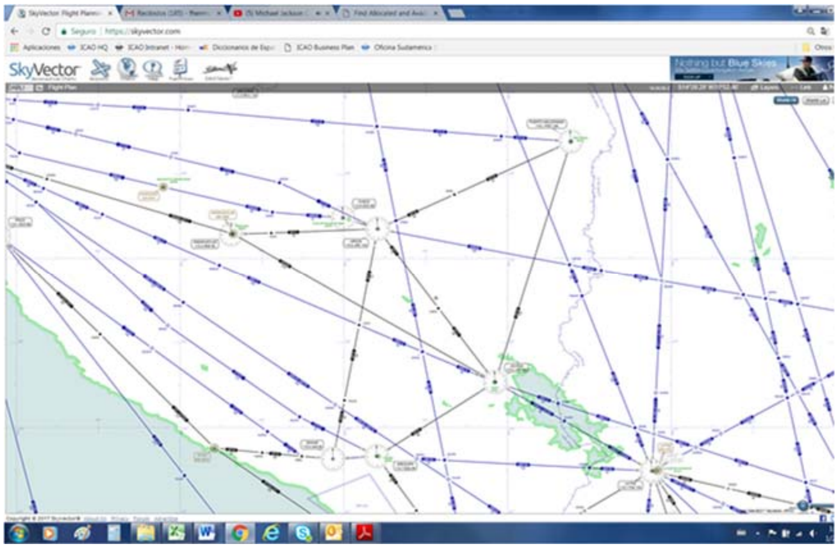
4-49 (~~UA 304~~)



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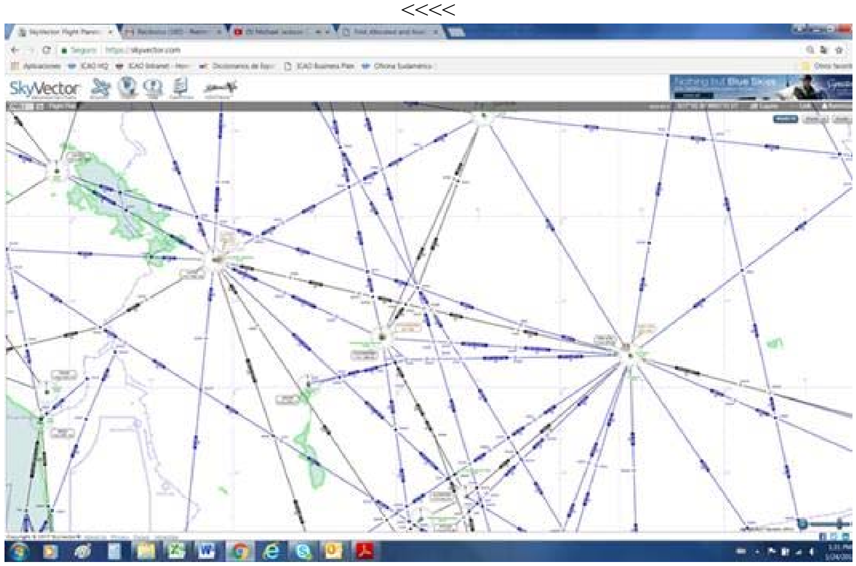

States	*Description*	*Results*
Bolivia Peru	Eliminate route UA304 segment LIMA (LIM) – VIRU VIRU (VIR) – CAMPO GRANDE (GRD).	Bolivia accepts the proposal and will create a domestic route. Peru accepts the proposal. Segment ANDAHUAYLAS (AND) – JULIACA (JUL) will be covered by a domestic route. <u>ACTIONS:</u> ELIMINATE ROUTE UA304 SEGMENT LIMA (LIM) – VIRU VIRU (VIR) – CAMPO GRANDE (GRD). PER: CREATE DOMESTIC ROUTE. BOL: CREATE DOMESTIC ROUTE. PER - BOL: AIP PUBLISH TBD

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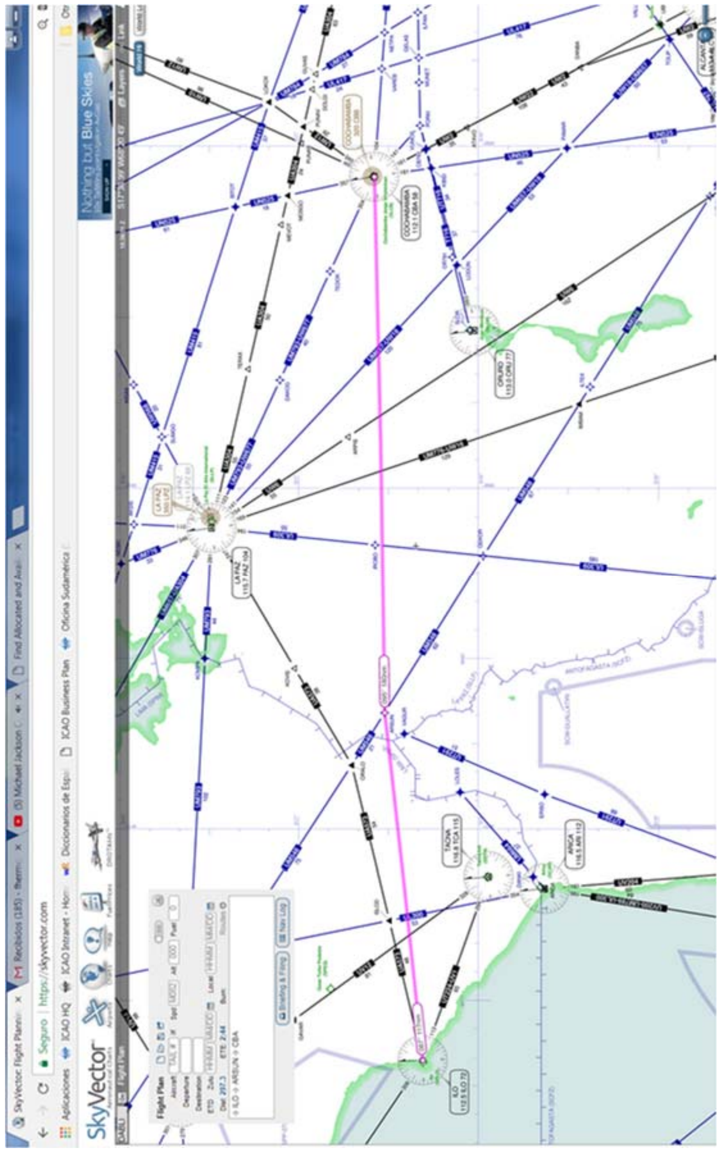
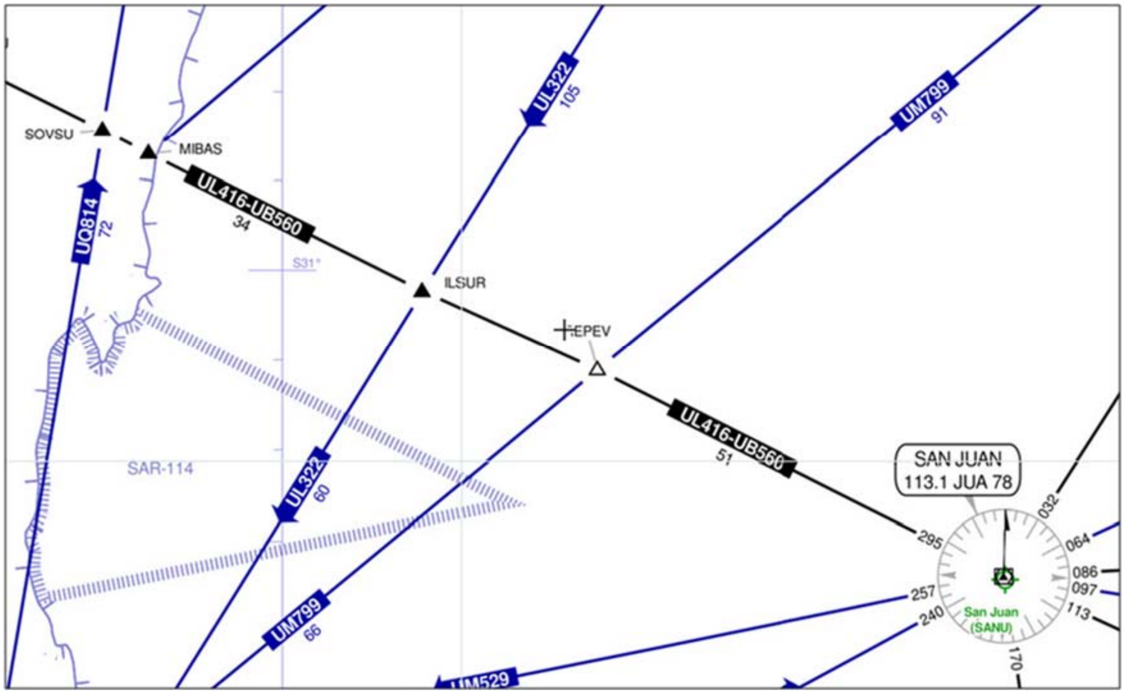
4-53 (~~UA573~~ – NEW RNAV in STAND BAND)



States	*Description*	*Results*
Bolivia Peru	Eliminate route UA573 Segment ILO (ILO) – ORALO – LA PAZ (PAZ). Crear route RNAV Segment ILO (ILO) – ARSUN – COCHABAMBA (CBB).	Bolivia propone ILO – ARSUN – IROBO – TEREP – COCHABAMBA (CBB). Chile accepts the proposal. Peru accepts the proposal. ACTIONS: CREATE RNAV ROUTE SEGMENT ILO (ILO) – ARSUN – COCHABAMBA (CBB). ELIMINATE ROUTE UA573 ILO – ORALO – LAPAZ
		PER - BOL: STAND BAND --- TO BE DETERMINED IF IT TURNS TO VERSION 5.

4-55 (~~UB650)~~



States	*Description*	*Results*
Argentina Chile	Eliminate UB560.	Argentina: Agree. Chile: Agree with proposal of Argentina and request to keep B560. <u>ACTIONS:</u> ARG: ELIMINATE UB560. NOTE- **NO CHANGES IN (BOTTOM) B560** ARG: AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

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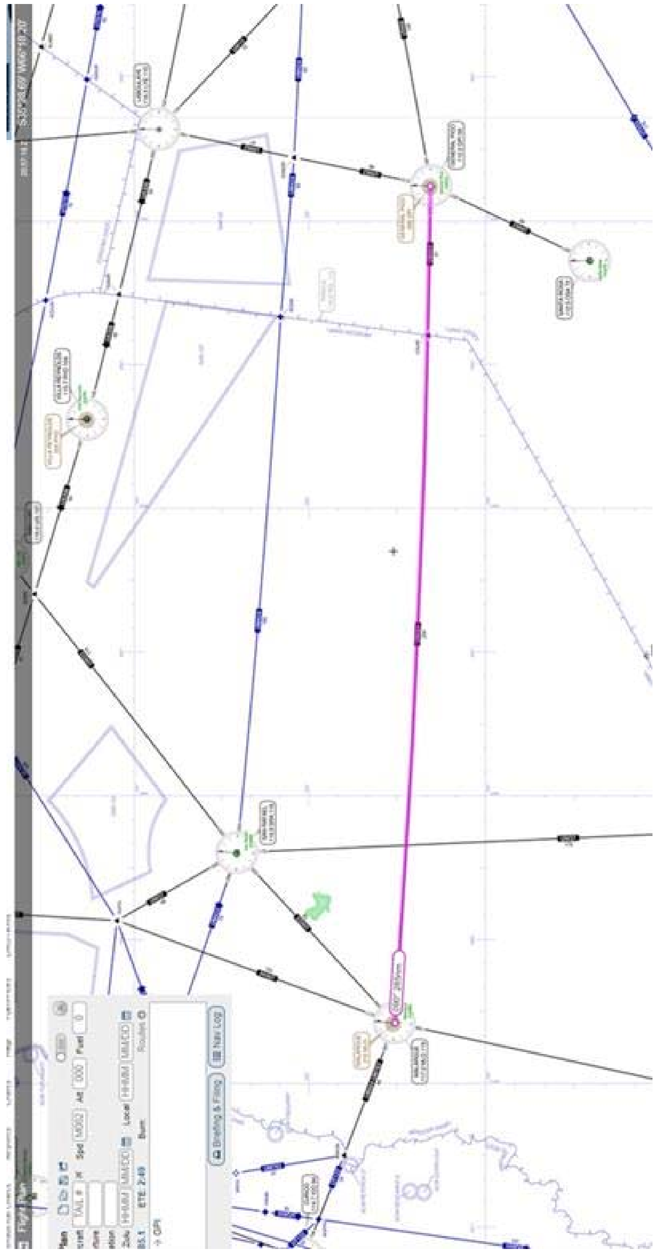
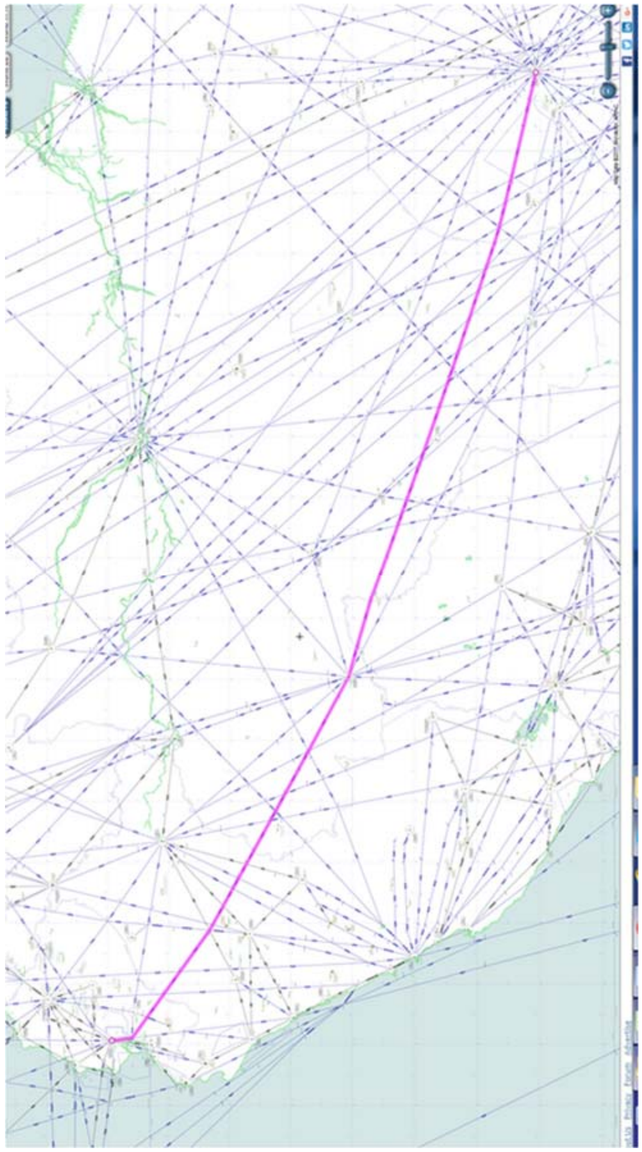
4-61 (UM 783->)		
		
States	*Description*	*Results*
Argentina Chile	Eliminate UB684. Extend UM783.	Argentina: Agree with extension of UM783 but no elimination of UB684. Chile: Agree with proposal of Argentina. ACTIONS: NOTE: KEEP UB684, **NO CHANGES**. ARG: EXTEND UM 783 MLG VOR – GPI VOR. ARG: AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

4-62 (~~UM530~~)



States	*Description*	*Results*
Ecuador Peru Brazil **Bolivia**	Eliminate route UM530 Segment GUAYAQUIL (GANDV) – BRAZILIA (BSI). Brazil creates domestic route RIO BRANCO (RCO) – BRAZILIA (BSI).	Ecuador accepts the proposal. Peru accepts the proposal. Brazil accepts the proposal. Bolivia also involved. Accepts proposal. ACTIONS: IS ELIMINATED BETWEEN GANDV – BSI, WHICH INVOLVES BOLIVIA FOR SEGMENT DADEK – BUVKI BOLIVIA AGREE BRAZIL AGREE, CONFIRMED TO COMPLETE ELIMINATE. ECU-PER-BOL -BRA: AIP PUBLISH **TBD**

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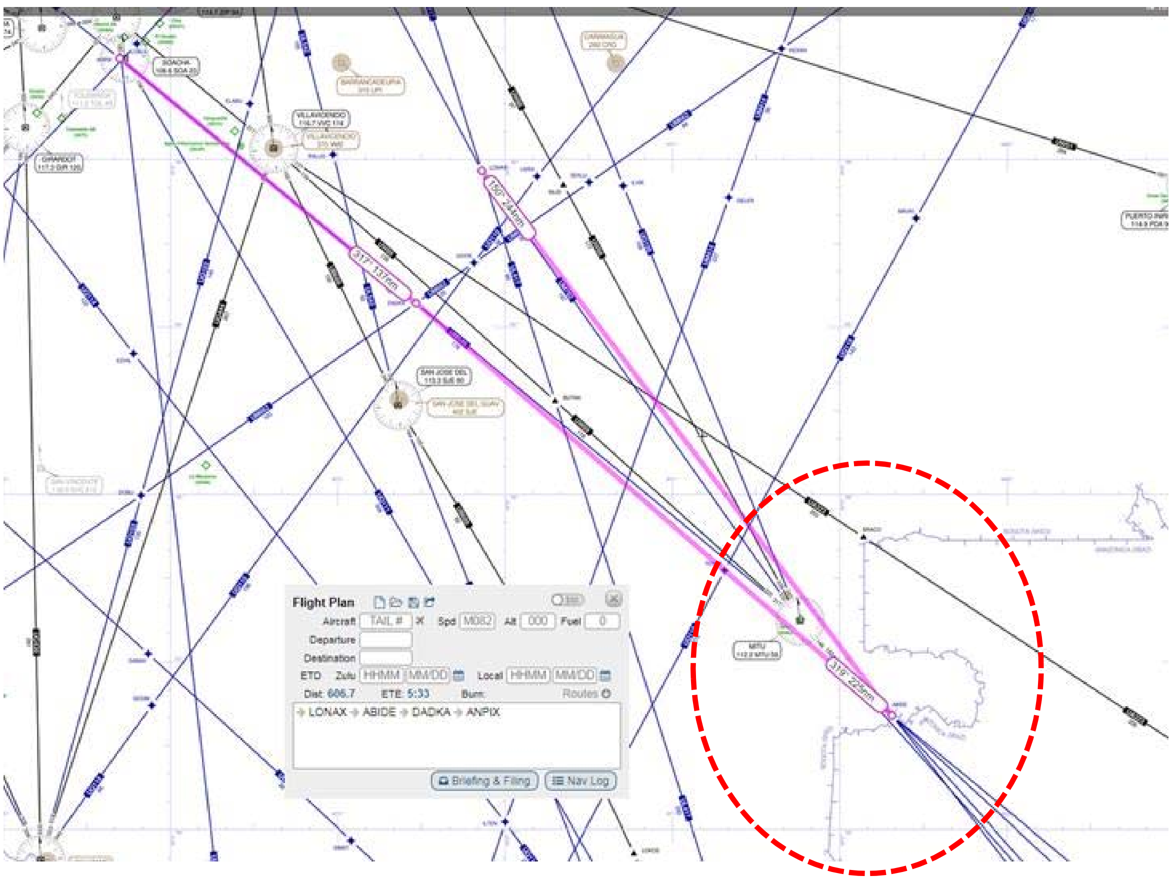
4-63 and 4-64



States	*Description*	*Results*
Colombia **Brazil**	Realign route UM549 segment ANPIX – DADKA – MITU (MTU) – ABIDE. Eliminate segment of route UM459 GAXES – VAKOB – MANSI – ITABI – VUBOM. Eliminate route UQ108. Extend and realign route UL201 segment LONAX – MIGOB – MABMA – HASTE.	COL: 1. UM549: THE REQUEST IS NOT UNDERSTOOD IN VIEW THAT IS ACTUALLY IS VIA ANPIX – DADKA – MTU – ABIDE 2. COLOMBIA REQUEST OF UM549 REALIGN VIA: ANPIX – DADKA – ABIDE 3. UQ108 COLOMBIA NOT ACCEPTS TO ELIMINATE. MUST KEEP. >>>>>>>>>>>>>>>>>> 1. COLOMBIA PROPOSE TO EXTEND UL 201: ABIDE – MIGOB – MABMA – HASTE 2. COLOMBIA PROPOSE TO REALIGN LA UM782: LONAX - ABIDE **PENDING** COLOMBIA WILL STUDY AN INTEGRAL SOLUTION TO THE TWO BOTTLENECKS IN ABIDE AND MITU. NEED TO ANALIZE WELL THE FLOW CONNECTION.

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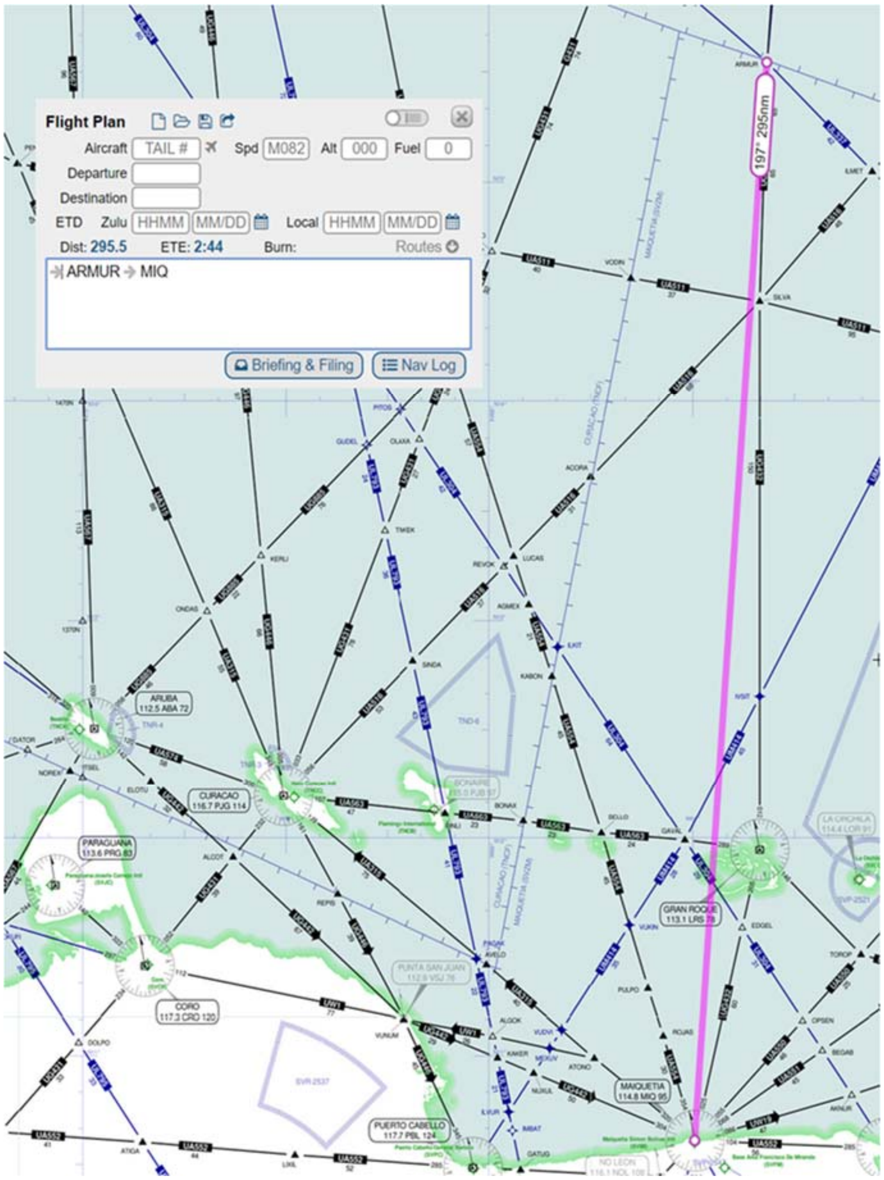
4-73 (~~UG432~~ – NEW UN 779)



States	*Description*	*Results*
Venezuela	Eliminate UG432 from ARMUR to MAIQUETIA. Add new RNAV route segment MAIQUETIA (MIQ) – ARMUR.	Venezuela accepts the proposal. ACTIONS: **ELIMINATE** UG432 FROM ARMUR TO MAIQUETIA. NO CHANGES TO BOTTOM G432. **CREATE** NEW RNAV DOMESTICA ROUTE UTXXX MAIQUETIA (MIQ) – ARMUR. MAY KEEP TO THE NORTH SAN JUAN FIR – SEND PROPOSAL TO MEXICO, III PNB. **COORDINATE / DEFINE**
	DISCUSS MEX III PBN	

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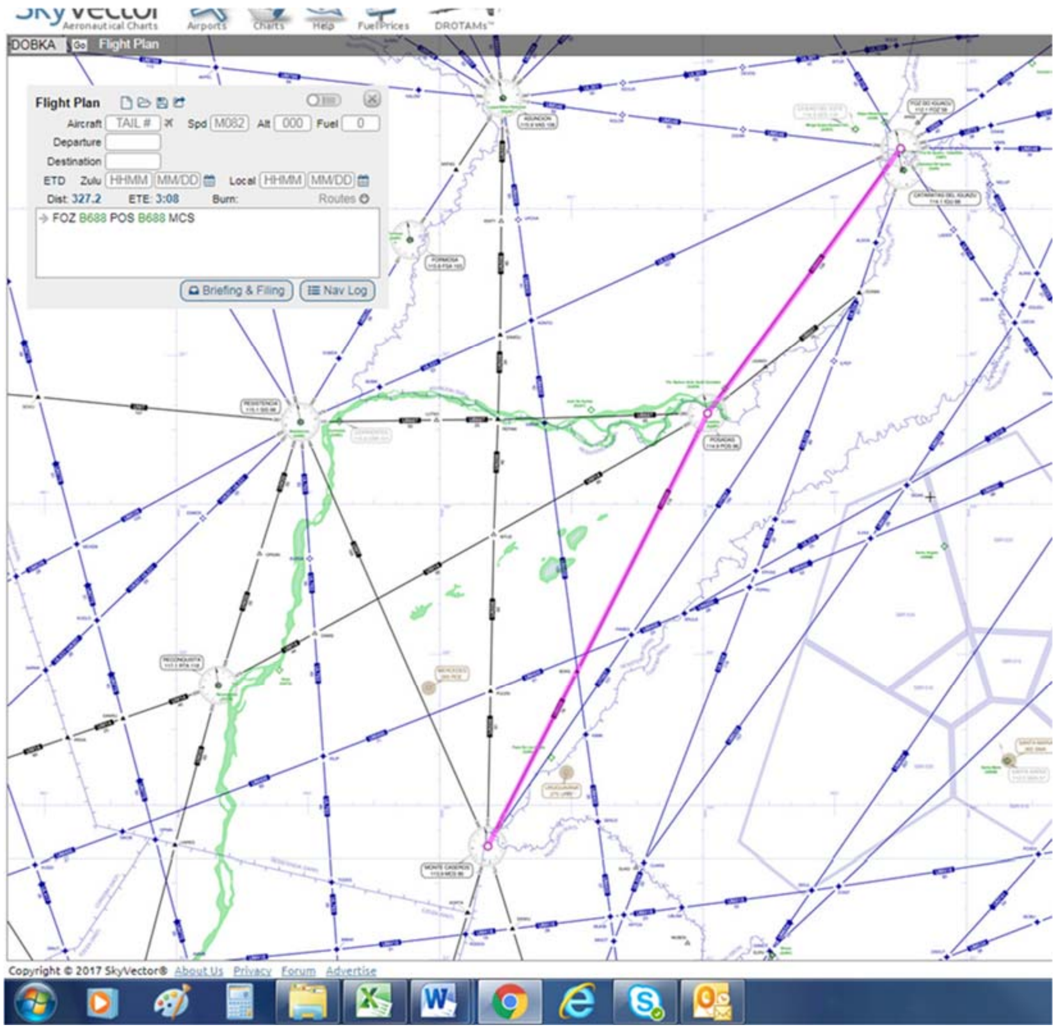
4-83 (NEW UN 785)



States	*Description*	*Results*
Argentina Brazil Paraguay	~~Eliminate UB688~~ RO: It was proposed to eliminate UB688, but there is optional initiative.	Argentina: Proposal is rejected by conventional flights. Brazil: Agree with proposal. Paraguay: Proposal is rejected because route is currently used and propose to create new RNAV route UMXXX in same trajectory. Publication is proposed to be on April and be valid on June. ACTIONS: **NOTE: KEEP THE UB 688** ARG-BRA-PAR: CREATE NEW RNAV REGIONAL **UN785,** FOZ – POS – MCS, IN SAME TRAJECTORY AND POINTS OF UB688 ARG-BRA-PAR: AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

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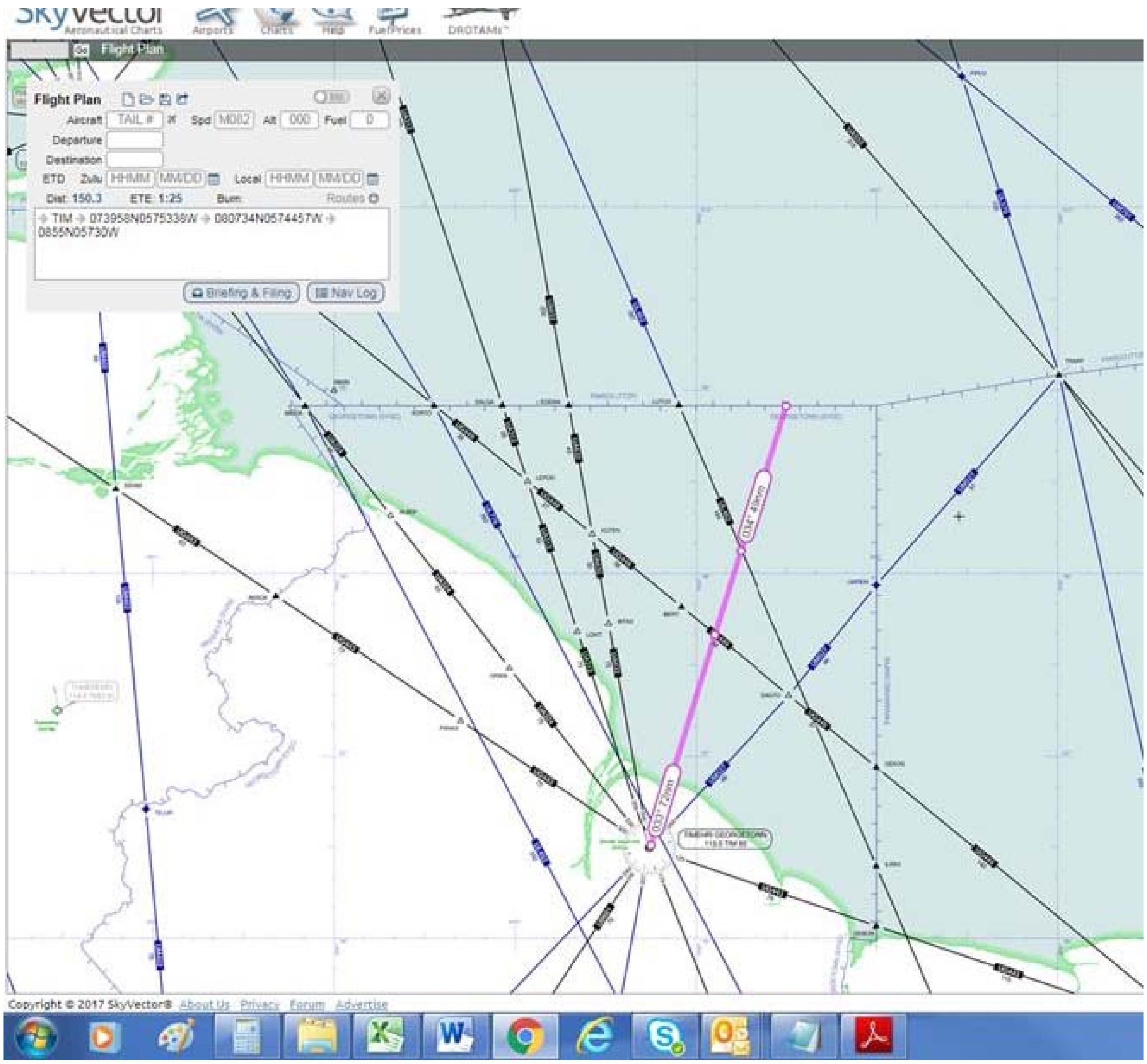
4-84 (UL 322 ->)



States	*Description*	*Results*
Guyana	Realign route UL322 from TIMEHRI GEORGETOWN (TIM) to ASIMO. **IS A KLM INPUT**	Bolivia rejected the proposal in analysis of the Atlantic Group. The extension of route **UL322** is accepted as coordinated between **KLM** and Guyana for segment TIMEHRI GEORGETOWN (TIM) and point **0855N 05730W** on the northern boundary of the Georgetown FIR. **ACTIONS:** EXTEND ROUTE UL322, SEGMENT TIM - **PADUN** FIR BNDRY – GEORGETOWN / PIARCO = **085500N 0573000W** **COORDINATION WITH PIARCO, NEEDED, GET TO MEXICO III PBN** AIP PUBLISH TBD
	TO BE DISCUSSED IN MEXICO III PBN	

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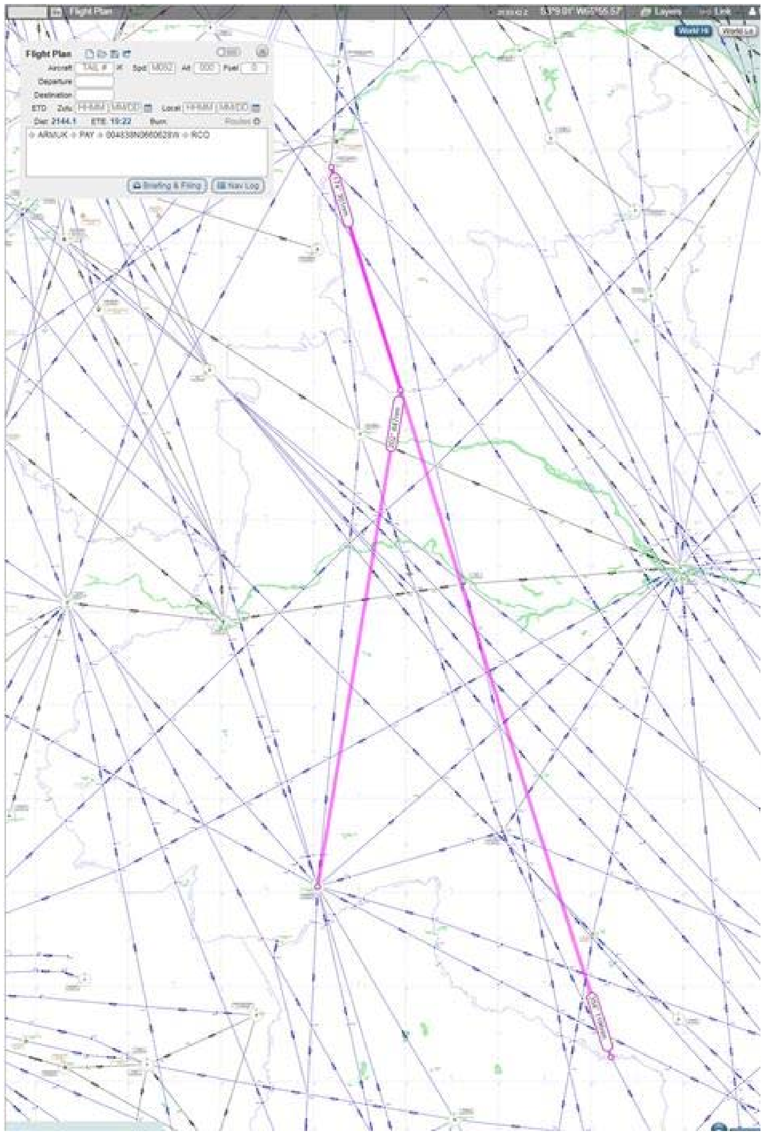
4-85 (<- UL206 -> + <-UL309 ->)		
		
States	*Description*	*Results*
Venezuela Brazil + Colombia	Realign route UL216 SAN FERNANDO DE APURE to FOZ **DISCUTIR EN SAMIG 21**	Its reconsidered to realign UL216 from ARMUK to VOR PAAND. In order to not lose connectivity, UL309 is realigned of VOR RCO to new Limit FIR Amazonico-FIR Maiquetia over the UL216. Brazil agree. Venezuela agree. ACTIONS: BRA-VEN: REALIGN **UL216** FROM ARMUK – XXXXX - VOR PAAND BRAZIL: REALIGN **UL309** OF VOR RCO TO XXXXX. **BRAZIL**: CALCULATES FIR POINT XXXXX FOR AGREEMENT WITH VENEZUELA. **COLOMBIA**; AGREE TO PUBLISH ELIMINATION IN ITS FIR. **VEN –BRA- COL**: AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER

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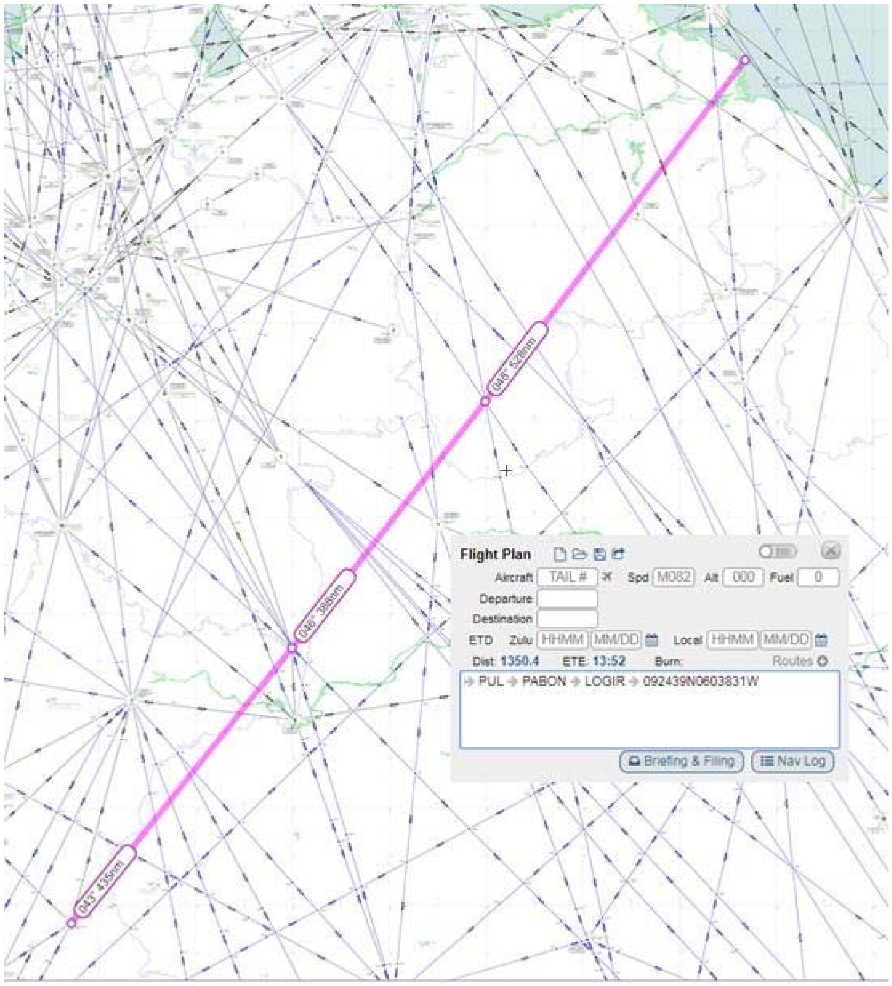
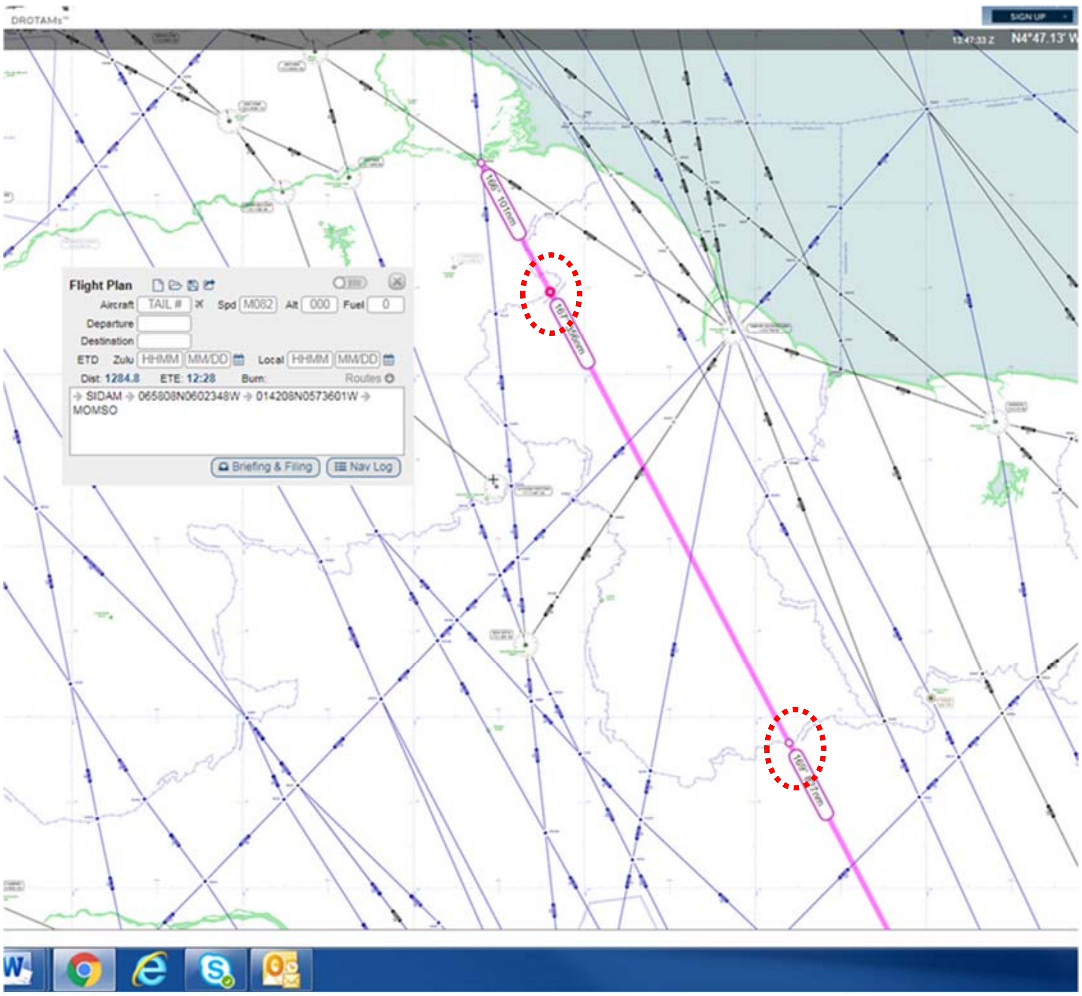
4-88 (UX XXX)



States	*Description*	*Results*
Venezuela **Brazil** **Colombia** **Peru** **INPUT OF KLM**	Add RNAV route segment CANAIMA (CMA) – LETICIA (LET) - LIMA (LIM). Original is modified. In coordination with KLM/Air France agree on the following points: PUL - PABON - LOGIR - WPT **092439N 0603831W** (FIR MAIQUETIA / FIR PIARCO). Venezuela accepts proposal. Brazil accepts proposal. Pending coordination with Colombia and coordination with PIARCO.	Original is modified. In coordination with KLM/Air France agree on the following points PUL - PABON - LOGIR - WPT **092439N 0603831W** (FIR MAIQUETIA / FIR PIARCO). • Venezuela accepts proposal. • Brazil accepts proposal. • COLOMBIA accepts proposal • Pending coordination with PIARCO. Take to III PBN – México. • Pending opinion of PIARCO / Trinidad & TABAGO. ONGOING ACTIONS: VENEZUELA AND BRAZIL: define limit points of FIR northern to SGC VOR. PERU – COLOMBI- BRAZIL: Agree on the use of PABON (north to Leticia) as limit in the LOA. Verify to move or change REMEX and AROTI, through the interconnections. Take note of delegations ATS. Take to Mexico III PBN for PIARCO/ Trinidad & Tabago opinion.
	DISCUSS IN MX III PBN	

<<<<<<*4-92 (NEW UP 535)*



States	*Description*	*Results*
Venezuela Guyana Brazil	New route UXXX SIDAM – MOMSO, involving the Maiquetia, Georgetown, Amazonica FIRs.	• Venezuela; Agrees with the initiative, which starts in SIDAM in the Maiquetia FIR. • Guandana: Agrees. Brazil: Agrees. **ACTIONS:** NEW ROUTE UP 535 SIDAM – MOMSO
		RO SAM: • **PANIV (065822.28 N / 0602410.60 W)** BNDRAND – VEN /GUAND VENEZUELA: Agrees point. GUANDANA: • **SUMVA (014148.58N / 0573559.45 W)** FIR BNDRAND – GUAND /BRA GUANDANA: BRAZIL: VEN-GUAND-BRA: AIP PUBLISH **TBD**

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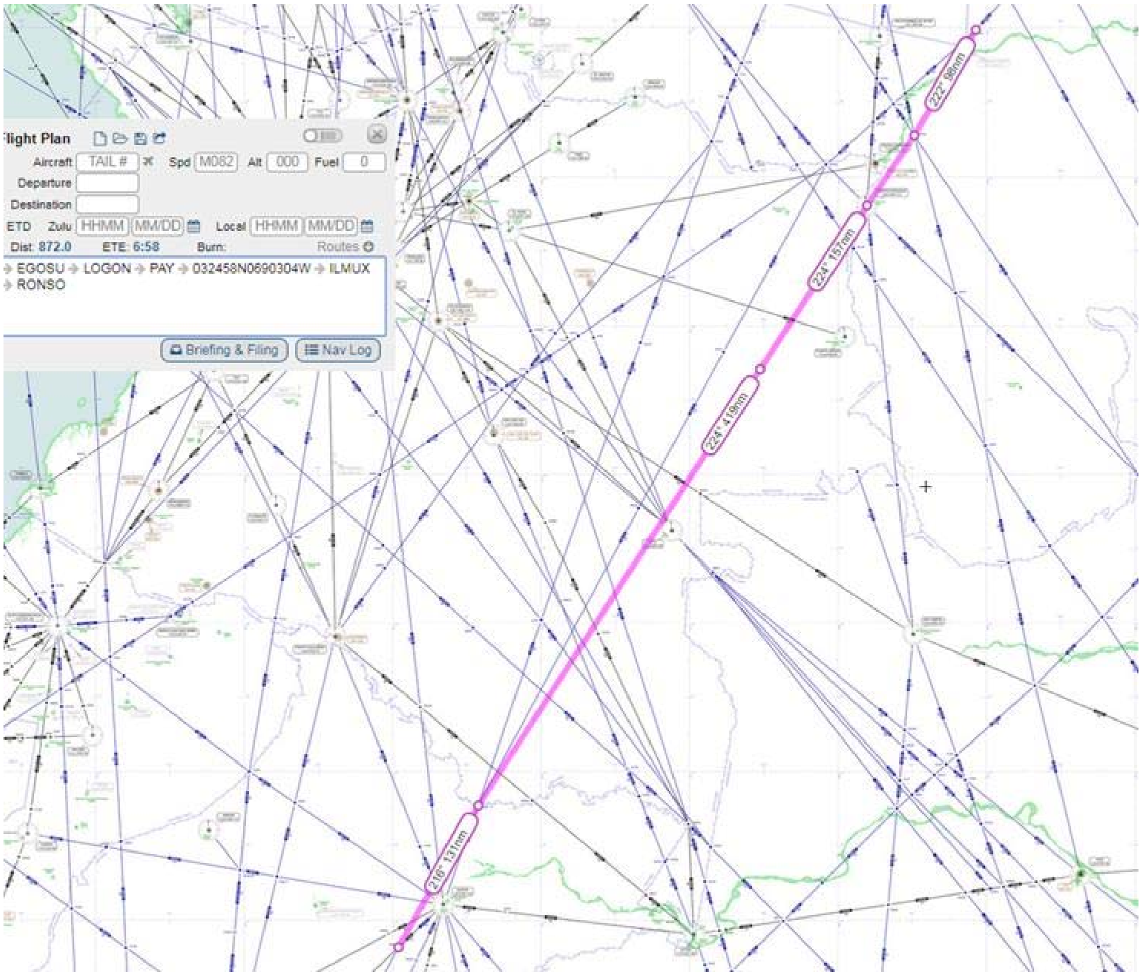
4-94 (NEW UP 776)



States	*Description*	*Results*
Colombia **Peru** **Venezuela** **INPUT OF KLM**	Establish RNAV route segment EGOSU - PUERTO AANDACUCHO - ILMUX - RONSO LODIN – ILROL. Eliminate route UQ118 (FIR BOGOTÁ). >>>>>>> Venezuela accepts the proposal. Pending coordination with Colombia Peru accepts ILMUX RONSO UT311in FIR LIMA.	Colombia: PROPOSAL: NEW RNAV ROUTE **EGOSU** – **PAAND** – XXXX close to MAVKI (aprox. 032458N 0690304W) - ILMUX – RONSO – LODIN – ILROL -ELIMINATE UQ118 AMAANDA – MAVKI – ILMUX -COLOMBIA ACCEPTS – INITIALLY APPROVED PRESENTATION DIRECT FLIGHT PLAN PAY - ILMUX ACTIONS: VEN: Confirm ? COLOMBIA: Agrees. Define LAT/LON point XXXXX lateral to the East of MAVKI. COLOMBIA; **Eliminate UQ 118**. PERU: Agrees. Use points already created from ILMUX –RONSO. **Tentative; AIP PUBLISH 16 AUGUST VALIDITY 11 OCTOBER**

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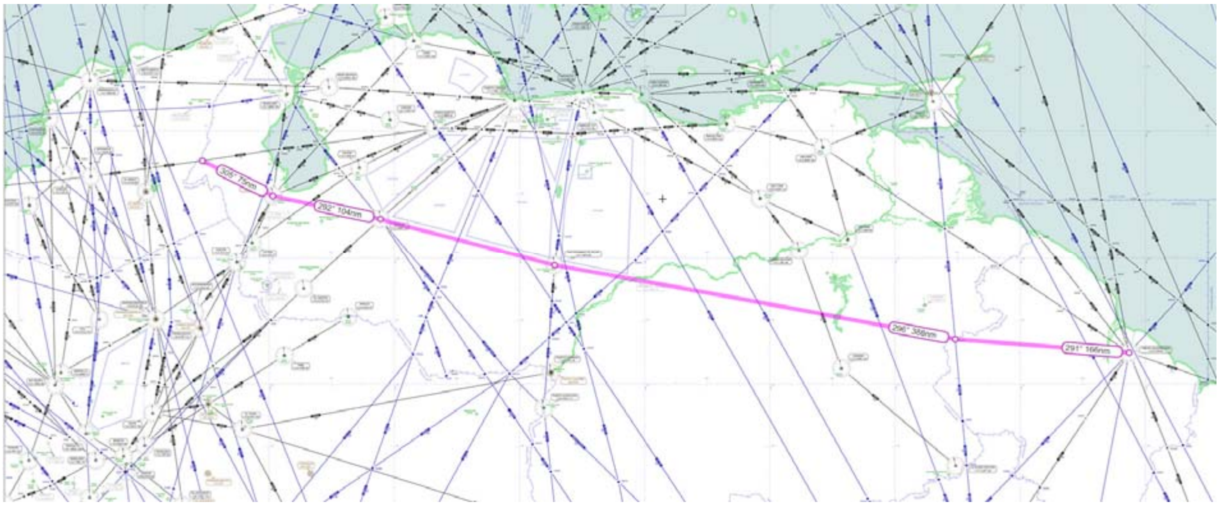
ROUTE UP549 TIM - TBG

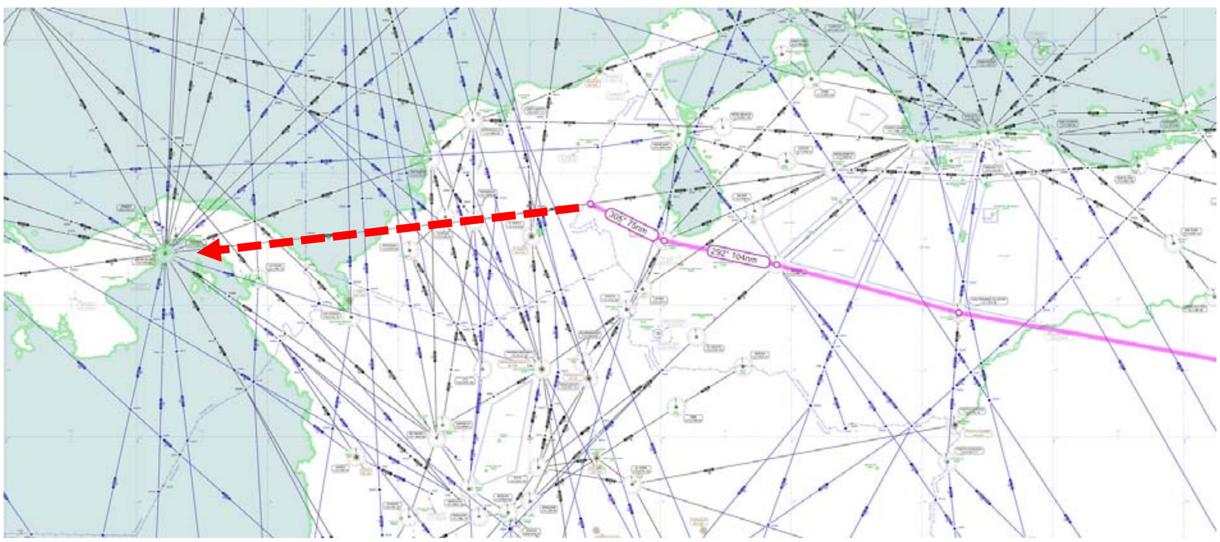
DATA

COPA 254/255 MPTO – SANDCJ year 2017 = 350 OPS.

VIA ROUTES UA553 -UW14- UA443 FLIGHT DISTANCE. 1330 NM.

4-95 (new UP 549)





States	*Description*	*Results*
Venezuela Guyana + Colombia	Implement RNAV route UXNNN between Georgetown and Panama city TIM VOR- TELUR –SFD- BNS –STB - SIDOS (BNDRAND BARANQUILLA-MAIQUETIA) to intercept route UA553. **No changes for Panama.** FLIGHT DISTANCE: 1293 NM , **SAVE 37 NM**	• Venezuela: Will analyze initiative concerning airspaces and trajectory. • Guyana: Agreed. • Colombia: Agreed **ACTIONS:** NEW ROUTE UP 549 – TIM VOR – TELUR – SAN FERNANDO SFD VOR – BARINAS BNS – STA BARBARA STB – SIDOS entry via UA553 - ESEDA COLOMBIA: AGREED VENEZUELA: AGREED – but confirm. GUANDANA: AGREED VEN-GUY : AIP PUBLISH **TBD**

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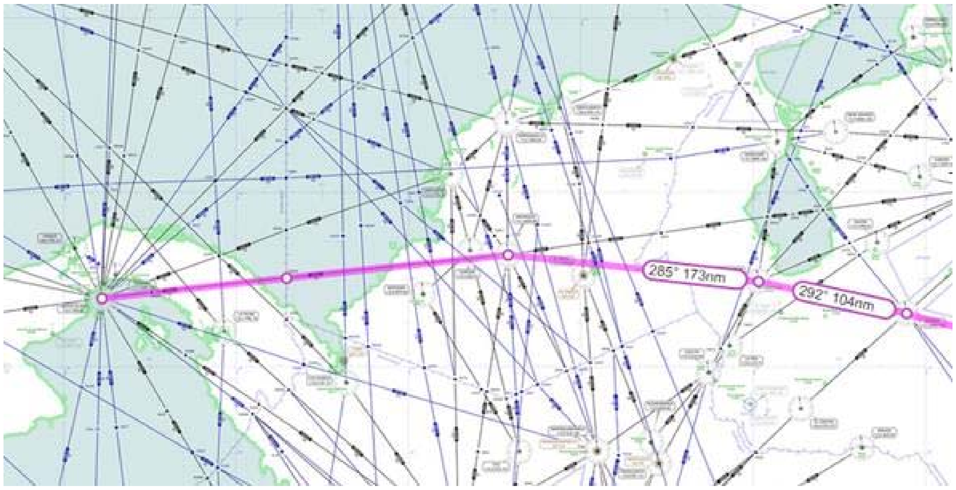
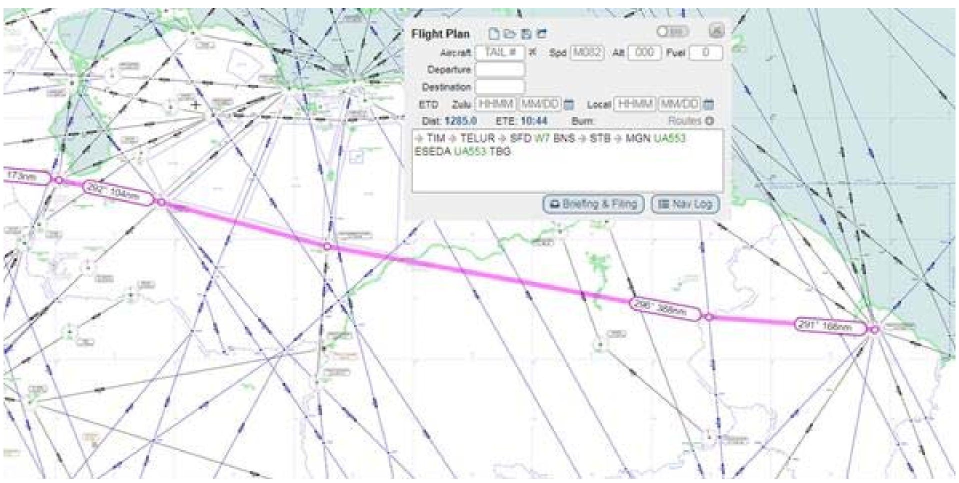
4-95 (option proposed by COLOMBIA)





States	*Description*	*Results*
Venezuela **Guyana** **Colombia** + **Panama**		NOTE: Colombia propose to improve from STB a MGN VOR in route UA553 to 100 NM to the west of SIDOS. **BUT** this option influent or complicates proposal 4-21

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APPENDIX C

<table>
<tr><th colspan="4">Redesign of TMA Air Spaces selected based on PBN Planning</th></tr>
<tr><th colspan="3">State</th><th>Implementation</th></tr>
<tr><td>Argentina</td><td colspan="2">BAIRES</td><td>Phase 1.- October 2017. Optimization of available resources. Completed.
Phase 2.- 2017-2020. Introduction to PBN concept.
(See SAM/IG/20-IP/04)
Phase 3. Total redesign of PBN. Foreseen implementation 2022</td></tr>
<tr><td rowspan="3">Bolivia</td><td colspan="2">Cochabamba</td><td rowspan="3">Phase 1.- July 2018. TMA LA PAZ PBN.
Phase 2.- August 2019. Final PBN designs in FIR LA PAZ with ATS surveillance.</td></tr>
<tr><td colspan="2">La Paz</td></tr>
<tr><td colspan="2">Santa Cruz</td></tr>
<tr><td rowspan="17">Brazil</td><td colspan="2">Brasilia</td><td>12 Nov 2015 (implemented)</td></tr>
<tr><td colspan="2">Belo Horizonte</td><td>12 Nov 2015 (implemented)</td></tr>
<tr><td colspan="2">Sao Paulo (partial modifications)</td><td>12 Nov 2015 ((implemented)</td></tr>
<tr><td colspan="2">Salvador</td><td>27 Apr 2017 (implemented)</td></tr>
<tr><td colspan="2">Manaos</td><td>17 Aug 2017 (implemented)</td></tr>
<tr><td rowspan="7">(PBN SUR)</td><td>Curitiba</td><td rowspan="7">12 Oct 2017 (implemented)</td></tr>
<tr><td>Florianopolis</td></tr>
<tr><td>Joinville</td></tr>
<tr><td>Navegantes</td></tr>
<tr><td>Porto Alegre</td></tr>
<tr><td>São Paulo (modifications)</td></tr>
<tr><td>Route´s Network FIR CW</td></tr>
<tr><td colspan="2">Vitoria</td><td>November 2018</td></tr>
<tr><td colspan="2">Fortaleza, Natal, João Pessoa, Recife</td><td>November 2019</td></tr>
<tr><td colspan="2">Sao Paulo (redesign)</td><td>September 2020</td></tr>
<tr><td colspan="2">Belém, Campo Grande and Sao Luis</td><td>October 2021</td></tr>
<tr><td colspan="2">Cuiaba, Boa Vista, Porto Velho and Rio Branco</td><td>October 2023</td></tr>
<tr><td rowspan="2">Chile</td><td colspan="2">Santiago (Sur)</td><td rowspan="2">08 Dec 2016 (implemented)</td></tr>
<tr><td colspan="2">Route´s Network of FIR Santiago</td></tr>
<tr><td>Colombia</td><td colspan="2">Bogota</td><td>12 Oct 2017 (implemented)</td></tr>
<tr><td>Ecuador</td><td colspan="2">Guayaquil</td><td>21 Jul 2016 (implemented)</td></tr>
<tr><td>Panama</td><td colspan="2">Panama</td><td>Beginning of project in 2018.</td></tr>
</table>

Redesign of TMA Air Spaces selected based on PBN Planning		
State		**Implementation**
		(See SAM/IG/20-IP/10)
Paraguay	Asuncion	17 Aug 2017 (implemented)
Peru	Arequipa	First semester 2019
	Cusco	First semester 2019
	Juliaca	First semester 2019
	Puerto Maldonado	First semester 2019
Uruguay	Carrasco and Laguna del Sauce	First semester 2018 * The TMA Carrasco will be optimized in line with Phase 2 of TMA Baires.
Venezuela	Maiquetia	December 2017
	Isla Margarita	Foreseen 6 December 2018

APPENDIX D

PROGRESS ON IMPLEMENTATION OF PANS-OPS/1 WORKSHOP RECOMMENDATIONS (Updated: 20 October, 2017)

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGI	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
1. IFPP Panel Inasmuch as possible, to seek regional harmonisation (SAM) in the use of documentation developed by States of recognised capacity in global air navigation, such as the United States (FAA) and European Community member countries (EUROCONTROL and EASA), while waiting for ICAO documentation.	YES	O/G	O/G	YES		YES			YES	YES	O/G		NO	YES	Argentina: Applies Resolution 457 of year 2016, which included the use of TERPS-FAA Concepts for IFP designs. **Paraguay**, is on tentative with FAA for the signing of agreement for the use of documentations.
2.Changes in the denomination of approach procedures (Circular 336) That States, when implementing the changes foreseen in Circular 336, take into account the processes for the development of the transition plan and the impact assessment, and publish an AIC on this issue, in coordination with all stakeholders..															**NOT APPLICABLE SINCE APRIL 2018** **ICAO HAS ISSUED CIRCULAR 353 AN/209 FOR THE TRANSITION OF CARTOGRAPHIC RNAV ARNP:**
3. Procedure validation That SAM States consider the adoption of documentation on ground and flight validation of procedures, similar to that applied by Argentina.	YES	YES	NO	O/G		OG			YES	NO	YES		O/G	YES	Brazil is performing studies for the implementation of ground validation using the FPSAT tool.

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGI	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
4. RNAV1/RNP/1 in SID/STARs That SAM States use RNAV-1 and RNP-1 in PBN SIDs/STARs, even in non-radar environments, since RNAV-1 is used exclusively with GNSS.	YES	YES	YES	O/G		YES			YES	YES	YES		O/G	YES	
5. RNAV-1 and RNP-1 in RNAV/ILS approaches That SAM States use RNAV-1 and RNP-1 in RNAV/ILS procedures, including non-radar environments, since RNAV-1 is used exclusively with GNSS.	YES	O/G	YES	O/G		YES			YES	YES	YES		O/G	NO	
6. Advanced RNP (A-RNP) That SAM States study the application of A-RNP at airports that have problems with DEP minima for reasons related to obstacles or aeronautical noise, which can be resolved with an RF Leg and/or values of less than 1 NM and down to 0.3 NM.	YES	O/G	O/G	NO		NO			O/G	N/A	OG		NO	NO	
7. ATC gradient That SAM States, when applying the ATC gradient, take into account the following: a) To be applied only at domestic airports; b) Prior CDM process among stakeholders; **c)** Assess the convenience of publishing different charts to	YES	YES	NO	O/G YES		O/G NO			O/G	O/G	NO		NO NO	YES YES	

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGI	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
enhance situational awareness of controllers and pilots.															
8. Identification of SIDs/STARs															
• That airspace planner should assess the best way of designating SIDs/STARs (with or without transition) through CDM with all stakeholders;	YES	YES	YES	O/G		O/G			O/G	YES	O/G		YES	YES	
• SAM States should apply the concept of transition in RNP AR procedures that have many intermediate fixes (IF), assessing their impact on the graphic representation in the chart and any possible problem in automated ATC systems.				O/G		NO				N/A	O/G		NO	NO	
9. Minimum altitudes of SIDs That SAM States:															
a) Publish, as an additional safety mechanism, the minimum altitudes in the SIDs, in critical segments on account of obstacles, to allow the pilot to monitor such altitude through the FMS;	YES	YES	O/G	O/G		YES			O/G	YES	YES		YES	YES	
b) Establish the proper connection between the SIDs and the ATS route network to ensure obstacle clearance.			YES	YES		YES				YES	YES		YES	YES	

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGI	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
10. Level segments to intercept the ILS glide slope That SAM States:															
a) Whenever possible, use level segments in the intermediate approach so that the aircraft may lose power and get ready for an ILS approach procedure, ensuring interception of the glide slope “below the path”;	YES	YES	YES	O/G		YES			OG	YES	YES		NO	YES	
b) If a level segment cannot be established, then a reduced slope in the intermediate segment should be used to allow the aircraft to lose power. Likewise, interception of the glide slope “below the path” shall be ensured.				O/G		YES					YES		NO	YES	
11. Elimination of publication of procedures on paper That SAM States assess the possibility of eliminating or substantially reducing publications on paper, especially the AIP, including air navigation procedures (routes, STARs, SIDs, IAC, etc.) with a view to allowing monthly updates, savings in printing/paper, and more expeditious publication and updating of such publications.	NO	O/G	O/G	O/G		YES			O/G	O/G	O/G		O/G	YES	

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGI	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
12. Retirement of information on ceiling and MDA/MDH from approach charts That SAM States publish the OCA/OCH in instrument approach procedures and **not** publish MDA/MDH and ceiling, in accordance with ICAO documentation (Annex 6, Doc 8168 and Doc 9365), to ensure harmonisation in the SAM Region..	NO	YES	O/G	O/G		O/G			YES	YES	YES		YES	YES	
13. Application of CCO/CDO techniques at airports with low traffic volume That SAM States:		YES	YES						O/G	YES				YES	
a) Publish an AIC and/or instruct air traffic controllers to authorise the approach direct to the IAF from a distance of approximately 200 NM from the airport, especially if there are no terrain and obstacle issues, in order to allow the pilot to calculate the ideal point of descent, using the IAF as a reference, and request it from the ATCO.	NO			NO		YES					NO		NO		
b) Develop the corresponding STARs and SIDs, trying to apply CCO/CDO techniques within the possibilities of each scenario under consideration.	YES			YES		YES				YES	YES		NO	YES	

Agenda Item 3: Implementation of air traffic flow management (ATFM) and improvement of procedures for coordination between agencies

3.1 Under this agenda item, the following papers were analysed:

a) WP/09 – *Follow-up to ATFM implementation* (presented by the Secretariat);
b) WP /10 - *ATFM CONOPS update* (presented by the Secretariat);
c) WP /11 - *A-CDM Project for the SAM Region* (presented by the Secretariat).
d) WP /17 – *Actions for ATFM implementation in Argentina* (presented by Argentina)
e) IP/10 - *Cooperation provided by Brazil for ATFM implementation in the ATM system of Argentina (*presented by Brazil); and
f) NI/14 – *Avance de la ATFM e implantación del A-CDM en el Estado Peruano* (presented by Peru).

3.2 The Meeting took note of the status of implementation of ATFM. Taking as a reference the Declaration of Bogota, the metric for the implementation of flow units/positions in the SAM Region, which remained at a level of 64% since SAMIG/20, increased to 71% following the commissioning of the FMU of Ezeiza, Buenos Aires, on 21 May 2018, as described below.

3.3 It was noted that Bolivia and Peru had signed an ATFM memorandum of understanding for coordination between the La Paz ACC and the Cusco FMP, and that effective flow management measures had been implemented since March 2018.

3.4 Joint tasks were being coordinated between the NACC and SAM Offices for updating the CAR/SAM ATFM CONOPS. The Meeting recommended that this activity be expedited because of its priority, which was also highlighted at GREPECAS/18. Accordingly, it was agreed to request the Secretariat to assess and coordinate the support offered by the RCC/12 to make available an ATFM consultant for the drafting of the aforementioned document.

3.5 It was recognised that the development of A-CDM (CDM at airports) was not a pre-condition for ATFM implementation. However, both concepts were supplementary. Information was presented on the A-CDM CONOPS, which should be aligned with the regional ATFM CONOPS. Within this context, note was taken of plans for a GREPECAS project for the development of the respective ASBU module, implementing this concept at SAM airports that so required.

3.6 The Meeting agreed that flow control measures that had a domino effect and caused delays between adjacent FIRs had been gradually eliminated and replaced by better coordination and more efficient work by the ACCs and FMPs/FMUs.

3.7 The Meeting noted that some States still needed to promote and strengthen FMP/FMU functions with resources and trained personnel, with powers to coordinate the adoption of ATFM initiatives (TMIs) with air traffic services in case of air traffic capacity/demand imbalances caused by scheduled or unforeseen events.

3.8 It was noted that ATFM refresher training programmes for FMP/FMU personnel had to continue, and that Project RLA/06/901 had convened an ATFM seminar on 11-15 June 2018 focusing on the analysis of practical cases and the application of capacity management measures in SAM States. The Meeting took note that the Spanish version of Doc 9971 – Third edition, was already posted on the ICAO website for review by ATFM personnel.

3.9 The Meeting took note that experts from Venezuela, Chile, Peru and Colombia had been participating at CADENA weekly sessions since late 2017, although not on a continuing basis. The consensus of the Meeting was that these sessions had positive aspects that favoured CDM and that could improve the data sharing culture between units in the Region. However, it was noted that sessions were mainly attended by participants from the Caribbean and NAM Regions. Accordingly, the data was not always relevant for those States that shared no boundaries with the CAR Region. Furthermore, it was noted that the time zone differences were an obstacle to participate in the sessions on Fridays at 1400 UTC.

3.10 The ANSPs of Argentina and Brazil had been participating in the initiative since the beginning. In March 2018, Colombia has expressed to CANSO its interest in becoming a member of CADENA and was receiving training. Paraguay and Uruguay stated that they were analysing the possibility of joining CADENA as members.

3.11 Argentina described the commissioning process for the Ezeiza FMU, installed at the ACC, on 21 May 2018. The CGNA of Brazil cooperated in this task. Emphasis was made on the phased process that included aspects concerning organisation, drafting of manuals and CONOPS, and continuous capacity measuring activities, resulting in training of ATFM and ATS personnel and airline staff. Users and airlines participated in the work, favouring CDM implementation.

3.12 The Meeting analysed the current scenario at the Baires TMA and at airports where low-cost operations had increased significantly. Measures for balancing demand in Ezeiza, Palomar and Aeroparque were described, as well as measures being taken in preparation for aircraft operations that would be generated by the G20 summit in November.

3.13 Peru presented the progress made in ATFM implementation through the Lima FMP, as well as the benefits obtained during the first quarter of 2018. FMP effectiveness was estimated at 92.22%. Measurements on the use of declared capacity at the AIJCH were presented.

3.14 It was also noted that the MOU between La Paz and Cusco had allowed for the inclusion of a tolerance of +/- 5 minutes for take-offs from La Paz, reducing flight delays between these airports. Likewise, it was noted that the rerouting TMI set forth in Doc 9971 was being assessed within the context of upcoming operations between the Pisco and Cusco airports.

3.15 The Meeting updated the information on ATFM focal points shown in **Appendix A** to this part of the report, and updated the ATFM survey on implementation activities, shown in **Appendix B** to this part of the report.

APPENDIX A / APÉNDICE A

LIST OF CONTACTS FOR OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS

LISTA DE CONTACTOS PARA PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
ARGENTINA*	Maria Estela Leban Directora de Regulaciones, Normas y Procedimientos Administración Nacional de Aviación Civil (ANAC) Tel: +54 911 58 338379 E-mail: meleban@anac.gob.ar	Silvana Vanesa Enriquez Jefe del Departamento ATS - Gerencia del Área Operativa Movil: 0054 9 11 4420 1306 Email: senriquez@eana.com.ar Nicolas Borovich Jefe de Departamento Planificación Tel: +5411 43203947 Cel.: +54911 31199377 Email: nborovich@eana.com.ar

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
BOLIVIA* (Plurinational State of) / **BOLIVIA (Estado Plurinacional de)**	ATCO Jesús I. Villca Jiménez Inspector ATM/SAR Dirección General de Aeronáutica Civil (DGAC) Teléfono: +591 2 211-4465 Cel.: +591 72023263 E-mail: jvillca@dgac.gob.bo	ATCO. Marco Sergio Barrios Barzola Supervisor ACC La Paz Tel/Fax: +591 2 281-0203 (ACC/La Paz) Tel: +591 2 223-8339 (Home/domicilio) Cel.: +591 7 052-3884 E-mail: mbarrios@aasana.bo masebarbar@hotmail.com
BRAZIL / BRASIL*	Sidnei Nascimento De Souza Jefe de Operaciones del CGNA Centro de Gerenciamento e Navegação Aérea – CGNA. Tel.: +55 21 2101-6531 Cel.: +55 21 99499-1658 Juarez Franklin Gouveia Centro de Gerenciamento e Navegação Aérea – CGNA Oficial ATM Tel.: +55 21 2101-6548 Cel.: +55 21 98554-3809 E-mail: franklinjfg@cgna.gov.br	Gerente Nacional - GNAC Tel.: +55 21 2101-6409 E-mail: gnac@cgna.gov.br Gerente Nacional de Fluxo – GNAF Tel.: +55 21 2101-6546 E-mail: grt@cgna.gov.br Gerencias Regionais – GER Tel.: +55 21 9949-6492 / +55 21 2101 98554 3598 E-mail: gr1@cgna.gov.br / gr2@cgna.gov.br

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
CHILE*	Patricio Zelada Ulloa Dirección General de Aeronáutica Civil Dirección de Aeródromos y Servicios Aeronáuticos (DASA) Sub Departamento de Servicios de Tránsito Oficina ATFM (FMU) Tel.: +56 2 2290-4605 E-mail: pzelada@dgac.gob.cl	FMP ACC Santiago Tel.: +56 2 2645-8882 ACC Santiago Cel.: +56 9 9158-1865 Supervisor ATC de turno E-mail: sup.accu@dgac.gob.cl

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
COLOMBIA	Mauricio José Corredor Monroy Unidad Administrativa Especial de Aeronáutica Civil (UAEAC) Jefe Grupo ATFCM Tel.: + 57 1 296-2628 E-mail: mauricio.corredor@aerocivil.gov.co Skype: mauricio.corredor.monroy	Unidad de Gestión de Afluencia de Tránsito Aéreo y Capacidad – FCMU COL (DE 1100 A 0500 UTC) E-mail: cfmu.dsna@aerocivil.gov.co Please copy to / Favor copiar a: E-mail: cns.fmu@aerocivil.gov.co aga.fmu@aerocivil.gov.co Telefonos: MANAGER: +57 1 296-2656 CNS: +57 1 296-2100 AGA: +57 1 296-2200 DEPARTURE FLOW MANAGEMENT: : +571 296-24 06 Celular MANAGER: +57 317 517-10 46 AGA: +57 317 363- 88 11 CNS: +57 318 330-73 74

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
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FR. GUIANA / GUYANA FRANCESA	Jean Michel Pubillier French West Indies and French Guiana Air Navigation Services Office: +596 596 42 24 88 GSM: +596 696 93 60 72 Email: jean-michel.pubillier@aviation-civile.gouv.fr	Hervé Thomas Head of ATC Services Cayenne Office: +596 594 35 93 04 GSM: +594 694 91 63 63 Email: herve.thomas@aviation-civile.gouv.fr

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
GUYANA		
PANAMÁ*	Gilda Espinosa Inspectora ANS/ATS Oficina de Vigilancia de la Seguridad Operacional para los Servicios de Navegación Aérea-OVISNA Autoridad Aeronáutica Civil de Panamá (AAC) Tel.: (507) 315-9031/315-9898 Email: gespinosa@aeronautica.gob.pa Ana Teresa Montenegro Inspectora ANS/PANS-OPS Oficina de Vigilancia de la Seguridad Operacional para los Servicios de Navegación Aérea-OVISNA Autoridad Aeronáutica Civil de Panamá (AAC) Tel.: (507) 315-9031/315-9898 Email: amontenegro@aeronautica.gob.pa	Supervisor de turno del Centro de Control Administración de Aeronáutica Civil Tel.: +507 315 9871 E-mail: cerap@aeronautica.gob.pa Ivan Chesgter De Leon Sub Director de Navegación Aérea Tel. ofic: +507 3159802 Cel: +507 6686 3279 E-mail: ideleon@aeronautica.gob.pe

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
PARAGUAY*	ATCO. Delia Cristina Giménez Aranda Jefe Departamento Evaluación de Sistemas CNS/ATM Dirección Nacional de Aeronáutica Civil (DINAC) Tel./Fax: +595 21205365 Cel.: +595 981841794 Email: eca@dinac.gov.py evaluacióngnna@gmail.com Mcal. Lopez /22 de setiembre Edif. Ministerio de Defensa Nacional Asunción Paraguay	**1. Unidad de Flujo (SGAS) – FMU SGAS (Unidad Operativa)** Current responsible / Responsable actual de Unidad: ATCO. José Filartiga Tel./Fax: +595 21 7585292 Tel.: +595 972 157412 E-mail: fmu.asu@gmail.com Mariano Roque Alonso-Paraguay Edificio Centro de Control de Área - Unificado **2. Unidad de Flujo (SGES) – FMU SGES (Unidad Operativa)** Current responsible / Responsable actual de Unidad: Lic. ATCO. David Gavilán Tel./Fax: +595 615973144 Cel.: +595 983 830-404 E-mail: daga_978@hotmail.com Minga Guazú-Paraguay Aeropuerto Internacional Guaraní

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
PERU*	Sady Orlando Beaumont Valdez Dirección General de Aeronáutica Civil (DGAC) Inspector de Navegación Aérea Tel.: +51 1 615 7880 Cel.: +51 987594185 E-mail: sbeaumont@mtc.gob.pe	Dante Samaniego Bilbao Puesto de Gestión de Flujo de Tránsito Aéreo (FMP LIMA) Teléfono: +511 630-1000 Ext.2482 - 2483 Dirección AFTN: SPIMZDZX e-mail: dsamaniego@corpac.gob.pe fmu_lima@corpac.gob.pe
SURINAM/ SURINAME	Mr. Manody Ramparichan Chief Air Traffic Services Tel.: +59 7 530-433 Mob.: +59 7 856 8424 Fax: +59 7 491-743 E-mail : manodyrampa@hotmail.com	Mrs. Kalawatie Radha Atwaroe ATS Supervisor ATS unit Zanderij Phone: Operations : +597 032-5203 Mob.: +597 955 5025 E-mail: radha_atwaroe@hotmail.coom
URUGUAY*	Dirección Nacional de Aeronáutica Civil DINACIA / DGAC INA Rosanna Barú Inspectora Navegación Aérea Tel: +598 2 604 0408 Ext 4461 E-mail: rbaru@dinacia.gub.uy	DINACIA / DGIA Tte Cnel. (Nav.) Gabriel Falco Director de Circulación Aérea Tel: +598 2 604 0408 Ext 5101 Cel: +598 9 804 6848 FAX E-mail: gfalco@dinacia.gub.uy DINACIA/ DGIA CTA Guillermo Facello Tel: +598 2 604 0408 Ext 5105 E-mail: atfmuruguay@dinacia.gub.uy ACC Montevideo Tel.: +598 260 00619 REDDIG

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
VENEZUELA* (Bolivarian Republic of) / **VENEZUELA (República Bolivariana de)***	Maribel Mayora Vallenilla Responsable ATFM Tel: +58 212 303-4532 (13:00 – 21:00 UTC) Cel: +58 416 611-0607 (H24) E-mail: atfm@inac.gob.ve m.mayora@inac.gob.ve Junel Javier Martínez Operaciones de ATFM Instituto Nacional de Aviación Civil – INAC Aeropuerto Internacional Simón Bolívar Edificio ATC, PB, Oficina ATFM Maiquetía, Vargas República Bolivariana de Venezuela Tel: +58 212 303 4532 E-mail: j.martinez@inac.gob.ve	

* *ESTADOS ACTUALIZARON TABLA EN SAMIG/21 / STATES HAS UPDATED TABLE IN SAMIG/21*

Others / Otros	INTERNATIONAL ORGANIZATIONS / ORGANIZACIONES INTERNACIONALES	ICAO / OACI
	Julio de Souza Pereira Assistant Director, Safety Flight Operations IATA Avda. Ibirapuera, 2332, cj 22 Torre I Sao Paulo, Brasil Tel: +55 11 21874236 Mob: +55 11 993800953 Email: pereiraj@iata.org	Fernando Hermoza Hübner RO/ATM/SAR Tel.: +511 611 8686, Ext. 106 E-mail: fhermoza@icao.int Roberto Sosa España RO/ANS & SFTY Tel.: +511 611 8686, Ext. 104 E-mail: rsosa@icao.int
	INDUSTRY / INDUSTRIA	
	Walter Nogueira Pizzo Gerente de Programas ATECH Tel: +55 11 3103 4600 ext 1054 Email: wpizzo@atech.com.br	

ATFM SURVEY

ATFM SURVEY	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY
1 . Regarding the SAM ATFM implementation plan, confirm if FMUs/FMPs have been established. If YES, indicate which is the responsible unit. If the answer is NO, indicate what are your plans for ATFM implementation based on regional requirements.	YES	NO	YES	YES	YES	YES		
2. Confirm if you have personnel trained in the ATFM implementation plan and if this staff is currently performing the corresponding functions according to the implementation plan.	YES	YES	YES	YES	NO	YES	YES	NO

ATFM SURVEY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
1 . Regarding the SAM ATFM implementation plan, confirm if FMUs/FMPs have been established. If YES, indicate which is the responsible unit. If the answer is NO, indicate what are your plans for ATFM implementation based on regional requirements.	YES	YES	YES		YES	YES	Panama: The responsible is the Control Centre Supervisor Argentina implemented FMU EZE 21 May 2018. Bolivia: The DGCA will prepare a plan to implement the ATFM, for this will require the cooperation of Peru, a request that will be formalized until the end of October 2017 Ecuador: FMP in Guayaquil ACC URUGUAY: ACC MVD Colombia has implemented a FMU which is names as FCMU COLOMBIA in the TMA BOG, foreseen to implement FPM'S in the remaining Control Centers (SKBQ) and radar rooms of Colombia (SKCL, SKRG, SKPE, SKVV, SKBG). (Via mail, May 2018)
2. Confirm if you have personnel trained in the ATFM implementation plan and if this staff is currently performing the corresponding functions according to the implementation plan.	YES	YES	YES	NO	YES	YES	Pending Guyana and Suriname.

ATFM SURVEY	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
5. How many airports in your State/country have apron capacity calculations? List the main ones. If the answer is NONE, indicate which airports you think require such calculations.	0	0	2	0	2	0	1		1	0	17		1	0	Argentina: Has defined a method, and is starting to calculate. Bolivia: SLLP, SLCB and SLVR Brazil: SBGR, SBCT Calculation is considered required for: SBBR, SBCF, SBKP, SBSP, SBGL and SBRJ. Chile: Calculation is required in SCEL, SCIE, and SCCF (The Loa of Calama.). Don´t have trained personnel for such task. Colombia: SKBO and SKRG. Is required for international airports which are (SKAR, SKBQ, SKBG, SKCL, SKCG, SKCC, SKLT, SKRG, SKMR, SKPE, SKRH, SKSP, SKM) and for the trunk ones (SKLT, SKVP, SKEJ, SKBU, SKPP, SKIP, SKPS, SKYP) since the capacity of this resource lacks management in relation to the growing demand. Ecuador: None of the airports in the country has apron capacity calculations. Considered as priority #1 that airports of San Cristobal (Galapagos), Baltra (Galapagos); and with priority #2 Guayaquil, Latacunga and Quito required the study of such calculations. Panama: MPTO. Paraguay: These calculations have not been performed due to lack of experts (specialists) duly trained for this purpose. Calculations are required for the two international airports mentioned above: "Silvio Pettirossi" in Asuncion and "Guaraní" in Minga Guazú. Peru: Cusco 7 C/D and 4 A/B positions. Calculations have been performed in 17 airports in the country. Uruguay: SUMU. Venezuela: None. We still do not have personnel duly trained to conduct these calculations, and do we have airports to perform calculation: international airport of Maiquetia, Margarita and Barcelona

ATFM SURVEY	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
6. Number of operations per hour at the airport considered to be the most important one:															Chile: SCEL Peru: SPJC
Runway capacity	SAEZ SACO SABE See Obs.	SLLP 16	SBGR 55	SCEL 40	SKBO 74	SEQM 25 SEGU 29	6		MPTO 44	SGAS 23	SPJC 35		SUMU 25 SULS 18	SVMI 34	Argentina: SAEZ: RWY: 11: 29 aircraft/hour 29: 27 aircraft/hour 35: 13 aircraft/hour 17: 15 aircraft/hour SACO: RWY: 18: 13 aircraft/hour 36: 21 aircraft/hour SABE: 35aircraft/hour (in OCT18 will have more accurate data) Brazil: SBBR (64) SBSP (41) SBGL (48)
Apron capacity	NO	NO	YES	NO	NO	NO	NO	NO	MPTO 49	NO	SPJC	NO	---	NO	Argentina: Has started calculations. Brazil: SBGR (90), SBCT (18) Uruguay: Pending
7. For the airport considered to be the most important one, number of trained personnel capable of providing, in terms of operations per hour, calculations for:															Argentina: Rwy 15. Sector 10 Ecuador: Rwy 1. Sector 1
Runway capacity	20	12	18	29	4	1	3		2	3	8		5	5	

ATFM SURVEY	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
Apron capacity	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	NO	----	NO	Brazil: The methodology and training of personnel for this task are the responsibility of the concessionaire. Uruguay: The methodology and training of personnel for this task are the responsibility of the concessionaire
ATS sector capacity	10	10	20	2	4	1	3		2	3	8		5	6	Argentina: Completed courses in June 2017. 10 people are now trained.

Agenda Item 4: Assessment of operational requirements to determine the implementation of improvements in communications, navigation and surveillance (CNS) capabilities for operations in en route and terminal areas

4.1 Under this agenda item, the following working and information papers were analysed:

a) WP/12 – *Follow-up to performance and activities of REDDIG II* (presented by the Secretariat);
b) WP /13 – *Follow-up to the implementation of the AMHS interconnection* (presented by the Secretariat);
c) WP /22 – *Survey on CNS capabilities of aircraft operating in the Americas and the North Atlantic* (presented by IATA);
d) IP/08 - *Status of SITA AMHS gateway interconnections (English only)* (presented by SITA);
e) NI/12 - *Evolución del sistema AMHS de Brasil* (presented by Brazil); and
f) NI/16 - *Interconexión de sistemas AMHS en la Región SAM* (presented by Peru).

4.2 The aforementioned working and information papers covered the following topics:

- Activities carried out under the SAM ATN architecture project, D1.
- Activities carried out under the ATN ground/ground and air/ground applications project, D2.
- Other CNS considerations

ACTIVITIES CARRIED OUT UNDER THE ATN ARCHITECTURE PROJECT – D1

Progress made in the implementation of REDDIG II

4.3 The Meeting took note of the main activities carried out in REDDIG II since the SAM/IG/20 meeting concerning the following aspects:

- Training programme;
- REDDIG II operation;
- Implementation of new services;
- Availability of REDDIG II; and
- REDDIG II security analysis

Training programme

4.4 The following courses were delivered:

- Advanced course on REDDIG II operation
- Course on IP networks, applied to REDDIG II
- Course on network fundamentals (basic) for personnel of the Manaus NCC

Advanced course on REDDIG operation

4.5 This course was addressed to the technical staff responsible for the operation and maintenance of a REDDIG II station, and was conducted on 13-16 June 2017 at the premises of the Training and Technical Update Section (SIAT) of the Fourth Integrated Air Defence and Air Traffic Control Centre – CINDACTA IV, Manaus, Brazil. For this event, one fellowship was granted per member State of Project RLA/03/901 and simultaneous interpretation services were provided. The course was attended by 36 delegates of Argentina, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Trinidad and Tobago, and Venezuela.

Course on IP networks, applied to REDDIG II

4.6 The course was addressed to technical staff with IP network knowledge that had participated in the courses "Interconnecting Cisco Network Devices Part 1 (ICND1)" and "Interconnecting Cisco Network Devices Part 2 (ICND2)", and was responsible for the operation and maintenance of the REDDIG II station. The course was held on 13-17 November 2017 at the premises of the Training and Technical Update Section (SIAT) of the Fourth Integrated Air Defence and Air Traffic Control Centre – CINDACTA IV, Manaus, Brazil. For this event, one fellowship was granted per member State of Project RLA/03/901, and simultaneous interpretation services were provided. The course was attended by 24 delegates of Argentina, Brazil, Chile, Guyana, Paraguay, Suriname, Trinidad and Tobago, and Venezuela.

Course on network fundamentals (basic) for the personnel of the Manaus NCC

4.7 This course was addressed to personnel working at the Manaus NCC, and was aimed at refreshing and supplementing the fundamental and advanced concepts on transmission systems used for voice and data transmission, applied to civil aviation.

REDDIG II operation

Activities carried out to resolve problems in the nodes

4.8 The Meeting took note of the activities carried out during 2017 to resolve problems and complete the tasks pending since the commissioning of REDDIG II (February 2015) at the nodes of Brasilia, Ecuador, La Paz, Ezeiza, Manaus, Suriname, and Venezuela. Full details can be found in WP/13.

Final acceptance tests of REDDIG II (FNAT)

4.9 The Meeting took note that the provisional acceptance tests of REDDIG II (document PSAT – NAT - 2022 NT - 2141167C Rev. H) had been conducted from 31 January to 5 February 2015. According to article 13.1 of contract Nº 2250120 (Provision of a new regional telecommunication network (REDDIG II)), the INEO & Level 3 consortium had 40 days to correct the deficiencies identified during the PSAT. Within the 40-day period, the INEO & Level 3 consortium corrected many of the deficiencies, except for the following major failures:

- Random freezing of the satellite modem (Skywan ID 1070) at some of the REDDIG II nodes; and
- Random freezing of the satellite modem of Manaus, chain A (Skywan ID 7000).

4.10 The INEO & Level 3 consortium finished correcting these major failures in late 2017. In this regard, the final acceptance tests of REDDIG II (FNAT) were conducted on 29-30 January 2018, and the FNAT certificate was signed on 30 January.

Implementation of new services

4.11 The Meeting took note that, since the RCC/20 meeting, the following AMHS circuits had been implemented and commissioned in REDDIG II:

- Brasilia - Bogota (May 2017)
- Brasilia - Georgetown (July 2017)
- Bogota - Caracas (December 2017)
- Brasilia - Caracas (March 2018)
- Brasilia - Ezeiza (March 2018)

4.12 Likewise, the Meeting took note that other AMHS circuits had been implemented but were not yet in operation. They were expected to be operational over the course of 2018:

- Ezeiza - Lima
- Ezeiza - Santiago
- Ezeiza - Montevideo
- La Paz - Lima
- Bogota - Guayaquil
- Caracas - Guayaquil
- Bogota - Panama (MEVAIII - REDDIG II interconnection)
- Brasilia - Montevideo

4.13 Likewise, connections had been established at the level of the network for the exchange of radar data between:

- Ezeiza - Santiago
- Ezeiza - Asunción

Availability of REDDIG II

4.14 The Meeting was informed about REDDIG II availability since the beginning of operations, as shown in **Appendix A** to this part of the report. The table shows that during the first two years of operation of REDDIG II (2015 and 2016), due to initial adjustment issues, availability levels were below 99.99%. However, after 2016, once random freezing problems in satellite modems had been solved, availability reached the expected level of more than 99.99%.

REDDIG II security analysis

4.15 The Meeting took note that the Sixth meeting on the technical-operational implementation of REDDIG II (RTO/6) had been presented with an initial action plan for the adoption of measures to mitigate identified threats which might affect REDDIG II security, as shown in **Appendix B** to this agenda item.

4.16 The Meeting took note that the Twenty-First Coordination Meeting of REDDIG (RCC/21) had considered that, in order to implement the action plan, the REDDIG II Administration should conduct, under Project RLA/03/901 and by the end of July 2018, a technical-economic study on the implementation of redundant equipment (router/firewall/switch) in each REDDIG II node, which, once completed, should be sent to REDDIG II member States for comments and possible approval by 30 September 2018.

FOLLOW-UP TO ACTIVITIES UNDER PROJECT D2, ATN GROUND-GROUND AND AIR-GROUND APPLICATIONS

Ground-ground applications

Follow-up to the operational interconnection of AMHS systems

4.17 The meeting took note that 15 AMHS interconnections had been implemented, 12 of which were in the operational phase and the remaining were in pre-operational phase, waiting for States to migrate to the operational phase. The goal of the Declaration of Bogota was to implement 26 interconnections by the end of 2016. The rate of implementation so far was 58%.

4.18 The Meeting took note of the status of implementation of AMHS interconnections in the SAM Region, as shown in **Appendix C** to this part of the report.

4.19 The Meeting considered that by June 2019, all AMHS interconnections should be completed, those contemplated in the Declaration of Bogota and those included in Table CNS II-1 of Volume II of the CAR/SAM Regional Air Navigation Plan (Doc 8733). See **Appendix D** to this part of the report.

4.20 The Meeting updated the information concerning the focal points for the implementation of AMHS interconnections, as shown in **Appendix E** to this part of the report.

4.21 The Meeting was reminded that any change made by a State to AMHS addressing should be communicated to the ATS Messaging Managing Centre (AMC) of EUROCONTROL, in accordance with the procedure established in ICAO State letter AN 7/49.1-09/34 dated 14 April 2009, and as reflected in Conclusion SAM/IG/18-2. According to this procedure, an external operator designated by the State should notify the AMC. The Meeting urged those States that had not yet designated the external operator for the AMC to do so as soon as possible.

4.22 Regarding the AMHS interconnection between the Brasilia MTA and the SITA Gateway, the Meeting took note that all tests had been carried out, and only commissioning was pending. For commissioning purposes, a review was made of guidance document “SITA transition planning” prepared by the AMC of EUROCONTROL. This guidance document offered planning, information and advice to AMHS COM centres of the Region affected by the implementation of the SITA AMHS Gateway in the AMHS network, as shown in **Appendix F** to this agenda item.

4.23 Brazil informed about the activities carried out for upgrading its AMHS system, including the implementation of new infrastructure for production purposes; a new AFTN gateway; a new standardisation environment and a new module for managing and supervising the entire system. Likewise, it stressed the need to activate the AMHS P1 interconnection with Madrid, so as to deactivate the existing AFTN connection, which used an old hardware platform and thus was difficult to support.

4.24 Peru presented information on the AMHS interconnections implemented between Peru and SAM States. It also informed about a sampling of non-delivery reports (NDR) of messages generated by the AMHS system.

4.25 The Meeting considered holding a teleconference on 14 June to complete the AMHS interconnection of Colombia and Venezuela with Ecuador, with the participation of the States involved and Peru. Technical and operational personnel should participate in this teleconference.

4.26 The Meeting also considered the need to conduct a teleconference between Argentina and Peru on 12 June to complete the implementation of the AMHS interconnection between the two States. Technical and operational personnel should participate in this teleconference.

4.27 The Meeting took note of the information provided by SITA describing the progress made in the implementation of interconnections between its AMHS gateway and AMHS systems of States worldwide, in coordination with ICAO Offices, AMHS centres and the AMC of EUROCONTROL.

4.28 In this regard, the Meeting took note that, by 2 May 2018, the status was as follows:

- The interconnections of the SITA gateway with Germany and Switzerland were active since 2016, and SITA exchanged messages with all the countries of the EUR Region;
- The interconnection with the APAC Region was active since 14 September 2017 through the nodes in WSSS and VTBB;
- The IOT and POT tests for the interconnection of the SITA gateway with southern Africa had been successfully completed. The decision was made to activate the interconnection, given the scarce number of SITA users in the African continent, and also because most of the users in that Region still used AFTN. This interconnection was active since April 2018;
- The POT tests with Jordan and Lebanon had been completed successfully. The activation of the interconnection with the MID Region was already scheduled for June 2018;
- Connectivity with the FAA had already been established. IOT under way;
- IOT and POT tests with Brazil had been completed successfully. Argentina upgraded its AMHS system to process the XF format. IOT tests were under way. SITA suggested that due to the scarce number of users in the SAM Region (no more than 10), the transition should be started using only the interconnection with Brazil.

4.29 In order to analyse the AMHS connection between the SAM Region and the SITA Gateway, the Meeting established an *ad hoc* group with delegates of Argentina, Brazil, Peru, Paraguay, SITA and the Secretariat. The group analysed the AMC guidance document and identified the actions required for the transition in the SAM Region.

4.30 As a result of the work carried out by the *ad hoc* group, the Meeting considered the following actions for the commissioning of the connection between the SITA gateway and the AMHS of the SAM Region (Brasilia and Ezeiza):

- In order not to delay the transition to the SITA Gateway Type X, which would affect the establishment of the AMHS interconnection between the Brasilia Centre and the Madrid Centre, initially, the Brasilia Centre would be used as primary connection for the SAM Region and, subsequently, upon completion of the tests between the Ezeiza Centre and the SITA Gateway Type X in Atlanta, the Region would try to use the two centres (Brasilia and Ezeiza) to interconnect with the SITA Gateway Type X of Atlanta.

- States that had not yet nominated the external operators for the AMC (Bolivia, Chile, Guyana, French Guiana, Suriname and Uruguay) should do so by 30 June 2018, making sure to review and update (as necessary) the information contained in the AMC system.

- The *ad hoc* group suggested the AIRAC date of 13 September 2018 to complete the transition.

- The coordinator of the Transition Plan (Transition Manager) would be the CNS Officer of the ICAO Lima Office.

4.31 In order to follow up on the actions specified by the *ad hoc* group, the Secretariat would conduct a teleconference on the week of 18 June 2018 with the focal points for the AMHS interconnection. At this teleconference, the specific action plan for the establishment of the interconnection with the SITA Gateway would be presented for review and approval.

OTHER CNS CONSIDERATIONS

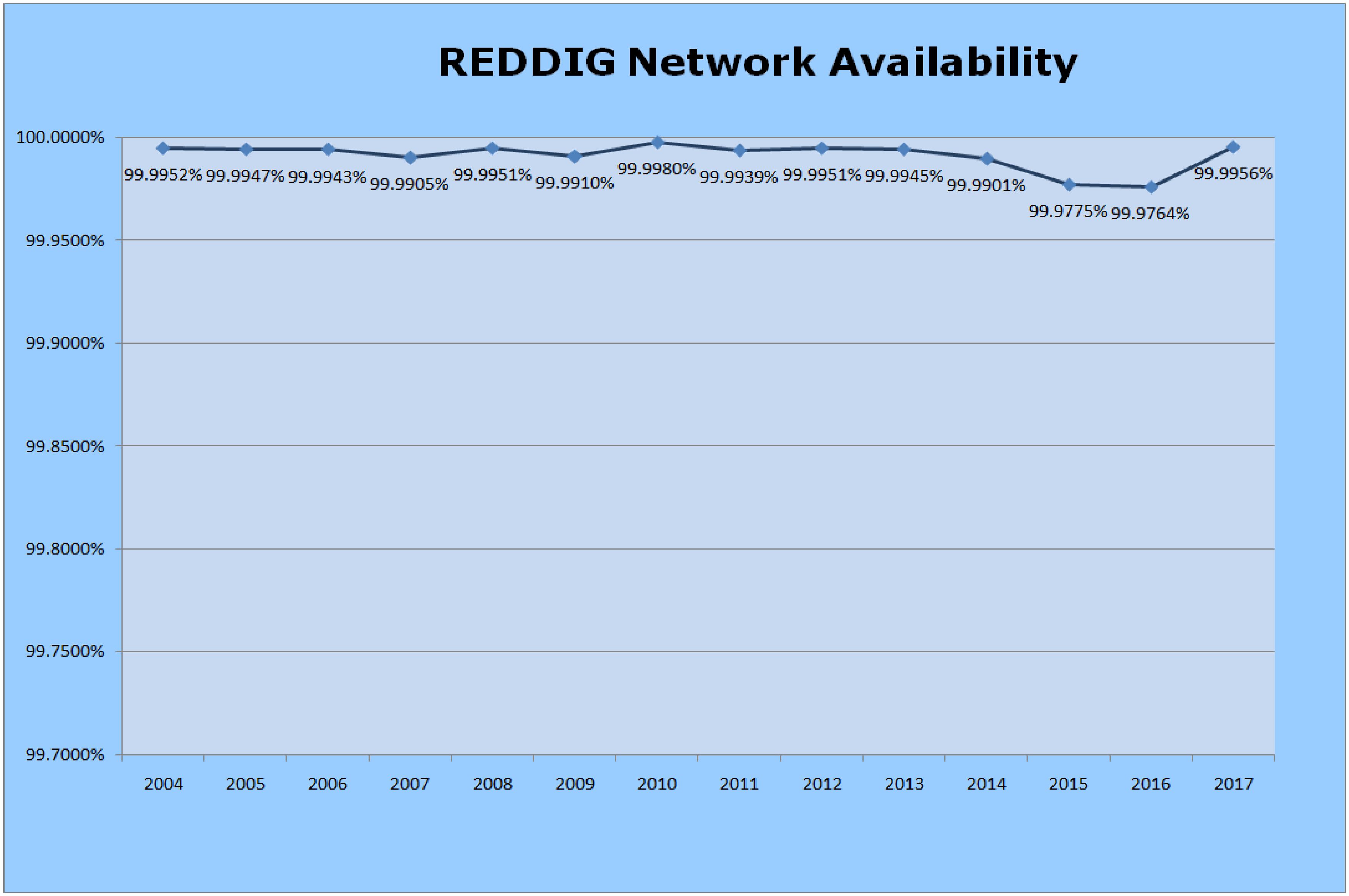
4.32 The Meeting analysed WP/22 of IATA on CNS capabilities of aircraft, which contained the results of a survey conducted among some airlines flying in the Americas and the North Atlantic. In this regard, the Meeting considered the following actions:

- The possibility for IATA to share the results of the survey with SAM States interested in receiving information concerning their FIRs;

- That SAM States analyse the results of the survey to support planning for the implementation of CNS systems and navigation performance;

- That the ICAO South American Office in Lima sends IATA’s survey to SAM States by 15 June so that it can be distributed to general aviation and other airlines not included in the original survey of IATA.

- States to answer the survey by the end of August 2018.


REDDIG Network Availability
100.0000%
99.9500%
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99.8500%
99.8000%
99.7500%
99.7000%
99.9952%
99.9947%
99.9943%
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99.9951%
99.9910%
99.9980%
99.9939%
99.9951%
99.9945%
99.9901%
99.9775%
99.9764%
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APPENDIX B

Security Analysis of REDDIG II

1 Introduction

1.1 Based on what was established in the teleconference of May 5, 2017, related to Conclusion RCC/20-3, Security Analysis of REDDIG II (formulated at the Twentieth Coordination Meeting of REDDIG - Project RLA/03/901 (RCC/20), and the work being done by the ad hoc group nominated at the Nineteenth REDDIG Coordination Meeting, with the objective of analyzing the security of REDDIG (conformed by Argentina, Brazil, Colombia, French Guiana (France), Paraguay, Peru and the Secretariat) to prepare a plan of action, specifying implementation dates for proposed actions, which are presented as Appendix H to the Agenda Item 3 of the final report of the RCC/20.

Action plan for the implementation of the security analysis of the REDDIG II

REDDIG II threats

1.2 Regarding the REDDIG II internal threats analysis, it was recalled that in each of the REDDIG II nodes should be installed redundant routers together with an "Ethernet switch", which will support all the "VLANs" of all IP services, the current and the future ones. This requirement was formulated at the third operational technical meeting of REDDIG through Conclusion RTO/3- *Installation of a router and redundant Ethernet switch for native IP services*

1.3 In order to standardize the configuration of the routers and switches, their technical characteristics, IP addressing, firewall, NAT application and other protocols, **an initial study** is presented below. This initial study will be distributed to delegates of the ad hoc group for their comments and **will be presented to the Sixth Operational Technical Meeting of REDDIG II** to be held in Manaus Brazil from June 12 to 16, 2017 for review. This study will subsequently be presented at the RCC/21 (March 2018) **for approval of the implementation** as an extension of the REDDIG II contract.

2. <u>Initial Study</u>

2.1 Timely it was established that all States should have implemented edge routers and it could be assumed that not all nodes have performed this action.

2.2 As mentioned in different circumstances, security in REDDIG II should be defined as the process by which resources are protected. Security objectives should be :

1) Protect confidentiality.
2) Maintain integrity.
3) Ensure availability.

2.3 Objectives that determine the imperative to protect the entire network in order to avoid threats and vulnerabilities.

2.4 A threat is an unauthorized access to a network or network device. Typically, threats are persistent due to vulnerabilities, which are problems that can arise as a result of poor hardware or software configuration, poor network design, inherited technology weaknesses, lack of training, or neglect of the final user.

2.5 El riesgo asumido se basa en el costo que se quiera tomar para salvaguardar la información. The security risks cannot be removed or prevented altogether; however, effective risk management and valuation can significantly minimize its existence. The risk assumed is based on the cost that is taken to safeguard the information.

2.6 The three main objectives of security seem very simple. However, the challenge of securing the network while taking operational needs into account can be a complex task. Administrators must carefully manage security policies to maintain the balance between transparent access, usage, and network security.

2.7 In relation to the above, and to the need for security external access, it is suggested:

1) To acquire networking equipment (routers firewall) for all nodes in order to:

   a) standardize the security equipment throughout the network,
   b) avoid unauthorized external and internal intrusions,
   c) address the lack of a border router in some nodes,
   d) management by the REDDIG II administrator of all firewalls (now subject to each state.

2) Implement a TACACS Server to control the accesses, create a community on the network computers to install a SISLOG (monitors all the events of the network, with the possibility of sending event information by mail), etc.

3) Define the assignment of user levels and keep a record on a server where all events will be hosted, which commands were executed, who entered, and so on.

4) Also, all of the above allows creating events for automatic backup when configuration changes are made to all networking computers.

2.8 It is extremely necessary to have a security plan to accurately define the architecture and operations, risks and security policies.

2.9 Subsequently, perform a joint analysis with the network personnel, to determine what type of events it is advisable to record (eg access to devices, changes in network interface status, hot restarts, changes in configuration parameters, etc.).

3. Firewalls

3.1 The most used application in recent years is the well-known firewall, a combination of hardware and software used by businesses and users to isolate the private network from abroad.

3.2 A firewall is a simple access control of the incoming / outgoing traffic of the user's network. In this control, the datagrams or packages that pass through it are reviewed and according to the rules imposed by the network administrator, will act accordingly: eliminating, forwarding or asking the administrator.

3.3 There are four types of firewalls: packet filtering, application level gateways, multilevel state inspection, and Circuit Level Gateways. The first two are the most used, but the multilevel inspection is the best considered. The big difference between them is the level of the OSI layer in which they work.

3.4 From the "Guide on Security Guidance for the Implementation of IP Networks" can be extracted:

3.4.1 Management must ensure adequate acquisition of the necessary resources for the protection of information, including network assets (routers, switches, etc.) and security (firewalls, IDS, IPS, etc.).

3.4.2 Each network must have a topology that takes into account the security aspects, considering at least the following:

a) Points of interconnection with other networks must have security assets, such as firewalls and IDS/IPS, installed and properly configured and monitored.

b) IP addresses should be designed so that they are not known on the Internet

c) Firewalls must be configured, at least, with the following rules:

- Deny all default policy;
- Web protocols (http, https, for example) only outgoing;
- E-mail protocols in both directions.

d) The routers must be configured considering the use of ACLs and NAT, as well as hiding the IP addresses.

e) Routers must be constantly updated, with different passwords and login from the factory.

f) The network interconnections with REDDIG II must be made with redundancy of assets, including those of security, and other measures that guarantee the availability and integrity of the information, as well as the performance of the network according to its specifications;

g) Connections with public networks (internet) must have a topology that guarantees security in multiple layers.

h) The network management must be done via the SNMP protocol version 3, with the activation of alerts and SNMP traps. Access to devices must be made using secure authentication;

i) Management links must be encrypted.

3.5 The Reference Guide constantly mentions the use of a firewall

4. <u>Acquisition of firewalls routers for the whole network</u>

4.1 The main objective is security, and in that sense the standardization and installation of networking equipment of the same characteristics will allow a greater robustness to the mitigation of vulnerabilities.

4.2 The administration of these equipments by the REDDIG II Administrator, and eventually the allowed access, with certain levels of privileges, to the different technicians that can intervene, will facilitate the control of accesses with good or bad intentions.

4.3 In this sense, the equipment required must have at least the following benefits:

1) A firewall as a combination of hardware and software used to isolate the private network from outside.

2) Allow reliable connections through proper firewall functions and access lists (ACLs).

3) Allow to configure NAT

4) Configuring Service Policies

5) Configuring access rules

6) Configuring AAA settings for access

7) Allow protocols inspection of each application layer

8) Provide information about the communications functions of the equipment

9) Allow the configuration of connection settings and quality of service (QoS)

10) Complex configurations for network protection.

11) Configuration of different modules.

5. Quantities and costs

5.1 In order to contemplate the installation of a firewall at all nodes and to have a backup, it is desirable to acquire 20 firewall equipment at an estimated value of around US$ 1000 to US$ 2000 each one. However, the value varies according to brand, model, license plates and licenses.

5.2 Take in consideration that equipment should be of a brand and supplier available in most States in order to be able to respond immediately to a contingency. Likewise, take in consideration the networking equipment that currently integrates the nodes of REDDIG II.

APPENDIX C

Implementation of the AMHS interconnection in each SAM States

Argentina

Software and hardware updating at all the terminals of AMHS national user agents was completed in late January 2018. The AMHS connection between Ezeiza and Brasilia will come on line on 5 April 2018. The migration to the operational phase of the following AMHS interconnections is expected by the end of the first semester of 2018:

- Ezeiza MTA - Lima MTA
- Ezeiza MTA - SITA GATEWAY
- Ezeiza MTA - Montevideo MTA
- Ezeiza MTA - Maiquetía MTA
- Ezeiza MTA - Santiago MTA

Bolivia

AMHS operational tests were resumed between the La Paz MTA and the Lima MTA on 26 December 2017, with some messages being exchanged. However, not all the tests could be completed due to problems in the AMHS system of La Paz. In order to resolve these problems, Bolivia will consult with the manufacturer of its AMHS system (Thales).

Bolivia has not yet appointed and registered an external COM operator for the EUROCONTROL AMC.

Brazil

The following AMHS connections became operational:

- Brasilia - Maiquetía (8 February 2018)
- Brasilia - Ezeiza (5 April 2018)

Regarding the AMHS interconnection between the Brasilia MTA and the SITA Gateway, all tests have been carried out, and only commissioning is pending. For commissioning purposes, a review was made of guidance document "SITA transition planning" drafted by the AMC of EUROCONTROL. This guidance document offers planning, information and advice to AMHS COM centres of the Region affected by the implementation of the SITA AMHS Gateway in the AMHS network, as shown in **Appendix A** to this working paper. The SAM/IG/21 Meeting should complete the review of the document. It is expected that the AMHS interconnection between the Brasilia MTA and the SITA Gateway in Atlanta will be operational by the end of the first semester of 2018.

SAM States must incorporate in their AMHS address lists the AMHS address of SITA as registered before the AMC. For this reason, those States that have not yet designated the external COM operator to the AMC (Bolivia, Chile, Guyana, French Guiana, Suriname and Uruguay) should do so as soon as possible in order to be able to access the AMC. Given the importance for States that have installed an AMHS system to designate a focal point to act as external AMC operator, the SAM/IG/18 meeting formulated Conclusion SAM/IG/18-2 ("*Designation and registration of SAM candidates before the AMC of EUROCONTROL*").
No progress was reported in terms of coordination for AMHS implementation at the interconnection between the Brasilia MTA and the Atlanta MTA, and between the Brasilia MTA and the Dakar MTA. The

interconnection between the Brasilia MTA and the Dakar MTA will be implemented through the AFISNET VSAT network.

Chile

Operational implementation of AMHS between the Santiago MTA and the Ezeiza MTA, foreseen for the end of the first semester of 2018, is still pending. The external COM operator for the AMC of EUROCONTROL has not been designated.

Colombia

Operational AMHS interconnection tests were successfully conducted between the Bogota MTA and the Panama MTA through the MEVAIII/REDDIG II interconnection. Operational implementation of this circuit requires completion of administrative arrangements with the MEVA III service provider. The circuit runs through the MEVAIII/REDDIG II interconnection in Bogota.

Ecuador

Operational implementation between the Guayaquil MTA and the Bogota and Maiquetía MTAs is still pending and scheduled for the end of the second semester of 2018.

French Guiana

A new AMHS system (COMSOFT) became operational in January 2018, but AMHS tests with the corresponding SAM States will take place in October or November 2018. Prior to the implementation of the AMHS interconnections, it would be necessary to install security equipment to counter any cyber threats. The external COM operator for the AMC of EUROCONTROL has not been designated.

Guyana

The reactivation of the AMHS circuit with Suriname is pending, and will be carried out once Suriname updates its AMHS system. Operational implementation of AMHS interconnection between the Georgetown MTA and the Maiquetia and the Port-of-Spain MTAs is scheduled for December 2018. The external COM operator for the AMC of EUROCONTROL has not been designated.

Panama

In mid-February 2018, positive operational tests were carried out between the Panama MTA and the Atlanta MTA through MEVA III. Operational implementation is scheduled for the end of the first semester of 2018. Regarding the status of implementation of the AMHS interconnection between the Panama MTA and the Bogota MTA, see paragraph 2.10.

Paraguay

Positive IP connectivity tests have been carried out between the Asunción MTA and the Brasilia MTA, and pending operational tests are scheduled for June 2018.

Peru

Regarding interconnection activities between the Lima MTA and the La Paz MTA, see paragraph 2.3. The operational interconnection between the Lima MTA and the Ezeiza MTA is scheduled for the end of the first semester of 2018. Finally, the interconnection between the Lima MTA and the Atlanta MTA through the MEVA III REDDIG II interconnection is scheduled for December 2018. Peru and Brazil are the SAM States with the largest number of operational AMHS connections.

Suriname

Updating of the AMHS system of Suriname has not yet started, awaiting approval by the aeronautical authority of Suriname. Upon completion of this process (no date reported), the AMHS connection with Guyana will be reactivated and AMHS interconnection tests resumed between the Paramaribo MTA and the Brasilia MTA. The external COM operator for the AMC of EUROCONTROL has not been designated.

Uruguay

The operational AMHS interconnection between the Montevideo MTA and the Brasilia MTA, and between the Montevideo MTA and the Brasilia MTA is scheduled for the end of the first semester of 2018. The external COM operator for the AMC of EUROCONTROL has not been designated.

Venezuela

With the commissioning of the new AMHS system on 20 September 2017, the following AMHS interconnections were implemented:

- Maiquetía MTA-Bogota MTA December 2017
- Maiquetía MTA-Lima MTA December 2017
- Maiquetía MTA-Brasilia MTA March 2018

Positive tests were carried out between the Maiquetía MTA and the Ezeiza MTA (system developed by CIPE) in May 2018, and operational connection is scheduled for the end of the first semester of 2018.

The operational interconnection between the Maiquetía MTA and the Atlanta, Cayenne, Guayaquil, Georgetown, Madrid and Port-of-Spain MTAs is scheduled for the end of the second semester of 2018.

APPENDIX B

AMHS INTERCONNECTION REQUIREMENT AND DATE OF IMPLEMENTATION IN THE SAM REGION

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
Argentina	Bolivia	Dec 2018	Pending initial coordination
	Brazil	Apr 2018	Final operational tests for AMHS interconnection between Brasilia and Ezeiza were successfully completed on 18 May 2016. Operational implementation 05/04/2018.
	Chile	Jun 2017	Positive operational tests carried out on mid December 2016. Pending decision from authorities of Argentina and Chile for operational implementation.
	Paraguay	Mar 2012	Implemented and operational
	Peru	Mar 2018	Positive operational tests carried out at the end of 2016. Pending decision from authorities of Argentina and Peru for operational implementation.
	South Africa	Jun 2019	Coordination began on December 2016. Interconnection implementation will be made through CAFSAT. Modernization of CAFSAT node Ezeiza is foreseen by mid-2018.
	Uruguay	Jun 2018	Connectivity in Protocol P1 level between MTA Ezeiza – Montevideo. Operational test foreseen June 2018.
	Venezuela	Jun 2018	Implemented and operational (out of service- failure in AMHS Venezuela) since Dec 2016. Operational since 20 September 2017. Tests foreseen for June 2018.
	SITA (Atlanta)	Apr 2018	Positive connectivity tests carried out. Operation foreseen December 2017.
Bolivia	Argentina	Dec 2018	Pending initial coordination
	Brazil	Sep 2018	Pending initial coordination
	Peru	Jun 2018	IP connectivity between La Paz and Lima MTAs achieved. Failure occurred in MTA La Paz, AASANA will consult Thales.
Brazil (Brasilia)	Argentina	Apr 2018	Final operational tests for AMHS interconnection between Brasilia and Ezeiza were successfully completed on 18 May 2016. Operational implementation 05/04/2018.
	Bolivia	Sep 2018	Pending initial coordination
	Colombia	May 2017	Operational May 2017.

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
	Spain	Dec 2017	Operations scheduled December 2017. AMHS circuit implemented through CAFSAT. To date in pre-operational phase. For beginning operations, Brasilia AMHS connection is expected - SITA(April 2018)
	United States	Jun 2018	Coordination began between Brazil and United States. Circuit implementation will be made through MEVAIII/REDDIGII.
	Guyana	Jul 2017	Operations in Protocol P1 level begun on 16 December 2016 at 17:00 UTC. On mid-February 2017 returned to AFTN configuration. AMHS tests resume on May 2017. Connection resume on July 2017.
	French Guiana	Dec 2018	Operation of an AMHS (CONSOFT) system is schedule by January 2018. AMHS interconnection scheduled October 2018.
	Paraguay	June 2018	Positive P1 connectivity tests were carried out. Pending operational tests by June 2018.
	Peru	Dec 2015	Implemented and operational 14 December 2015
	Senegal	Dec 2018	Coordination began between Brazil and Senegal (Dec 2016). Interconnection will be made through AFISNET satellite network which Brazilian node was installed in Recife.
	Sita (Atlanta)	Jun 2018	Successful operational and IP interoperability tests carried out in August 2017. Operation foreseen by June 2018
	Suriname	Dec 2018	Entered into operation on 15 Dec 2016 at 17:00 UTC. On mid-February 2017 returned to AFTN configuration. Pending updating of AMHS system by Suriname.
	Uruguay	Jun 2018	IP connectivity completed. (First week October 2016). IP Protocol tests successfully concluded the week of 28 Nov 2016 (30 Nov and 1 Dec). Positive operational tests made in August 2017 and commissioning in June 2018.
	Venezuela	Mar 2018	Positive connectivity in Protocol P1 level between Brasilia and Caracas (Oct 2016). Operational since 20 September 2017. Positive operational tests foreseen February 2018.

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
Chile	Argentina	Jun 2018	Positive operational tests carried out in mid-December 2016. Pending decision from authorities of Argentina and Chile for operational implementation.
	Peru	Dec 2016	Began operations on mid-December 2016.
Colombia	Brazil	May 2017	Operational May 2017.
	Ecuador	Dec 2018	Successful IP connectivity tests. Pending resume of operational tests.
	Panama	Jun 2018	Circuital interconnection has been configured through MEVA III/REDDIG II (Mid-February 2017). Positive operational tests August 2017. Operational implementation will be carried out once Colombia and Panama complete contract the AMHS circuit with MEVA III communication provider to establish Bogota-Panama AMHS circuit through MEVAIII/REDDIGII interconnection.
	Peru	Sep 2010	Implemented and operational
	Venezuela	Dec 2017	Operational since 20 September 2017 with new AMHS System. Tests foreseen November 2017.
Ecuador	Colombia	June 2018	IP connectivity tests successfully made. Pending resume of operational tests.
	Peru	Jul 2012	Implemented and operational
	Venezuela	Jun 2018	Operational since 20 September 2017 with new AMHS System. Operational tests with Venezuela carried out in November 2017. Problems in MTA Quito occurred in AMHS messages.
French Guiana (France)	Brazil	Dec 2018	French Guiana has scheduled for January 2018 the commissioning of an AMHS (CONSOFT) system. AMHS interconnection foreseen to begin October 2018.
	Venezuela	Dec 2018	French Guiana has scheduled for January 2018 the commissioning of an AMHS (CONSOFT) system. AMHS interconnection foreseen to begin on October 2018.
Guyana	Brazil	Jul 2017	Began operations on 15 Dec 2017 at 17:00 UTC. At mid-February 2017 returned to AFTN configuration. AMHS tests resumed on May 2017. Operational connection resumed on July 2017.
	Suriname	Jun 2011	Implemented and operational
	Trinidad & Tobago	Dec 2018	Pending coordination

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
	Venezuela	June 2018	Operational since 20 September 2017 with new AMHS System. Tests foreseen May 2018.
Panama	Colombia	Jun 2018	Circuital interconnection has been configured through MEVA III/REDDIG II (mid-February 2017). Positive operational tests made on August 2017. Operational implementation will take place once Colombia and Panama contract AMHS circuit to the MEVA III communications provider in MEVAIII/REDDIGII interconnection.
	United States	Jun 2018	By mid-February 2018 positive operational test were conducted between MTA Panama and MTA Atlanta
Paraguay	Argentina	Mar 2012	Implemented and operational
	Brazil	Jun 2018	IP interconnectivity tests began mid July 2016. Pending of operational tests on June 2018.
Peru	Argentina	Jun 2018	Positive operational tests carried out at the end of 2016. Pending decision from authorities of Argentina and Chile for operational implementation.
	Bolivia	Jun 2018	Successful IP connectivity between La Paz MTA and Lima MTA. Failure occurred in MTA La Paz, AASANA will consult Thales.
	Brazil	Dec 2015	Implemented 14 December 2015
	Chile	Dec 2016	Entered into operations the second half of Dec 2016.
	Colombia	Sep 2010	Implemented
	Ecuador	Jul 2012	Implemented
	United States	Dec 2018	Initial coordination has begun for the AMHS connection through the MEVAIII/REDDIGII interconnection.
	Venezuela	Dec 2017	Operational since 20 September 2017 with new AMHS System. Tests foreseen October 2017. Operational since December 2017
Suriname	Brazil	Dec 2018	Began operations on 15 Dec 2016 at 17:00 UTC. At mid-February 2017 returned to AFTN configuration. Pending Suriname AMHS system updating.
	Guyana	Jun 2011/Dec 2018	Implemented and operational until last quarter 2017. AMHS problems in Suriname identified. Pending updating.
	Venezuela	Dec 2018	New AMHS system operative in Venezuela since 20 September 2017.

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
			Tests and operation shall begin once Suriname updates its AMHS.
Uruguay	Argentina	Jun 2018	Positive P1 connectivity between Ezeiza and Montevideo achieved. Operational tests foreseen June 2017.
	Brazil	Jun 2018	IP connectivity tests completed (first week October 2016) Protocol P1 successfully concluded the week of 28 November 2016 (30 November and 1 December). Positive operational test made on August 2017. Operations foreseen June 2018.
Venezuela	Argentina	Jun 2018	Implemented and operational (out of service- failure in AMHS Venezuela) New AMHS system started operations in Venezuela on 20 September 2017. Tests with Venezuela foreseen Jun 2018.
	Brazil	Mar 2018	IP Connectivity achieved between Brasilia and Caracas (Oct 2016) New AMHS system started operations in Venezuela on 20 September 2017. Positive tests carried out in February 2018).
	Colombia	Dec 2017	New AMHS system started operations in Venezuela on 20 September 2017. Positive tests carried out in November 2017. Began operation in December 2017.
	Spain	Dec 2018	Pending initial coordination. Interconnection will be made through a communication circuit rented to a local provider. Implementation in progress.
	United States	Dec 2018	Pending initial coordination. AMHS circuit will be implemented through MEVAIII/REDDIGII interconnection.
	Ecuador	Dec 2018	New AMHS system started operations in Venezuela on 20 September 2017. Operational tests with Venezuela carried out in November 2017. Problems with MTA Quito identified in AMHS messages priorities.
	Guyana	Dec 2018	New AMHS system started operations in Venezuela on 20 September 2017. Tests with Venezuela foreseen June 2018.
	French Guiana	Dec 2018	French Guiana has scheduled for January 2018 the commissioning of an AMHS (CONSOFT) system. AMHS interconnection scheduled since October 2018.

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
	Peru	Dec 2017	New AMHS system started operations in Venezuela on 20 September 2017. Tests foreseen November 2017.
	Suriname	Dec 2018	New AMHS system started operations in Venezuela on 20 September 2017. Pending operational tests to be made when Suriname updates its AHMS system.
	Trinidad & Tobago	Dec 2018	New AMHS system started operations in Venezuela on 20 September 2017. Initial coordination done.

Green highlighted: AMHS interconnection operative
Light green: almost operational

APPENDIX E

NATIONAL FOCAL POINTS/PUNTOS FOCALES NACIONALES
IMPLEMENTATION OF INTERCONNECTION OF AMHS SYSTEM /IMPLANTACIÓN INTERCONEXIÓN DE SISTEMAS AMHS

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
ARGENTINA	EANA /ANAC	Hernán Gabriel Canna	Especialista CNS EANA	(54 11) 4480-2362	hcanna@eana.com.ar
		Javier Shenk	Gerente CNS (Communication, Navigation and Surveillance) EANA	(54911) 28370135	Jschenk@eana.com.ar
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APPENDIX F

SITA Gateway Transition Planning

SITA Gateway Transition Planning

Introduction

This guide provides planning, transition information and advice to COM Centres impacted by the implementation of AMHS SITA Gateway on the AFS Network. It provides AMC support for COM Centres to enable a smooth integration of a SITA AMHS Gateway. To allow the AMC Operator to successfully coordinate the activity, important steps and information are required to be followed.

In the ICAO Memorandum sent to all ICAO Regional CNS Officers, it states that the 'ATS Messaging Management Centre (AMC) will coordinate the activity' and that 'each COM Centre shall take actions.' Whilst the AMC Operator cannot mandate the steps in this guide, it requests the cooperation of COM Centres to follow the steps allowing a smooth transition of new SITA AMHS Gateways into Global operations. The risks of not coordinating the transition activity include message looping, message loss and NDRs throughout the global AMHS network which could impact ATC Services.

ICAO Memorandum 11th January 2016

Reference: EUR/NAT 16-0013.TEC (FIC/SAN) - 11 January 2016

'The work with respect to the introduction of the SITA PRMD and related routings will be coordinated out by the ATS Messaging Management Centre (AMC)2 (Ref.: State Letter AN 7/49.1-09/34, 14 April 2009 refers), however to ensure that such a Global activity has the correct level of engagement, Regional coordination is required. Please note that each State/COM Centre is affected and shall take actions, regardless of whether the COM Centre currently supports an AFTN to SITA connection. Every COM Centre will be required to route SITA AMHS messages to their Regional SITA AMHS gateway and validate the User Addresses in the AMC for their State.'

Planning

With respect to the ICAO Memorandum, this guide should be followed by COM Centres implementing a SITA AMHS Gateway. Importantly, a point of contact for the activity should be appointed. This will be a representative from a COM Centre, ideally the Regional Focal Point.

The appointed contact will be known as the **Transition Manager** who will inform, coordinate with the Regional COM Centres and coordinate with the AMC Operator who is responsible for the overall integration activity.

Prior to the activity, the Transition Manager having coordinated with SITA will contact the AMC Operator to notify the intention of integrating a new SITA Gateway COM Centre by providing the following information:

- Contact Details for who is managing the transition of the SITA Gateway into operations (Transition Manager).
- The planned AIRAC date the transition will occur.
- Confirmation that testing has been completed at the Gateway with SITA.
- The status (if required) of the SITA Gateway for the Region once in operation: Primary/Alternate.

Accordingly the AMC will inform ICAO Regional CNS Officer, all Regional Focal Points and impacted Regional COM Centres regarding the planned activity. Contact details for the Transition Manager who will be coordinating the activity will also be provided. Following the acknowledgement by the AMC Operator, the following planning activity will be carried out by the Transition Manager.

Confirm that the COM Centres are ready for the activity

The Transition Manager will coordinate with each COM Centre in the Region to confirm the followings:

- COM Centre accesses the AMC Application.
- Data in the Network Inventory is complete and up to date.
- Data in the AMHS User Address is complete and up to date.
- Routing tables are complete and PRMD = SITA routes to the new SITA Gateway*.

See Appendix A for accessing and using AMC functions.

**This may require coordination with adjacent COM Centres if the SITA Gateway is more than one hop in the network.*

Once the above information has been coordinated for each COM Centre the following 'Planning Acknowledgement Table' must be completed by the Transition Manager and submitted to the AMC Operator to confirm Regional Acknowledgement at least one AIRAC Cycle before the transition date.

Planning Acknowledgement Table

COM Centre	Contact	Tel.	E-mail	Check AMC Access	Check Net. Inv.	Check Add. Rout.	ACK Date
e.g. WSSS	*Mr. Smith*	*+1123456789*	*mr.smith@comcentre.org*	✓	✓	✓	*9/12/16*

By analysing the planning ACK table the AMC will inform the Transitional Manager, Regional CNS Officer, Regional Focal Points and all impacted COM Centres to **confirm** the activity.

Transition

Carry out an AMC cycle to integrate SITA Gateway

Transition will occur on the agreed AIRAC date for the Region. During the AIRAC cycle leading to the transition date, the following tasks will be completed:

- The agreed transition date will be published on the AMC Bulletin Board by the AMC Operator.
- On AIRAC day **08-14**, the AMC Operator will check and modify if necessary the routing tables entered by the COM centres in the AMC Application to make sure PRMD SITA is routed correctly.
- On AIRAC day **15-20** each COM Centre will check and confirm routing and user address list in the AMC.
- On AIRAC day **21-24** the following Transition Acknowledgement Table must be completed and sent to the AMC Operator by the Transition Manager.

Transition Acknowledgement Table

COM Centre	Contact	AFTN	E-mail	Check routing	Check address list	ACK Date
e.g. WSSS	*Mr. Smith*	*WSSSABCD*	*mr.smith@comcentre.org*	✓	✓	*9/12/16*

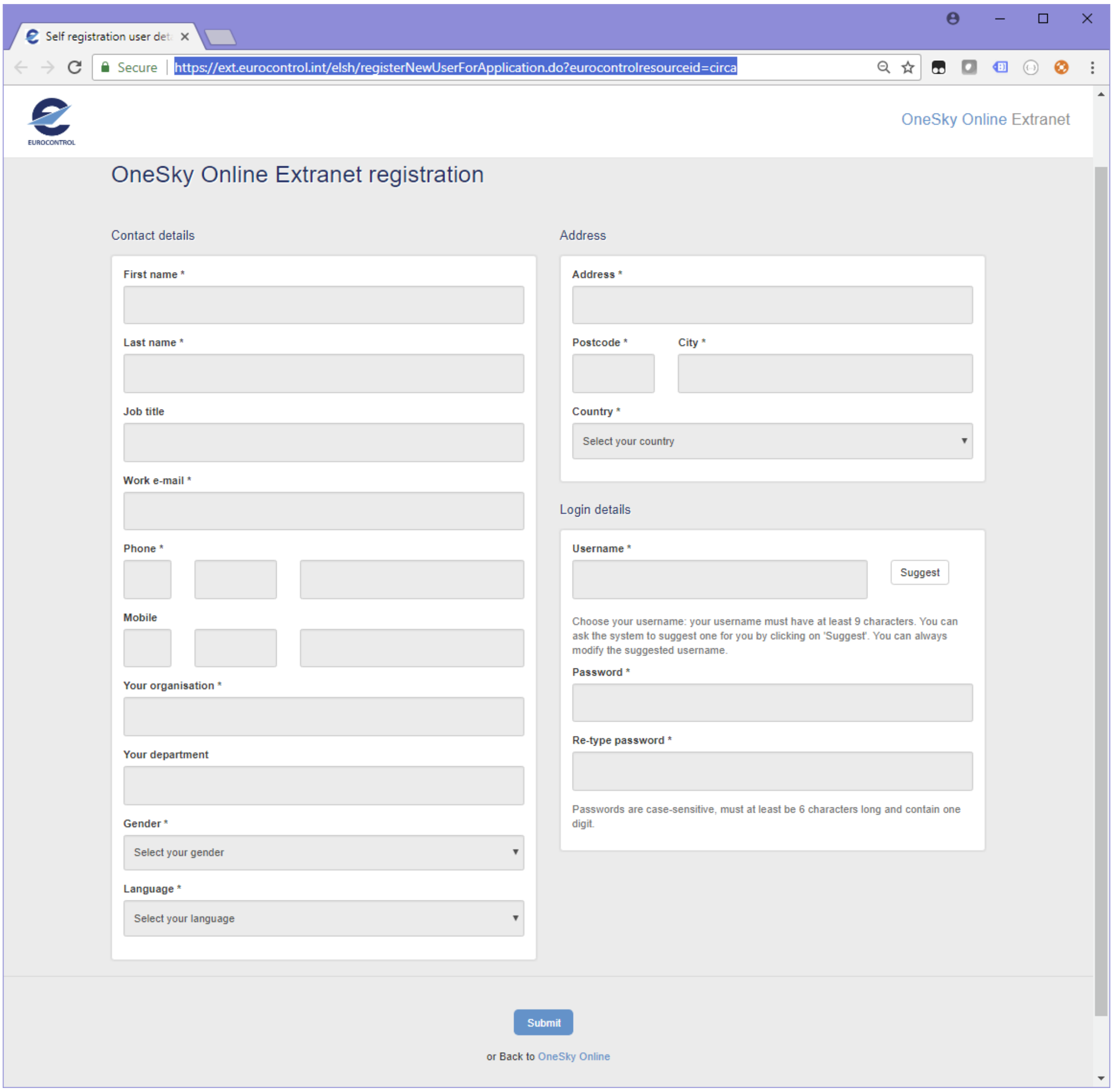
- By analysing the received Transition Acknowledgement Table, the AMC Operator will confirm that the activity will continue as planned if all COM Centres acknowledge the process. On Day **25** of the AIRAC, the AMC Bulletin Board will be updated to confirm that the activity is taking place. The Transition Manager will inform each COM Centre in the Region by e-mail and AFTN/AMHS message.
- On Day **28** after **11:00 UTC**, each COM Centre will confirm by e-mail with the AMC Operator that their implementation of the AMHS User Address list and routing the SITA PRMD to the SITA Gateway is complete. Confirmation of completion of the transition will be sent by the AMC Operator to the Regional COM Centres, the ICAO Regional CNS Officer, Regional Focal Point and SITA.

Appendix A

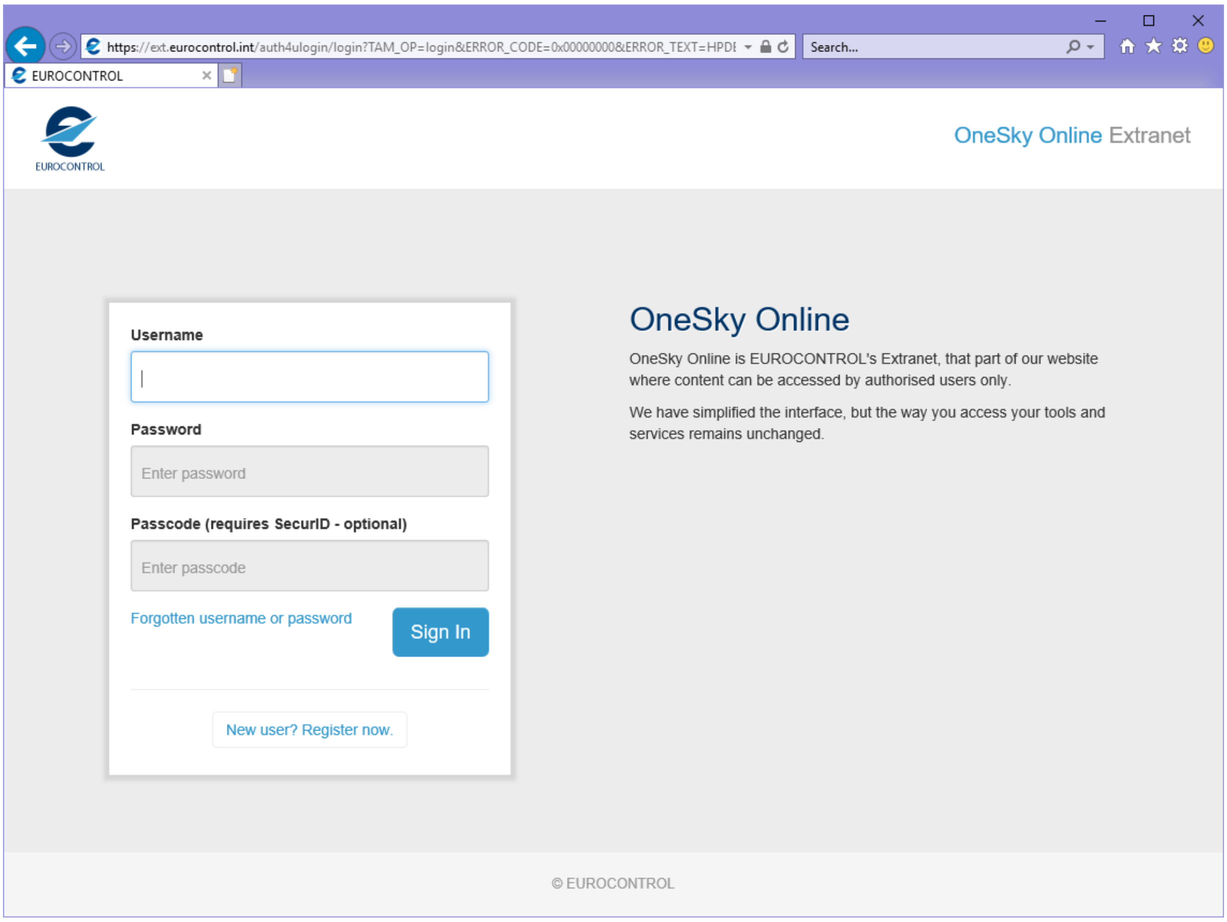
Confirm that the COM Centres are ready for the activity

The Transition Manager will coordinate with each COM Centre in the Region to confirm the followings:

- The COM Centre accesses the AMC Application. If not please register at https://ext.eurocontrol.int/elsh/registerNewUserForApplication.do?eurocontrolresourceid=circa:

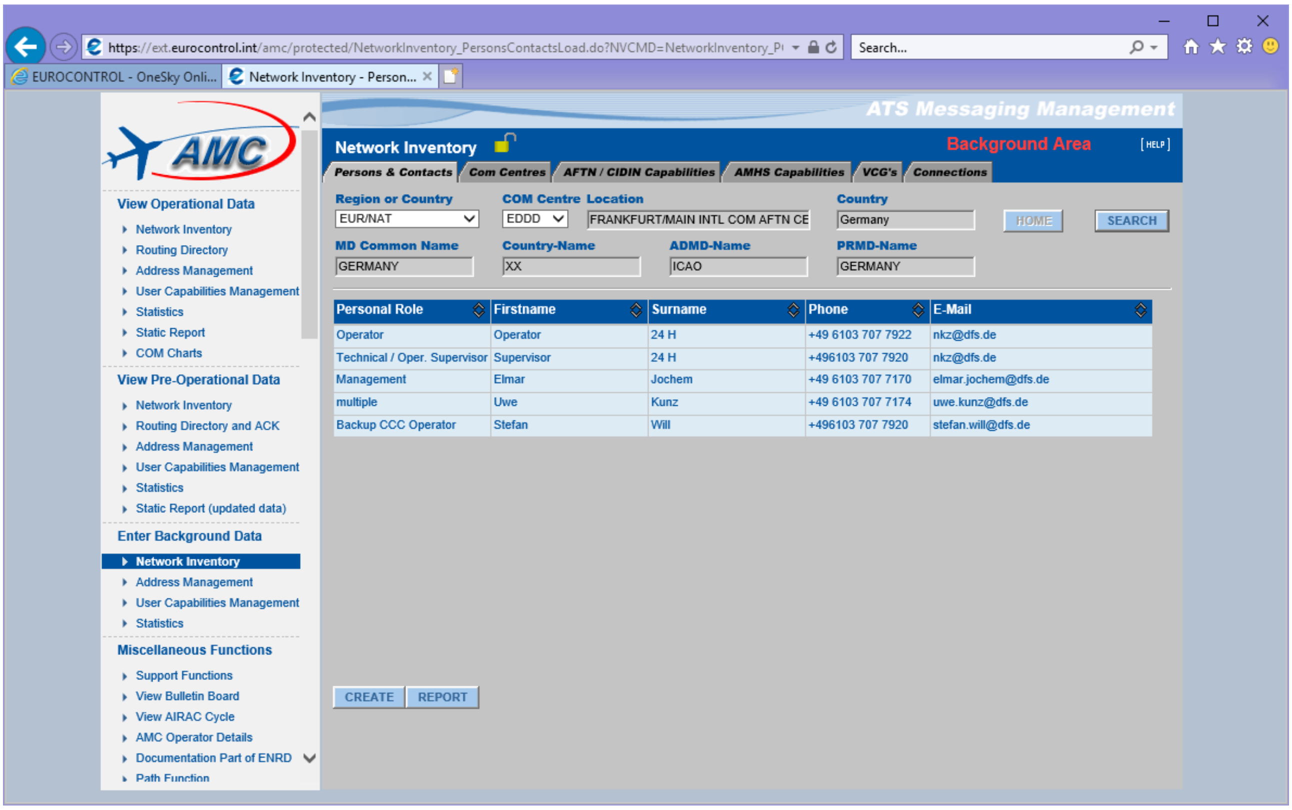


Then access the AMC at https://ext.eurocontrol.int/amc/index.do, which will require a login into OneSky Online:



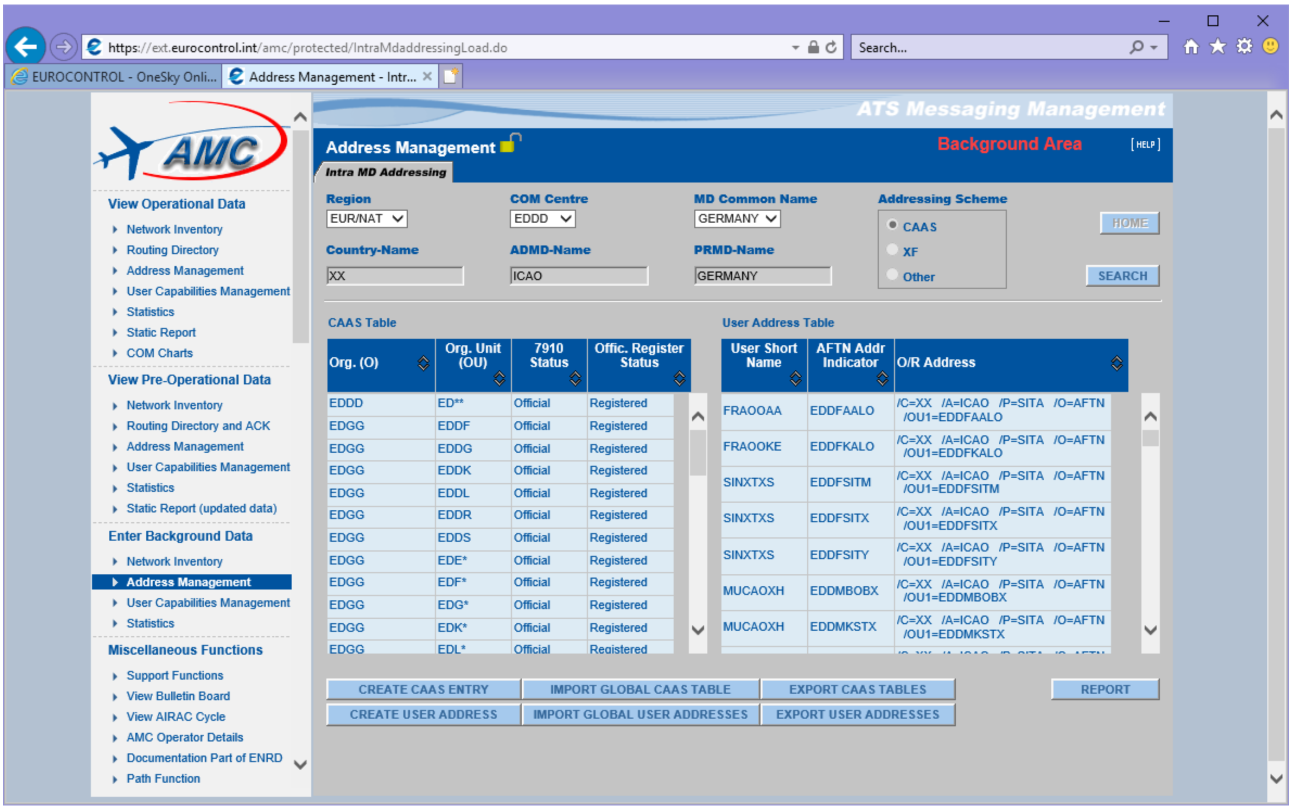
- Data in the Network Inventory are complete and up to date.

  Check all 6 sections: Persons&Contacts, Com Centres, AFTN/CIDIN Capabilities, AMHS Capabilities, VCG’s and Connections.

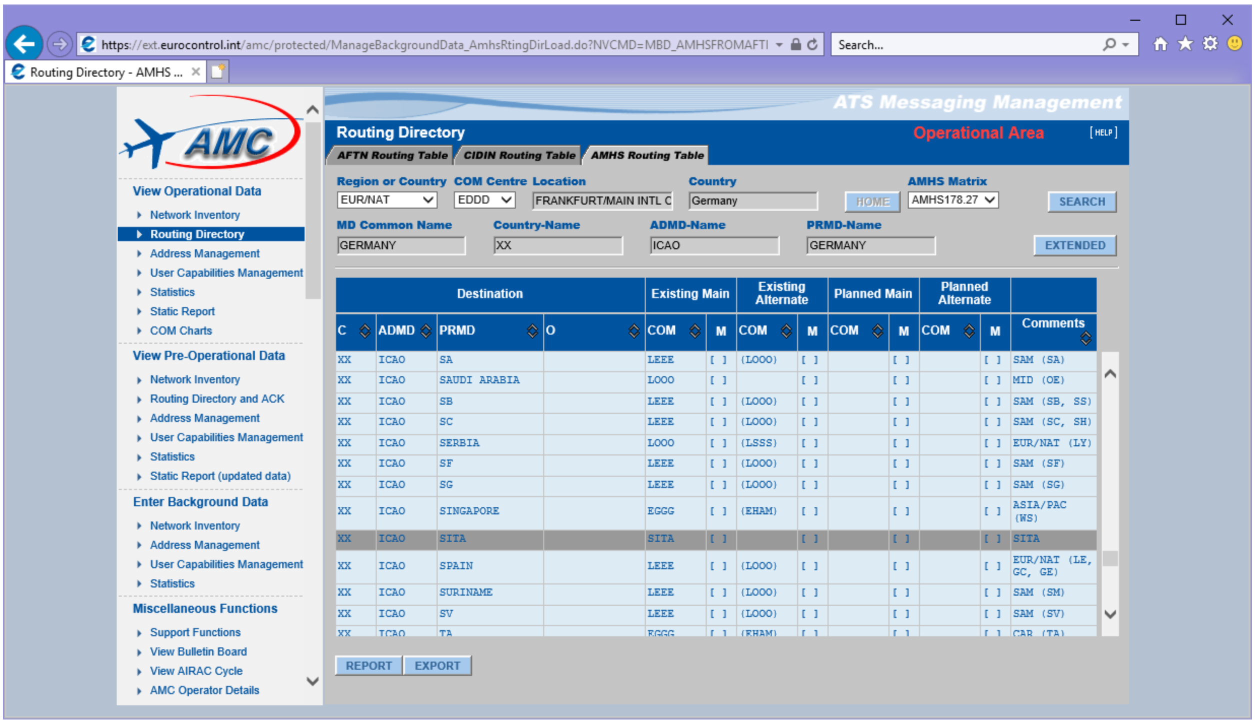


- Data in the AMHS User Address are complete and up to date.

  Check the Intra MD Addressing section:



- Routing tables are complete and PRMD = SITA effectively routes to the new SITA Gateway.
- Check all three sections for AFTN, CIDIN and AMHS Routing tables under **View Operational Data and inform Transition Manager if there is a need to update the routing tables.**



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

5.1 Under this agenda item, the following papers were analysed:

a) WP/14 – *Follow-up to the performance of AIDC operation in the SAM Region* (presented by the Secretariat);
b) WP/19 – *Follow-up to actions to mitigate flight plan errors and duplication/multiplicity in the SAM Region* (presented by the Secretariat);
c) WP/20 - *FLP – Regional harmonisation and best practices* (presented by IATA).
d) NI/11 - *Estudio sobre factibilidad y conveniencia del uso del servicio ADS-B por satélite en la Región SAM* (presented by the Secretariat);
e) NI/13 - *Desempeño de la interconexión AIDC entre el ACC Lima y ACC adyacentes durante la fase pre-operacional* (presented by Peru); and
f) NI/15 - *Plan de acción para mitigar errores y duplicidad de los planes de vuelo* (presented by Peru).

FOLLOW-UP TO THE PERFORMANCE OF AIDC OPERATION IN THE SAM REGION

5.2 As follow-up to AIDC performance, the updated information provided by each SAM State on progress made is shown below:

Argentina

5.3 At national level, the AIDC between the ACC of Cordoba and the ACC of Ezeiza was in the pre-operational phase since 2015, and the letter of operational agreement between these ACCs had been amended to introduce the operational use of AIDC as primary means. AIDC training for the controllers of the ACCs of Comodoro Rivadavia, Mendoza and Resistencia had been completed in late September 2017.

5.4 AIDC had been implemented at the operational level between the Ezeiza ACC and Aeroparque airport (SABE). Likewise, an updated letter of agreement had been prepared that contemplated the use of AIDC as primary means of coordination between the Cordoba ACC and the Mendoza ACC.

5.5 AIDC was expected to be operational between all national ACCs by the second semester of 2018. AIDC was expected to be operational with adjacent regional ACCs by 2019.

Bolivia

5.6 ATM system automation was expected to be operational at the main ATS units of Bolivia in 2019. The automated ATM systems to be installed were Thales Topsky-ATC. In this regard, Bolivia reported that the AIDC functionality was not included in the ATM automation system and had an additional cost. This issue was currently under discussion between the State of Bolivia and the manufacturer**.**

5.7 Once automation was operational at ATS units and once the AIDC functionality issue was resolved with the manufacturer, Bolivia would start coordinating with the ACCs of adjacent States for the conduction of AIDC tests.

Brazil

5.8 During the first quarter of 2018, the SAGITARIO system entered into operation at the Atlantico ACC. Likewise, the AIDC was implemented operationally between the Atlantico ACC and the Recife ACC and between the Atlantico ACC and the Amazonico ACC. Thus, Brazil so far had AIDC in place and in operation between all its national ACCs. AIDC was only pending between the Atlantico ACC and the Curitba ACC, which would enter into operation during the first semester of 2018.

5.9 The Brazilian company Atech would install the latest version of the SAGITARIO system, which included the FPL2012 form and the AIDC architecture based on PAN-ICD v1.0. This version was expected to be fully installed in all the ACCs of Brazil between July and August 2018, at which time it would be possible to resume operational tests with adjacent ACCs of the Region.

Chile

5.10 At national level, AIDC connections had been operationally implemented between the Punta Arenas ACC and the Puerto Montt ACC, and between the Iquique ACC and the Antofagasta APP since mid-2017. Positive AIDC tests had been conducted between the Iquique ACC and the Cordoba ACC, which were expected to become operational by 2019.

5.11 The AIDC pre-operational phase started between the Iquique ACC and the Lima ACC started on 16 May 2018. It was expected to become operational in 2018 upon completion of the pre-operational phase.

Colombia

5.12 AIDC interconnections implemented at national level (Bogota ACC –Barranquilla ACC) and at intra-regional level (Bogota ACC - Guayaquil ACC, Bogota ACC - Lima ACC and Bogota ACC – Panama ACC) were in the pre-operational phase since late 2015. The letters of operational agreement between the aforementioned ACCs were revised to include the use of AIDC as primary means. An amendment to the letter of operational agreement was signed between the Bogota ACC and the Lima ACC, where AIDC was still in the pre-operational phase.

5.13 AIDC connections between the Bogota ACC and the Lima and Guayaquil ACCs were expected to become operational by 18 June 2018. In the case of the interconnection between the Bogota ACC and the Panama ACC, pre-operational tests were expected to be resumed in July 2018 once the Panama FDP database had been updated.

Ecuador

5.14 At national level, the AIDC between the Guayaquil ACC and the Quito APP became operational in February 2017, for which an amendment to the letter of operational agreement had been signed on 1 February 2017 to introduce AIDC as primary means. Positive AIDC tests had been conducted between the Guayaquil ACC and the Manta APP and Shell in late 2017, which were expected to become operational by the end of the first semester of 2018.

5.15 At regional level, the AIDC between the Guayaquil ACC and the Lima ACC and between the Guayaquil ACC and the Bogota ACC were in the pre-operational phase since August 2015. The letters of operational agreement between these ACCs had been amended to introduce AIDC as primary means. They were expected to become operational by the end of the first semester of 2018, no later than 18 June.

5.16 Positive pre-operational tests had been conducted between the Guayaquil ACC and CENAMER during the first quarter of 2017, expecting it to enter the operational phase in 2018.

French Guiana

5.17 The implementation of AIDC with the ACCs of adjacent States was foreseen for the period 2018-2019. In mid-2017, a new ATM automation system, which included AIDC, had been installed in the Cayenne ACC.

Guyana

5.18 The implementation of AIDC with the ACCs of adjacent States was scheduled for 2019. To date, Guyana had no AIDC.

Panama

5.19 Panama had started discussions with the parties responsible for AIDC in CENAMER, Bogota and Kingston in order to start establishing the respective letters of agreement between adjacent centres, contemplating AIDC as the primary means of coordination between adjacent ACCs.

5.20 It was expected that, by the last quarter of 2018, upon completion of the migration from AFTN to AMHS, the AIDC pre-operational phase would be resumed between CENAMER, Bogota and Barranquilla, and the operational phase would start on the second quarter of 2019. It should be noted that no tests had been conducted so far with Rio Negro and Medellín.

Paraguay

5.21 Paraguay still had an outdated FDP. Consequently, only technical AIDC interconnection tests had been conducted with the ACCs of Resistencia and Curitiba, where the interconnection proved successful, unlike AIDC coordination, due to errors in the system. The State was calling for bids for the procurement of a new ATM system. Taking into account the time the process would take, it was estimated that, by the first quarter of 2019, the ATM system would be available to resume the tests that had been postponed.

Peru

5.22 The AIDC in the Lima ACC was in the pre-operational phase with the Guayaquil ACC and the Bogota ACC since August 2015. In this regard, the letter of operational agreement had been amended to include AIDC as the primary means of coordination. The upgrading of the automated ATM system of the Lima ACC was completed in late 2017, a process that had started in March 2017.

5.23 Following the commissioning of the automated system, pre-operational tests were formally resumed in May 2018 between the Lima ACC and the ACCs of Guayaquil, Bogota and Iquique. It was expected that by the end of the first semester of 2018, the Lima ACC would have an operational AIDC with the three ACCs mentioned above.

5.24 The tests that were carried out revealed the most frequent errors in AIDC coordination, such as lack of an FPL, duplicated FPLs, errors inherent to automated systems (in the case of Peru, errors were quickly resolved by the manufacturer), and errors due to human performance (the latter were the most frequent and abundant).

5.25 Regarding errors inherent to automated systems, it was noted that, since the Guayaquil ACC system was an older version, it had some limitations that, although they would not hamper transition to the operational phase of AIDC, would generate some unnecessary rejections in certain coordination activities. The main reasons were:

- Absence of Box 18 in the ABI message. As a result, when there was no FPL in the automated system of Lima, and the Guayaquil system sent an ABI, the Lima system tried to generate an FPL based on the ABI. Since there was no data in Box 18, it was impossible to cross-check the content of Box 10, reason why the system rejected the ABI with LRM 15.
- Rejection by Guayaquil of ABI messages from Lima due to LRM 23 (inconsistency between the estimate to the point of transfer and the EOBT of the FPL). More modern versions of the automated systems did not reject ABI messages on these grounds.

5.26 It would be advisable for Ecuador to consider upgrading its automated system in order to overcome these problems and thus improve AIDC functionality and have access to additional messages that were currently not supported by its system.

5.27 Statistics derived from AIDC pre-operational tests between the Lima ACC and the ACCs of Guayaquil and Bogota in a sample taken on 1 and 13 May 2018 are shown in **Appendix A** to this part of the report.

Suriname

5.28 The implementation of AIDC with the ACCs of adjacent States was foreseen for 2019. So far, Suriname had no AIDC.

Uruguay

5.29 The implementation of AIDC with the ACCs of adjacent States was foreseen for the period 2018-2019.

Venezuela

5.30 The implementation of AIDC with the ACCs of adjacent States was foreseen for late 2019. So far, Venezuela had no AIDC. It was noted that the new ATM automation system bought from ATECH of Brazil (Sagitario system) would become operational by the end of the first quarter of 2019. Once the automated system had been installed and commissioned, Venezuela would start the implementation of the AIDC interconnection with adjacent States.

Lessons learned

5.31 It was noted that, in several cases in which the States had reported being in the pre-operational phase, in practice the AIDC was not being used and coordination between adjacent ACCs took place in the traditional manner (voice channel).

5.32 The most significant consequence of this was the loss of skills and/or lack of experience of air traffic controllers of the affected ACCs in the proper use of AIDC functionalities in the automated systems. This was reflected in the high percentage of errors due to human factors in the statistics reported by Peru after formally resuming pre-operational tests with the ACCs of Guayaquil and Bogota starting on 1 May 2018, as shown in **Appendix B** to this part of the report.

5.33 In this sense, the Meeting deemed it advisable that States in the pre-operational phase conduct statistical measurements of AIDC performance in order to identify the most frequent errors and seek a solution thereto. States should submit reports with performance statistics obtained following these measurements at the SAM/IG/22 meeting.

5.34 In view of the foregoing, the Meeting formulated the following conclusion:

<table>
<tr><td colspan="2">CONCLUSION
SAM/IG/21-03   ACTIVITIES REQUIRED IN THE AIDC PRE-OPERATIONAL PHASE TO REDUCE MIGRATION TIMES TO THE OPERATIONAL PHASE</td></tr>
<tr><td>That:

SAM States currently in the pre-operational phase of AIDC, in order to reduce time in this phase and migrate to the operational phase:

a) operate AIDC for a period of time to obtain the skills required for the use thereof;
b) monitor AIDC operation, recording errors made during the reporting, coordination and transfer stages;
c) conduct statistical measurements based on the results of b), in order to identify the most frequent errors;
d) based on the results of c), take the necessary action to mitigate errors; and
e) report the results obtained in c) and d) and disseminate the lessons learned at events, teleconferences and AIDC implementation meetings of the SAM Region, so that they may serve as a reference for other AIDC implementations.</td><td>Expected impact:

☐ Political / Global

☒ Inter-regional

☒ Financial

☒ Environmental

☒Technical/Operational</td></tr>
<tr><td colspan="2">Why: To reduce AIDC operation time in the pre-operational phase and migrate to the operational phase.</td></tr>
<tr><td>When: For AIC interconnections currently in the pre-operational phase, no later than the middle of the</td><td>Status:

Adopted at SAM/IG/21</td></tr>
</table>

second semester of 2018.	
Who: ☒Coordinators ☒States ☒ICAO Secretariat ☐ICAO HQ ☒Other: Users/industry	

FOLLOW-UP TO THE IMPLEMENTATION OF ACTIVITIES CONTEMPLATED IN THE MOUs FOR THE INTERCONNECTION OF ATS SURVEILLANCE SYSTEMS

5.35 At present, operational radar data exchange only existed between Argentina and Uruguay. Radar data exchange tests had been carried out between Venezuela-Brazil, Argentina-Chile and Argentina-Paraguay.

5.36 The Meeting took note that radar data exchange tests had been scheduled for the second semester of 2018 between Peru-Ecuador, Peru-Colombia and Peru-Chile, to which end coordination and bilateral agreements were still pending between the States involved. In order to follow-up on these activities, the Meeting considered holding teleconferences as needed.

FOLLOW-UP TO ACTIONS TO MITIGATE FLIGHT PLAN ERRORS AND DUPLICATION/MULTIPLICITY IN THE SAM REGION

5.37 Regarding progress made in actions to mitigate flight plan errors and duplication/multiplicity since the SAM/IG/20 meeting, the Meeting took note of the following:

Follow-up to the implementation of automated systems for FPL 2012

5.38 Regarding progress made in the implementation of automated systems for FPL 2012, Bolivia had started the implementation of an ATM automation project at ATS units in La Paz, Cochabamba, Santa Cruz and Trinidad, called SIDACTA. The automated system to be installed at these ATS units was Thales TopSky-ATC, to be completed in 2019.

5.39 Likewise, Brazil informed that, by the end of the first quarter of 2018, the FDPs of the ACCs of Brasilia and Curitiba were already processing FPL 2012 automatically, thus eliminating the converters in these centres. The remaining ACCs would be upgraded during the second semester of 2018.

5.40 Peru had also completed in late 2017 the upgrading of the automated system of the Lima ACC (INDRA AIRCON 2100), which, *inter alia,* overcame the limitations in the maximum number of characters in Box 10 of FPL 2012.

5.41 Finally, Venezuela informed that they were expecting to have a new automated system at the Maiquetía ACC by the end of the first quarter of 2019, thus eliminating the FPL2012 converter.

5.42 Based on the analysis of the status of implementation of automated systems in the SAM Region, in compliance with Amendment 1 to Edition 15 of Doc 4444 (FPL2012), the progress made so far in the 27 SAM States was as follows:

FPL 2012 processing capacity of automated system FDPs	
Native support to FPL 2012 with intelligent templates for error detection	74%

Use of FPL 2012 converters	15%
Manual solutions	11%
FPL 2012 processing capacity in AMHS/AFTN terminals	
Native support to FPL 2012 with intelligent templates for error detection	67%
No capacity	33%

5.43 **Appendix C** to this part of the report contains an updated table on the status of implementation of automation in compliance with amendment 1 to Edition 75 of Doc 4444.

5.44 The delegates of Argentina and Uruguay informed that the automated systems of the ACCs of Ezeiza, Córdoba and Montevideo only supported a maximum of 20 characters in Box 10 of the FPL.

Analysis of flight plan errors and duplication in the SAM Region

5.45 The Meeting updated the information on action taken to mitigate flight plan errors and duplication.

Argentina

5.46 The implementation of single addresses to receive FPLs at each ACC of Argentina was foreseen for the end of 2020, in compliance with Conclusion SAM/IG/19-2.

Bolivia

5.47 At present, flight plans continued to be filed in physical format (paper). There were plans to implement a facility for filing flight plans on-line, *via* Internet, and through a mobile application in cellular phones.

Brazil

5.48 By the end of 2018, all flight plans would start being centralised at the CGNA (Air navigation management centre) through SIGMA (Integrated aircraft movement management system).

Chile

5.49 Chile had been in contact with the airlines in order to minimise errors in the generation of flight plans. They were reviewing the internal addressing structure to avoid flight plan multiplicity, and a study had been started for the creation of a national centre to receive flight plans.

Colombia

5.50 Meetings had been held with aircraft operators (Avianca, LATAM, Spirit, Viva Colombia, Iberia) in October 2017 regarding procedures for filing flight plans at the international AIS offices rather than directly to the ACCs, in order to avoid flight plan duplication.

Ecuador

5.51 On 22 February 2018, a meeting had been held with airline representatives to inform them of the forthcoming adoption of a single national address for receiving flight plans, which would become operational in August 2018.

Panama

5.52 Panama had completed the upgrading of the ATM automation system at the Panama ACC, and was in the process of updating the ATC system database.

Paraguay

5.53 Duplicated flight plans continued to be received. Operational training on duplicated flight plans had been provided to the personnel in charge of repairing FPLs. Conversations had been held with some airline dispatchers operating in Paraguay, regarding the delivery of duplicated FPLs, especially for flights leaving the airports of the country, where only those issued by the ARO offices were considered as valid, and they informed that this issue would be reported to their base office. Duplicated FPLs continued to be received. Likewise, there were some cases of missing FPLs, especially for overflights.

Peru

5.54 Regarding procedures to mitigate the duplication/multiplicity of scheduled commercial flight plans in SAM States, Peru had already implemented them since late July 2017. In this regard, it had issued aeronautical information circular AIC/05/2017.

5.55 On 14 December 2017 at 15:00 hours, the Aeronautical Information Office received the representatives of JetBue, where the first letter of agreement was signed to start transmitting flight plans *via* AMHS at the single address SPIMZPZX, starting on 16 December 2017. So far, 7 letters of agreement had been signed with various airlines. Five additional letters of agreement were to be signed by June 2018 (Copa, AeroMéxico, United, American and Delta).

5.56 During AIDC pre-operational tests between the Lima ACC and the ACCs of Guayaquil and Bogota, the ARO Office of Lima monitored all the FPLs entering the FDP of the automated system in Lima through the AFTN/AMHS, and noted that airlines frequently filed their flight plans in duplicate. Based on this information, a table was prepared to identify the addresses from which these FPLs were being transmitted. This table is shown in **Appendix D** to this part of the report.

Venezuela

5.57 Venezuela had implemented, on a pre-operational basis, an IDS centralised automated system for handling flight plans that reduced filing errors. This system had been installed at the ARO Office in Maiquetía. Compliance with Conclusion SAMIG/19-2 was expected by the first quarter of 2019.

Other States

5.58 Guyana, French Guiana, Suriname and Uruguay showed no progress in the implementation of Conclusion SAMIG/19-2.

Regional harmonisation and best practices in flight plan management

5.59 The Meeting took note that the Fourth AIDC meeting held jointly by the NAM/CAR/SAM Regions (Lima, Peru, 16-20 April 2018) formulated Recommendations AIDC/4 – Measures to optimise flight plan management, and AIDC/5 – Configuration of ATC system databases.

5.60 Regarding the latter, the Meeting deemed it advisable to highlight that, in order to achieve optimum performance of the AIDC interconnection between adjacent ACCs, the database of these ACCs should be up to date, not only with regard to local information. It was also necessary to keep the information on immediate external route points and segments updated so that the FPLs could be properly processed by the automated systems and avoid generating AIDC coordination errors due to an incorrect route.

5.61 To this end, the Meeting deemed it important that, whenever States made changes to the configuration of their airspace (mainly routes and significant points), upper and lower airspace charts should be delivered to AIDC focal points of the adjacent ACCs with which an AIDC interconnection had been established, so that database managers could update such information accordingly.

5.62 The Meeting took note of a map and a template containing a preliminary analysis based on information collected from the AIPs and AICs of the Region by IATA, shown in **Appendix E**, and considered that SAM States should update such information no later than the end of June 2018.

5.63 Regarding the harmonisation of procedures for recognising the box corresponding to the destination alternate aerodrome (DEST ALTN) as optional for flight plans of United States' airlines departing from the SAM Region to said country, it was noted that Conclusion SAM/IG/14-17 and Recommendation AIDC/4 of the NAM/CAR/SAM AIDC meeting endorsed the application of this measure by SAM States.

5.64 Likewise, the Meeting took note that LAR 121 (paragraph 121.2585) of the SRVSOP, which had been adopted by most SAM States, included the optional use of DEST ALTN information in the flight plan, pursuant to the corresponding SARPs in ICAO Annex 6. Accordingly, there were no technical or regulatory obstacles to comply with Conclusion SAM/IG/14-17, and States were urged to promote the use of this option in the flight plan of United States' airlines.

Duplication in 3-letter radio aid designators (VOR and NDB)

5.65 The Meeting took note that the duplication of 3-letter radio aid designators and their respective frequencies was currently permitted, provided they were located more than 600 nautical miles apart (List N° 4 OAC radio aid identifiers in the Caribbean and South America). Although this rule was still useful for frequency allocation, it was currently insufficient for the assignment of 3-letter designators. Modern aircraft had a much larger range compared to aircraft that existed when the rule was introduced, and ANSP automated systems were unable to process flight plans containing significant points or radio aid designators of remote FIRs that had the same name or designator as one located in the FIR in question.

5.66 The Meeting recognised that this generated the following issues:

- The affected FPL is rejected by the local automated system, and sent to the queue of erroneous messages.
- Need for manual intervention to repair the affected FPL message, which usually involved manual mutilation of the route at the point with the duplicated name to allow for FPL processing by the local automated system.

- Failure in AIDC coordination with the remote ACC where the radio aid with the same name was located, due to manual mutilation by the first ACC affected.

5.67 In this regard, the Meeting felt the need to consider short- and medium-term solutions to prevent the occurrence of such situations that hindered the flight plan automation process, including:

- Prevent the duplication of radio aid designators.
- Increase the separation required between duplicated radio aid designators.
- Consider the possibility of including numbers among the valid characters for radio aid designators, in order to increase the number of character combinations.
- Consider increasing the number of characters for radio aid designators.
- Require automated system manufacturers to provide the capability of processing duplicated designators using mechanisms or algorithms to validate the consistency of the routes entered in the FPLs.

STUDY OF THE FEASIBILITY AND CONVENIENCE OF USING THE SATELLITE ADS-B SERVICE IN THE SAM REGION

5.68 The Meeting took note of the preliminary study on the feasibility and convenience of using the satellite ADS-B service in the SAM Region, shown in **Appendix F** to this part of the report. This preliminary study had been conducted by a surveillance expert of Ecuador, under Project RLA/06/901, with the support of AIREON.

5.69 The preliminary study contained a technical-economic analysis of the conventional satellite ADS-B service, and of ground ADS-B for en-route operations starting at 10000 ft for some SAM States.

5.70 In order to complete the en-route coverage study, the Meeting felt that States should review the information presented. In this regard, the Secretariat would send the initial study to the States for comments by the end of June 2018, requesting their feedback by mid-August 2018.

5.71 Regarding radar surveillance coverage, the Meeting requested SAM States to update the surveillance table contained in the CAR/SAM regional air navigation plan, CNS II CAR/SAM 5 of the eANP Volume II, and to provide the geographic coordinates of the location of the surveillance systems or, if coordinates could not be provided, to send surveillance coverage at 10000, 15000 and 25000 ft. In this regard, Brazil informed that it would review the surveillance table contained in the regional air navigation plan and would send coverage diagrams at 10000, 15000 and 25000 ft by mid-June 2018. During the Meeting, Paraguay, Uruguay and Venezuela provided the list of their surveillance systems with the respective coordinates.

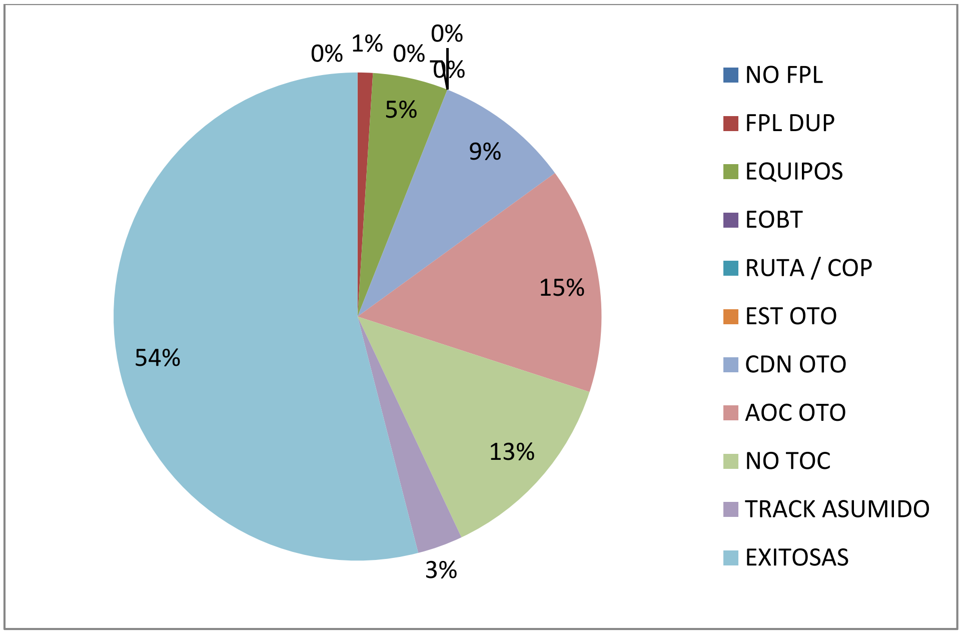
5.72 The Meeting took note that the final study would be presented at the SAM/IG/22 meeting. In this regard, it considered that a proposal should be submitted to the next coordination meeting of Project RLA/06/901, for the approval of a mission by a surveillance expert to Lima for one week (September 2018) to complete the study.

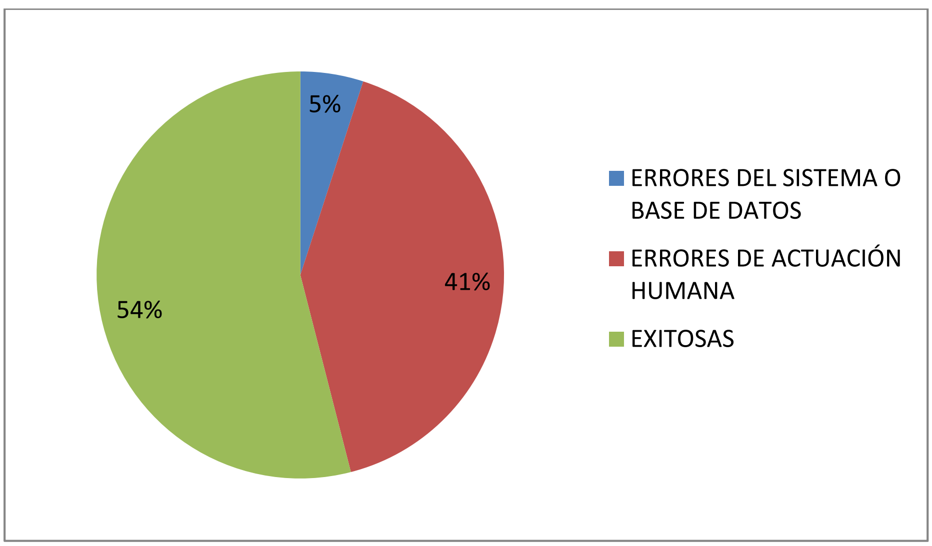
APPENDIXA

AIDC PRE-OPERATIONAL TESTING PERFORMANCE STATISTICS BETWEEN ADJACENT LIMA ACC AND ACC

EXCHANGE OF AIDC MESSAGES IN THE SENSE SEFG-SPIM

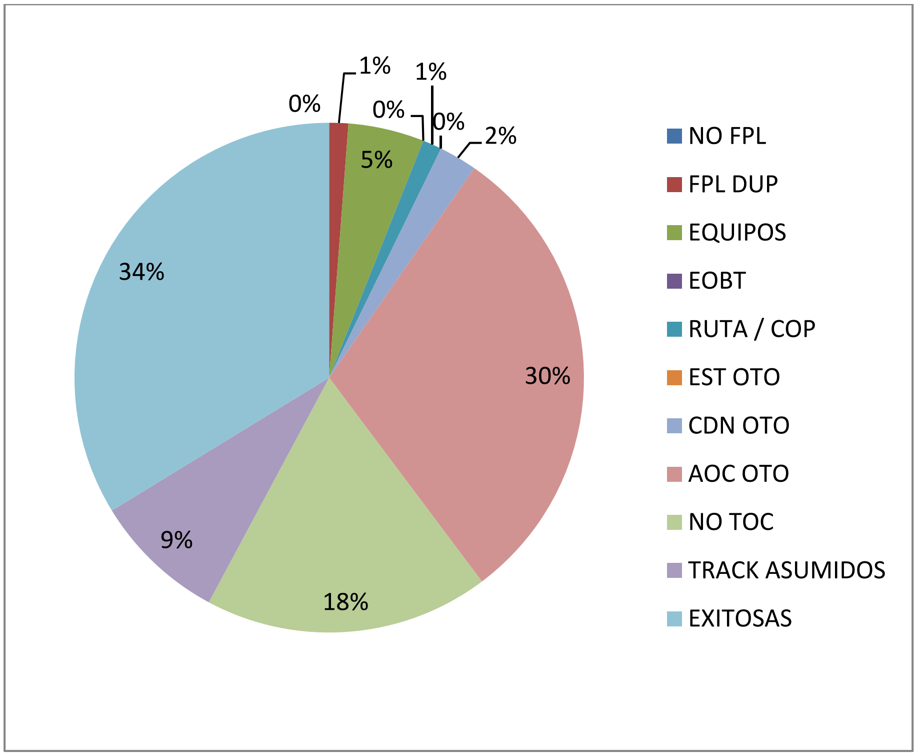
SAMPLE 01/05/2018

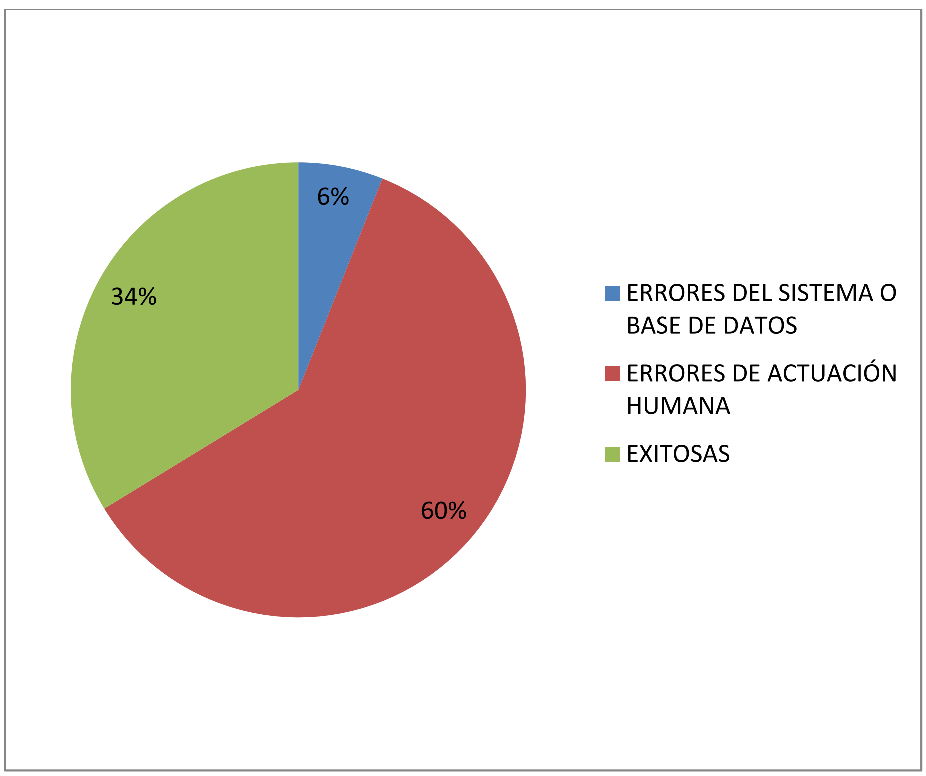




EXCHANGE OF AIDC MESSAGES IN THE SENSE SEFG-SPIM

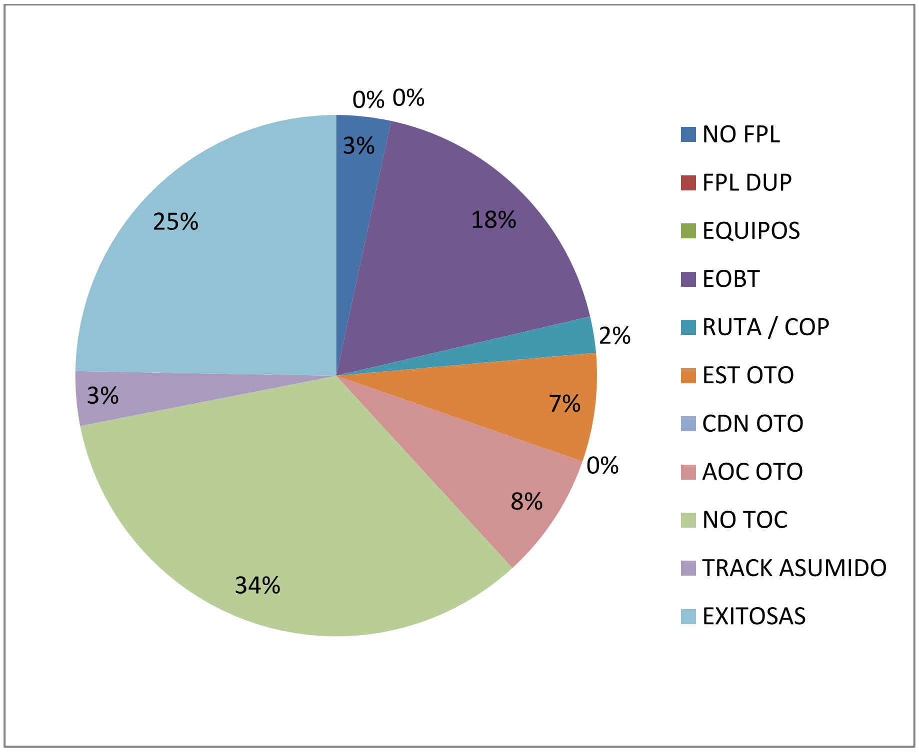
SAMPLE 13/05/2018

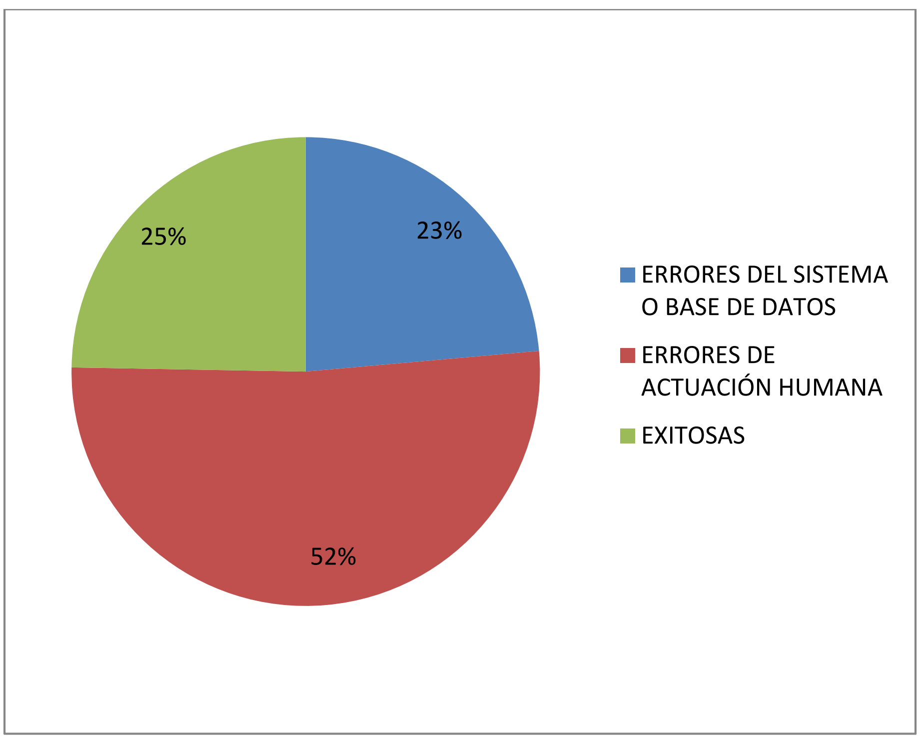




EXCHANGE OF AIDC MESSAGES IN THE SENSE SPIM-SEFG

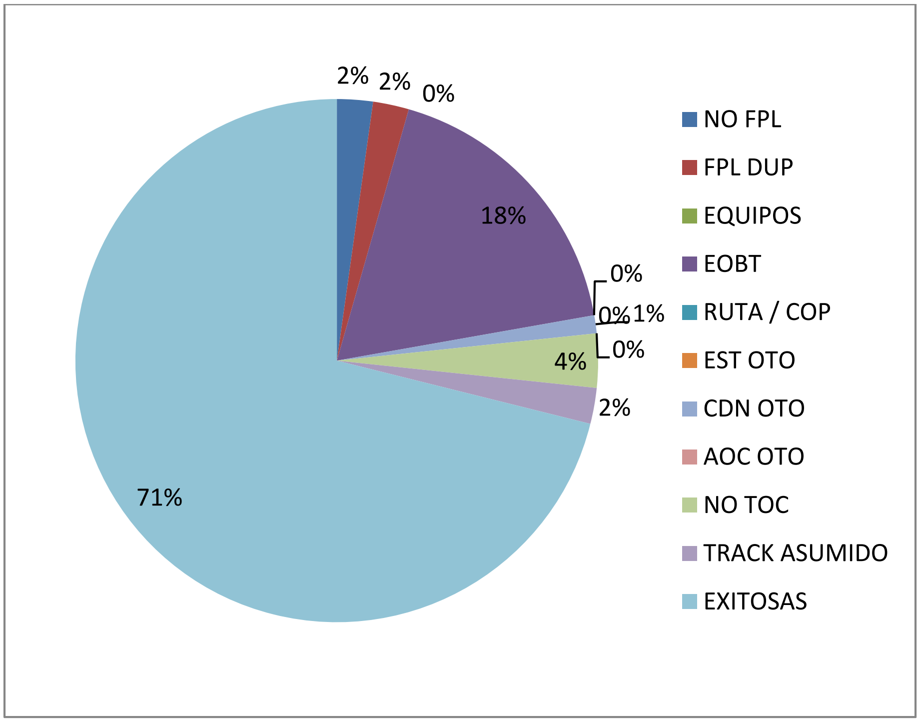
SAMPLE 01/05/2018

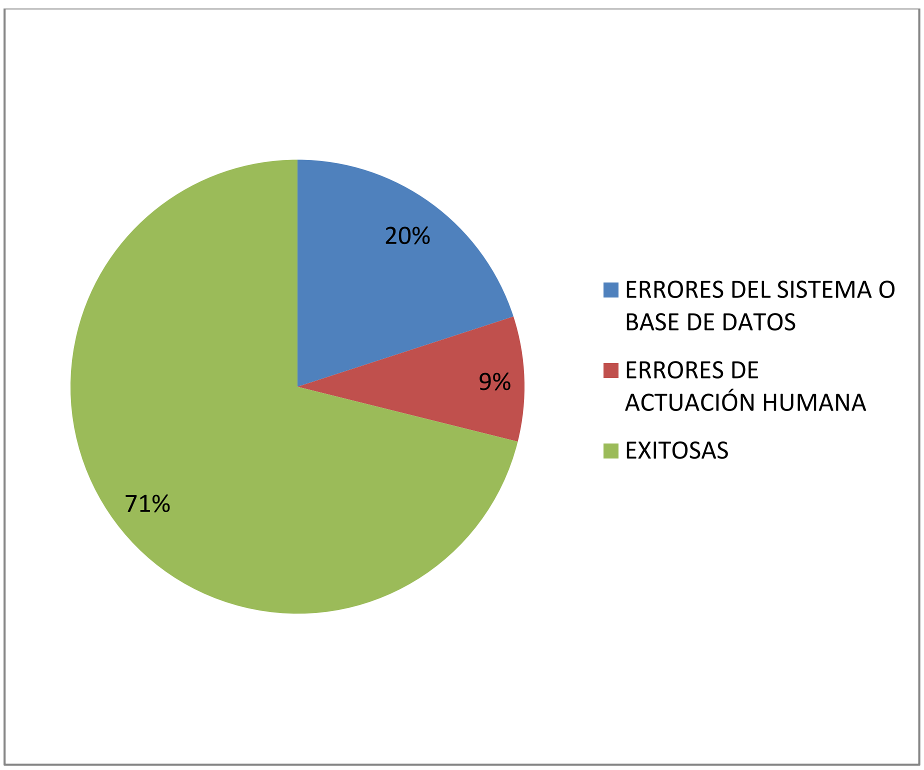




EXCHANGE OF AIDC MESSAGES IN THE SENSE SPIM-SEFG

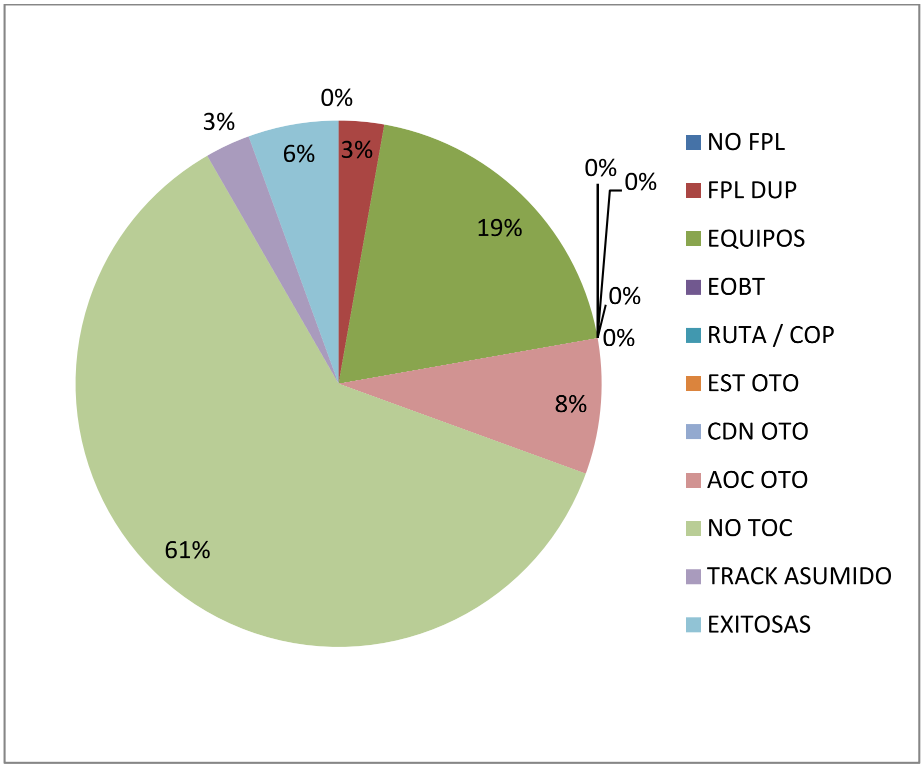
SAMPLE 13/05/2018

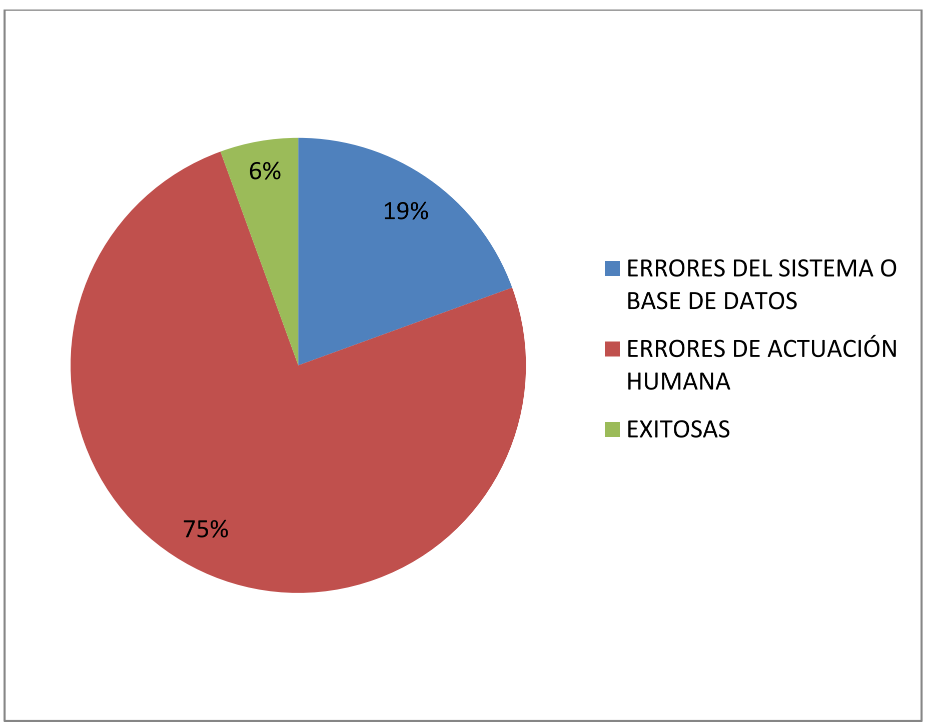




EXCHANGE OF AIDC MESSAGES IN THE SENSE SKED-SPIM

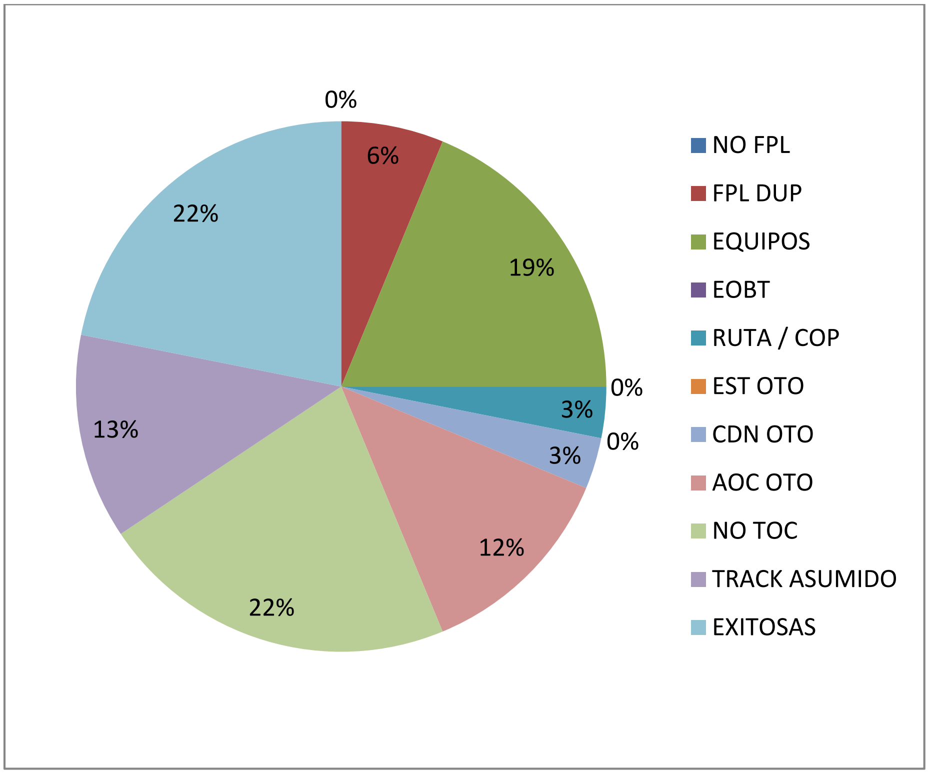
SAMPLE 01/05/2018

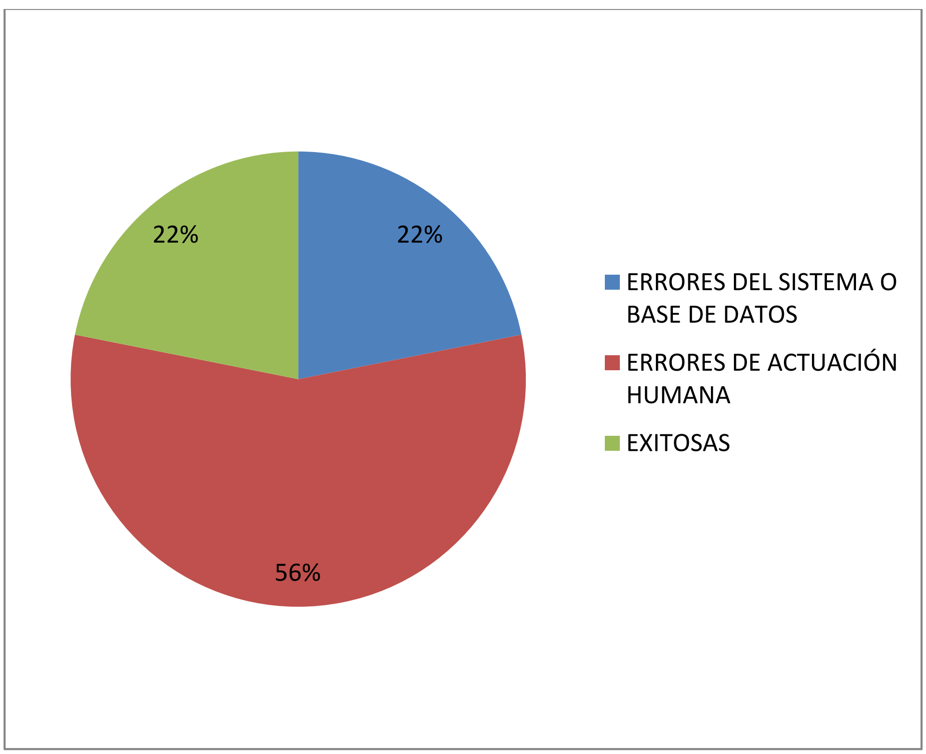




EXCHANGE OF AIDC MESSAGES IN THE SENSE SKED-SPIM

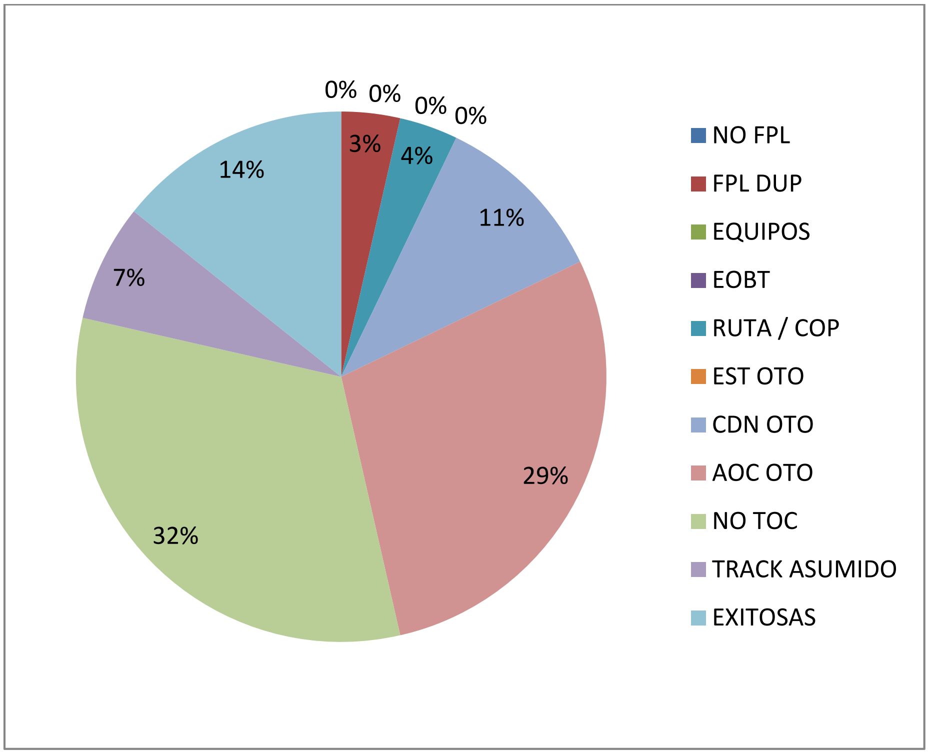
SAMPLE 13/05/2018

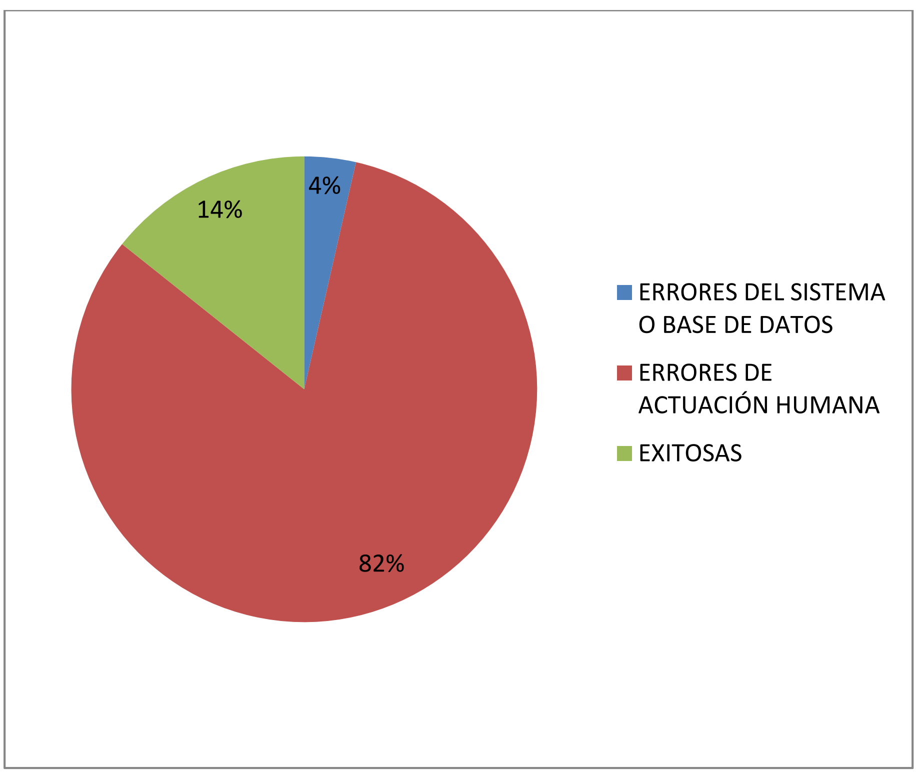




EXCHANGE OF AIDC MESSAGES IN THE SENSE SPIM-SKED

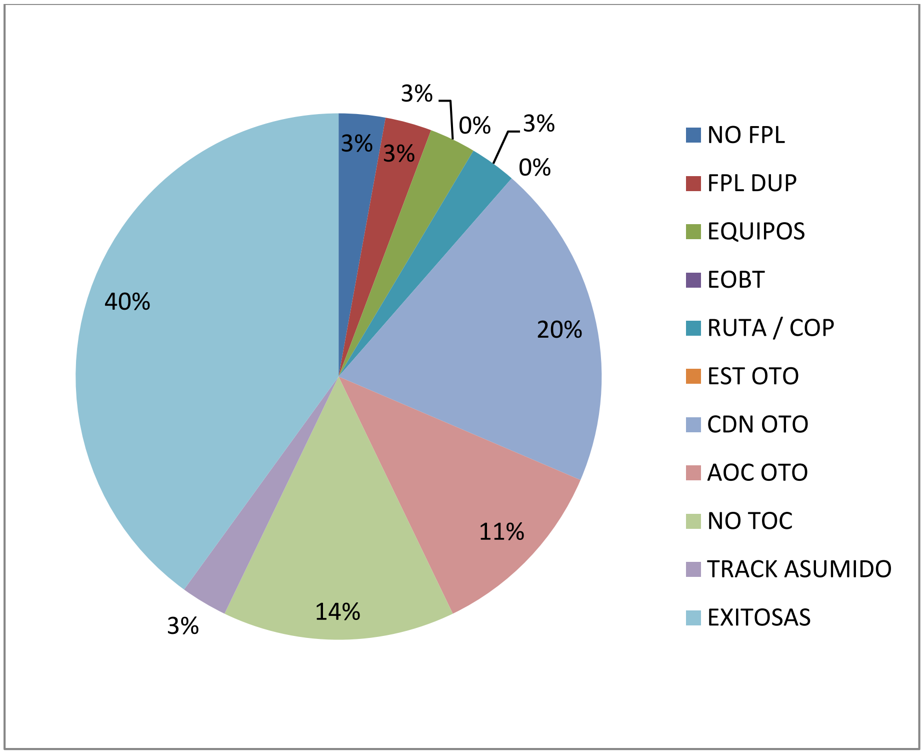
SAMPLE 01/05/2018

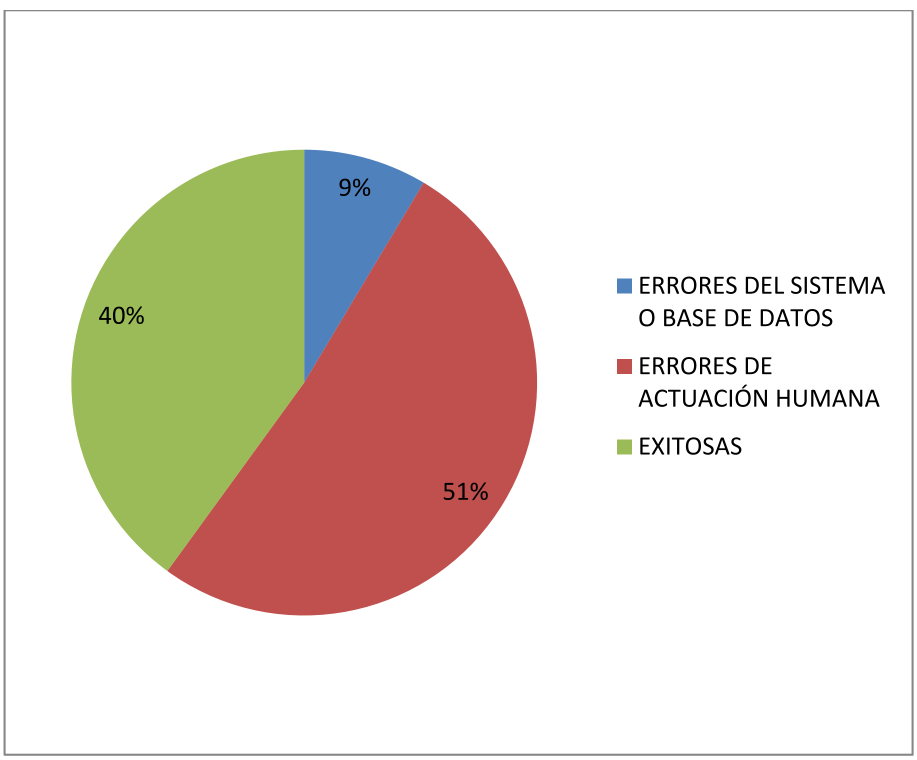




EXCHANGE OF AIDC MESSAGES IN THE SENSE SPIM-SKED

SAMPLE 13/05/2018





APPENDIX B

FOLLOW-UP TO TESTS

1. NOTIFICATION PHASE

ABI MESSAGES							
FIR	01/05/2018			13/05/2018			TOTAL
	TOTAL MESSAGES	ERROR MESSAGE	ERROR %	TOTAL MESSAGES	ERROR MESSAGE	ERROR %	
SEFG	172	24	13.95%	173	24	13.87%	48
SKED	64	12	18.75%	67	12	17.91%	24

ABI – SEFG ERRORS		
DAY 1	6	4
	7	1
	15	5
	23	15
	41	16
DAY 13	6	2
	7	1
	15	4
	23	15
	41	17

ABI – SKED ERRORS		
DAY 1	7	1
	15	8
	41	3
	57	2
DAY 2	7	3
	15	7
	41	3

2. COORDINATION PHASE:

EST - SEFG (2 errors: 57)			
DAY 1	EST	# OTO	ERROR ACP
	156	7	2(error 6)
EST - SEFG (1 error: 6 – 1 error: 7)			
DAY 13	EST	# OTO	ERROR ACP
	156	0	0

EST - SKED (5 errores: 57 – 1 error:7 - 1 error:6)			
DAY 1	EST	# OTO	ERROR ACP
	50	0	0
EST - SKED (1 error: 57 – 2 error:7 - 1 error:6)			
DAY 13	EST	# OTO	ERROR ACP
	51	0	0

Errors in CDN messages are result of errors in ABI messages (errors 23 and 41)

3. TRANSFERENCE PHASE:

OTO TOC-AOC								
FIR	01/05/2018			13/05/2018			TOTAL TOT AOC	%
	TOC	NO AOC	%	TOC	NO AOC	%		
SEFG	88	25	28.41%	137	28	20.44%	53	23.56%
SKED	21	12	57.14%	37	12	32.43%	24	41.38%

SEFG		# TOC	OTO	%
DAY 1	OUT	37	10	27.03%
	IN	51	15	29.41%
DAY 13	OUT	80	2	2.50%
	IN	57	26	45.61%

SKED		# TOC	OTO	%
DAY 1	OUT	15	8	53.33%
	IN	6	4	66.67%
DAY 13	OUT	21	6	28.57%
	IN	16	6	37.50%

APPENDIX C / APÉNDICE C

STATUS OF THE AUTOMATION IMPLEMENTATION TO GIVE EFFECT TO THE AMENDMENT TO THE FLIGHT PLAN FORMAT /

ESTADO DE IMPLANTACION DE LA AUTOMATIZACIÓN PARA DAR CUMPLIMIENTO DE LA ENMIENDA EN EL FORMATO DEL PLAN DE VUELO

STATE/ ESTADO	ACC	AFTN/AMHS (Template FPL 2012)	FDP /FPL2012
Argentina	Comodoro Rivadavia	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated/Automatización Implemented June 2016/ Implementado Junio 2016
	Cordoba	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated / Automatizado
	Ezeiza	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated / Automatizado
	Mendoza	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated/Automatización Implemented June 2016/ Implementado Junio 2016
	Resistencia	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated/Automatización Implemented June 2016/ Implementado Junio 2016
Bolivia	Cochabamba /La Paz	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Manual It is foreseen by the end of 2019 an ATM automated system compatible with FPL/12 in the new Cochabamba ACC and La Paz ACC (back up) / Se tiene previsto para finales de 2019 un sistema automatizado ATM compatible con el FPL/12 en el nuevo ACC de Cochabamba y La Paz ACC (respaldo)
Brazil / Brasil	Amazónico	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado (use of converter) / (uso de convertidor centralizado)

STATE/ ESTADO	ACC	AFTN/AMHS (Template FPL 2012)	FDP /FPL2012
	Atlántico	Implemented (AMHS terminal) / Implantado (terminal AMHS)	An update in Sagitario ATM automated system (from ATECH Brazil) which includes the new FPL/12 flight plan format to deactivate the centralized inverter was implemented sat the end of the first quarter of 2018 in the ACC of Brasilia, Curitiba. In the rest of the ACCs the deactivation of the converters is expected by the end of 2018 / Para finales del tercer trimestre del 2018 se actualizó el Sagitario (sistema automatizado ATM de Brasil de la empresa ATECH) que incluye el nuevo formato de plan de vuelo FPL/12 y se desactivó el convertidor centralizado en los ACCs de Brasilia y Curitiba .La desactivación de los conversores en los restantes ACCs está previsto para finales de 2018
	Brasilia	Implemented (AMHS terminal) / Implantado (terminal AMHS)	
	Curitiba	Implemented (AMHS terminal) / Implantado (terminal AMHS)	
	Recife	Implemented (AMHS terminal) / Implantado (terminal AMHS)	

STATE/ ESTADO	ACC	AFTN/AMHS (Template FPL 2012)	FDP /FPL2012
Chile	Iquique	Not implemented (AFTN terminal) / No Implantado (terminal AFTN)	Automated /Automatizado
	Punta Arenas	Not implemented (AFTN terminal) / No Implantado (terminal AFTN)	Automatizado /
	Puerto Montt	Not implemented (AFTN terminal) / No Implantado (terminal AFTN)	Automated /Automatizado
	Santiago	Not implemented (AFTN terminal) / No Implantado (terminal AFTN)	Automated/Automatizado
	Santiago Oceanico	Not implemented (AFTN terminal) / No Implantado (terminal AFTN)	Automated/Automatizado
Colombia	Barranquilla	Not implemented (AMHS terminal) No implantado (terminal AMHS)	Automated /Automatizado
	Bogotá	Not implemented (AMHS terminal) No implantado (terminal AMHS)	Automated /Automatizado
Ecuador	Guayaquil	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado
French Guiana (France) Guyana Francesa (Francia)	Rochambeau	No Implemented (AMHS terminal) / No Implantado (terminal AMHS)	Automated / Automatizado
Guyana	Timehri	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated / Automatizado
Panama	Panama	Implemented / implantado (AMHS terminal))	Automated /Automatizado
Paraguay	Asunción	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Manual Automated at the first quarter of 2020 / Será Automatizado primer trimestre de 2020

STATE/ ESTADO	ACC	AFTN/AMHS (Template FPL 2012)	FDP /FPL2012
Peru	Lima	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Update automation system made at the end of third quarter 2017/ Actualización Sistema automatizado realizado a finales del tercer trimester del 2017
Suriname/Surinam	Paramaribo	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated (out of service, working manually) / Automatizado (fuera de servicio, trabajando manualmente)
Uruguay	Montevideo	Implemented (AMHS terminal) / Implantado(terminal AMHS)	Automated / Automatizado
Venezuela	Maiquetia	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado (use of converter) / (uso de convertidor) By the first quarter 2019 it is foreseen a new automation system in Maiquetía ACC/ Para primer trimestre 2019 se estima operación del nuevo sistema automatizado del ACC de Maiquetía

APPENDIX D

FPL Monitoring Results

AIRLINES	Observations	Migration actions
Avianca – Aerogal Group ROUTE: SPJC-SEGU ROUTE: SPJC-SEQM	It is observed that from 112 FPL transmitted from February to April 2018, all FPL were registered as duplicates because FPL were received by different addresses at the same time.	To avoid duplication, coordination was made with the presentative of the company to send FLP only from the address EDDFTAIX set in the letter of agreement
LATAM Airlines RUTA: SPJC-KLAX	The LAN database not transmitted FPL to the Guayaquil FIR, therefore the AIDC could not be set. The Database of addresses AFTN was outdated.	Coordination was made with the airline to update their AFTN addresses database. Soon after, FPL transmitting from Guayaquil was achieved.
AMERICAN AIRLINES ROUTE: SPJC-KMIA	AAL not transmitted FPL to FIR Guayaquil for not having the SEFGZQZX address configured in its database, therefore the AIDC could not be set.	Coordination was made with the airline to update their AFTN addresses database. Pending sing of letter of agreement with FIR Lima, but thanks to coordination with the airline FPL was transmitted from Guayaquil.
LAN Ecuador ROUTE: SEGU-SPJC ROUTE: SEQM-SPJC	It is observed that from 56 FPL transmitted from March to April 2018, 16 FPL were registered as duplicates because FPL were received by SEGUZPZX (ARO SEGU) and KDENXLDS (JEPPESEN) addresses.	Coordination was made with both representatives from Ecuador and the airline to solve the problem. Currently, the FDD LIMA staff eliminates duplicate FPL.
LAN Airlines ROUTE: SCEL-KMIA	Duplication is observed in FPL because it was received at the same time by SCELZPZX (ARO SCEL) and KDENXLSD (JEPPESEN) addresses. ARO SCEL do not transmit FPL to FIR SEGU.	Coordination will be made with both representatives from Ecuador and airline to solve the problem. Currently, the FDD LIMA staff eliminates duplicate FPL.
OTHER AIRLINES WITH WHICH LETTER OF AGREEMENT HAS BEEN SIGNED	It is observed that from 1386 FPL transmitted by airlines (KLM, IBE, LPE, TPU, AFR, NKS, JBU) from February to April 2018, all FPL were registered without duplication.	N/A

APPENDIX E

Airframe Equipage and Capability - The Americas and North Atlantic

Airframe Equipage and Capability - The Americas and North Atlantic

Please complete a SEPARATE FORM for each airframe TYPE in your airline.

* Required

Airspace User Point of Contact

Name: *
Please enter your full name.

Your answer

Company: *
Name of the company you represent.

Your answer

Airline IATA Code:
If your company is an IATA member, please enter your two letter IATA code.

Your answer

Airline ICAO Code:
If available, please enter your airline ICAO three letter code.

Your answer

Company address - line 1:

Please enter your company address - first line.

Your answer

Company address - line 2:

Please enter your company address - second line.

Your answer

City:

Please enter the city name or location where your company is based.

Your answer

State or Province:

Please enter the State or Province where your company is based.

Your answer

Post Code / ZIP Code:

Please enter your company HQ postal code / ZIP code.

Your answer

Country:

Please enter the country where your company HQ is located.

Your answer

Your e-mail address: *

Please provide your primary e-mail address.

Your answer

Your phone number:

Please provide a phone number where you can be contacted.

Your answer

AIRCRAFT

In fleets where there are different equipage standards across the various airframes, please use one reference aircraft to represent the typical fleet standard. This is usually represented by the airframe used as the flight simulator reference aircraft for that fleet.

ICAO flight plan code for this aircraft type: *

Please enter the aircraft type code you use when filing flight plans for this fleet.

Your answer

How many aircraft of this type in the your fleet: *

Total number of this aircraft type you operate.

Your answer

Your airlines anticipated retirement date for this fleet:

Approximate year.

Date

mm/dd/yyyy

Is this fleet approved for

Please select all that apply.

- [ ] RVSM
- [ ] North Atlantic HLA operations
- [ ] TCAS In-Trail Climb / Descent
- [ ] ETOPS

Flight Information Regions (FIR) where this fleet operates

Please select from the listed FIRs all of the areas where this aircraft type operates.

- [ ] Edmonton
- [ ] Gander Domestic

- [ ] Moncton
- [ ] Montreal
- [ ] Toronto
- [ ] Vancouver
- [ ] Winnipeg
- [ ] Albuquerque
- [ ] Anchorage
- [ ] Atlanta
- [ ] Boston
- [ ] Chicago
- [ ] Cleveland
- [ ] Denver
- [ ] Forth Worth
- [ ] Houston Domestic
- [ ] Indianapolis
- [ ] Jacksonville
- [ ] Kansas City
- [ ] Los Angeles
- [ ] Memphis
- [ ] Miami Domestic
- [ ] Minneapolis
- [ ] New York Domestic

- [ ] Oakland Domestic
- [ ] Salt Lake City
- [ ] Seattle
- [ ] Washington
- [ ] Curaco
- [ ] Habana
- [ ] Kingston
- [ ] Nassau
- [ ] Piarco
- [ ] Port Au Prince
- [ ] San Juan
- [ ] Santo Domingo
- [ ] Central America
- [ ] Mexico
- [ ] Panama
- [ ] Amazónica
- [ ] Antofagasta
- [ ] Asuncion
- [ ] Barranquilla
- [ ] Bogota
- [ ] Brasilia
- [ ] Comodoro Rivadavia

- [ ] Comodoro Rivadavia
- [ ] Cordoba
- [ ] Curitiba
- [ ] Ezeiza
- [ ] Georgetown
- [ ] Guayaquil
- [ ] La Paz
- [ ] Lima
- [ ] Maiquetia
- [ ] Mendoza
- [ ] Montevideo
- [ ] Paramaribo
- [ ] Puerto Montt
- [ ] Punta Arenas
- [ ] Recife
- [ ] Resistencia
- [ ] Rochambeau
- [ ] Santiago
- [ ] Atlantico Oceanic
- [ ] Bodo Oceanic
- [ ] Gander Oceanic
- [ ] Houston Oceanic

- [ ] Mazatlan Oceanic
- [ ] Miami Oceanic
- [ ] New York Oceanic
- [ ] Oakland Oceanic
- [ ] Reykjavik Oceanic
- [ ] Santa Maria Oceanic
- [ ] Shanwick Oceanic
- [ ] Trans-Polar (North and/or South)

COMMUNICATIONS

This section deals with the avionic communications equipage standard on this fleet.

Is this fleet equipped with

Please select all that apply.

- [ ] AeroMAX / WiMAX - or any form of gate link communications
- [ ] 8.33kHz VHF Transceivers

- [ ] HF Transceivers
- [ ] High Frequency Data Link (HFDL)
- [ ] ACARS
- [ ] CPDLC based on ATN/VDL Mode 2
- [ ] CPDLC based on FANS 1/A or newer FANS standard
- [ ] Cockpit SatCom voice based on INMARSAT
- [ ] Cockpit SatCom data based on INMARSAT
- [ ] Cockpit SatCom voice based on IRIDIUM
- [ ] Cockpit SatCom data based on IRIDIUM
- [ ] Emergency Locator Transmitter(s) - ELTs

If equipped with HF transceivers, how many are carried

- ( ) 1
- ( ) 2
- ( ) More than 2

ICAO 8.8 kHz operating frequency ULD Mandate. ICAO Annex 6 Amendment 36 states that a Low Frequency Underwater Locator Beacon shall be installed on all aircraft with a maximum certified take-off mass of over 27,000 kg, operating over water at particular distances to land suitable for making an emergency landing. ICAO

Annex 6 Amendment 36 further states that an LF-ULB shall be installed by January 1, 2018. Will your airline equip this airframe type with LF-ULB by 1st January 2018

- Yes
- No
- Later than the ICAO deadline (e.g. EASA / European deadline 2019)

NAVIGATION

This section deals with the avionic navigation equipage standard on this fleet.

Is this fleet equipped with Multi Mode Receivers - MMRs

Select the number of MMRs on this aircraft type.

- None
- 1
- 2
- 3

Is this fleet equipped with GNSS Space Based Augmentation System (SBAS) / WAAS, EGNOS etc.

Please indicate if this fleet has the ability to use SBAS.

- [ ] No
- [ ] Yes

Is this fleet equipped with GNSS Receivers

Please indicate the number of GNSS receivers on the standard airframe for this fleet.

- None
- 1

- ○ 2
- ○ 3

If this fleet is equipped with GNSS, what standard are the receivers

Please select the specification / standard of the GNSS receivers used.

- ☐ TSO-C129a
- ☐ TSO-C145c
- ☐ TSO-C146c
- ☐ TSO-C196
- ☐ Other:

If this fleet is equipped with GNSS, what integrity scheme is utilized

Please indicate the type of GNSS integrity employed on this fleet.

- ☐ RAIM
- ☐ AAIM
- ☐ FDE
- ☐ Other:

Is this fleet equipped with GBAS

Please indicate if this fleet has the ability to use Ground Based Augmentation System approaches.

- ○ No
- ○ Yes

Is this fleet approved for

Please select all that apply.

- [ ] RNAV 10 (RNP 10)
- [ ] RNAV 5 / B-RNAV
- [ ] RNAV 2
- [ ] RNAV 1
- [ ] RNP 4
- [ ] RNP 2
- [ ] RNP 1 / P-RNAV
- [ ] RNP 0.3
- [ ] RNP <0.3
- [ ] RNP APCH
- [ ] Advanced RNP
- [ ] APV Baro VNAV
- [ ] LPV SBAS

Is this fleet equipped with

Please select all that apply.

- [ ] INS / IRU
- [ ] FMS RTA

- [ ] FMS RF
- [ ] FMS FRT

Is this fleet equipped with MLS

Please indicate if this fleet is equipped with Microwave Landing System.

- ( ) No
- ( ) Yes

SURVEILLANCE

This section deals with the surveillance equipage for this fleet.

Is this fleet equipped with

Please select all that apply.

- [ ] Mode S
- [ ] Mode S - ELS

- [ ] Mode S - EHS
- [ ] ADS-B OUT based on DO-260
- [ ] ADS-B OUT based on DO-260A
- [ ] ADS-B OUT based on DO-260B or later
- [ ] ADS-B IN displayed on a cockpit integrated EFB
- [ ] ADS-B IN displayed on cockpit Primary Flight Display(s)
- [ ] ADS-B IN displayed on a cockpit stand alone device, e.g. iPad
- [ ] ADS-C
- [ ] FMS WPR

AUTOFLIGHT

This section deals with the auto flight capability of this fleet.

Is this fleet equipped with

Please select all that apply.

- [ ] FMS
- [ ] LNAV

- [ ] VNAV
- [ ] Auto-Throttle
- [ ] CAT III
- [ ] CAT II
- [ ] CAT I

CAUTION / WARNING SYSTEMS

This section deals with the alerting systems on this fleet.

Is this fleet equipped with ACAS / TCAS

- ( ) Yes
- ( ) No

If ACAS / TCAS equipped, what is the software version number

Your answer

If ACAS / TCAS equipped, who is the manufacturer of the TCAS / ACAS unit

Please indicate the OEM of this piece of equipment.

Your answer

Please indicate any update plans your airline has for the ACAS / TCAS system on this fleet over the next five years

For example, will you upgrade the system as soon as software upgrades are released by the OEM or will you wait for specific regional mandates before upgrading.

Your answer

Is this fleet equipped with

Please select the applicable ground proximity warning equipage.

- ◯ GPWS
- ◯ EGPWS
- ◯ No ground proximity warning system

Please confirm that the GNSS (GPS) system supplies position information to the (E)GPWS system on this airframe type

- ◯ Yes
- ◯ No

If (E)GPWS equipped, please confirm the software version in use

Your answer

RECORDERS

This section deals with the voice and data recorders on this fleet.

This fleet is equipped with

Please select all that apply.

- ☐ Voice Recorder
- ☐ Data Link Communications Recorder

- [ ] Quick Access Flight Data Recorder (QAR)
- [ ] Flight Data Recorder
- [ ] Other:

DISPLAYS

This section deals with the various cockpit displays on this fleet.

Is this fleet equipped with

Please select all that apply.

- [ ] Electronic Primary Flight Instruments (glass cockpit)
- [ ] Integrated Electronic Flight Bag

- [ ] Stand-alone Electronic Flight Bag
- [ ] Flight Crew portable computers or portable electronic devices
- [ ] Multi-purpose control display units (MCDUs)
- [ ] Specialized data communications displays (e.g. DCDUs)
- [ ] Stand-alone cockpit display of traffic information (CDTI)
- [ ] Head-up Display (HUD)
- [ ] Stand-alone runway alignment and roll-out display
- [ ] TIS-B Display
- [ ] FIS-B Display
- [ ] Other:

FLIGHT CREW CERTIFICATION

This section focuses on the certification of flight crew on this fleet and specifically their ability to avail of all the aircraft capabilities.

Are all the flight crew who operate this fleet certified to use the full capability of the aircraft

For example, are they certified by your State Regulator to use CPDLC, RNP AR APCH (as applicable to your fleet).

- ○ Yes
- ○ No

If flight crew are not certified to use all the aircraft capabilities, please list the systems that are excluded

For example, crew may not certified for CAT III landings.

Your answer

Do your filed flight plans for this fleet reflect the current crew and specific aircraft capability or do you use a generic repetitive flight plan

The question seeks to determine if specific crew / aircraft capabilities are reflected in the filed flight plans for this fleet.

- ◯ We use crew certification and aircraft equipage specific flight plans
- ◯ We use generic non-crew specific flight plans
- ◯ Other:

FLEET UPDATE PLANS

Please indicate your avionic and other update plans for this fleet. For example, ADS-B IN, SatCom, HFDL, GNSS, SBAS etc.

List your update plans here

Your answer

GENERAL

Please provide your airlines perspective on the following items.

Space Based ADS-B

Your answer

IRIS - Proposed European Aeronautical Continental / Oceanic SatCom System

Your answer

AeroMAX - airfield WiFi / Gate Link

Your answer

Use of Internet Protocol (IP) for AOC data communications

Your answer

ICAO Future Communications System - LDACS

Your answer

Cockpit Synthetic Vision Systems

Your answer

Any additional comments you wish to add...

Your answer

SUBMIT

Never submit passwords through Google Forms.

APPENDIX F

INTERNATIONAL CIVIL AVIATION ORGANIZATION
SOUTH AMERICAN REGIONAL OFFICE

Project RLA/06/901 – Assistance in the implementation of an ATM regional system according to the ATM operational concept and the corresponding technological support for communications, navigation and surveillance (CNS)

STUDY ON THE FEASIBILITY AND CONVENIENCE OF
USING THE SATELLITE ADS-B SERVICE
IN THE SAM REGION

Version 1.0

April 2018

Table of Contents

List of Tables

ACRONYMS

ACAS	Airborne collision avoidance system
ADS-B	Automatic dependent surveillance (broadcast)
ADS-C	Automatic dependent surveillance (contract)
ANSP	Air navigation service provider
ASTERIX	EUROCONTROL standard for the ATM (air traffic management) surveillance data messaging binary format
ATM	Air traffic management
ATN	Aeronautical telecommunication network
ATS	Air traffic services
CAA	Civil aviation authority
ATC	Air traffic control
ELS	Elementary surveillance
ES	Extended squitter
ESARR	EUROCONTROL safety regulatory requirement
FAA	Federal Aviation Administration
FOD	Foreign object debris
FRUIT	Asynchronous false responses
GNSS	Global navigation satellite system
GPS	Global positioning system
GS	Ground station
ICAO	International Civil Aviation Organization
ID	Identification
KPA	Key performance area
MLAT	Multilateration
MSSR	Monopulse secondary surveillance radar
MTBCF	Mean time between critical failures
MTBF	Mean time between failures
MTTR	Mean time to repair
NM	Nautical mile
PoD or PD	Probability of detection
PCL	Passive coherent location
PRM	Precision runway monitor
PSR	Primary surveillance radar
R&D	Research and development
RF	Radio frequency
Rx	Receiver
SAP	System access parameter
SESAR	Single European Sky ATM Research Programme
SMR	Surface movement radar
SSR	Secondary surveillance radar
STCA	Short-term conflict alert
TDOA	Time difference of arrival
TIS-B	Traffic information service (broadcast)
TMA	Terminal manoeuvring area
TOA	Time of arrival
TWT	Travelling-wave tube
Tx	Transmitter
UAT	Universal access transceiver

VDL	VHF data link
VHF	Very high frequency
WAM	Wide area multilateration

Introduction

According to Project **RLA/06/901 – Assistance in the implementation of an ATM regional system according to the ATM operational concept and the corresponding technological support for communications, navigation, and surveillance (CNS)**, and according to the activity framework approved at the Eleventh Meeting of the Coordination Committee (RCC/11), held in Lima, Peru on 5 October 2017, the need was felt to conduct a study on the convenience and feasibility of adopting the satellite ADS-B service at a regional level within the framework of the action plan for the implementation of surveillance, multilateration and ADS systems in the Region.

To this end, a request was made to the DGCA of Ecuador to facilitate the support of Mr. **Iván Salas Garzón,** CNS expert, for the conduction of this study during the course of a mission to Lima, Peru, on 23-27 April of this year, which was effectively carried out and whose output is this guide.

Objective of the Study

The objective of this study is to determine the effectiveness of a new service called satellite ADS-B, to meet the requirements of operations in upper and lower routes.

Study methodology

- Review of basic concepts and basic differences of ADS-B and satellite ADS-B.
- Considerations on surveillance data acquisition formats in the ICAO Global Air Navigation Plan, and existing capabilities of surveillance sensors in the SAM Region.
- Analysis of technical and economic issues of the satellite ADS-B service, compared to existing capabilities in the Region, for its use in the future.
- Surveillance coverage in the SAM Region to meet operational requirements in upper and lower routes.
- Conclusions and recommendations.

1. <u>Background</u>

Compilation of texts and opinions on surveillance within the aeronautical scene

1.1 Surveillance of aircraft traffic in airspace

At present, surveillance solutions are tools that allow air traffic controllers to visualise the airspace under their responsibility and to see who is in it. However, these solutions have evolved significantly. Today, there are technologies that make surveillance possible in very difficult environments, and which allow for ***more precise, safe and efficient air traffic control.***

Consequently, on the ground, air traffic controllers make sure that those hundreds of aircraft fly safely and achieve a given level of efficiency, with the critical support of modern surveillance technologies.

You can always read that some solutions are better than others, but the truth is that there is not necessarily one single solution for everybody. One solution may provide exceptional results in a complex approach area, but might be less effective in mountainous areas. One might even discover that optimum results will be only obtained through a combination of surveillance technologies.

One might then infer that ***it is better to consider a surveillance solution that is tailored to each environment, its current and foreseen traffic, and its financial budget***, a solution that may accommodate future traffic flows while meeting current requirements for improved safety, efficiency and lower costs.

To this end, and considering the world surveillance scenario, we may find collaborative systems, independent systems, and ways to combine them. However, taking into account the nature of this study, we will focus on ADS-B and its satellite option for receiving ADS messages, as will be explained later.

Accordingly, we will first review briefly the ADS-B concepts, since the SAM Region already has a study on the implementation of this surveillance technology. Then, this will be supplemented with the satellite ADS-B concept, as the basis for the study on the feasibility and convenience of its application in the SAM Region.

1.2 What is ADS-B?

ADS-B (Automatic Dependent Surveillance-Broadcast) is a surveillance technology that provides air traffic control (ATC) with a more accurate image of the tri-dimensional position of the aircraft during its en-route, approach, terminal or surface operations.

To this end, the aircraft sends its identification, position, altitude, speed, and other information, and this transmission is received by ADS-B ground stations for subsequent display on the controller's screen, similar to the blip obtained from a secondary radar.

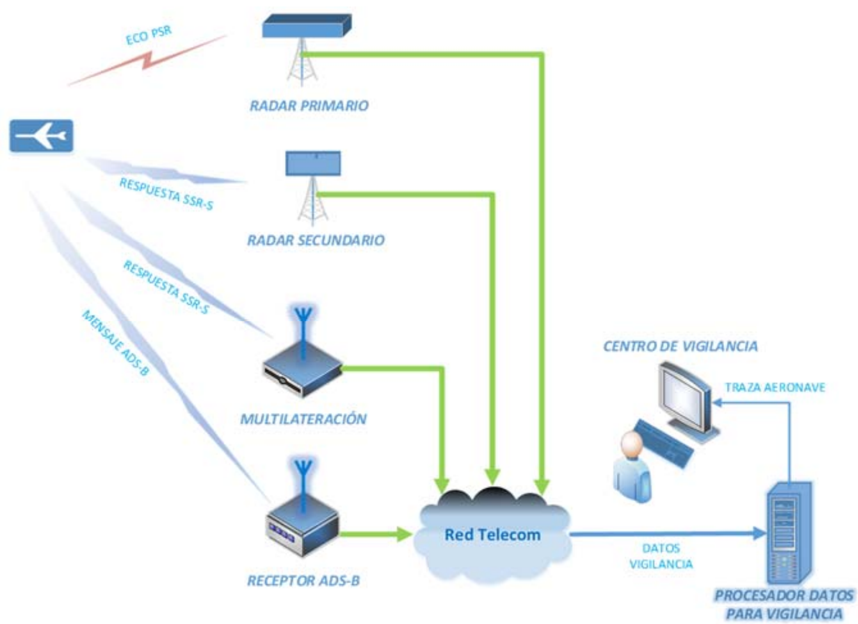
ADS-B delivers the information it receives from the aircraft to air traffic control (ATC) through display systems, where aircraft can be observed, separated, and directed with better precision and efficiency, within the area of coverage of the facility being used. It should be noted that these surveillance services are currently being used in areas that lack or have very little radar coverage or support from radar surveillance systems. It is a fact that the United States Federal Aviation Administration (FAA) is planning to dismantle terminal radar sites in certain areas in order to save costs associated with the maintenance of such systems and rely less on conventional radar.

Furthermore, this technology has the potential of providing situational awareness to pilots through ADS-B In and other future applications, thus improving support to these users now and in the future.

1.3 Use of ADS-B for air traffic surveillance and its relationship with avionics

All aeronautical administrations of the SAM Region have an air navigation service provider (ANSP) in flight information regions (FIRs). FIRs contain many areas with route services and many more approach areas, and thus always require extensive surveillance management as part of the strategy based on the effectiveness of the systems that support such management.

The scope of the surveillance service is defined, in general terms, as shown in the following graph:



Graph No. 1 – Types of sensors to be integrated into surveillance centres

The graph shows the ADS-B sensor, its relationship with surveillance activities, and its contribution to air traffic control.

Main advantages:

- ADS-B acquisition, installation and operating costs are the lowest compared to other surveillance systems.
- Minimum infrastructure requirements, since the equipment can be installed in a simple infrastructure or even in one already in existence, such as a radio station, radar or navigation aid.
- High positioning precision (given by the Global Positioning System, GPS, and/or similar)

- High update rate (1 second)
- Each position report is delivered with an indication of the associated data integrity; users may determine what applications are compatible with the data.
- Immune to multipath
- Low latency
- In general, very low cost throughout its service life
- Can be used for surveillance of aircraft and ground vehicles.
- An air-ground data link can be available
- Intention available (levelled altitude, next waypoint, etc.)
- Greater precision and more accurate air traffic control result in improved safety and efficiency and greater fuel savings and less pollution.

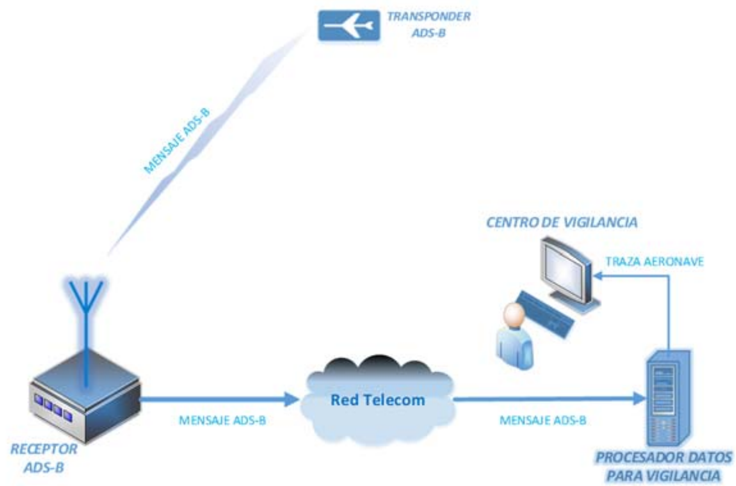
Main disadvantages:

- *All aircraft must be equipped with a transponder capable of broadcasting an extended message (extended squitter) in mode S.*
- *The determination of the position and speed of the aircraft is based exclusively on the GNSS (global navigation satellite system). Aircraft position is determined on board and is not validated with ground systems.*
- The ionosphere around the equator could affect the GNSS.
- Not all the national fleet of a State has transponders with ADS-B capabilities.
- Not all the aircraft operating in the SAM Region have the same avionics. Therefore, some flights with ES capability transmit messages in version 0 and others in version 1.
- The cost of acquisition of the transponders required for feeding the ADS-B on the ground could still be high, especially for general aviation. In many cases, general aviation still does not have FMC/FMS equipment required for data processing.
- In view of the above, the implementation process will probably need to establish exclusionary airspaces for the establishment and operation of surveillance with ADS-B sensors.
- Many air traffic display centres do not have the capability of processing ASTERIX data category 21ed. 1.8, or processing and merging data in accordance with the technical recommendations for the SAM Region.

1.4 Introduction of a new service for ANSPs called satellite ADS-B

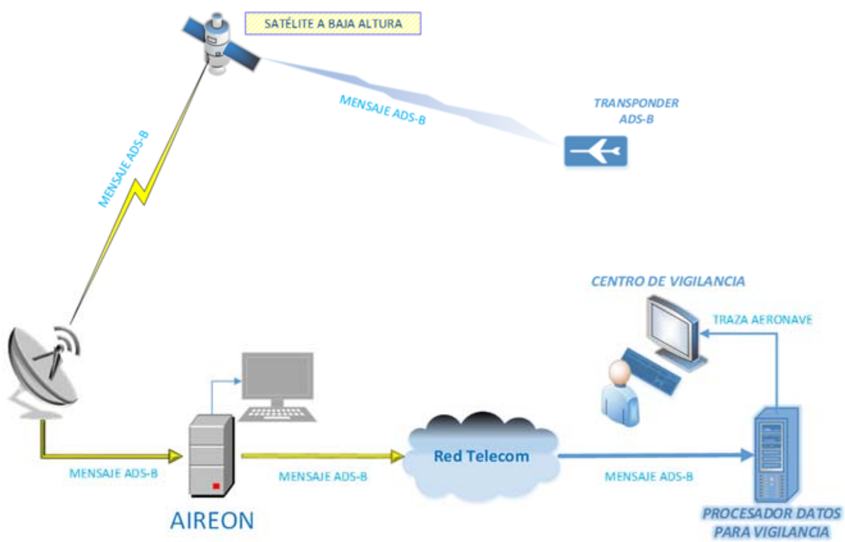
Comparison of operating principles

The general operating scheme of the two modalities is as follows:



Graph No. 2 – Conventional ADS-B

Note that the ADS-B receiver is located somewhere on the ground and the message from the aircraft requires line-of-sight to reach that receiver. This means that there is a strong dependence on the terrain and on the altitude of the aircraft to achieve total coverage within the range of the equipment.



Graph No. 3 – Satellite ADS-B

Note that, with this mode, the ADS-B message will always be in the line-of-sight of the satellite. Accordingly, it does not depend on the terrain or the altitude of the aircraft to receive the message.

Comparison between ground ADS-B and satellite ADS-B:

- ***The key difference is the mode of transfer of ADS-B data broadcast from airborne avionics to data consumption centres.***

- ***In the conventional mode, the ADS-B message that is broadcast by the aircraft can be received directly by the receiver equipment on the ground, within the pre-defined technical range. This equipment is located on a strategic site in order to obtain the maximum possible line-of-sight coverage; the message is then channelled and delivered to the end user.***

- ***In the satellite mode, the ADS-B message that is broadcast by the aircraft can be received directly by a constellation of low-altitude satellites, processed at a data centre and then channelled by a telecommunication system for delivery to the end user.***

The aforementioned difference is significant in terms of coverage: while a ground-based receiver has natural or man-made obstacles around it, which usually limit its coverage, especially at low altitude, a satellite does not have such limitation and may achieve 100% coverage, even at low altitude. This is a significant advantage for detecting aircraft at any time, anywhere.

- That stated in the previous paragraph is seen more clearly in extensive tracts of land and mountainous areas, considering the distance range of the equipment and line-of-sight obstacles, respectively.

- Accordingly, it is felt that satellite ADS-B would never have coverage issues based on range or terrain. This is the main advantage and, probably, the only one over one or more ADS-B receivers on the ground.

- The data received by the ADS-B receiver on the ground is the same as that captured by the satellite ADS-B. In general, this means that the same information will be received regardless of the means used. There is no difference.

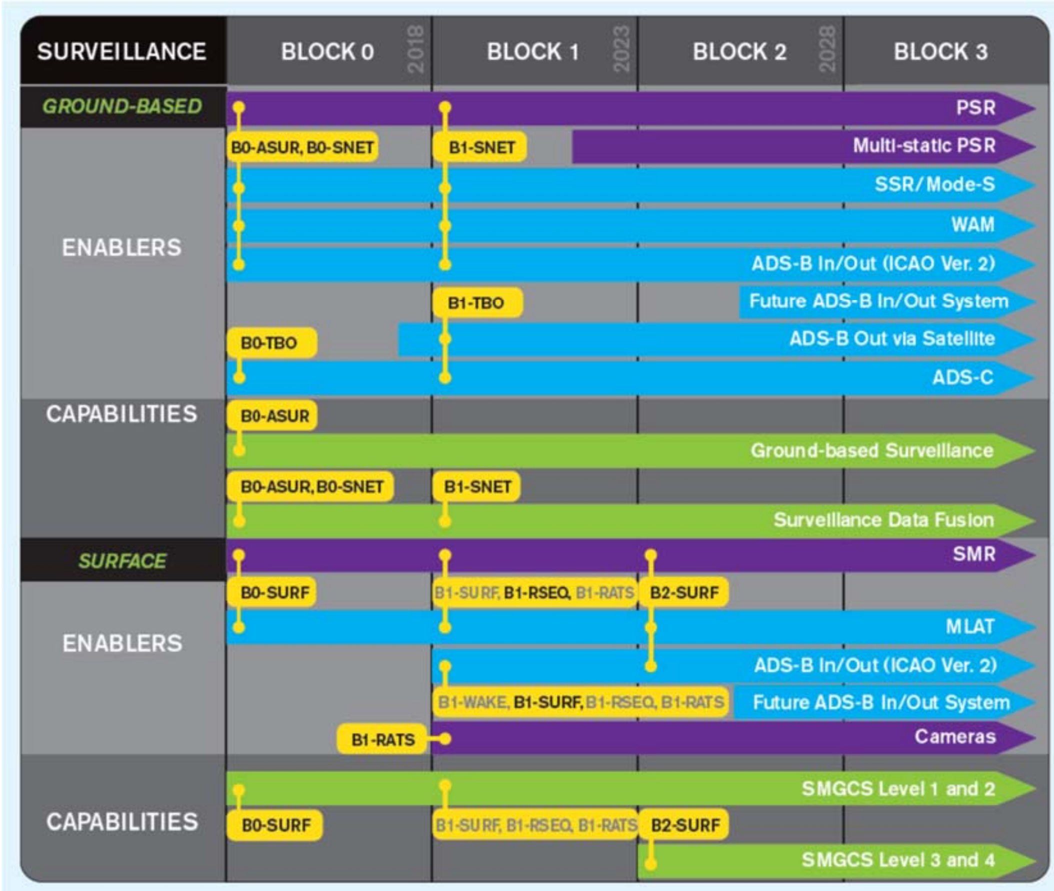
- Satellite ADS-B data would reach the end users through an external telecommunication provider, which is not part of the ANSP. Accordingly, latency may increase and must be continuously monitored.

2. Analysis of current surveillance services

2.1 Coverage requirements

2.1.1 Global Air Navigation Plan guidelines

The Global Air Navigation Plan contemplates some surveillance concepts and timings, as summarised in the following graph (Surveillance through Aviation System Block Upgrades (ASBU)):



Graph No. 4 Surveillance diagram – Global Air Navigation Plan

Graph No. 4 shows that ADS-B systems are envisaged as support (enablers) in two modalities, ground-based ADS-B and satellite ADS-B. The former is already in Block 0 and the latter is contemplated starting in 2018 in the same block. Therefore, it may be concluded that both service modalities are already part of the Global Plan.

In the SAM Region, surveillance system planning is contained in the *SAM Performance-based air navigation implementation plan (PBIP Version 1.5 November 2017).* This document covers regional planning of air navigation systems for the period 2017-2023.

Focusing only on the satellite ADS-B service, this service, in general terms, is expected to: “improve traffic synchronisation and initial trajectory-based operation”.

B1-TBO	Mejor sincronización del tránsito y fase inicial de la operación basada en trayectorias
	Mejoras en la sincronización del flujo del tránsito en los puntos de integración en ruta y optimización de la secuencia de aproximación mediante el uso de 4DTRAD y aplicaciones de aeropuerto, p. ej., D-TAXI.
Aplicabilidad	
	Se necesita una sincronización eficaz de las instalaciones de a bordo y en tierra para derivar beneficios apreciables, en particular para quienes estén equipados. Los beneficios aumentan con el número de aeronaves equipadas en el área donde se prestan los servicios.
Beneficios	
Capacidad:	Efecto positivo debido a la reducción del volumen de trabajo relacionado con el establecimiento de la secuencia cerca del punto de convergencia y otras intervenciones tácticas. Efecto positivo debido a la reducción del volumen de trabajo relacionado con las autorizaciones de salida y de rodaje.
Eficiencia:	Aumenta al utilizar la capacidad de hora de llegada requerida (RTA) de la aeronave para planificar la sincronización del tránsito a través del espacio aéreo en ruta y hacia el espacio aéreo terminal. Las operaciones "de lazo cerrado" en procedimientos RNAV aseguran que los sistemas de a bordo y en tierra tengan una visión común de la evolución del tránsito y facilitan su optimización. La eficiencia de los vuelos aumenta mediante la planificación previa del comienzo del descenso, el perfil de descenso y las medidas de demora en ruta, así como una mayor eficiencia de las rutas en el espacio aéreo terminal.
Medio ambiente:	Trayectorias más económicas y ecológicas, en particular absorción de algunas demoras.
Seguridad operacional:	Mayor seguridad operacional en los aeropuertos y sus inmediaciones al reducir los malentendidos y errores de interpretación de las autorizaciones complejas de salida y de rodaje.
Previsibilidad:	Mayor previsibilidad del sistema ATM para todos los interesados mediante una gestión más estratégica del flujo del tránsito dentro del espacio aéreo en ruta y terminal de las FIR, aplicando la capacidad RTA o el control de velocidad de la aeronave para lograr una CTA en tierra. Secuenciación y medición previsibles y reproducibles. Operaciones "de lazo cerrado" en procedimientos RNAV, asegurando que los sistemas de a bordo y en tierra tengan una visión común de la evolución del tránsito.
Costo:	Está en curso el establecimiento del análisis de rentabilidad. Los beneficios de los servicios aeroportuarios propuestos ya quedaron demostrados en el programa CASCADE de EUROCONTROL.

Graph No. 5 B1-TBO scheme – Global Air Navigation Plan

Consideration is also given to surveillance trends in the same Global Air Navigation Plan (GANP):

Vigilancia

Las tendencias importantes de los próximos 20 años consistirán en lo siguiente:

a) se combinarán técnicas diferentes para obtener la mejor relación de costo y beneficios según las limitaciones locales;

b) la vigilancia en cooperación se basará en tecnologías existentes utilizando las bandas RF de 1030/1090 MHz (SSR, Modo S, WAM y ADS-B);

c) mientras pueden determinarse perfeccionamientos de las capacidades, se prevé que la infraestructura de vigilancia planificada pueda satisfacer todas las demandas que se le impongan;

d) la parte de a bordo del sistema de vigilancia pasará a ser más importante y debería servir para el futuro con interoperabilidad mundial para las diversas técnicas de vigilancia que se utilizarán;

e) aumentará el uso de los parámetros de aeronave por enlace descendente con las ventajas siguientes:

1) clara presentación del distintivo de llamada y el nivel;

2) mejor conciencia de la situación;

3) uso de algunos de los parámetros de aeronave por enlace descendente (DAP) y notificación de altitud con intervalos de 25 ft para mejorar los algoritmos de seguimiento radar;

4) presentación de listas de pilas verticales;

5) reducción de la transmisión radioeléctrica (controlador y piloto);

6) mejor gestión de las aeronaves en pilas; y

7) reducciones en las salidas de nivel.

f) la funcionalidad pasará de tierra a aire.

Graph No. 6 – Surveillance trends in the GANP

Considering that the “coverage” parameter is the most significant difference between the two ways of retrieving ADS-B messages sent by a transponder with such capability, this guidance document will analyse coverage in both modalities, conventional and satellite, since the end product must be seamless for air traffic control. Accordingly, line-of-sight coverage graphs will be prepared using data available on the date of issuance of this guide, to be used as baseline. However, other important parameters will also be analysed, such as service availability and latency.

Finally, for the purpose of this analysis, some recommendations contained in the “Global surveillance guide” (insert reference) will be used as a reference.

- ***Whatever the geographical difficulties or traffic level, ANSPs must have the most suitable surveillance capability:***

  - First, the focus must be on the requirements rather than on the products;
  - Consideration must be given to comprehensive airspace safety and security, on the ground and en route;
  - Performance excellence and cost effectiveness are mandatory through an optimised solution;
  - Several interface options to any ATM system are required;
  - Validation tools and proven, especially designed, multiple-sensor simulation help optimise system design.

- ***The global surveillance solution provider must help customers identify the best solution that meets their needs.***

  - Definition of the desired surveillance coverage
  - Identification of site-related limitations: Complex coverage and terrain restrictions / filling gaps
  - Identification of operational restrictions: site accessibility, existing systems, limited communications

- ***Surveillance infrastructure modelling to cover new routes***

- Various criteria, such as operational requirements, mean and maximum traffic density, (current and future) budget, environment (terrain, propagation, etc.), as well as safety and security objectives, must be taken into account in order to provide an optimum solution.

- ***Global surveillance system optimisation is based on several assessments:***

  - Performance rates (probability of detection / proper identification, positioning accuracy)
  - Cost assessment (procurement of equipment, operation, maintenance)
  - External footprint (spectrum utilisation, environmental impact).

- ***Global surveillance systems are an efficient way of combining various technologies and distributing part of the load of "ancillaries" among the surveillance layers, such as:***

  - Infrastructure (tower, antennae, etc.)
  - Sources of energy (power supply, etc.)
  - Communication links

- ***PSR and SSR are frequently installed at the same facility. Alternative technologies could also be implemented in an integrated infrastructure.***

  - Integration of an ADS-B receiver into an SSR
  - Integration of ADS-B capability into a WAM station
  - Integration of a PSR station and an ADS-B + WAM into a common system

As may be noted, ICAO, in general, contemplates the use of ADS-B sensors together with ground equipment, and also the alternative involving the acquisition of data using low-altitude satellites. It also provides various recommendations in this regard.

This is clearly reflected in the following documents: Global Air Navigation Plan, the PBIP (Performance-based Implementation Plan - Version 1.5 of November 2017) at the regional level, and there are also industry recommendations on surveillance sensors.

2.1.2 Data contained in the CAR/SAM Regional Plan, Volume II, 2015

The analysis of surveillance capabilities in the SAM Region (14 countries) will be based on part of the total number of installed systems, which include ***156 SSR and 33 ADS-B.***

The coverage capacity of the systems is plotted using "radio-mobile" software, which shows line-of-sight range. However, not all the systems of the Region are included, since their coordinates are not available.

2.1.3 Parameters for defining surveillance sensor performance

"Performance modelling. Within the context of the performance-based approach, the objective of modelling is not to explain how the air navigation system works in terms of data flows, messages, etc., but to construct ATM performance models which help to—qualitatively and/or quantitatively—understand the cause-effect relationships between performance variables, showing how individual performance objectives can be achieved and how they interact (enhance or interfere) with each other." (ICAO Doc 9883)

Based on the above and on ISO 13236 (see Annex 2), the 4 elements considered for quality systems and that are related to surveillance systems are: capacity, integrity, time, and continuity of service:

I. Detection of all aircraft operations in the airspace under consideration
II. Integrity of surveillance information
III. Timeliness of surveillance information at the control centres
IV. Continuity of aircraft detection

Supporting metrics. Supporting metrics are used to defining performance indicators. These values will be measured in each airspace segment and for each surveillance sensor, in order to obtain statistics for areas covered by two or more sensors.

I. Percentage of airspace coverage by surveillance sensors
II. Percentage of valid responses by airborne avionics, with position verified on the aircraft
III. Time in seconds between the issuance of the surveillance response by avionics and its reception at a surveillance centre
IV. Percentage in time for the resolution of failures affecting continuity

Performance goals. These are the performance indicator values that must be attained or exceeded in order to consider that a performance objective has been fully achieved.

I. 95% coverage of surveillance sensors in airspace
II. 98% of valid responses of avionics, with position verified on the aircraft
III. 2 seconds or less between the issuance of the surveillance response by the avionics and its reception at the surveillance centre
IV. Mean time to repair of failures, if any, must not exceed 1 hour at the site. Added to the fact that service is supported by systems that do not fail before 25,000 hours of service. (insert references)

The concepts described so far will be developed below, together with the goals to be achieved, in order to determine the feasibility and convenience of using the so-called satellite ADS-B service, which is the subject matter of this study.

2.2 Development of surveillance performance parameters

2.2.1 Airspace coverage

- Existing conditions, by FIR size and continental geographical size:

Using data taken from the **CAR/SAM** air navigation plan, **Volume II, 2015**, on the capacity of surveillance sensors (SSR and ADS) in SAM States, information provided by the States on ADS-B (April 2018), and geographical data of each State, a table is shown with number of SSR sensors, FIR size and continental size in each case, in order to establish the ratio of sensors available per km2 in each area (the lower the number of km2, the greater the coverage). This is important because, obviously, it is not possible to place stations with radar sensors in oceanic areas.

Based on the foregoing, the ratio between the FIR size and the continental size of each country is also important.

No.	***Country***	***SSR/ADS***	***FIR area (km2)***	***FIR ratio (km2/SSR)***	***Continental area (km2)***	***Continental ratio (km2/SSR)***	***FIR/Cont. ratio***
1	ARGENTINA	25 / 0	17,908,074.62	716,322.98	2,792,573.00	111,702.92	6.41
2	BOLIVIA	1 / 0	1,085,891.42	1,085,891.42	1,098,581.00	1,098,581.00	1.0
3	BRASIL	69 / 0	n/a	n/a	8,514,877.00	123,404.01	
4	CHILE	11 / 0	10,038,771.54	912,615.59	756,102.00	68,736.55	13.28
5	COLOMBIA	15 / 11	1,648,431.14	109,895.41	1,141,748.00	76,116.53	1.44
6	ECUADOR	7 / 0	942,758.82	134,679.83	283,561.00	40,508.71	3.32
7	FRENCH GUI.	1 / 5	1,383,199.17	1,383,199.17	83,534.00	83,534.00	16.56
8	GUYANA	0 / 5	270,916.57	n/a	214,970.00	n/a	1.26
9	PANAMA	3 / 0	621,464.86	207,154.95	74,177.00	24,725.67	8.38
10	PARAGUAY	1 / 6	399,136.50	49,892.06	406,752.00	50,844.00	1.0
11	PERU	8 / 2	3,564,434.95	445,554.37	1,285,216.00	160,652.00	2.77
12	SURINAME	1 / 0	262,126.10	262,126.10	163,820.00	163,820.00	1.60
13	URUGUAY	2 / 0	2,326,000.97	1,163,000.49	176,215.00	88,107.50	13.20
14	VENEZUELA	10 / 0	1,204,815.45	120,481.54	916,445.00	91,644.50	1.31

Table No. 1 Data on FIR size and continental size

According to the data, Chile and Uruguay, for example, have abundant oceanic airspace in their FIRs with respect to their continental area, which means long routes. On the other hand, Paraguay only has continental routes. The previous table describes the general geographical situation of the Region.

In countries where data on the position of surveillance sensors is available, the coverage area is calculated based on 1° x 1° units, for example:

Referential surface measurement:

1° x 1° unit =	12,321.00	Km2
Country	***FIR size***	***Units***
Argentina	17,908,074.62	1,453.46
Colombia	1,648,431.14	133.79
Ecuador	942,758.82	76.52
French Guiana	1,383,199.17	112.26

Table No. 2 Reference for calculating coverage with respect to FIRs

Graphs showing FIR boundaries and routes contained therein have been used to determine radar sensor coverage. Ground-based ADS-B sensors have not been taken into account for this activity.

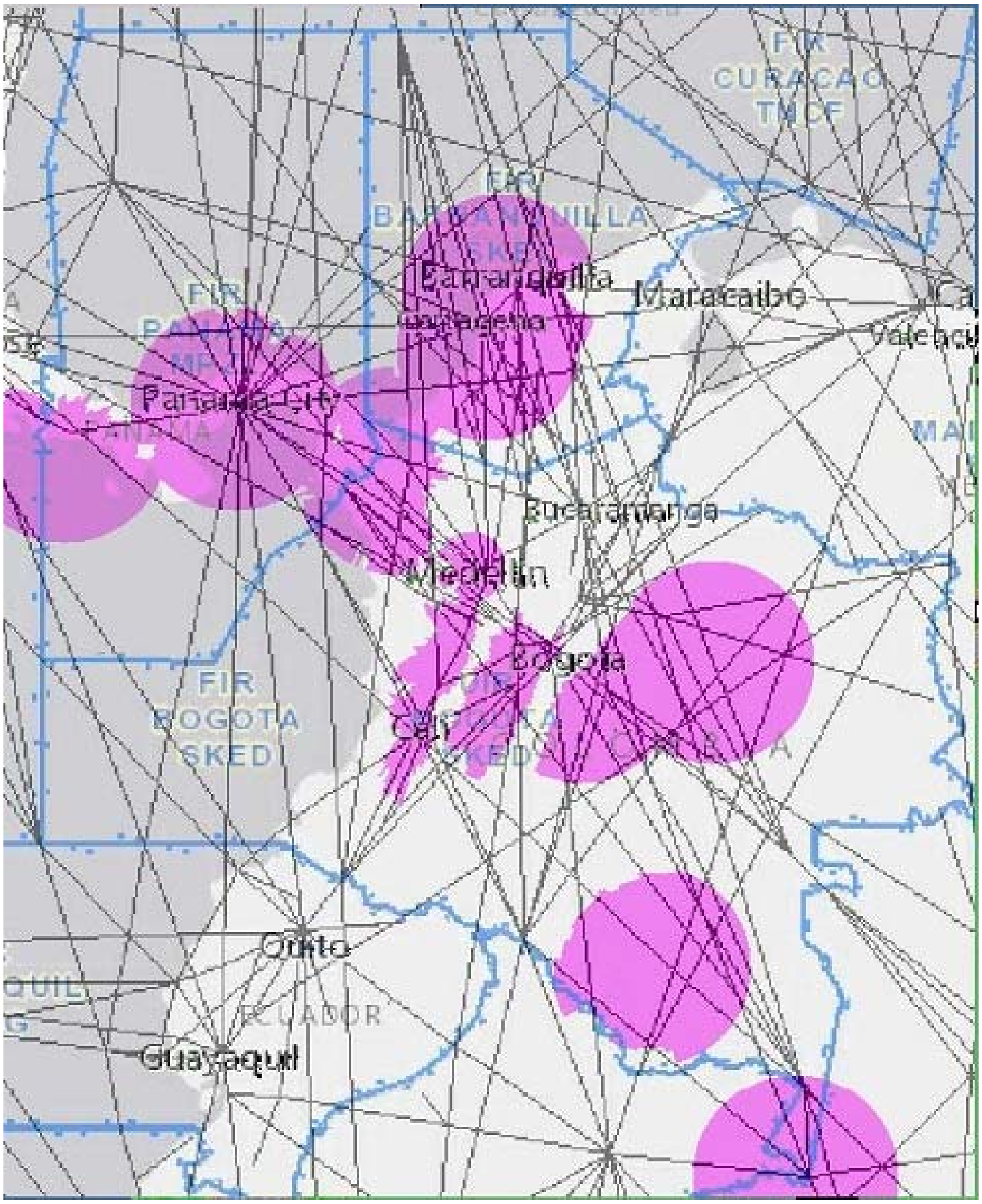
For ease of presentation, the FIRs of Colombia-Panama, Ecuador-Peru and Argentina-Chile are shown. The entire oceanic segment of the Pacific is also analysed.

Colombia-Panama – SSR sensors: 15 Colombia / 3 Panama.

Colombia. Regarding the geographical size of the FIR, it has about, 1 radar per every 110,000 km2, and 1 radar per every 76.000 km2 in its continental area. Also note that it has an oceanic area of 506,683 km2 (FIR size minus continental size), where surveillance sensors cannot be installed on the surface.

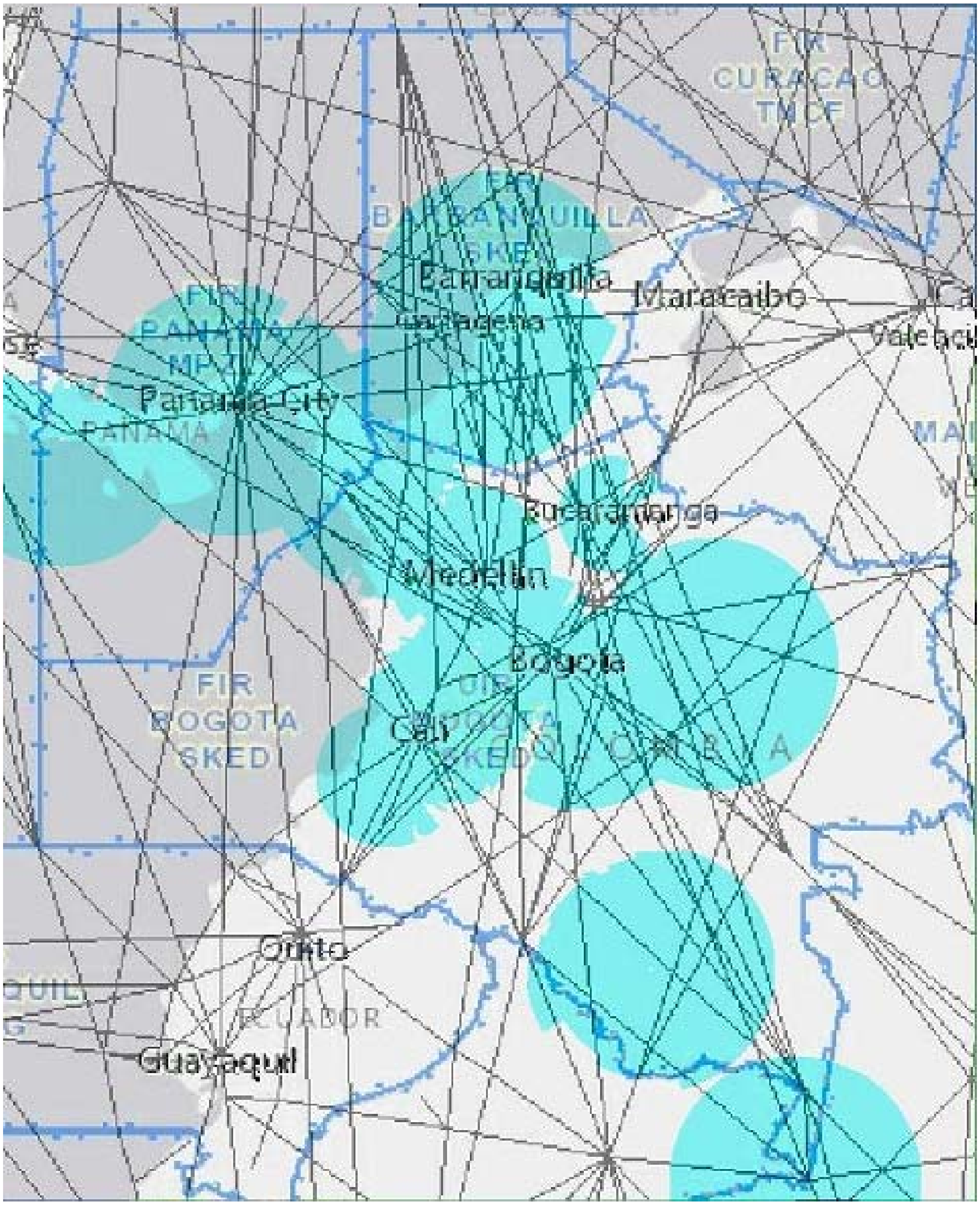
Panama. Regarding the geographical size of the FIR, it has 1 radar per every 207,000 km2, and 1 radar per every 25,000 km2 in its continental area. Also note that it has an oceanic area of 547,287 km2, where surveillance sensors cannot be installed on the surface.

10,000 ft. Colombia: 37.37% coverage; Panama: 33.70% coverage



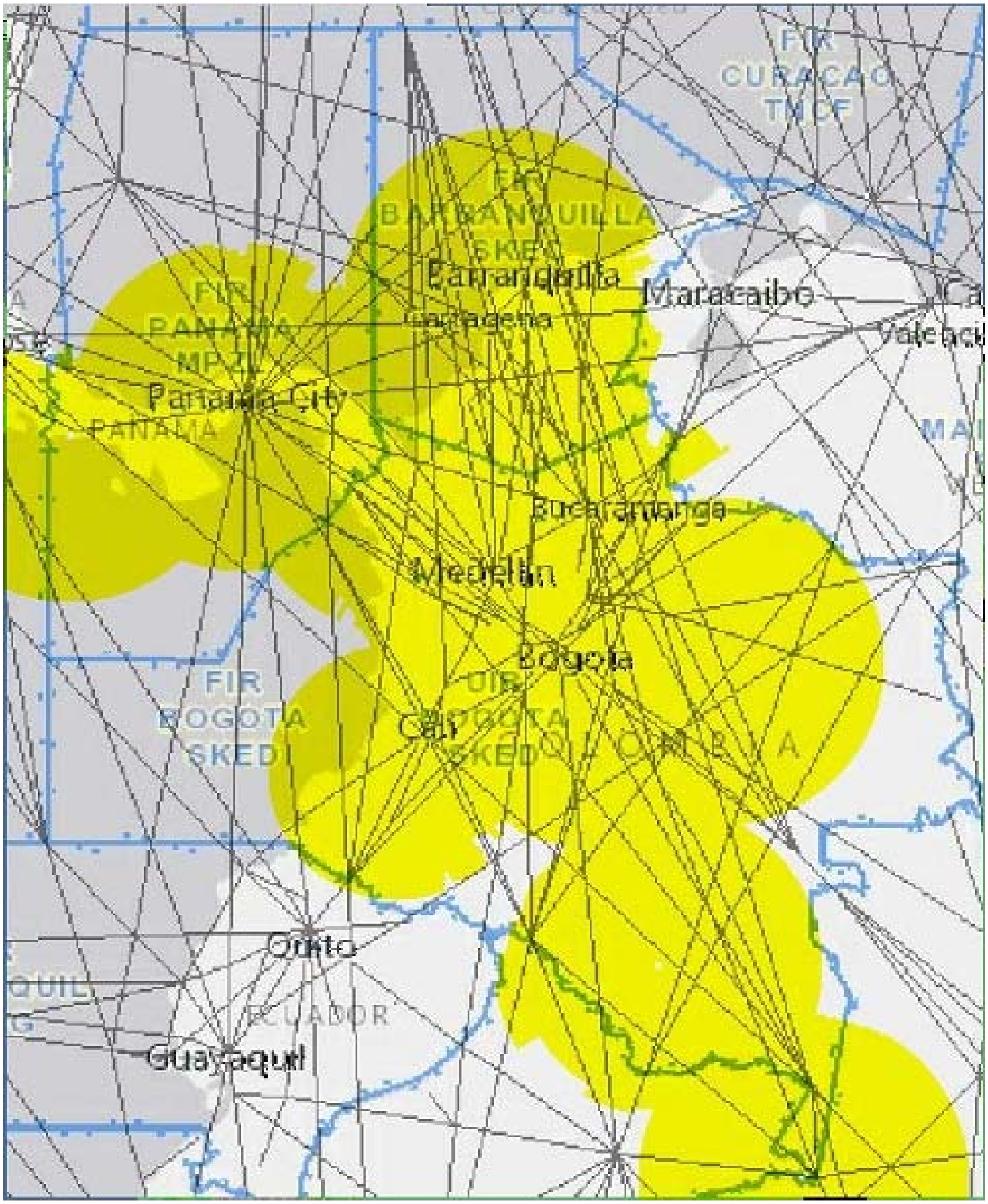
Graph No. 7 Colombia-Panama – 10,000 ft.

15,000 ft. Colombia: 49.33% coverage; Panama: 41.63% coverage



Graph No. 8 Colombia - Panama – 15,000 ft.

25,000 ft. Colombia: 77.73% coverage; Panama: 59.48% coverage



Graph No. 9 Colombia - Panama – 25,000 ft.

Notes on Colombia

a) Low-altitude coverage (10,000 ft.) is a little more than one third of the FIR and continues to grow above the initial level, reaching approximately 80% at 25,000 ft.

b) Based on the above, full coverage in the FIR will not be possible due to the irregular terrain and the existing oceanic airspace, where no surveillance systems may be installed on the surface.

Notes on Panama

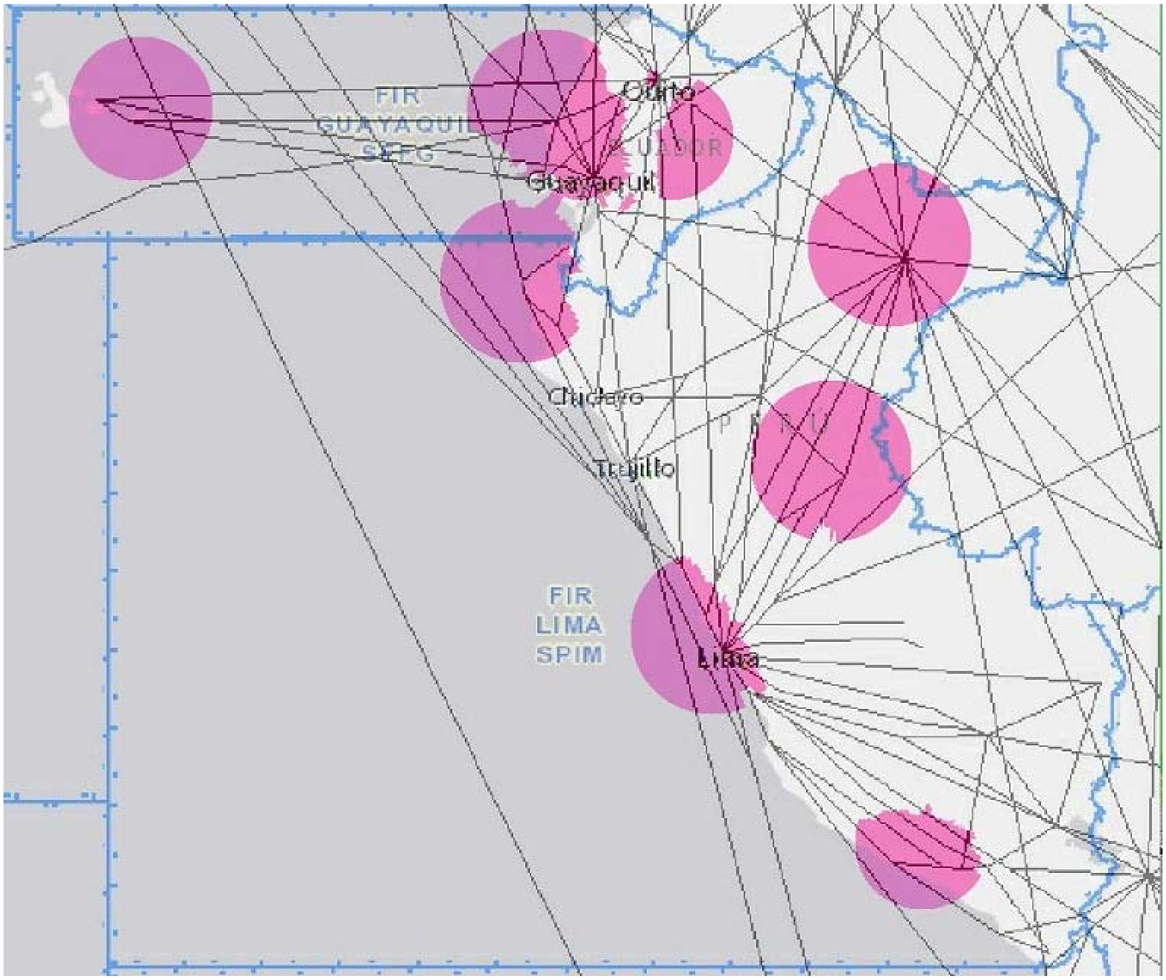
a) Low-altitude coverage (10,000 ft.) is one third of the FIR y continues to grow above the initial level, reaching approximately 60% at 25,000 ft.
b) Based on the above, full coverage in the FIR will not be possible due to the irregular terrain and the existing oceanic airspace, where no surveillance systems may be installed on the surface.

Ecuador-Peru. SSR sensors: 7 Ecuador / 8 Peru

Ecuador. Regarding the geographical size of the FIR, it has 1 radar for every 134,679 km2, and 1 radar for every 40,508 km2 in its continental area. It should also be noted that the oceanic area has 659,197 km2, where no surveillance systems can be installed on the surface.

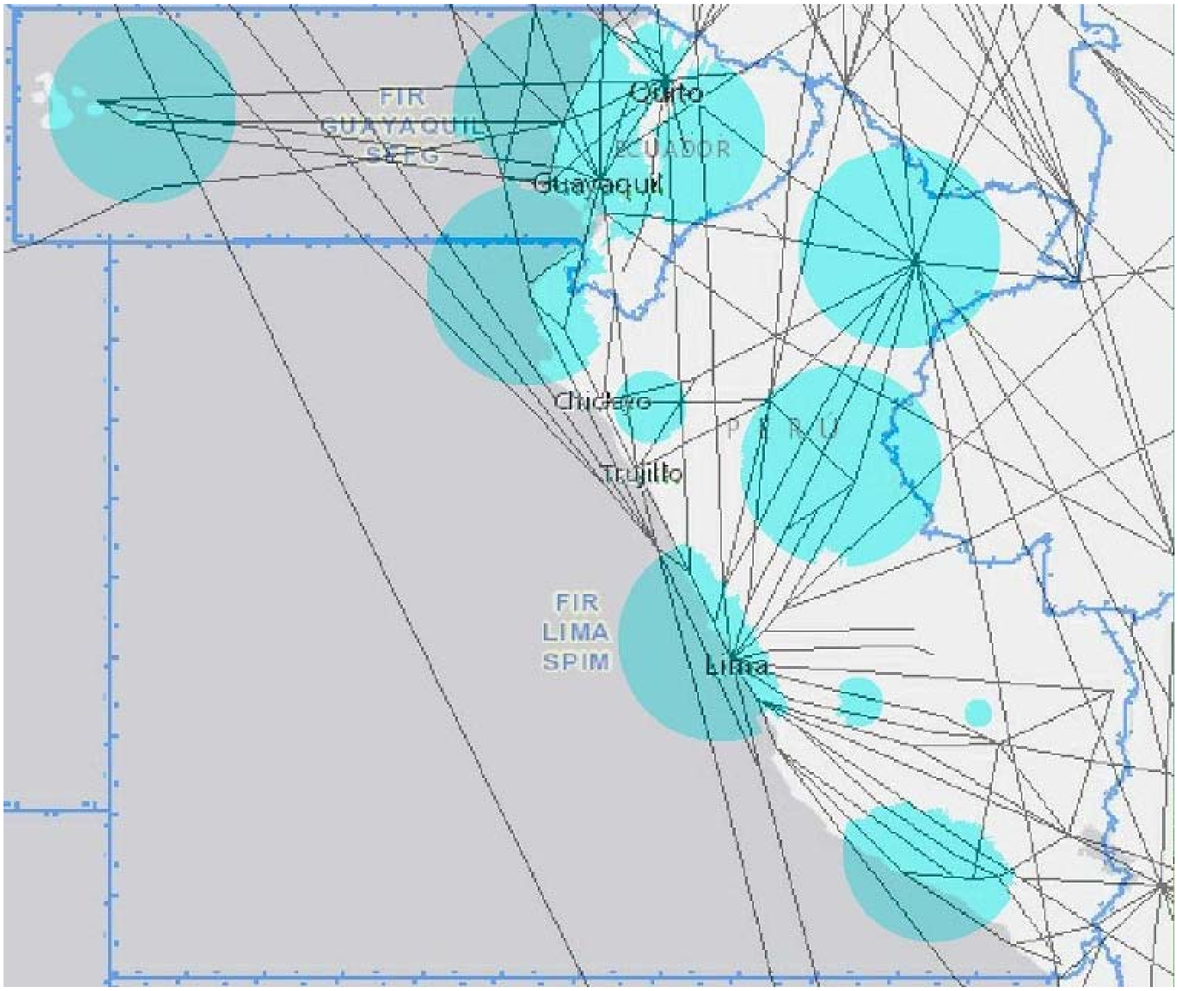
Peru. Regarding the geographical size of the FIR, it has 1 radar for every 445,000 km2, and 1 radar for every 160,000 km2 in its continental area. It should also be noted that its oceanic area has 2’279,218 km2, where no surveillance systems can be installed on the surface.

10,000 ft. Ecuador: 27.45% coverage; Peru: 13.14% coverage



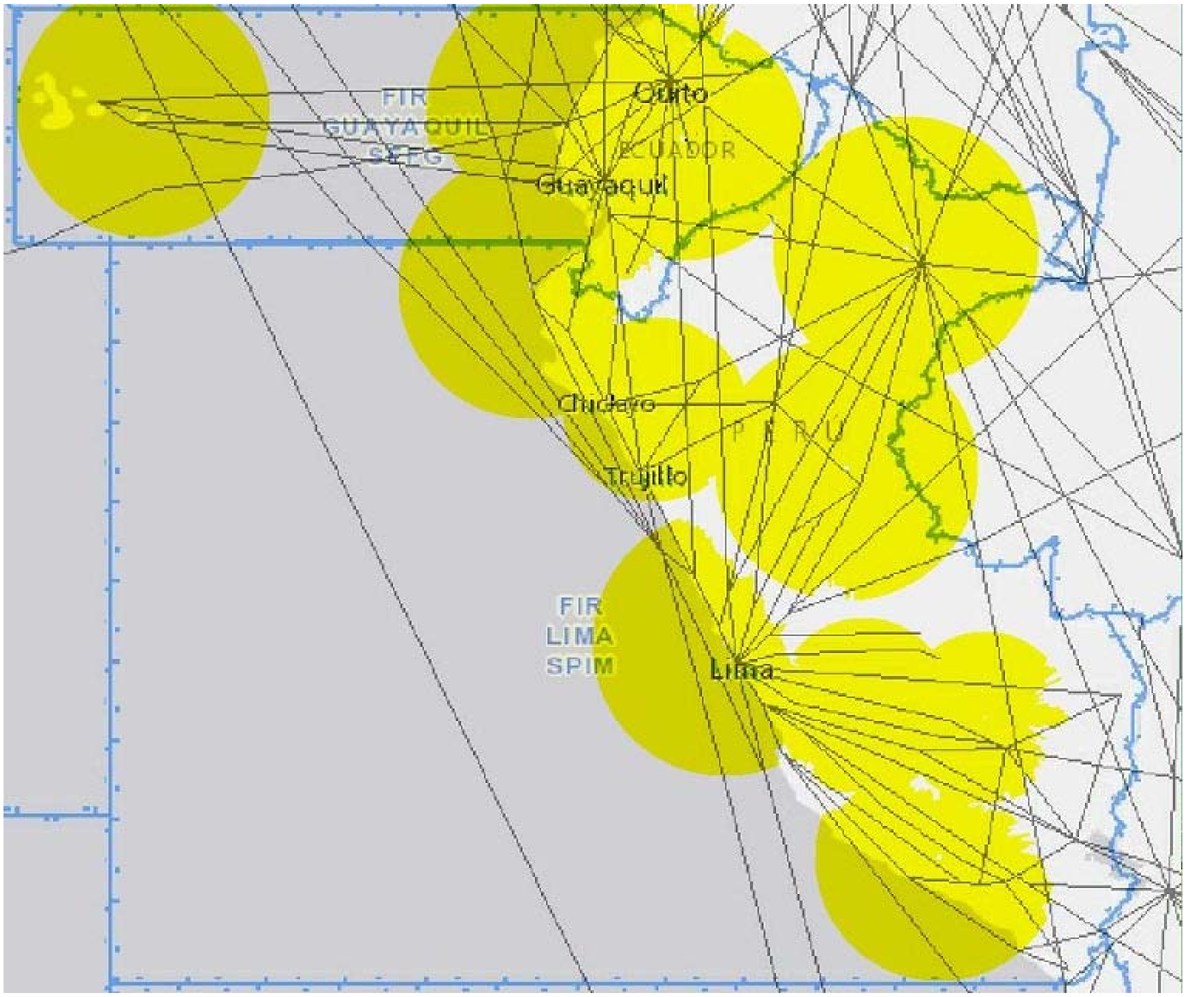
Graph No. 10 Ecuador - Peru – 10,000 ft.

15,000 ft. Ecuador: 45.74% coverage; Peru: 19.70% coverage



Graph No. 11 Ecuador - Peru – 15,000 ft.

25,000 ft. Ecuador: 74.49% coverage; Peru: 43.21% coverage



Graph No. 12 Ecuador – Peru – 25,000 ft.

Notes on Ecuador

a) Low-altitude coverage (10,000 ft.) is almost one fourth of the FIR and continues to grow above the initial level, reaching about 78% at 25,000 ft.
b) Based on the above, full coverage in the FIR cannot be achieved due to the irregular terrain and the existing oceanic airspace, where no surveillance systems can be installed on the surface.

Notes on Peru

a) Low-altitude coverage (10,000 ft.) only reaches 13%. The low resulting value is explained by the large extent of oceanic airspace, which is part of the Lima FIR. And although it continues to grow above the initial level, it reaches 43% approximately, at 25,000 ft., which is a significant value taking into account its oceanic segment.

b) Based on the above, full coverage in the FIR cannot be achieved due to the large oceanic airspace, where no surveillance systems can be installed on the surface, and, to a lesser extent, due to its irregular terrain.

Argentina - Chile. SSR sensors: 27 Argentina / 10 Chile

Argentina. Regarding the geographic size of the FIR, it has 1 radar for every 716,000 km2, and 1 radar for every 112,000 km2 in its continental area. It should also be noted that it has an oceanic area of 15’115,501 km2, where surveillance sensors cannot be installed on the surface.

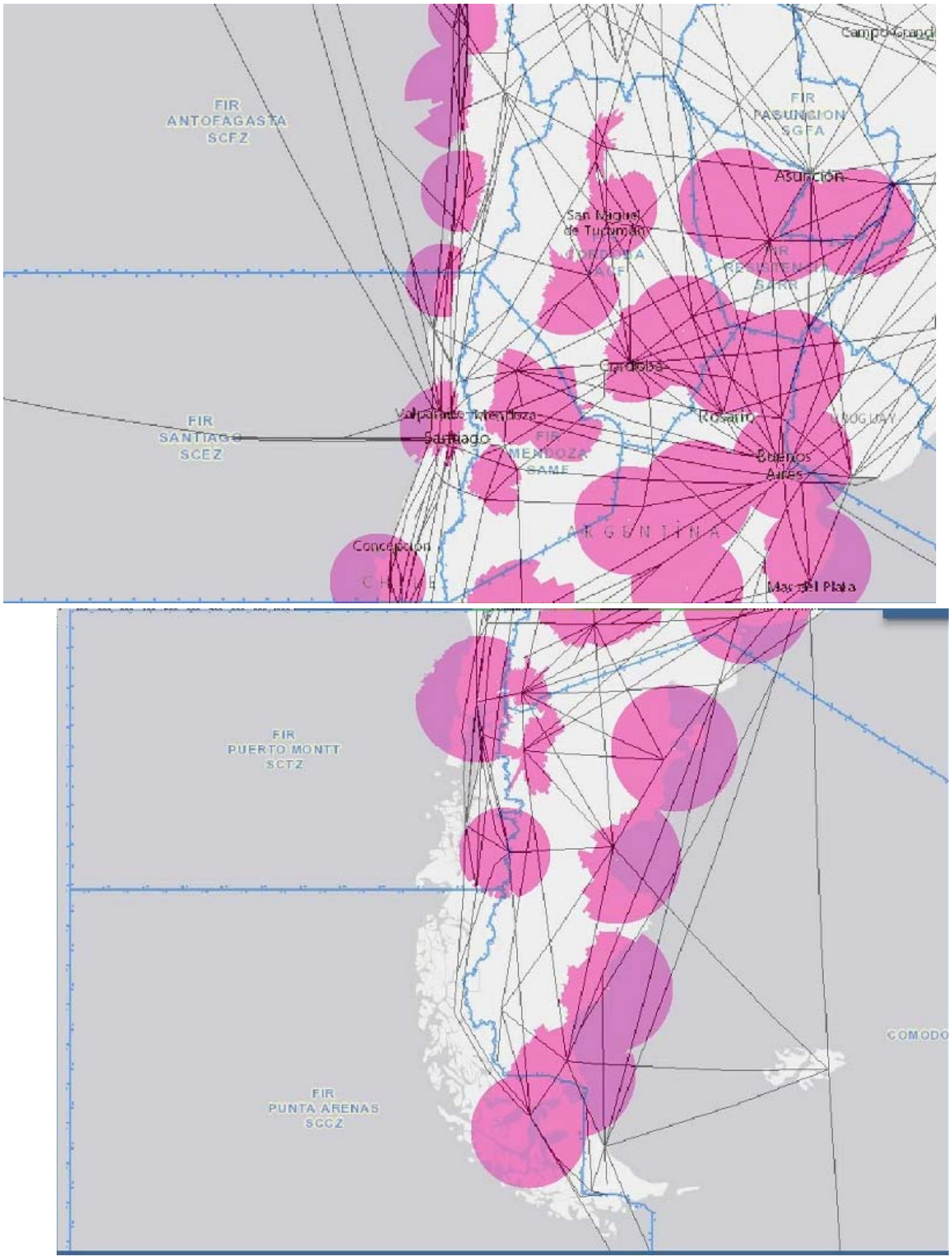
According to available data, the oceanic area under the jurisdiction of Argentina is the largest in the SAM Region and it is really large.

Chile. Regarding the geographic size of the FIR, it has 1 radar for every 912,000 km2, and 1 radar for every 68,000 km2 in its continental area. It should also be noted that the oceanic area has 9’282,669 km2, where surveillance systems cannot be installed on the surface.

The oceanic area of Chile is also very extensive, although smaller than that of Argentina.

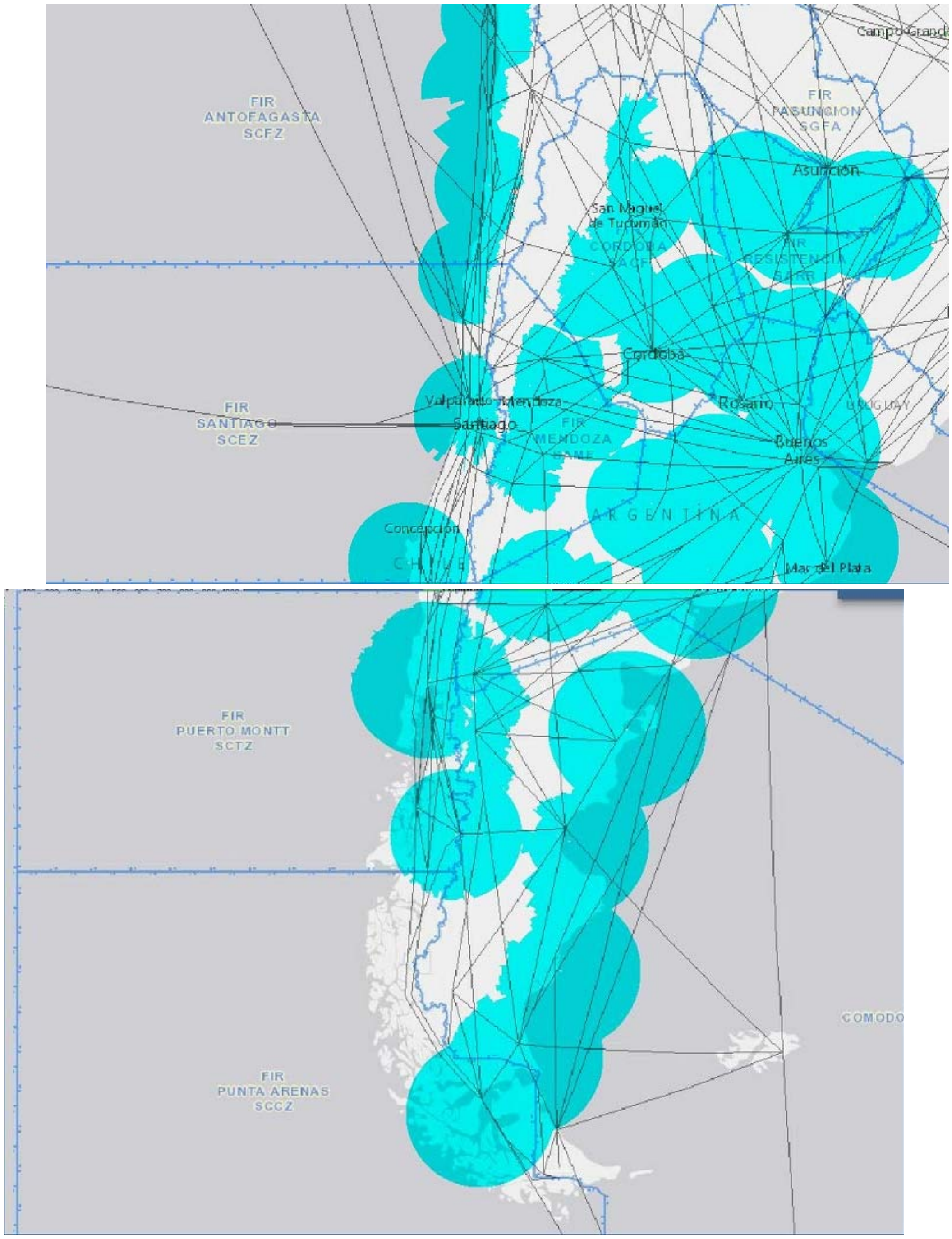
Note. For practical reasons of the radio-mobile tool, the coverage of Argentina and Chile was illustrated in two graphs.

10,000 ft. Argentina: 12.73% coverage; Chile: 8.96% coverage



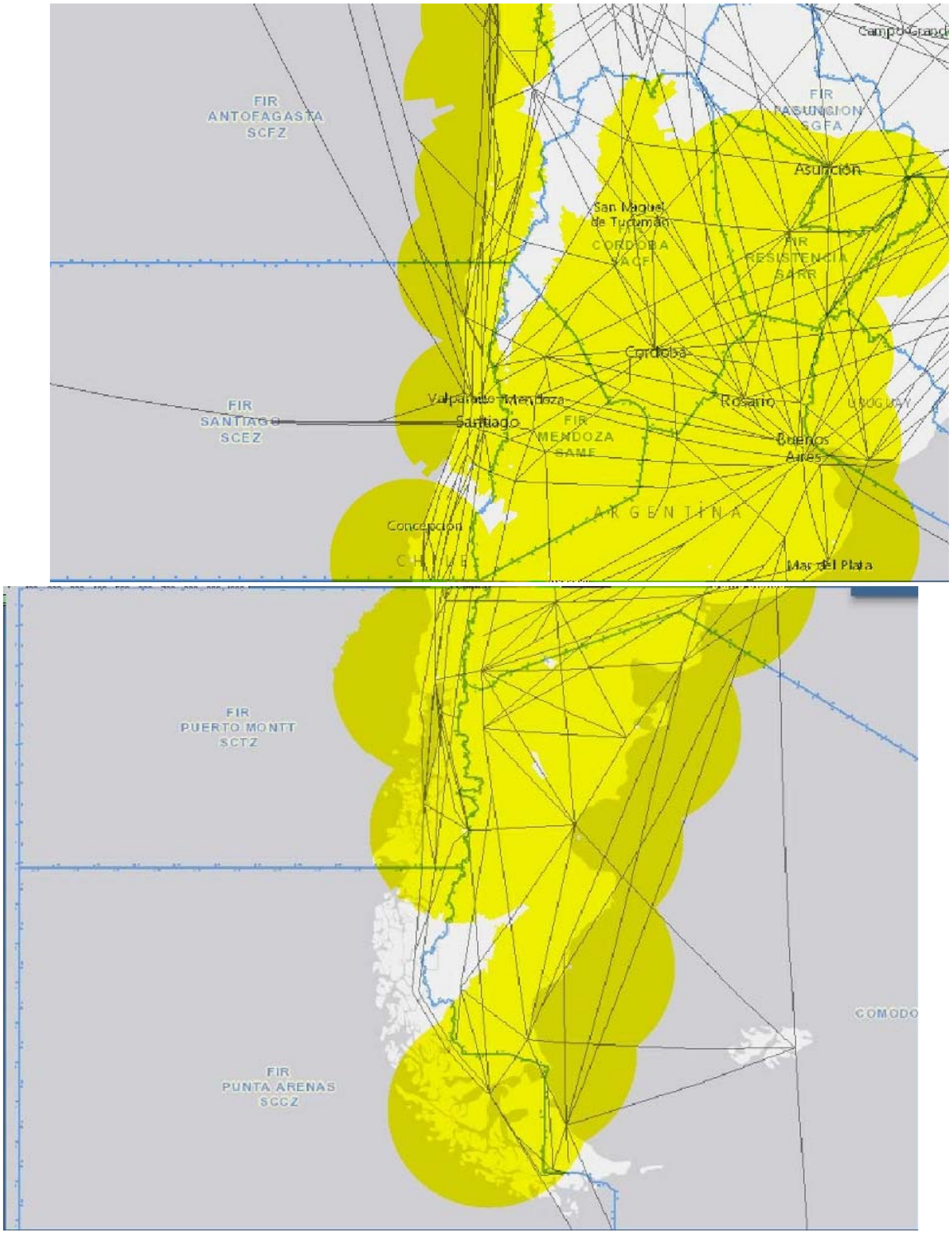
Graph No. 13 Argentina - Chile – 10,000 ft.

15,000 ft. Argentina: 15.27% coverage; Chile: 11.66% coverage



Graph No. 14 Argentina-Chile – 15,000 ft.

25,000 ft. Argentina: 18.58% coverage; Chile: 17.55% coverage



Graph No. 15 Argentina - Chile – 25,000 ft.

Notes on Argentina

a) Low-altitude coverage (10,000 ft.) is a little more than one tenth of the FIR, despite the significant number of sensors. However, it should be noted that this includes all the FIRs of the country. The value continues to grow above the initial level, reaching up to about 18% at 25,000 ft., but is still low.

b) Based on the above, it will not be possible to obtain a significant coverage in the FIR, given the extensive oceanic airspace, where no surveillance systems can be installed on the surface.

Notes on Chile

a) Low-altitude coverage (10,000 ft.) is less than one tenth of the FIR, despite the significant number of sensors. However, and just like in Argentina, this includes all the FIRs of the country. The value continues to increase above the initial level, reaching about 18% at 25,000 ft., which is still low.
b) Based on the above, it will not be possible to obtain a significant coverage in the FIR given the extensive oceanic airspace, where no surveillance systems can be installed on the surface.

French Guiana:

As a very special case, its FIR has a geographical size of 1’383,199 km2, a continental area of 83,534 km2, and, consequently, a oceanic area of 1’299,665 km2, where no surveillance systems may be installed on the surface.

Graph No. 16 Cayenne FIR - French Guiana

***Notes on* French Guiana**

a) Even if its continental territory were totally covered with surveillance sensors, it is obvious that surveillance coverage in the FIR could not exceed 10%, at best.

Notes on coverage

i) It is obvious that coverage with ground-based SSR sensors is as expected, taking into account that they rely on line-of-sight for aircraft detection.

Variations between 10,000 to 25,000 ft. above sea level, show an upward trend in all cases, and this is explained because the aforementioned sensors require line-o-sight to detect aircraft.

ii) In general, it may be concluded that coverage with ground-based surveillance sensors is not enough, especially for levels below 15,000 ft. Aircraft operations take place at all flight levels, so it is desirable to have full coverage at all levels.

iii) In oceanic airspaces, obviously, it is not possible to install surveillance sensors. Accordingly, there would be no coverage except in that part of the ocean where sensors are located along the coast or on an island and, even so, the curvature of the earth must be taken into account for the line-of-sight from the shore or island.

There are countries like Argentina and Chile that apparently have low surveillance coverage, but those low percentages are explained by their extensive oceanic airspaces.

iv) All ground-based surveillance systems play an important surveillance role, but coverage is not enough (not 100%) in most places where they are installed, is almost inexistent in other places, and they are not available in oceanic areas.

2.2.2 Information integrity

Information integrity of surveillance messages is defined based on three possible types of errors: central processing errors, correlation errors, and spurious errors.

No data is available on the aforementioned errors. However, taking into account that ADS-B messages do not undergo any content changes from the moment they are sent by the aircraft, received, processed and transported by AIREON, to delivery to the user through data channels, this type of parameter will not be applied in this study.

2.2.3 Reception time or latency

The reception time required by the existing surveillance service for displaying aircraft blips and making real-time traffic control decisions is 1 to 4 seconds as refresher range, depending on the technical characteristics of the sensor used:

- 4 seconds for secondary surveillance radar (SSR)

This type of sensor requires that amount of time to update data in detection mode (query/response) due to the associated movement of the antenna. This radar system has been in use for many years as main surveillance sensor for air traffic control centres, both for approach and en route, and the service has been satisfactory at all times. Therefore, its latency is acceptable.

- 1 second for multilateration (MLAT)

This type of sensor reduces to 1 second the update time for acquiring aircraft data for surveillance services (and MLAT, an alternative system to SSR). Therefore, this latency is very acceptable.

Notwithstanding the above, and given the short latency, it should be noted that MLAT support systems require processing time (position calculation) that might increase latency. Accordingly, an additional 0.5 or 1 second should be considered for a more realistic latency.

- 1 second for automatic dependent surveillance - broadcast (ADS-B)

This type of sensor also reduces update time for obtaining surveillance data to 1 second, compared to SSR. Since this sensor is more efficient than the other two, and since the future trend is to use it massively, latency is adequate to continue with its application.

As in the case of MLAT, given the short latency, it should also be noted that support systems for this sensor require processing times that might add some more time until the surveillance message is delivered to the user. Therefore, an additional 0.5 or 1 second should be considered for a more realistic and practical latency.

Notes on latency

i) Latency values usually considered for existing surveillance systems range from 1 to 4 seconds, and there is no known demand for other values in civil aviation.

ii) If we leave aside mechanical equipment and only take into account electromagnetic propagation and computer systems, the processing speed is very fast in both cases. Therefore, the 1sec time interval for issuing a signal is very adequate. Systems can easily handle it.

iii) In any case, after issuing the signal, some additional time is needed for reception, validation or other actions. Accordingly, some more time will need to be added. This would increase latency to 1 second or more.

2.2.4 Service availability

Service availability refers to its quality or availability, that is, that it can be used whenever required. However, as with any other support system, it is not infallible over time, during normal operation. Two statistical parameters indicate the behaviour of these systems over time:

Mean time to repair (MTTR)

Mean time between failures will be used for establishing the time it takes a service provider, **in average,** to restore service when it has been interrupted for any reason.

The value of this parameter is used by the ANSP for the adoption of primary contingency measures and to prepare for longer-lasting contingency measures, even if they are the same in some cases. The average MTTR of an ADS-B = 20 min.; a system with several ADS-B sensors = 30 min. (insert reference)

Uninterrupted operation for continuing display

Although there is an MTTR parameter and surveillance centres usually work 24x7, it is critical to know the mean time between critical failures (MTBCF).

This will enable us to develop contingency plans for ANSP services on a timely basis. MTBF of an ADS-B = 25,000 hours; a system with several ADS-B sensors = 20,000 hours (insert reference)

Notes on the MTTR and MTBCF parameters

i) The two parameters combined provide the total availability of an ADS-B message, from its issuance in the transponder to its arrival at the data processing centre. An acceptable value is 99.99%, excluding programmed interruptions.

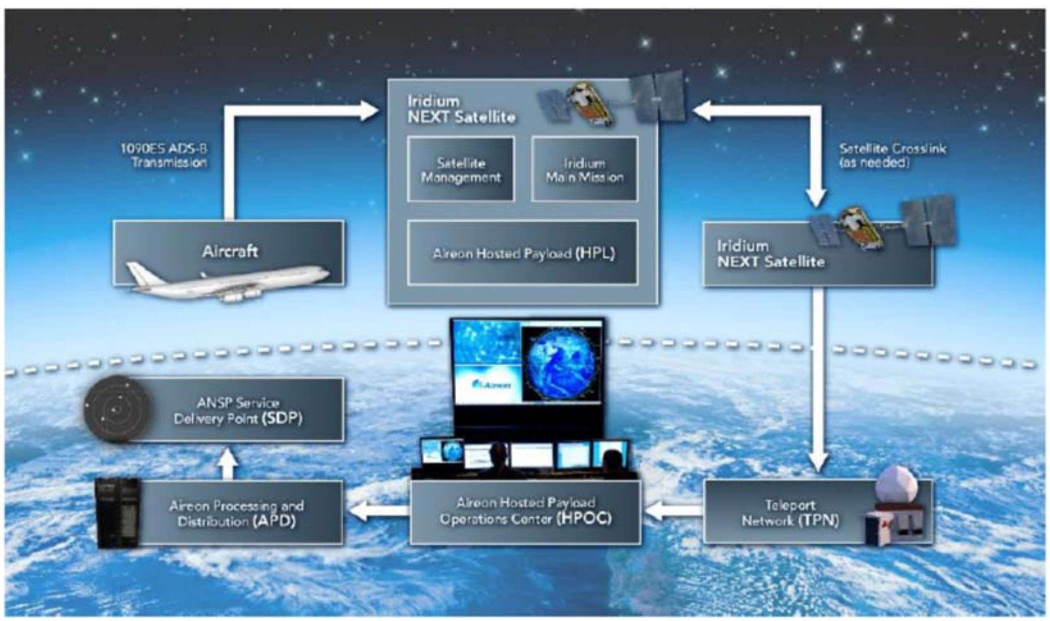
2.3 ***Study of the satellite ADS-B service***

2.3.1 Profile of the company providing the satellite ADS-B service

AIREON, the company providing the satellite ADS-B service, was born from a joint project of Nav Canada (Canada), ENAV (Italy), Naviair (Denmark) and the Irish Aviation Authority (Ireland), which are air navigation service providers (ANSPs), and Iridium Communications, which provides satellite telecommunication services. Its website www.aireon.com offers more information on the subject.

Objective of the service: Provide surveillance capabilities to supplement the infrastructure of an ANSP, and also to increase surveillance in areas with limited or no radar coverage. Furthermore, the AIREON system will receive, process, filter, format and validate the ADS-B messages received, for delivery to air navigation service providers (ANSPs) for use in air traffic control (ATC).

The following graph illustrates the service:



Graph No. 17 The AIREON network

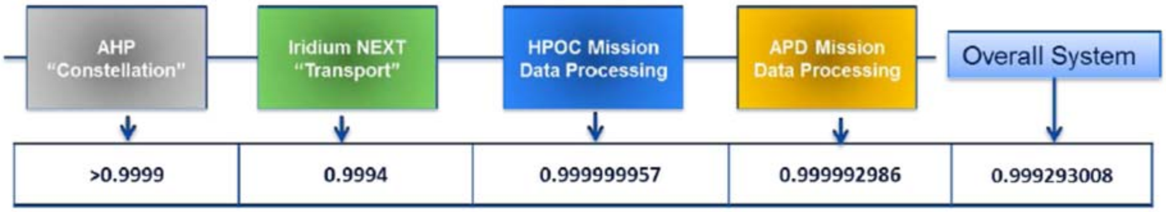
2.3.2 Technical parameters that define the satellite ADS-B service

Based on the information provided by AIREON, they have three indicators that determine the quality of their service: availability, latency, and probability of update, and they define reference values.

I. Availability

"Availability" is calculated by dividing the number of status reports within the spatial volume of service over a period of time in which such service is operational or degraded, by the total number of possible status reports during the same time period. Programmed maintenance periods are not taken into account for availability calculations.

Reference values:



Graph No. 18 Availability of satellite ADS-B (taken from AIREON)

Parameter	Source (Standard)	Required Value	Aireon Design Target
Service Volume Availability	ICAO Global Operational Data Link Document (GOLD); April 26, 2013	≥ 0.999	≥ 0.999

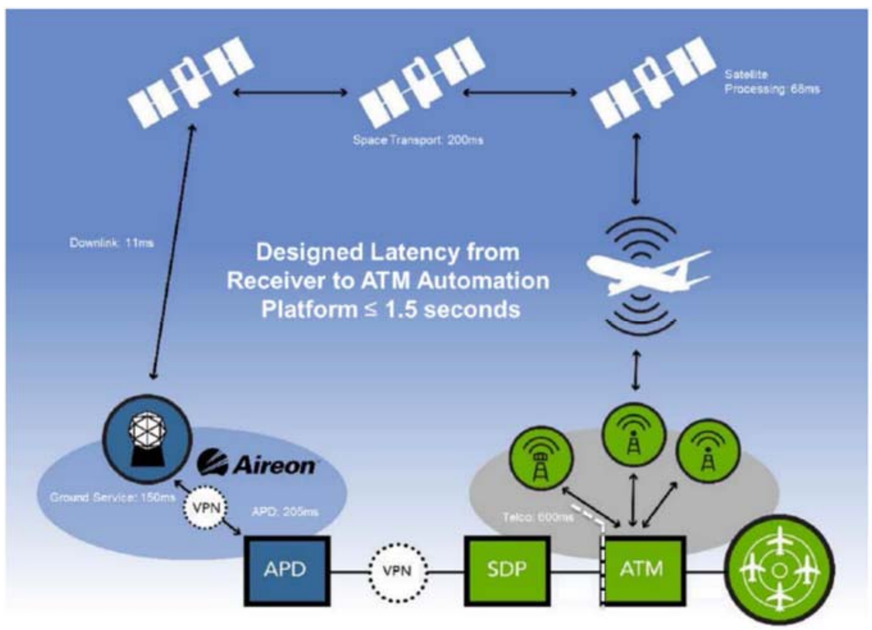
Graph No. 19 Compliance with availability (taken from AIREON)

II. Latency

"Latency" is the amount of time required to deliver data of interest to the user, from the input interface of the AIREON receiver to the service delivery point (SDP), and corresponds to the duration of internal processing and communication channels, under the responsibility of the company.

Reference values

The AIREON latency system is designed for a processing time of 1.5 seconds, which is better than the 2.0 sec requirement specified in EUROCONTROL documentation. When an SDP is implemented at a customer facility, AIREON contemplates the distribution of data to the user, resulting in a total latency of: ATC SUR Processing (1.5s) + SUR Distribute (0.5s) = 2.0s.



Graph No. 20 Latency in the AIREON system (taken from AIREON)

It is foreseen that the latency of the AIREON service will be less than 1.5 seconds for the provision of en route and oceanic ATC separation services.

Parameter	Source (Standard)	Required Value	Aireon Design Target
Latency	Eurocontrol GEN SUR, Section 3.7.3.1.5	≤ 2.0s (99th percentile)	≤ 1.5s (99th percentile) Measurement to ATM Automation

Graph No. 21 - Compliance with EUROCONTROL latency (taken from AIREON)

III. Probability of update

The "probability of update" is the probability of receiving at least one target ADS-B report at the point of service delivery within the required period of time. The required period of time for this update interval is usually relative to an aircraft separation standard applicable to the airspace volume where the service is being provided. Reference values:

Parameter	Source (Standard)	Required Value	Aireon Design Target
Probability of Update	EUROCAE Technical Specification for an 1090 MHz Extended Squitter ADS-B Ground System, ED-129B	≥ 96% for an Update Interval of 8 seconds (for low density en route airspace)	≥ 96% for an Update Interval of 8 seconds (for low density en route airspace)

Graph No. 22 Compliance with EUROCAE update (taken from AIREON)

IV. Coverage

AIREON establishes that, based on the availability of a low-altitude satellite constellation that illuminates the entire planet, the geographical coverage of the service is 100%, since ADS-B transponders (signals issued from the aircraft) all over the airspace have line-of-sight between them, that is, satellite-transponder.

Notwithstanding the above, AIREON documents guarantee coverage at 10,000 ft. of altitude or above.

To this end, the company also defines minimum technical characteristics to be met by ADS-B Out transponders.

2.3.3 Minimum conditions for on board ADS-B

In order to determine the minimum technical conditions to be met by ADS-B transponders, AIREON takes into account latency and probability of update metrics, which are dependant upon avionics and flight level:

- Avionics must be RTCA DO-260B / EUROCAE ED-102A compliant (Note: message format versions prior to DO-260 are compatible)
- Antennae mounted on top and omnidirectional in azimuth
- ADS-B transponder equipment class (transmission power) A1, B1 or higher - Minimum 125W on the antenna

These three operating metrics are key for the provision of ATC separation services using satellite ADS-B.

2.3.4 Telecommunication network for the SAM Region

Taking into account that part of the process of delivering ADS-B messages to the users through AIREON requires an appropriate telecommunication network, and that the SAM Region has a data network called REDDIG, which has significant coverage to reach the surveillance data acquisition centres, AIREON considers that the platform can be used for the satellite ADS-B process. To this end, it establishes some minimum quality parameters, namely:

- ✓ System availability > 0.999
- ✓ Acceptance of multicast data
- ✓ Automatic delivery of data with low latency

- ✓ Segregation of surveillance data for each connected ANSP

Based on the assessment of REDDIG II as analysed by AIREON, REDDIG meets these performance parameters.

2.3.5 ADS-B data bandwidth estimated by AIREON for the Region

It has also estimated the total bandwidth required in case all the States were to subscribe to space-based ADS-B data services, for use in ground, oceanic, lower and upper airspace. Table 3 shows the total potential bandwidth of the system to be used by the States, estimated based on air traffic levels in 2030, totalling 2,061 Kbps for a 24-hour period.

Country	FIR	CAT021		CAT025		CAT238		CAT253		Total	
		Mean (kbps)	Max (kbps)	Mean (kbps)	Max (kbps)	Mean (kbps)	Max (kbps)	Mean (kbps)	Max (kbps)	Mean (kbps)	Max (kbps)
Argentina	SACF	8	21	0	1	0	19	6	32	14	73
Argentina	SARR	3	11	0	1	0	17	6	32	9	61
Argentina	SAMF	9	14	0	1	0	17	6	32	15	64
Argentina	SAEF	15	29	0	1	0	39	6	32	21	101
Argentina	SAVF	6	14	0	1	0	85	6	32	12	132
Bolivia	SLLF	6	16	0	1	0	21	6	32	12	70
Brazil	SBAZ	24	48	0	1	0	43	6	32	30	124
Brazil	SBRE	23	43	0	1	0	30	6	32	29	106
Brazil	SBBS	53	93	0	1	0	27	6	32	59	153
Brazil	SBCW	29	50	0	1	0	23	6	32	35	106
Chile	SCFZ	8	18	0	1	0	30	6	32	14	81
Chile	SCEZ	10	23	0	1	0	26	6	32	16	82
Chile	SCTZ	9	10	0	1	0	23	6	32	15	66
Chile	SCCZ	9	9	0	1	0	39	6	32	15	81
Colombia	SKEC	10	28	0	1	0	17	6	32	16	78
Colombia	SKED	26	51	0	1	0	23	6	32	32	107
Ecuador	SEGU	6	18	0	1	0	20	6	32	12	71
Guyana	SYGC	9	13	0	1	0	16	6	32	15	62
Paraguay	SGFA	9	9	0	1	0	17	6	32	15	59
Peru	SPIM	19	34	0	1	0	36	6	32	25	103
Suriname	SMPM	9	11	0	1	0	16	6	32	15	60
Uruguay	SUEO	5	14	0	1	0	30	6	32	11	77
Venezuela	SVZM	10	24	0	1	0	22	6	32	16	79

Country	FIR	CAT021		CAT025		CAT238		CAT253		Total	
		Mean (kbps)	Max (kbps)	Mean (kbps)	Max (kbps)	Mean (kbps)	Max (kbps)	Mean (kbps)	Max (kbps)	Mean (kbps)	Max (kbps)
French Guyana	SOOO	9	9	0	1	0	23	6	32	15	65

Table No. 3 REDDIG bandwidth for the satellite ADS-B service

2.4 Cost of implementing ADS-B data distribution

AIREON charges ANSPs for the delivery of ADS-B surveillance data, based on the following components:

• Hours of flight over airspace of the FIR that corresponds to the ANSP
• Density of traffic overflying the airspace of the FIR/ANSP
• Airspace area: oceanic or land

The charge per flight is calculated by AIREON based on the time (hours of flight) that an aircraft equipped with ADS-B takes to cross the service volume hired by the ANSP. Such service volume can be the entire airspace of the ANSP, one or more FIRs within its controlled airspace, or an airspace defined by coordinates. The charge starts when the aircraft enters the hired service volume and ends when the aircraft leaves the hired service volume.

Then, AIREON provides surveillance data services for the hired service volume + 50 NM outside of this airspace, for planning purposes. This cost varies between ANSPs, since each airspace area has its own traffic volume and the ANSPs may wish to subscribe to part of the airspace or to all the controlled airspace.

The rates applied per hour of flight to each flight equipped with ADS-B are consistent worldwide, and have been defined based on traffic density around the service volume.

For confidentiality reasons, AIREON cannot share the rates per hour. However, as a practical exercise, this study contains the following table prepared by AIREON, comparing the cost of AIREON data services for 1,000km and 500km flights, with the cost of air navigation services of ANSPs of the SAM Region.

An example of the cost per km of flight calculated by AIREON for countries used as a reference is shown below:

State/ANSP	Charge per 500 Km	Charge per 1,000 km
Ecuador	$227.66	$455.32
Colombia	$143.48	$286.96
Peru	$165.00	$330.00
French Guiana	$226.48	$452.97

Graph No. 23 – Examples of cost per km flown (taken from AIREON)

3. Feasibility of using the service

Based on the minimum parameters required for surveillance systems and on the data received from AIREON, it is possible to define the feasibility of using the satellite ADS-B.

3.1 Provider

3.1.1 Service provider and the SAM Region

The surveillance service has a significant impact on the provision of air navigation services, particularly on the safety and efficiency of aircraft operations. Accordingly, it is very important to make sure that the support of surveillance data systems/providers to air traffic status display offers a level of service that is appropriate for the control and guidance requirements at each site and region; in this case, the South American Region and each country of the region.

In addition to already-known surveillance systems developed in the last 10 years, a new service modality has emerged for the generation of surveillance data, based on ADS-B messages issued by aircraft with such capability. This modality involves the provision of surveillance data, by collecting ADS-B messages via satellite and delivering them to interested users using data channels. The company that has had this initiative is called AIREON.

Based on a technical analysis, this modality is considered to be feasible in accordance with the tests conducted so far, and 11 ANSPs are already using it. Likewise, the satellite network for collecting ADS-B messages will be completed in October 2018, and the EASA certification process is about to be completed.

Accordingly, the service does exist and the company is at the disposal of interested users. Therefore, a comparative analysis will be conducted of what an ANPS requires and what AIREON offers.

3.1.2 Service capacity, latency and availability

The key performance parameters to be used are as follows:

- ***Service capacity or coverage in the airspace***

A system that can detect all the aircraft in the entire subcontinent and beyond, in addition to providing a continuous and quality service, would be in fact convenient for civil aviation and for each of the countries, particularly for areas lacking adequate coverage.

- ***Information delivery response time or latency***

The required information must reach the data acquisition centre, in this case, an air traffic control centre, on a timely basis. The aircraft positioning information must reach this centre practically in real time.

- ***Availability of information***

All services/systems must be available all the time required by civil aviation (24x7), for safety reasons. However, no equipment or system is infallible and outages occur occasionally due to programmed maintenance or upgrades to the system in use.

Comparative table:

No.	Description	Metric	Expected value	AIREON compliance
1	Coverage 10,000	%	>75	100
2	Coverage 15,000	%	>85	100
3	Coverage 25,000	%	>95	100
4	Latency	Seconds	<2 seconds	2
5	Availability	%	> 99.98	99.99

Table No. 4 Value of key parameters

They are expected to provide support for:

- safety
- environment
- profitability
- flight efficiency
- flexibility
- predictability
- accessibility and equity
- participation and collaboration
- interoperability

3.1.3 ANSP provider – user data process

AIREON's experience is recent but real, according to the information received. Accordingly, each country must define its coverage requirements. The other technical issues are inherent to AIREON's service and are acceptable.

It should also be noted that the greater the airspace to be covered by satellite ADS-B, the greater the homogeneity of the information, although this should be demonstrated by stringent experimental tests, since support infrastructure also increases and everything should be properly tested, particularly telecommunication networks.

If a country is starting to use this service, it is important to share its experience with the rest of the Region. However, it should not be forgotten that the first part of the project involves all aircraft in the airspace having ADS-B Out capabilities.

3.2 Operators

3.2.1 Availability of avionics with ADS-B capabilities

No precise data is available on this issue. In the SAM Region, about 40% of aircraft are equipped with a transponder with ADS-B Out capability.

If most aircraft operators (aircraft in general) in a country do not have ADS-B capability in their transponders, it will not be possible to take advantage of the satellite ADS-B service in the short term, and extensive efforts would be initially required to enjoy the ADS-B service and, eventually, satellite ADS-B. This means that they would still have to rely on secondary radar or multilateration, even though they are not as efficient as ADS. Two years would be a good time frame for having the use of ADS-B regulated and required.

3.2.2 Aviation administration regulations

Intensive efforts must be made to improve national regulations and plans to require the use of ADS-B on all aircraft, particularly in general aviation.

4. Associated risks

It is also important to consider the risks that might result from unforeseen events occurring under normal operating conditions of the service, the effects of which must be annulled or mitigated. In this regard, the following is established:

4.1 Service interruption

Description. Total lack of service.
Mitigation. One or more ADS-B stations of the ANSP or two stations of the provider to convey sensor data directly to consumer centres.

4.2 Partial coverage

Description. Partial coverage.
Mitigation. One or more ADS-B stations of the ANSP or two stations of the provider to convey sensor data directly to consumption centres.

4.3 Data integrity

Description. The data delivered are rejected due to lack of integrity.
Mitigation. One or more ADS-B stations of the ANSP or two stations of the provider to provide sensor data directly to consumption centres.

4.4 Extended outages

Description. More extended disruption periods.
Mitigation. One or more ADS-B stations of the ANSP or two stations of the provider to convey sensor data directly to consumption centres.

4.5 Non availability of ADS-B ES 2020 transponders on aircraft

Description. Aircraft lack the appropriate minimum equipment
Mitigation 1. Safety regulations
Mitigation 2. Implementation of surveillance by sectors

4.6 Last-mile failure of data channels for information delivery

Description. Last-mile failure of data channels.
Mitigation. Data channels will have redundant infrastructure in all cases.

4.7 Cost of non leasable service for the ANSP

Description. High cost for the ANSP
Alternative. Contract for partial coverage in high-traffic areas.

5. Convenience of using the service

5.1 Reference costs

A cost breakdown is not available, since AIREON does not provide that information. But for the purpose of this study, it has provided an overall cost for the following countries: Chile, Colombia, Ecuador, Panama, Peru, along the Pacific coast, and French Guiana, as follows:

Country	Total annual cost for 15 years (highest cost) US$	Total annual cost for 15 years (lowest cost) US$	Difference US$
CHILE	2,022,467	1,915,776	106,690
COLOMBIA	1,922,467	1,815,776	106,690
ECUADOR	722,467	615,776	106,690
PERU	2,122,467	2,015,776	106,690

Table No. 4 Cost of the satellite ADS-B service, without and with REDDIG

Note 1. The costs shown in the previous table include the entire airspace of the country (continental + oceanic) and its FIR(s) and the cost of telecommunication networks.

Note 2. The difference in cost is related to the use of an independent telecommunication network (higher recurrent cost) or REDDIG.

5.2 Cost/coverage of satellite ADS-B *vs.* SSR costs

Costs provided by AIREON for each km2 of the FIR and coverage.

Country	Sat. ADS-B	Cost of service (US$)	% coverage of FIR (10-15-25 thousand ft.)	Annual cost/ km2 FIR
Chile	1	2,022,467	100-100-100	0.20
Colombia	1	1,922,467	100-100-100	1.17
Ecuador	1	722,467	100-100-100	0.77
Peru	1	2,122,467	100-100-100	0.60

Table No. 5 Cost of the surveillance service with satellite ADS-B

Cost exercise using SSR - Ecuador

In this country, 7 radars are available at US$ 1’500,000 each (reference value), with a total investment of US$ 10’500,000, and if we consider 20% for maintenance throughout their service life, they total 12’600,000.

The service life of a radar, with quality equipment, is 15 years, resulting in an annual cost of US$ 840,000. Taking into account coverage data, which varies for the three altitudes, this amount of financial resources is enough for partial, not total, coverage, particularly in the oceanic area.

Obviously, this coverage is explained by line-of-sight limitations and the fact that facilities are only located on land.

Furthermore, if the satellite ADS-B service has 100% coverage and the annual cost is US$ 722,467, it offers an advantage in terms of coverage, and a lower recurrent cost for the service, without assuming the cost of maintenance, operating logistics, technological upgrades and remote locations. A more detailed analysis of this issue is shown further below.

The disadvantage could be the dependence on a single provider and, from what we know, there is no other. However, mitigation measures can be taken or very detailed contingency plans can be defined in case of service interruption.

Another disadvantage that should also be taken into account is the initial cost for aircraft operators that do not have transponders with ADS-B Out capability. This will take some time to resolve, whether through ground-based ADS-B or satellite ADS-B.

Some tables using the reference cases are shown below:

Country	# of SSRs	Cost of equipment (US$)	Total cost (+ 20%)	Annual cost (15 years)	% FIR coverage (10-15-25 thousand ft.)	Annual cost/ km2 FIR
Chile	11	16,500,000	19,800,000	1,320,000	9-12-18	19.40
Colombia	15	22,500,000	27,000,000	1,800,000	37-49-78	4.26
Ecuador	7	10,500,000	12,600,000	840,000	27-46-74	10.97
Peru	8	12,000,000	14,400,000	960,000	13-20-43	5.75

Table 6A. Cost of the surveillance service with SSR sensors – 10,000 ft

Country	No. SSR	Cost of equipment (US$)	Total cost (+ 20%)	Annual cost (15 years)	% FIR coverage (10-15-25 mil ft)	Annual cost / km2 FIR
Chile	11	16,500,000	19,800,000	1.320,000	9-12-18	14.55
Colombia	15	22,500,000	27,000,000	1.800,000	37-49-78	3.22
Ecuador	7	10,500,000	12,600,000	840,000	27-46-74	6.44
Peru	8	12,000,000	14,400,000	960,000	13-20-43	3.73

Table 6B. Cost of surveillance service with SSR sensors – 15,000 ft

Country	# of SSRs	Cost of equipment (US$)	Total cost (+ 20%)	Annual cost (15 years)	% FIR coverage (10-15-25 thousand ft.)	Annual cost / km2 FIR
Chile	11	16,500,000	19,800,000	1,320,000	9-12-18	9.70
Colombia	15	22,500,000	27,000,000	1,800,000	37-49-78	2.02
Ecuador	7	10,500,000	12,600,000	840,000	27-46-74	4.00
Peru	8	12,000,000	14,400,000	960,000	13-20-43	1.74

Table 6C. Cost of the surveillance service with SSR sensors – 25,000 ft

The values in the initial table (Table No. 5 - AIREON) and the values in Tables No. 6, which contemplate SSR sensors, show that the annual cost per km2 of the FIR with ground-based systems is higher than the space-based systems in all the altitudes under consideration and in all the countries. Accordingly, we may conclude that the satellite ADS-B service is convenient from the financial point of view, compared to the use of SSR.

But it should also be noted that, the higher the altitude of coverage, the lower the annual cost per km2 of the SSR, since the coverage percentage increases. The aforementioned coverage cannot be expected to reach values above 85-90% at higher altitudes, since ground-based systems rely heavily on line-of-sight, geographical obstacles and power limitations of support equipment, in addition to the curvature of the earth. Accordingly, the main impact on coverage is at low altitude, as shown in the tables.

5.3 Cost/coverage *vs.* cost of ground-based ADS-B

The costs provided by AIREON for each FIR km2 and coverage. The following table is the same as Table 5.

Country	Satellite ADS-B	Cost of service (US$)	% FIR coverage (10-15-25 thousand ft.)	Annual cost/ km2 FIR
Chile	1	2,022,467	100-100-100	0.20
Colombia	1	1,922,467	100-100-100	1.17
Ecuador	1	722,467	100-100-100	0.77
Peru	1	2,122,467	100-100-100	0.60

Table No. 7 Cost of the surveillance service with satellite ADS-B

Cost exercise using ground-based ADS-B stations - Ecuador

Assuming that Ecuador had 7 ADS-B stations at US$ 300,000 each, this gives a total investment of US$ 2’100,000, and if we consider 20% for maintenance throughout their service life, it totals US$ 2’520,000. The service life of an ADS-B system, with quality equipment, could be 10 years. If we distribute this cost per year, the result is: US$ 252,000.

Taking coverage data, which would be similar to that for radar, for three altitudes, this amount of financial resources would be enough for partial, not total, coverage, particularly in oceanic areas. Obviously, this coverage is explained by line-of-sight limitations and the fact that facilities are located on land, as in the case of SSR.

Furthermore, if the satellite ADS-B service has 100% coverage and the annual cost is US$ 500,000, the annual financial cost is higher, although it offers a significant advantage in terms of coverage, without assuming the cost of maintenance, operating logistics, technological upgrades and remote locations. A more detailed analysis of this issue is shown further below.

The disadvantage is the dependence on a single provider and, from what we know, there is no other. However, mitigation measures can be taken or very detailed contingency plans can be defined in case of service interruption.

Some tables using the reference cases are shown below:

Country	# of ADS	Cost of equipment (US$)	Total cost (+ 20%)	Annual cost (10 years)	% FIR coverage (10-15-25 thousand ft.)	Annual cost / km2 FIR
Chile	11	3,300,000	3,960,000	396,000	9-12-18	5.82
Colombia	15	4,500,000	5,400,000	540,000	37-49-78	1.28
Ecuador	7	2,100,000	2,520,000	252,000	27-46-74	3.29
Peru	8	2,400,000	2,880,000	288,000	13-20-43	1.72

Table 8A. Cost of the surveillance service with ground-based ADS-B sensors / 10,000 ft

Country	# of ADS	Cost of equipment (US$)	Total cost (+ 20%)	Annual cost (10 years)	% FIR coverage (10-15-25 thousand ft.)	Annual cost / km2 FIR
Chile	11	3,300,000	3,960,000	396,000	9-12-18	4.36
Colombia	15	4,500,000	5,400,000	540,000	37-49-78	0.97
Ecuador	7	2,100,000	2,520,000	252,000	27-46-74	1.93
Peru	8	2,400,000	2,880,000	288,000	13-20-43	1.12

Table 8B. Cost of the surveillance service with ground-based ADS-B sensors / 15,000 ft

Country	# of ADS	Cost of equipment (US$)	Total cost (+ 20%)	Annual cost (10 years)	% FIR coverage (10-15-25 thousand ft.)	Annual cost / km2 FIR
Chile	11	3,300,000	3,960,000	396,000	9-12-18	2.91
Colombia	15	4,500,000	5,400,000	540,000	37-49-78	0.61
Ecuador	7	2,100,000	2,520,000	252,000	27-46-74	1.20
Peru	8	2,400,000	2,880,000	288,000	13-20-43	0.52

Table 8C. Cost of the surveillance service with ground-based ADS-B sensors / 25,000 ft

The values in the initial table (Table No. 7 - AIREON) and the values in Tables No. 8, for ground-based SSR sensors, show that the annual cost per km2 of FIR with ground-based systems varies in all the altitudes under consideration and in all the countries, in relation to the satellite ADS-B service. Accordingly, it is necessary to analyse all cases, altitudes and countries to decide whether the satellite ADS-B service is convenient from the financial point of view with respect to the use of ground-based ADS-B.

But it should also be noted that, in the case of the analysis of SSR systems, the higher the altitude of coverage, the lower the annual cost per km2 of ground-based ADS-B, since the coverage percentage trend increases. However, the aforementioned coverage cannot be expected to reach values above 85-90% at higher altitudes, since ground-based systems rely heavily on line-of-sight, geographical obstacles and power limitations of support equipment, in addition to the curvature of the earth. Accordingly, the main impact on coverage is at low altitudes, as shown in the tables.

General comments:

- Ground-based ADS-B and SSR systems basically provide the same airspace coverage.

- The satellite ADS-B service has greater coverage than ground-based SSR and ADS-B. Satellite ADS-B has practically 100% coverage worldwide.

- The overall cost and cost per km2 is higher with ground-based systems if SSR is used compared to satellite ADS-B systems.

- Overall cost of ground-based ADS-B systems in relation to satellite ADS-B is lower than for ground-based systems. However, the cost per km2 varies with altitude and country, and thus requires an analysis of each particular case.

- In general, the recommendation is to consider the use of ADS-B, both ground-based and space-based, based on a study of altitudes and cost.

6. General considerations on service contracting

6.1 Identification of areas with and without surveillance sensors for transponder certification

The countries and the region in general should note and analyse the significant change in coverage (100%) offered by AIREON, compared to the existing service based on systems installed on the ground, which in the best of cases reaches 80% coverage.

This condition is very advantageous but also involves a requirement, which is that 100% of aircraft must be equipped with a transponder with ADS-B Out capability.

The service must also be technically certified to make sure it meets the coverage offered, and especially that it meets the latency and availability parameters.

6.2 Data and coordination channels

Another key condition is to consider the telecommunication networks that will take the surveillance data to the consumption centres. These networks must be redundant and demonstrate not only service integrity but also service continuity, provided either by AIREON or other independent networks.

6.3 Service level agreement

The Service Level Agreement must be the basic document for hiring AIREON technical services.

The document must be based on the following service assumptions (taken from ***ICAO Doc 9883 "Manual on global performance of the air navigation system")*:**

— Safety:

- Total airspace coverage to minimise the risk of incidents or accidents
- Easier air traffic control

— Capacity:

- In theory, total coverage of airspace and thus enhanced air traffic control

— Flight efficiency:

- Shorter duration of aircraft operations

— Services and procedures:

- Pre-planning of aircraft operations made easier, given the shorter duration of aircraft operations

— Predictability:

- Greater coverage and reliability of the tool for air traffic control, and allows for greater use of airspace

— Flexibility:

- Greater coverage and reliability of the tool for air traffic control, and allows for more flexibility

— Environment:

- Fewer stations, equipment and civil infrastructure
- Shorter duration of aircraft operations

— Profitability:

- Shorter duration of operations make the commercial operation more profitable or reduce the cost of air navigation services.

- Outsourcing of the ADS-B signal would minimise (prior study) costs and certain risks involved in equipment management

— Human resources

- Less man-hours for technical activities

— Regulation and standardisation

- Existing regulations

For the drafting of the service level agreement (SLA) document, in addition to the assumptions listed above, information was requested on the subject from AIREON. The information received does not provide the details but rather general information about the agreement, such as:

— Operational service

  - Service characteristics and performance parameters
  - Reports of failures/outages, response time, and parties responsible for correcting the failure
  - Protocols for communication between users and management
  - Coordination of scheduled routine reviews

— Quality of service

  - Definition of service parameters and monthly statistics
  - Remediation of parameters in case of degradation
  - Procedure for changing the level of service

- Duties and responsibilities of the provider and the customer

  - List of individuals, with their respective contact information, on the user and the provider side, who are responsible for scheduled and random activities, required for meeting performance requirements.

Accordingly, the ANS will depend on the scope of the service requested by the customer and the scope of the service that can be provided by AIREON.

Likewise, the service provider must pass coverage, latency and availability tests, and provide statistics to support the decision as to whether ATC conditions have improved at each site where the service is provided.

7. Recommendations for the Region

7.1 Technical aspects

- The use of the AIREON service is feasible and would improve the current surveillance conditions in terms of the coverage that would be achieved, provided proof is given of compliance with the minimum parameters of the proposed service concerning retrieval of the ADS-B message at all times and locations, and its transport through reliable telecommunication networks.

- The service will be effective provided all aircraft have the ADS-B capability in their transponders; otherwise, its full implementation is not practical until such time that the aforementioned condition is met. An alternative could be to apply the service in segregated airspace, where there is the certainty that all aircraft have transponders with ADS-B Out capability.

- The use of avionics with ADS-B capability should be regulated and planned for immediately if ground- or space-based ADS-B services are to be available in the short term, given the limited number of aircraft with such avionics in the SAM Region.

- It should be noted that areas with low-altitude continental routes (below 15,000 ft.) would not have good coverage with ground-based sensors due to the terrain, since they will always rely on line-of-sight for detecting aircraft. Practical coverage requirements must be analysed for each sector and for each State.

  In some cases, this recommendation must be also considered for altitudes above 15,000 ft.

- Regarding oceanic airspaces, it is clearly important to have data on aircraft operating over such locations (also provided by AIREON). Current and future traffic must be analysed, although ANSPs should have this service available for safety reasons.

- It should also be noted that the company could provide its services in specific airspaces defined by the ANSP, and not necessarily in the entire FIR. This flexibility should also be analysed by those responsible for air traffic control, together with those in charge of surveillance systems, in order to maximise surveillance efficacy.

7.2 Efficiency

Since more precise data is not available at present, a cost analysis was conducted only on a trial basis, and the results were as follows:

- Based on trials performed, it is advisable and reasonable to use the satellite ADS service, rather than SSR. But this is not the case if compared with ADS-B sensors, except for the coverage parameter and low altitudes (10 and 15 thousand ft.)

- Although the cost could be high in some cases, it should always be borne in mind that coverage is a significant and convenient parameter for safety purposes.

7.3 General

- ANSPs must seriously contemplate the satellite ADS-B service. Surveillance coverage is a very interesting parameter and this ADS-B message retrieval modality meets it.

- All aircraft must have transponders with ADS-B capability to support surveillance in the airspace.

- Costs must be analysed by each State in order to establish the efficiency to be achieved with ground-based ADS-B or radar surveillance systems and with satellite ADS-B systems.

<<<<<<<<<<<< END OF THE GUIDE >>>>>>>>>

Annex 1

Number of SSR systems in the SAM Region

No.	Country	Number of SSR systems
1	ARGENTINA	25
2	BOLIVIA	1
3	BRAZIL	69
4	CHILE	10
5	COLOMBIA	15
6	ECUADOR	7
7	FRENCH GUIANA	0
8	GUYANA	0
9	PANAMA	3
10	PARAGUAY	8
11	PERU	8
12	SURINAME	0
13	URUGUAY	2
14	VENEZUELA	10
	TOTAL	***158***

Annex 2

Characteristics according to ISO 13236 (RD 23). EUROCONTROL. Specification for ATM Surveillance System Performance (Volume 1)

The ISO 13236 ([RD 23]) framework defines 8 generic qualities of service characteristics, which are subsequently refined to properly reflect the main characteristics of ATM surveillance systems, 4 of which are taken as a reference (not in the same order as the ISO):

- **Capacity:** Characteristics related to capacity represent the ability to provide a certain number of service units to users.

  - ✓ **Capacity** is not retained, because it depends upon the environment of the surveillance system and cannot be defined in generic terms.

- **Integrity:** Characteristics related to the integrity take into account the impact of errors and inaccuracies on service quality. Strictly speaking, "integrity" is traditionally associated to error rate issues, while "precision" transmits a notion of accuracy. An important specialisation of integrity in this broader sense of "precision" is the notion of "relevance", understood as the subjective degree of adaptation of the service to its expected use.

  - ✓ **Integrity** is further divided into three different performance characteristics: core, correlated, spurious, and large errors of data elements.

- **Time:** The characteristics related to time are divided into two main groups: absolute time and time intervals between events, which can be further divided in terms of transfer delays, etc.

  - ✓ ***Time*** is translated into delay in processing data elements that are sent from the aircraft to the user of the ground-based surveillance system.

- **Reliability:** The characteristics related to reliability are used for assessing the frequency and duration of service failures. Significant generic specialisations are "availability" and "maintainability". In a strict sense, "reliability" means the rate/probability of failure.

  - ✓ **Reliability** is further divided into availability and continuity of data elements and of the entire surveillance system.

Agenda Item 6: Other business

6.1 Under this agenda item, the following papers were analysed:

a) WP/21 – *Cancellation of the letter of operational agreement between Argentina, Torre de Paso de los Libres and Brazil, Radio Uruguaiana* (presented by Brazil);
b) IP/03 – *AIM activities in support of air navigation* (presented by the Secretariat);
c) NI/04 – *MET activities in support of air navigation* (presented by the Secretariat); and
d) NI/09 - *Pasos para la resolución de duplicidad de códigos 5LNC en Venezuela* (presented by Venezuela).

6.2 Argentina and Brazil started conversations during the Meeting to define actions concerning the letter of operational agreement between Torre Paso de los Libres and Radio Uruguaiana, and concerning the currently designated TMA. The delegates exchanged documentation, which would continue to be analysed on a bilateral basis. The Secretariat offered assistance on this matter as deemed appropriate by the States.

6.3 The Meeting took note of AIM activities in support of air navigation, within the scope of GREPECAS projects. Details of these tasks are contained in IP/03.

6.4 The Meeting was informed about MET activities in support of air navigation, within the scope of GREPECAS projects. Details of these tasks are contained in IP /04.

6.5 Venezuela informed about activities scheduled to resolve duplication of 5LNC codes in ICARD. IP/09 shows details of the organisation of these activities.

6.6 Bolivia and Brazil signed a letter of ATS operational agreement between the La Paz ACC and the Amazónico ACC for the Puerto Suárez and Corumbá airports, effective on 11 October 2018. Copy of this letter was provided to the Secretariat.

6.7 Brazil and Uruguay signed a letter of ATS operational agreement between the Curitiba ACC and the Montevideo ACC, effective on 31 July 2018. Copy of this letter was provided to the Secretariat.