SAM/IG/20

INTERNATIONAL CIVIL AVIATION ORGANIZATION
South American Office

Regional Project RLA/06/901

TWENTIETH WORKSHOP/MEETING OF THE SAM IMPLEMENTATION GROUP

(SAM/IG/20)

FINAL REPORT

Lima, Peru, 16 to 20 October 2017

INDEX

HISTORY OF THE MEETING

ii-1 PLACE AND DURATION OF THE MEETING

The Twentieth Workshop/Meeting of the SAM Implementation Group (SAM/IG/20) was held at the premises of the ICAO South American Regional Office in Lima, Peru, from 16 to 20 October 2017, under the auspices of Regional Project RLA/06/901.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Oscar Quesada, Acting 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. Onofrio Smarrelli acted as Secretary assisted by Messrs. Fernando Hermoza, RO/ATM/SAR and Roberto Sosa RO/ANS/SFTY.

In addition the Secretariat counted with the support of Mr. Julio Pereira and Mrs. Martha Soto, Rapporteurs of PBN and AFTM Groups respectively; Gustavo Adolfo Chiri, Rapporteur of the CNS group; and Jorge Merino of automation.

ii-4 WORKING LANGUAGES

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

ii-5 AGENDA

The following agenda was adopted:

Agenda Item 1: Follow-up to conclusions and decisions adopted by SAM/IG meetings and updating to SAM Regional performance-based air navigation implementation plan

Agenda Item 2: Optimization of the SAM airspace
a) PBN regional implementation progress
b) Actions to standardise minimum longitudinal separations between en-route aircraft
c) Results and recommendations of PANS-OPS workshops
d) Coordination for the SAM route network Version 04

Agenda Item 3: Implementation of Air Traffic Flow Management (ATFM)
a) Procedures for coordination between FMP/FMP
b) Updating of ATFM CONOPS

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 60 participants from 10 States of the SAM Region (Argentina, Bolivia, Brazil, Chile, Panama, Paraguay, Peru, Suriname, Uruguay and Venezuela), and as Observers 1 State from CAR Region (United States), 1 International Organization (IATA) and 5 Observers from the aeronautical industry (AIREON, FREQUENTIS, IACIT, SITA ON AIR and THALES). The list of participants is shown in page iii-1.

LISTA DE PARTICIPANTES / LIST OF PARTICIPANTS

ARGENTINA
1. Néstor Damián Battistessa
2. María Estela Leban
3. Esteban Manuel Mendoza
4. Mario Cristian Correa
5. Jorge Roberto Cornelio
6. Nicolas Borovich
7. Silvia Beatriz García
8. Guillermo Cocchi
9. Gustavo Adolfo Chiri
10. Marta Alicia Médici

BOLIVIA
11. Jaime Yuri Alvarez Miranda
12. Walter Jorge Olivera Ballesteros
13. César Varela Carvajal

BRASIL / BRAZIL
14. José Nuno
15. Paulo Eduardo Albuquerque Magella
16. Ari Rodrígues Bertolino
17. Eduardo Alberto Do Nascimento Fontes
18. Jose Izidro Apolinário
19. Murilo Albuquerque Loureiro
20. José Airton Patrício
21. Luiz Antonio Dos Santos

CHILE
22. Alfonso De La Vega Sepúlveda

ESTADOS UNIDOS / UNITED STATES
23. Raúl Chong

PANAMÁ
24. Iván De León Almengor
25. Mario Facey
26. Gilda Espinosa

PARAGUAY
27. Roque Díaz Estigarribia
28. Liz Rocío Portillo Castellanos
29. Sindulfo Ibarrola
30. Víctor José Alexis Morán

PERÚ
31. Francisco Burgos
32. Laura Rojas Rojas
33. Martha del Rocío Soto Ansaldi
34. Rodrigo Jhonatan Aguirre Herrera
35. Eloy Tafur
36. Tatiana Mendoza Tinco
37. Libio Benites Condori
38. Dante Samaniego Bilbao
39. César Rebaza Benítes
40. Raúl Anastacio Granda
41. Jorge García Villalobos
42. José Manuel Rubira Chauca
43. Sara Siles La Rosa
44. Jorge Merino Rodríguez

SURINAM/SURINAME
45. Lansdorf Renaldo
46. Quincy Cyrus

URUGUAY
47. Tabaré Sardeña
48. Rosanna Barú
49. Gustavo Turcatti

VENEZUELA
50. Rafael Enrique Briceño Méndez
51. Omar Enrique Linares

AIREON
52. Ana Blanco-Persiani
53. Francisco Almeida da Silva

FREQUENTIS
54. Gerd Groebminger
55. Matthias Gerlich

IACIT
56. Luiz Antonio Freitas de Castro

IATA
57. Julio de Souza Pereira
58. David Guerrero (AVIANCA)

SITAONAIR

59. Adriana Mattos

THALES

60. Daniel Vert

OACI / ICAO

61. Onofrio Smarrelli
62. Fernando Hermoza
63. Roberto Sosa

Agenda Item 1: Follow-up to conclusions and decisions adopted by SAMI/IG meetings, the new Electronic Air Navigation Plan (eANP) and the SAM Plan

1.1 Under this agenda item, the Meeting reviewed the following papers:

a) WP/02 – *Follow-up to valid conclusions formulated by SAMI/IG meetings and pending activities* (presented by the Secretariat);
b) WP/03 – *Updating of the SAM performance-based air navigation implementation plan* (presented by the Secretariat);
c) WP/04 – *Progress and future actions related to the Regional Plan for the sustainability of air transport in the SAM Region* (presented by the Secretariat); and
D) WP/12 - *Volume III of the CAR/SAM Air Navigation Plan and performance-based decision-making method* (presented by the IATA).

Conclusions and Decisions adopted by SAM/IG meetings

1.2 The Meeting reviewed the valid conclusions and decisions, as well as pending activities of the workshops/meetings of the SAM Implementation Group (SAM/IG), which are presented as **Appendix A** to this agenda item. The list of conclusions and activities comprise:

a) the tasks to be carried out and/or the corresponding conclusion in the areas under analysis;
b) the specific tasks which will lead to compliance of the main task;
c) expected results from each task;
d) finalisation dates;
e) parties responsible for their execution;
f) supporting members for the task; and
g) status of implementation of the same, and when needed for a better understanding, an explanatory comment on the status of implementation.

1.3 The Meeting also completed the table shown in **Appendix B** to this agenda item, which lists the tasks to be carried out by the States for implementation monitoring purposes.

Updating of the SAM performance-based air navigation implementation plan

1.4 The Meeting took note that, in order to allow States to have a better understanding of the performance-based air navigation planning process based on the Manual on global performance of the air navigation system (Doc 9883) and the ASBU framework as part of the Global air navigation plan (GANP Version V), and to review the changes made to the SAM Performance-based air navigation implementation plan (PBIP), a workshop on the implementation of the aviation system block upgrades (ASBU) and the alignment of the Regional and National performance-based air navigation plans in the SAM Region had been held in Lima, Peru on 14-18 August 2017, the summary of which is shown in **Appendix C** to this agenda item.

1.5 The Meeting took note of the new version of the SAM Performance-based air navigation implementation plan (PBIP) version 1.5, which had been submitted for review at the *Workshop on the implementation of the Aviation system block upgrades (ASBU) and the alignment of the Regional and National Performance-based air navigation plans in the SAM Region*.

1.6 The PBIP version 1.5 was amended as a result of the progress made in the implementation of the tasks contemplated by the plan in the AGA/AOP, AIM, ATM, CNS, MET, SAR, Human Resources and Safety areas for the period 2012-2016, the air navigation implementation activities planned for the period 2017-2019 in response to global air navigation requirements, ICAO strategic objectives, as well as the sustainable development goals established by the United Nations for the next 15 years post-2015, the drafting of a preliminary safety plan for the SAM Region, the need to introduce environmental protection aspects, and the amendments contained in the fifth edition of the Global air navigation plan (GANP). The PBIP version 1.5 covers the period 2017 - 2023.

1.7 The Meeting reviewed the ATM and CNS sections of the plan and introduced the changes. See Appendix D to this agenda item. Since Uruguay had worked since the beginning on Chapters 10 and 11 *Development of human resources and competence management* and *Aviation safety management*, it expressed its desire to make some additional comments therein. In this regard, the Meeting felt the need to circulate Version 1.5 of the PBIP to the States for additional comments. The Secretariat would send a letter to the States on the week of 23 October, requesting their comments on the changes made to the PBIP, to be sent to the ICAO SAM Office by 20 November 2017. The amended plan would be submitted to the Fifteenth Meeting of Civil Aviation Authorities of the SAM Region, to be held in Asuncion, Paraguay, on 3-5 December 2017, for its approval.

Volume III of the CAR/SAM Air navigation plan and the performance-based decision-making method

1.8 The Meeting took note that part of the documentation contained in the PBIP would be included in Volume III of the CAR/SAM Air Navigation Plan (Doc 8733 eANP), which would also include part of the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (RPBANIP) corresponding to the CAR Region. This activity was expected to be completed by 2019. In the meantime, the PBIP and the RPBANIP would be the reference documents for performance-based air navigation planning aligned with ASBU for the SAM and NAM/CAR Regions, respectively.

1.9 The Meeting deemed it important to hold a workshop on the Performance-based decision-making method and the identification of indicators, to support the activities for completing Volume III of the eANP, and to develop or update the national performance-based plans. In this regard, it was noted that the SAM Office would conduct a workshop on the second semester of 2018 and would coordinate with the ICAO Mexico Regional Office to see the possibility of making it a CAR/SAM event.

Regional plan for the sustainment of air transport in the SAM Region

1.10 The Meeting took note of the progress made in the drafting of the Region plan for the sustainment of air transport in the SAM Region. In this regard, information was provided on the documentation prepared for each axis of the plan:

- Air connectivity,
- Safety,
- Institutional building, and
- Environmental protection.

1.11 The Meeting took note that the plan was scheduled to be completed by mid-2018. This task would be undertaken by a group of experts designated by the States, and by Regional Officers of the ICAO SAM Office, using as a basis all the documentation developed so far. This activity was expected to be endorsed by the Fifteenth Meeting of Civil Aviation Authorities of the SAM Region. The Meeting felt that it was important for ATM and CNS experts of the States of the Region to assist the experts designated by the States in the drafting of the plan concerning the issues of their competence.

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.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-37	**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.	Apply recommendations made by PANS-OPS Group (Appendix B to the Report on Agenda Item 2 SAM/IG/18)	Recommendations made by PANS-OPS Group	December 2017	STATES	RO/ATM	**CONCLUDED** Follow-up is being compiled in SAM/IG/19 Tables. Table were updated during PANS/OPS/2 workshop (Set 2017)
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		**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

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
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 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.	Analysis of the application of the longitudinal separation of 40 NM Sign of MoUs and/or LOAs	Implementation	SAM/IG/18	States	RO/ATM	**VALID** See implementation progress on Appendix D of Agenda Item 2 of SAM/IG/18 Report. Paragraph a) finalized Paragraph b) in process Paragraph c) non applicable (PBN).
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**	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	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
	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) hours, during which period NOTAMs should	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,					

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	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.						
No.	**Task to be developed**	**Specific tasks**	**Deliverables**	**Finalization date**	**Responsible**	**Supporting members to the task**	**Status of implementation**
6. Assessment of operational requirements in order to determine the implementation of communications and surveillance (CNS) capabilities improvement for en-route and terminal area operations							
6-25	**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	Registry of external operators to AMC Eurocontrol	External operators nominated by States from SAM Region that are registered	December 2017	States	RO/CNS	**VALID** To date, the following States have registered external operators to AMC Eurocotrol: Brazil, Colombia, Ecuador, Paraguay, Peru and Venezuela. Argentina reported that its registration process has begun.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	updated version of the adopted AMHS addresses for all AMHS users worldwide.						
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 testing operations. Operational phase began on 31 March 2016 and was interrupted in July 2016 returning to pre-operational phase- Pending operational test phase between Lima ACC-Bogota ACC and Guayaquil ACC – Bogota ACC 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	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 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
	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.						
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	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.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	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						
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)** 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	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** Argentina (initial phase), 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
	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.						
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**	Panama foresees completion for SAM/IG/20 Peru foresees completion by December 2017. Orientation was provided by the Secretariat to Suriname to carry out activites
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 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.	**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
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.	**O/G**		**YES**	**YES**		**YES**	**YES**			**O/G**				**YES**	Argentina is preparing a convention for the use of data safety events and indicators registered by airlines through IATA.
Conclusion SAM/IG/14-4 **Follow-up of the PBN goals established in the Bogota Declaration** a) complete the template contained in Appendix E to this part of the report; b) do the calculations and/or collect data on (estimated and actual) fuel and CO_2 savings, using the IFSET tool for the estimates; c) send the data cited in a) and b) to the SAM Regional Office before 30 June and 31 December each year.	**YES** **YES**	**YES**	**YES** **YES**	**YES** **YES**		**YES**	**YES**				**YES**		**YES**	**YES**	The SAMIG/19 meeting introduced a new template for including data of runways of AOP of eANP. States should update data in the new template. goals have been accomplished and follow-up is being made in RCC, SAM/IG and AN&FS meetings. Table amended in SAM/IG/19 is been applied. CO_2 savings calculations from PBN implementations continue being received.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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.													**YES**	**YES**	Letter pending submitting to States; in parallel consultation through the SRVSOP is being made to States to receive procedures as how to keep database updated once it is published. Brazil informed that they coordinate with CARSAMMA data base, therefore it should be analyze if it matches with this conclusion.
Conclusion SAM/IG/14-10 **ATFM preparatory activities** That SAM States do their utmost to:															Paragraph a) concluded Paragraph b) **VALID**
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**	
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**	**O/G**	**YES**	**YES**	**YES**	**O/G**	**N/A**	**YES**	**O/G**	**YES**	**YES**	**O/G**	**O/G**	**YES**	Implementation of procedure in progress.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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**	**NO**	**NO**	**NO**	**YES**	**YES**	**YES**	**NO**	**NO**	**YES**	Activity incomplete.
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.	**O/G**	**O/G**	**YES**	**NO**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	**N/A**	**NO**	
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 operational phase remains

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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**
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**	**YES**	**YES**			**YES**		**YES**		**O/G**	**YES**	At present, the model amendment to the letter of operational agreement on AIDC is being used by Colombia, Ecuador, Panama and Peru
Conclusion SAM/IG/17/01: Implementation of actions to maintain the security in REDDIG II That REDDIG II member States and the REDDIG II Administration analyse the implementation of the initial actions described in Appendix A to this agenda item in order	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	**N/A**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	RCC/20 approved an action plan to keep REDDIG II safe. Some activities have already been executed such as the installation of antivirus in the NMS, another are in progress.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
to maintain the required security in REDDIG II and submit the results of this analysis at the Twentieth meeting of the Coordination Committee of Project RLA/03/01 (RCC/20 March 2017) for approval.															
Conclusion SAM/IG/17/02: Analysis of the REDDIG II connection configuration for the transport SITA data link services That REDDIG II member States that have implemented or are in the process of implementing the ground-air data link service and the REDDIG II and SITA administration hold the necessary teleconferences to analyse the REDDIG II connection configuration shown in Appendix B to this agenda item, starting on 21 June 2016, and submit the results of the analysis at the SAM/IG/18 meeting.	**O/G**	**N/A**	**O/G**	**O/G**	**N/A**	**O/G**	**O/G**	**N/A**	**N/A**	**N/A**	**O/G**	**N/A**	**O/G**	**N/A**	REDDIG II connection configuration was approved. SAM Region States members of REDDIG that decide to use SITA services with data link, could use it through REDDIG II

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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 by the PANS OPS/2 Workshop (Sep 2017).
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.	**NO**	**NO**	**SI**	**SI**	**SI**	**SI**	**N/A**	**NO**	**NO**	**SI**	**SI**	**SI**	**NO**	**SI**	
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.	**NO**	**NO**	**NO**	**YES**	**NO**	**NO**	**NO**	**NO**	**YES**	**NO**	**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/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) hours, during which period NOTAMs should be replaced with ATFM initiatives generated and agreed by FMPs/FMUs, and which should be managed through ATFM	**O/G**	**NO**	**YES**	**O/G**			**NO**	**NO**	**O/G**	**YES**	**YES**	**NO**	**YES**	**YES**	Chile continues using NOTAM for flow control Argentina does not have FMU yet, but Ezeiza, Resistencia and Mendoza ACC are coordinating ATFM measures with Brazil and Chile Pending FMP/FMU implementation in Bolivia, French Guiana 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
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**		**a)O/G b)O/G**							**YES**	**a)YES b)YES**			**YES**	

APPENDIX C

Workshop on the implementation of the aviation system block upgrades (ASBU) and the alignment of regional and national performance-based air navigation systems implementation plans

SUMMARY

INTERNATIONAL CIVIL AVIATION ORGANIZATION
South American Regional Office

Workshop on the implementation of the aviation system block upgrades (ASBU) and the alignment of regional and national performance-based air navigation systems implementation plans

SUMMARY

Lima, Peru, from 14 to 18 August 2017

TABLE OF CONTENTS

HISTORY

ii-1 PLACE AND DURATION

The Workshop on the implementation of the aviation system block upgrades (ASBU) and the alignment of regional and national performance-based air navigation systems implementation plans was held at the ICAO South American Regional Office, Lima, Peru, from 14 to 18 August 2017.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Franklin Hoyer, Regional Director of the ICAO South American Office, greeted the participants and acknowledged their continuous support to the regional activities undertaken by the South American Regional Office, as well as the continuous support of civil aviation authorities of the South American Region.

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

The Workshop was conducted from 09:30 to 15:30 hours.

Mr. Onofrio Smarrelli, ICAO SAM CNS RO, featured the Workshop Secretariat assisted by and Mr. Saulo Da Silva, Chief, Global Interoperable System and Miss Olga De Frutos, Associate Technical Officer ANB/SAF/PCI from ICAO HQ (Montreal, Canada), Mrs. Veronica Chavez, TAO, Mr. Jorge Armoa, AIM/MET RO, Mr. Fabio Salvatierra, AGA RO, Mr. Fernando Hermoza, ATM/SAR RO and Mr. Roberto Sosa ANS/SFTY RO from ICAO SAM Office.

ii-4 WORKING LANGUAGES

The working languages of the event were Spanish and English, with simultaneous interpretation services.

ii-5 AGENDA

The agenda is contained in Appendix A to this summary.

ii-6 ATTENDANCE

The event was attended by 28 participants from 8 SAM States (Argentina, Bolivia, Brazil, Chile, Panama, Paraguay, Peru and Venezuela), one NAM State (United States) as well as representatives from ATECH, IATA AND THALES ALENIA SPACE. The list of participants appears in **Appendix B.**

1 **SUMMARY OF THE WORKSHOP**

1.1 Objectives

1.1.1 The objectives of the workshop were as follows:

- Allow the participants to understand the air navigation performance planning process, based on the Manual on global performance of the air navigation system (Doc 9883) and the ASBU framework as part of the Global air navigation plan (GANP).

- Review the Performance-based air navigation implementation plan for the SAM Region (PBIP), especially the regional performance objectives and their alignment with the key performance indicators contained in the 5th edition of the Global air navigation plan (GANP) and the regional performance indicators.

- Define the data/inputs that must be provided by States and users for monitoring the agreed key performance indicators (KPIs).

1.2.2 The eighteen presentations made during the workshop are posted in the following website: https://www.icao.int/SAM/Pages/MeetingsDocumentation.aspx?m=2017-ASBU

2 **SUMMARY OF WORKSHOP PRESENTATIONS**

2.1 The workshop was divided into six sessions. Session 0 was an introduction to the event, with a description of the objective, agenda, schedule and administrative aspects of the workshop. Three presentations were made in session 1, *Introduction: Global air navigation plan (GANP) and ASBU*, one in session 2, *Performance management associated to the ASBU framework*, four in session 3, *Technology roadmap associated with the ASBU framework*, and nine in session 4, *Global, regional and national planning*. In session 5, the results and recommendations of the workshop were presented.

SESSION 1: INTRODUCTION: GLOBAL AIR NAVIGATION PLAN (GANP) AND ASBU

PRESENTATION 1: GLOBAL AIR NAVIGATION PLAN (GANP) AND AVIATION SYSTEM BLOCK UPGRADES (ASBU) (ICAO HQ)

2.2 The purpose of this presentation was to level the field in terms of knowledge about the GANP and ASBU and their operational impact. It was noted that the GANP was a strategic document for planning air navigation improvements at global, regional and national level, covering the following disciplines: ATM, CNS, AGA, AIM and MET. The GANP offered a long-term vision to assist the entire aeronautical community, ensuring continuity and harmonisation amongst modernisation programmes.

2.3 The last edition of the GANP (V) was endorsed by the A39 (September 2016), and introduced very few changes with respect to the fourth edition, published in 2013, which introduced the Aviation System Block Upgrades (ASBU) framework. A new edition is foreseen for 2019, which will have a multi-layered structure: executive, global, regional and national.

2.4 Operational improvements are organised in the ASBU. ASBU is a global operational framework that allows all member States to improve their air navigation capabilities based on their operational requirements. The operational improvements described in the ASBU are not mandatory and do not have to be implemented everywhere, only in operational scenarios where performance needs to be improved. The following ASBU-related terms were defined: threads, elements, modules and blocks.

2.5 The most important message of the GANP is that we must work together at all levels if we want to achieve the system that we need to meet the expectations of the aeronautical community. How to measure expectations? Through performance. How to achieve performance? By offering services. How to offer services? Through deployment (ASBU, GANP).

QUIZ ON ASBU

2.6 A quiz on ASBU was taken to see if the participants had understood the ASBU framework and its components (threads, elements, enablers, modules, and blocks).

PRESENTATION 2: ASBU BLOCK 0 (ICAO HQ)

2.7 The 18 modules of Block 0 were briefly explained. Block 0 started in 2013 when ICAO standards, procedures and regulations, and the ground and airborne technology were already available for the implementation of the elements.

PRESENTATION 3: AIRLINE REQUIREMENTS: "OBTAINING OPERATIONAL IMPROVEMENTS" (IATA)

2.8 In this presentation, IATA highlighted the need for States, when developing their national air navigation plan, to incorporate the airspace concept (see ICAO Doc 9992). This concept was based on implementation of different phases: planning, design, validation, implementation and review. It was also noted that airlines did not need States to implement ASBU (including PBN) unless it brought operational improvements. IATA also stressed the importance of engaging users in the development of air navigation plans.

SESSION 2: PERFORMANCE MANAGEMENT PROCESS ASSOCIATED WITH THE ASBU FRAMEWORK

PRESENTATION 4: PERFORMANCE-BASED DECISION-MAKING METHOD (ICAO HQ)

2.9 This presentation described the performance-based decision-making method, which included various procedures to meet the expectations of the aeronautical community, improving the performance of the air navigation system and optimising the allocation and use of available resources. The decision-making method was based on three important aspects:

- Strong focus on the desired/required results.
- Reliance on facts and data for decision-making.
- Justified collaborative decision-making.

The method comprises 6 steps:

1. Scope, context, overall aspiration, and expectations
2. SWOT analysis/set of objectives
3. Set of goals/calculation of requirements
4. Identification of the optimum solution

5. Deployment of the optimum solution
6. Assessment results

2.10 When preparing their national air navigation plans, States should apply the performance-based decision-making method.

2.11 The participants had the opportunity to do exercises related to each of the stages of the performance-based decision-making method.

SESSION 3: TECHNOLOGY ROADMAP ASSOCIATED WITH THE ASBU FRAMEWORK

PRESENTATION 5: TECHNOLOGY ROADMAP (ICAO RO)

2.12 Information was provided on the global roadmap for communication systems (ground-air datalink, ground-ground data communications, and ground-air voice communications), navigation systems, surveillance systems (ground, air-air), information management systems (IM), and avionics, as described in the GANP. Information was provided on the relationship between module elements and the technological systems in the different blocks. Medium- and long-term plans for navigation and surveillance infrastructure in the SAM Region were also presented. Information was also provided on the importance of protecting the existing radio frequency spectrum and supporting the ICAO position at ITU global radio frequency conferences to secure the frequencies required for the future technological applications described in the technology roadmap of the GANP.

PRESENTATION 6: CONSIDERATIONS OF THE INDUSTRY ON ASBU (THALES)

2.13 In this presentation, Thales informed that it was a member of ICCAIA (International Coordinating Council of Airspace Industries Associations), an international organisation recognised by ICAO that participates as observer in ICAO committees and panels, such as the ASBU Panel Project Team and the ATM RPP (ATM Requiremet Performance Panel).

2.14 Thales also noted that it would be participating at the Second global air navigation industry symposium (GANIS/2) to be held in ICAO Headquarters in Montreal in December 2017. Thales noted that it meets the requirements of the enablers of the elements contained in ASBU Blocks 0 and 1 modules through its products TOPSKY ATC, TOPSKY TWR, ECO system and MAESTRO AMAN/DMAN. It also informed that, together with EUROCONTROL, the FAA, different users (SWISS, QANTAS, Brussels Airlines) and ANSPs (DKR, ATNS, AIRSERVICES, and SID), it had participated in global interoperability pre-operational demonstrations for FF-ICE.

PRESENTATION 7: CONSIDERATIONS OF THE INDUSTRY ON ASBU (ATECH)

2.14 ATECH compared what was included in some of the modules of ASBU Block 0 with what was already implemented in ATECH automation products, such as the ATECH ATM/ATFM system. It also presented the update planned for the ATECH ATM/ATFM system in 2018, which would cover some of the modules in Block 1. It was noted that ATECH, together with DECEA, had participated in the FAA Mini Global II SWIM demonstrations and the SESAR SWIM Global demostration. Furthermore, ATECH informed that it had signed an agreement with EUROCONTROL in 2015 for the exchange of pre-departure flight plans. In 2017, ATECH started the installation of SWIM at DECEA.

COMMENTS ON THE PRESENTATIONS BY THE INDUSTRY

2.15 In order to ensure the interoperability of its automated systems, it was felt that the industry should organise forums on this topic in view of the problems that currently existed for achieving interoperability, as in the AIDC, and possible problems for achieving interoperability of future automated systems (FF-ICE, SWIM, etc). Likewise, participation in operational demonstrations such as FF-ICE and Mini Global II would support interoperability between the different automated systems.

PRESENTATION 8: BLOCK 0 TO BLOCK 1 (ICAO HQ)

2.16 This presentation stressed the fact that in order to achieve a globally interoperable air traffic management system during all flight phases and for all users, it was necessary to comply with the agreed levels of safety, provide cost-effective and environmentally sustainable operations, and meet security requirements. A description was made of the 17 modules of Block 1 and the operational improvements that would result from their implementation.

SESSION 4: GLOBAL, REGIONAL, AND NATIONAL PLANNING

PRESENTATION 9: ALIGNMENT OF NATIONAL, REGIONAL, AND GLOBAL PLANS (ICAO HQ)

2.17 In this presentation, information was given on the interaction among global, regional, and national plans. In this sense, the following aspects were summarised:

2.17.1 Based on the GANP, regional and national planning processes should be aligned and used for identifying those elements that would better meet the operational requirements identified. Implementation parameters, such as the complexity of the operational environment, constraints, and available resources, will impact the development of regional and national implementation plans aligned with the GANP.

2.17.2 This planning requires the interaction and cooperation amongst stakeholders, regulators, airspace users, air navigation service providers (ANSPs), aerodrome operators, and the industry in order to obtain their commitment to implementation.

2.17.3 Implementations at global, regional, sub-regional, and ultimately, at State level, must be considered as part of the global and regional planning process of GREPECAS. Consequently, implementation arrangements, including effective dates, can be collectively agreed and applied by all stakeholders.

2.17.4 When drafting national plans, there is no simple solution or standard form. National requirements must be verified against the operational environment, priorities must be defined, plans must be aligned with the GANP, the ASBU framework, and the Regional Plan, and system improvement options must be defined.

PRESENTATION 10: REGIONAL AIR NAVIGATION PLAN (eANP) (ICAO RO)

2.18 Information was provided on the content, function and development of air navigation plans. Background information was provided on the CAR/SAM Air Navigation Plan (Doc 8733) and its evolution to the eANP (Electronic Air Navigation Plan), which is presented in electronic format, in three volumes. At present, Volumes 1 and 2 have been approved, while the volume on ASBU is expected to be ready by 2018. In the meantime, during the transition to Volume III for the SAM Region, consideration will be given to the Performance-based air navigation systems implementation plan (PBIP) for the SAM Region in accordance with GREPECAS Decision PPRC/4-3.

PRESENTATION 11: PERFORMANCE-BASED AIR NAVIGATION SYSTEMS IMPLEMENTATION PLAN (PBIP) FOR THE SAM REGION

2.19 Background information was presented concerning the implementation of the Performance-based air navigation systems implementation plan (PBIP) for the SAM Region and its evolution. A new version of the PBIP (Version 1.5) was presented with the changes resulting from the status of implementation of ATM, CNS, AIS, AGA and MET systems, as well as the new version of the GANP (5th edition) and planning for air navigation support systems for the 2017-2023 period. The participants conducted an initial review of changes made to the PBIP. In this regard, it was felt that the new version of the PBIP should be circulated to all the States of the Region for a more thorough review.

PRESENTATION 12: NATIONAL AIR NAVIGATION PLAN OF BRAZIL

2.20 A presentation was made of the National Plan of Brazil, called Sirius, and its relationship with ASBU modules. Information was provided on the challenges faced by the Sirius programme, such as the integration of the SMS with the ATM planning process, the drafting of a CDM methodology, the adoption of project management best practices, the establishment of a governance programme, the establishment of a performance-based programme with operational indicators to measure performance, the analysis of ANS services, infrastructure, and human performance, the conduction of a cost-benefit analysis, the forecasting of future ATM system demand, and the harmonisation with other plans.

PRESENTATION 13: NATIONAL AIR NAVIGATION PLAN OF CHILE

2.21 A presentation was made of the Institutional Air Navigation Plan (PNAI), which was developed taking into account the guidelines of the Global Air Navigation Plan (GANP) contained in the 5th edition of Doc 9750 (2016), as approved by the International Civil Aviation Organization (ICAO) in its Assembly of October 2016 (A-39), and the Performance-based air navigation systems implementation plan (PBIP) for the SAM Region, and is aimed at the implementation of air traffic management (ATM) as agreed by ICAO contracting States. The plan incorporates the performance-based navigation (PBN) concept and its alignment with the Aviation System Block Upgrades (ASBU) methodology. At national level, the objective of the plan is to encourage the implementation of a national air traffic management system that will permit aircraft operators to comply with their intended departure and arrival schedules and maintain their preferred flight profiles with minimum restrictions and without compromising the agreed levels of safety. The plan also has an institutional objective, which is to serve as a guide for the replacement and upgrading of navaids, the establishment of goals for the development of specific capabilities, and for reaching the highest level of interoperability and harmonisation among sub-systems in order to achieve an integrated national ATM system. The plan covers the 2017-2020 period.

PRESENTATION 14: NATIONAL AIR NAVIGATION PLAN OF COLOMBIA

2.22 Colombia did not participate in the workshop but sent a presentation concerning its air navigation plan, called PNA COL. The PNA COL consists of three volumes: Volume 1 contains the operational requirements and was published on 7 September 2014; Volume 2 refers to Facilities and Services and was published on 7 May 2016; and Volume 3, on Regulations, was published on 1 September 2014. Volumes 1 and 2, covering the 2017-2030 period, have been updated. The PNA COL covers the modules in Blocks 0, 1, 2 and 3, linking them to the elements of the ATM operational concept and the 11 key performance areas (KPAs). The presentation contains information on the development of indicators for the KPAs.

PRESENTATION 15: NATIONAL AIR NAVIGATION PLAN OF VENEZUELA

2.23 An explanation was given of the Performance-based air navigation plan of Venezuela for the 2015-2023 period. The plan is being applied in the Maiquetia flight information region (FIR). In order to achieve the objective of the plan, consideration was given to the development of three approaches: a frame of reference, operational requirements and facilities and services. The plan started to be developed on 25 August 2015, with the assistance of the ICAO SAM Office. The objective of the plan was to achieve a more efficient and interoperable airspace to safely meet future capacity requirements, increase the capacity of air traffic management systems, optimise aerodrome operations and further the transition from AIS to AIM, optimise airspace, reduce CO2 emissions, and implement new ATM automated systems. The plan contemplates the participation of the following aeronautical community stakeholders: air navigation service providers, airport service providers, aeronautical authorities, and airspace users. The plan takes into account the ASBU Block 0 modules to be implemented.

PRESENTATION 16: FAA ASBU IMPLEMENTATION STATUS

2.24 A presentation was made on the improvements to be provided by NEXGEN to current systems, including radar, inefficient routes, voice communications, differing information, fragmented weather forecasts, and restricted visibility. The National Airspace System (NAS) was presented, which covers the period from 2014 to 2025 and beyond. Information was provided on the status of implementation of the 63 elements of the 18 Block 0 modules. Version V of the GANP increased the number of Block 0 elements from 63 to 69. It was noted that ASBU should be simple, easy to understand and relevant.

PRESENTATION 17: MAKING THE PLANET A BETTER PLACE TO LIVE (IATA)

2.25 IATA explained some facts regarding fuel consumption, stressing the need to count in seconds rather than in minutes. It also explained the concepts of Minimum Time Track, Minimum Cost Track, and Cost Index. The implications of consumption on each flight phase were described as an introduction to a case study on potential savings, which involved the application of concepts such as the savings calculation method, continuous descent operations, and ATFM.

3 RESULTS/RECOMMENDATIONS

3.1 Regional operational requirements should be analysed using the performance-based decision-making method, in order to define specific performance objectives at a regional level and identify the associated performance indicators, so as to facilitate measurement of performance benefits in the PBIP.

3.2 At the next meeting of the Coordination Committee of Project RLA/06/901 to be held on the week of 2 October 2017, the Secretariat should submit for approval:

- The conduction of a workshop on performance indicators on the second half of 2018.

- The development of a process to collect the data required for calculating the performance indicators contemplated in the PBIP, as well as of a simple tool to facilitate such calculation and its display.

3.3 The ICAO section in charge of updating and drafting the GANP should prepare a form containing information to assist States in the drafting of their national plans aligned with the GANP and the regional plans.

3.4 Those States that have not yet completed or updated their national air navigation plan aligned with the GANP and the PBIP should do so in order to comply with GREPECAS Conclusion 17/6 *Follow-up on the implementation of A38 resolutions regarding air navigation.*

3.5 The Secretariat should circulate the PBIP amongst the States of the Region, in order to receive their comments no later than 13 October 2017.

APPENDIX A

INTERNATIONAL CIVIL AVIATION ORGANIZATION
SAM REGIONAL OFFICE

Workshop on the implementation of the aviation system block upgrades (ASBU) and the alignment of regional and national performance-based air navigation systems implementation plans

(Lima, Peru, 14 -18 Augusto 2017)

AGENDA

Date/Time	**Lead**	**Topic**	**Objective**
DAY 1	Monday, 14 August		
INTRODUCTION: GLOBAL AIR NAVIGATION PLAN AND ASBU FRAMEWORK			
8:30 - 9:00		Registration	
9:00 - 9:30		Opening ceremony Photo group	
9:30 - 10:00		Welcome, Introductions and workshop objectives and expectations	
10:00 - 10:30	*Break*		
10:30 - 11:00	ICAO HQ	ASBU Test	
11:00 – 12:30	ICAO HQ	Global Air Navigation Plan (GANP) and the Aviation System Block Upgrade (ASBU) Framework	
12:30 - 13:30	*Lunch*		
13:30 - 14:30	All	Test Result	
14:30 - 15:30	ICAO HQ	ASBU BLOCK 0	
DAY 2	Tuesday, 15 August		
9:00 - 9:30	IATA	Airline Requirements	
PERFORMANCE MANAGEMENT PROCESS ASSOCIATED WITH THE ASBU FRAMEWORK			
9:30 - 10:30	ICAO HQ All	Performance‐based Decision‐making Method	
10:30 - 11:00	*Break*		
11:00 - 12:30	All	Performance‐based Decision‐making Method (Cont.)	
12:30 - 13:30	*Lunch*		
13:30 - 15:30	All	Performance‐based Decision‐making Method (Cont.)	

DAY 3	Wednesday, 16 August		
CONTINUATION PERFORMANCE MANAGEMENT PROCESS ASSOCIATED WITH THE ASBU FRAMEWORK			
9:00 - 10:30	All	Performance - based Decision - making Method (Cont.)	
10:30 - 11:00	*Break*		
11:00 - 12:30	All	Performance - based Decision - making Method (Cont.)	
12:30 - 13:30	*Lunch*		
TECHNOLOGY ROADMAPS ASSOCIATED WITH THE ASBU FRAMEWORK			
13:30 - 14:00	ICAO RO	Roadmap on Technology - C, N, S, Avionics and IM	
14:00 - 14:30	Thales	ASBU industry consideration Roadmap on Technology	
14:30 - 15:00	Atech	ASBU industry consideration	
15:00-15:30	ICAO HQ	Block BO to Block B1	
DAY 4	Thursday, 17 August		
GLOBAL, REGIONAL AND NATIONAL PLANNING			
9:00 - 9:30	ICAO HQ	Alignment of National, Regional and Global Plan	
9:30 - 10:00	ICAO RO	Regional electronic Air Navigation Plan (e-ANP)	
10:00-10-30	ICAO RO	Air Navigation System Performance-Based Implementation Plan for the SAM Region (PBIP)	
10:30 - 11:00	*Break*		
11:00 - 12:30	ICAO RO All	Air Navigation System Performance-Based Implementation Plan for the SAM Region (PBIP)	
12:30 - 13:30	*Lunch*		
13:30 - 14:00	IATA	Making the world a better place to live (environment)	
14:00 - 15:00	US	ASBU implementation status	
15:00 -15:30	Venezuela	AIR NAVIGATION PLAN	
15:30 - 16:00	Brazil	AIR NAVIGATION PLAN	
DAY 5	Friday, 18 August		
9:00 - 9:30	Chile	AIR NAVIGATION PLAN	
9:30 - 10:00	All	Air Navigation System Performance-Based Implementation Plan for the SAM Region (PBIP)	
10:00 - 10:30	*Break*		
RESULTS AND RECOMMENDATIONS			
10:30 - 12:30	ICAO RO	Conclusions and recommendations Wrap up and feedback Closing	
12:30	*End of the meeting*		

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APPENDIX D

AIR NAVIGATION SYSTEM PERFORMANCE-BASED IMPLEMENTATION PLAN FOR THE SAM REGION

Version 1.5

August 2017

INTERNATIONAL CIVIL AVIATION ORGANIZATION

SOUTH AMERICAN REGIONAL OFFICE

AIR NAVIGATION SYSTEM PERFORMANCE-BASED IMPLEMENTATION PLAN FOR THE SAM REGION

Version 1.5

August 2017

TABLE OF CONTENTS

ATTACHMENTS TO THE DOCUMENT

FOREWORD

The Air Navigation System Performance-Based Air Navigation System Implementation Plan for the SAM Region is published by the ICAO South American Regional Office on behalf of States accredited and International Organizations involved. It considers implementations at short and mid-term, as indicated in the guidelines contained in the Global Air Navigation Plan and the plan initiatives required for evolution to a Global ATM System, as shown in the Global ATM Operational Concept.

The Regional Office, on behalf of States and Organizations involved, will publish the required revised versions of the plan to reflect current implementation activities.

Copies of the plan can be obtained by contacting:

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The present edition (Version 1.2) includes all revisions and modifications until May 2013. Subsequent amendments and corrigenda will be indicated in the Record of Amendment and Corrigenda Table, according to the procedure established in page 5.

It should also be mentioned that a list of reference documents used in the preparation of this document is presented in **Attachment H**.

The issue of amendments and corrigenda is announced regularly through correspondence with States and International Organizations, and in the ICAO website, which holders of this publication should consult. The blank boxes facilitate the recording of amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS

No.	Date applicable	Date entered	Entered by
1	May 2013		

CORRIGENDA

No.	Date applicable	Date entered	Entered by

1. Chapter 1: Foreword

1.1 Objective

1.1.1 This *Air Navigation System Performance-Based Implementation Plan for the SAM Region* has been drafted taking into account the ICAO Global Air Navigation Plan (GANP) (Doc 9750), and is framed within the Aviation System Block Upgrades (ASBU) methodology, with the aim of achieving a more efficient and interoperable airspace to meet future capacity demand, without compromising air navigation safety.

1.1.2 This Plan seeks to establish an implementation strategy so that benefits can be obtained for the air navigation community, based on the ATM-related infrastructure and available and foreseen aircraft capabilities. The document contains the Regional vision for the air navigation system (AGA/AOP, AIM, ATM, CNS, MET, SAR, Human Resources and Safety), giving high priority to environmental protection, training and safety.

1.2 Scope

1.2.1 This migration plan covers the SAM Region up to its boundaries, and includes the short- and medium-term implementations of the systems in support of the air navigation services between 2017 and 2023, period including the continuation of ASBU Block 0 implementation and the beginning of selected ASBU Block 1 implementation. The long-term initiatives required for the evolution to a global ATM system, as shown in the Global ATM Operational Concept, will be added to this Plan as they are developed and approved.

1.3 Background

1.3.1 The Global ATM Operational Concept was approved by the Eleventh Air Navigation Conference (Montreal, September-October 2003) and published as Doc. 9854-AN/458.

1.3.2 In order to align global planning to the ATM Operational Concept, the Eleventh Air Navigation Conference (AN-Conf/11), recommended States and Regional Planning and Implementation Groups (PIRG), through Recommendation 1/1, to consider the Concept as a common global framework to guide in the planning for the implementation of the systems in support of the air navigation services.

1.3.3 GREPECAS/15 approved Conclusion 15/1 for the development by the Group of a regional performance-based plan, in keeping with the Global Air Navigation Plan and the Global ATM Operational Concept.

1.3.4 The *Air Navigation System Performance-Based Implementation Plan for the SAM Region* was completed in May 2011, and approved by the Twelfth Meeting of Civil Aviation Authorities of the SAM Region (RAAC/12) (Lima, Peru, October 2011).

1.3.5 The 37 Session of the International Civil Aviation Organization (ICAO) General Assembly (2010) directed the Organization to double its efforts to meet the global needs for airspace interoperability while maintaining its focus on safety. The block upgrades initiative was formalized at the Twelfth Air Navigation Conference (AN-Conf/12) (Montreal, November 2012) and incorporated in the GANP, 4th Edition (Doc 9750).

1.3.6 The block upgrades describe a way to apply the concepts defined in the GANP with the goal of implementing regional performance improvements. They include the development of technology roadmaps, to ensure that standards are mature and to facilitate synchronized implementation between air and ground systems and between regions. The ultimate goal is to achieve global interoperability. Safety demands this level of interoperability and harmonization but it must be achieved at a reasonable cost with commensurate benefits.

1.3.7 Include the development of technology roadmaps to ensure the rules are ready and facilitate the synchronized implementation of between air and land systems and between the regions. The ultimate goal is to achieve global interoperability. Safety demands this level of interoperability and harmonization, but it must be achieved at a reasonable cost with measurable benefits.

1.3.8 Through Recommendation 6/1 - *Regional performance framework – planning methodologies and tools*, AN-Conf/12 urged States and PIRGs to harmonize the regional and national navigation plans with the ASBU methodology in response to this.

1.3.9 The *Air Navigation System Performance-Based Implementation Plan for the SAM Region* has been aligned with the ASBU methodology (Version of May 2013). (After this edition, a new amendment was made on November 2013).

1.3.10 Through State Letter AN 13/54-15/77 dated 1 December 2015, ICAO informed on the GANP proposal of amendment (Fifth Edition) reflecting changes incorporated according to recommendations formulated by the Twelfth Air Navigation Conference (AN-Conf/12), as well as slight updating needed. The Fifth Edition of GANP was sustained by the 39 Session of the International Civil Aviation Organization (ICAO) General Assembly.

1.3.11 Considering the progress made in the implementation of air navigation systems in the SAM Region during 2012-2016 and the Fifth Edition of the GANP, the Air Navigation System Performance-Based Implementation Plan for the SAM Region was updated.

1.4 Stakeholder roles and responsibilities

1.4.1 Stakeholders including service providers, regulators, airspace users and manufacturers are facing increased levels of interaction as new, modernized ATM operations are implemented. The highly integrated nature of capabilities covered by the block upgrades requires a significant level of coordination and cooperation among all stakeholders. Working together is essential for achieving global harmonization and interoperability.

1.4.2 States, operators and industry will benefit from the availability of Standards and Recommended Practices (SARPs) with realistic lead times. This will enable regional regulations to be identified, allowing for the development of adequate action plans and, if needed, investment in new facilities and/or infrastructure.

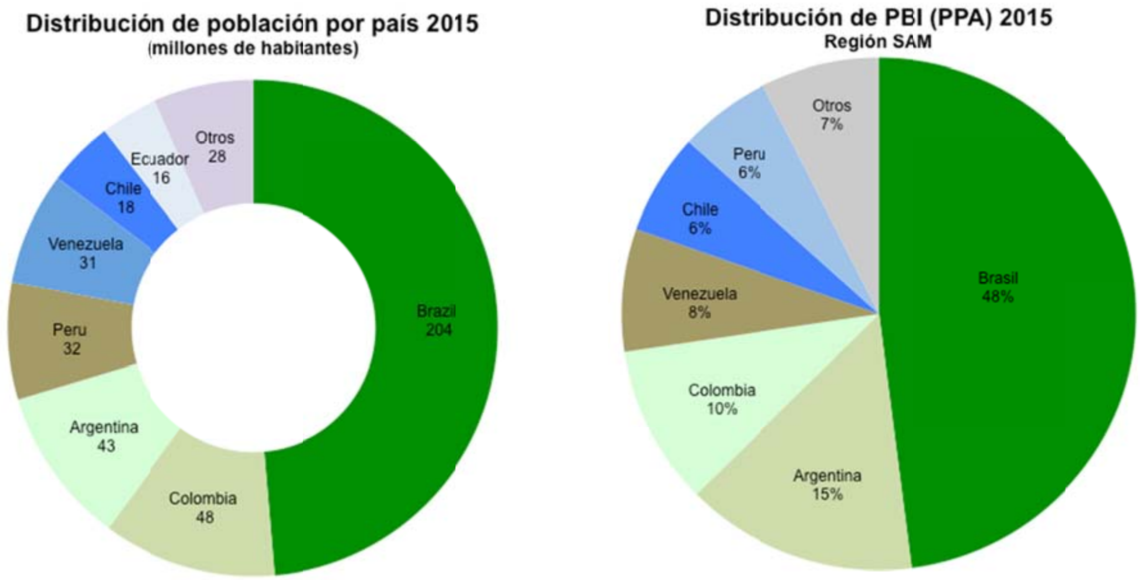
1.4.3 For the industry, this constitutes a basis for planning future development and delivering products on the market at the proper target time. For service providers or operators, block upgrades should serve as a planning tool for resource management, capital investment, training as well as potential reorganization.

2. Chapter 2: Air Traffic and connectivity in the SAM Region

2.1 Introduction

2.1.1 SAM Region consists mainly of raw materials export economies. It is one of the most diverse regions of the world regarding social, cultural and demographic issues. It has also a variety geographic with all kinds of climates and altitudes, with a total of 81 assets recognized as world heritage by UNESCO. Therefore, it has a varied and attractive proposal which attracts many types of tourists and investors. According to figures from the World Bank, in the last 20 years the number of passengers transported in the region has grown 3.5 times (annual average of 7.9%).

Figure 1 – Population and PBI distribution by State

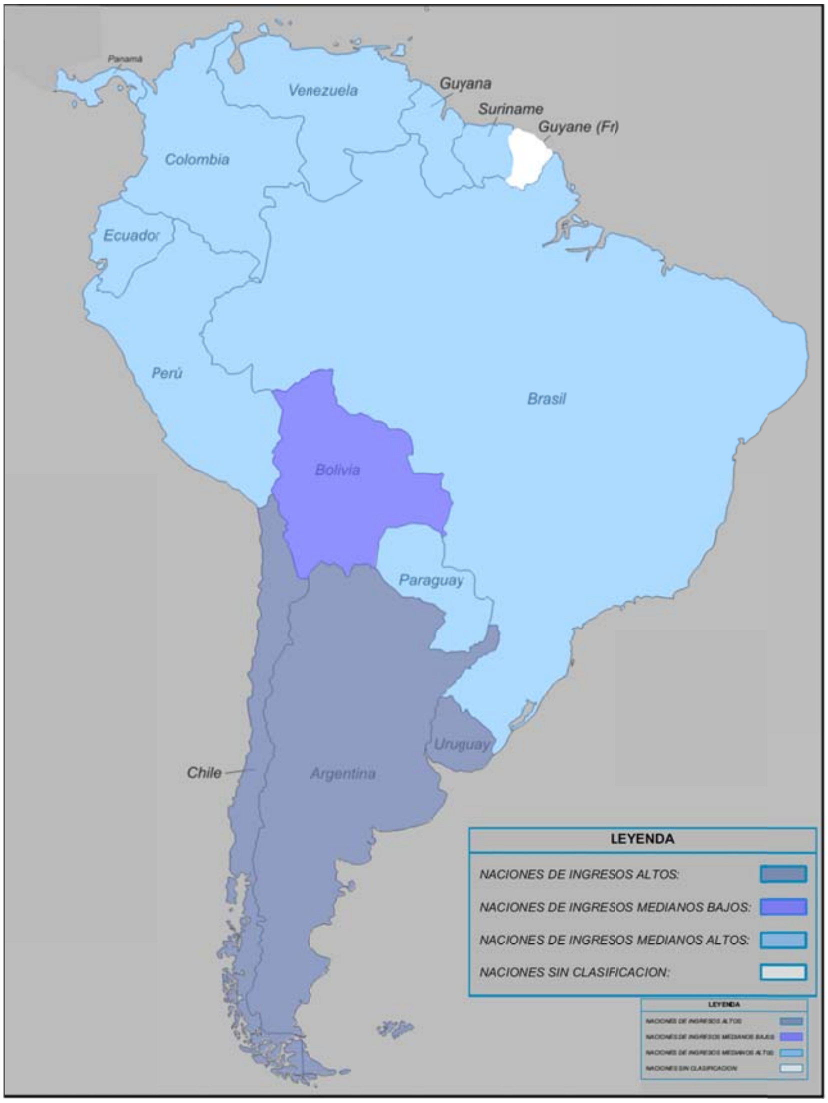


Total population : 422 million of habitants

Total PBI: 3.6 trillion (4.9% of global PBI)

Source: IMF (International Monetary Fund) (United Nations) for French Guiana

Figure 2 – Map of the SAM Region by level of income according to the World Bank classification



Source: WB (World Bankl).

2.1. SAM Region air industry in numbers

2.2.

2.2.1. Table 1 – General Information of air industry in the SAM

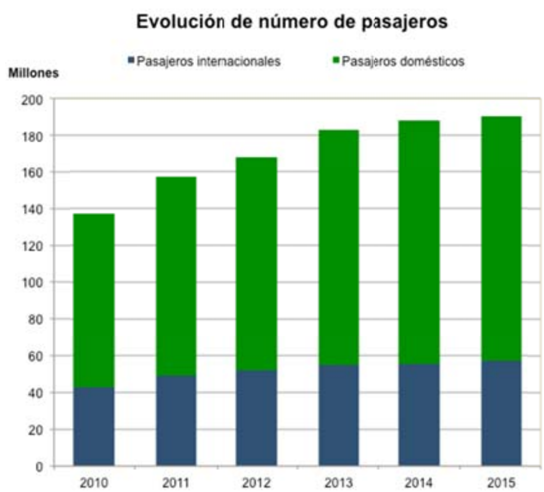
PBI – Travel and tourism*	US$ 134 billions
Employment – Travel and tourism*	5.4 millions
Tourism expenses	US$ 63.1 billion
Total passengers	198.4 millions
Airports	>300 (106 international)
Operating Airlines	>80
Countries destination with direct routes	67 (52 direct connections)

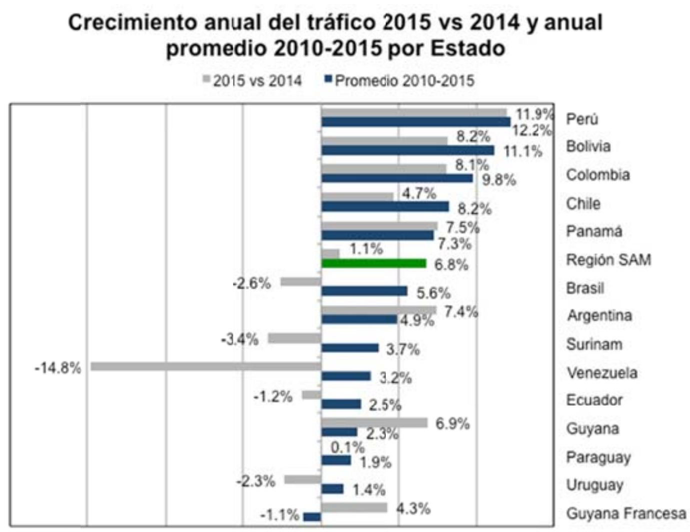
2.2.2. During 2015, according to the information provided by IATA, the total flow passengers transferred to/from and within the region reached 198.4 million passengers. Of these, Brazil, Colombia, Argentina and Peru are the countries with higher passenger traffic and explain more than 75% of the total traffic of the year 2015.

2.2.3. In 2016, the SAM Region total traffic showed a growth of only 1.2% over the previous year, mainly due to the contraction of Brazil traffic (- 2.6%) and Venezuela (- 14.8%). However, it is noteworthy that in previous years traffic increased at rates higher than 7% (with the exception of the year 2014 where increased 3.2%) which located 2010-2015 average annual growth at 7.2%.

2.2.4. In terms of composition of destination, 70% of the traffic corresponds to domestic traffic within each State, 8% corresponds to intra-regional traffic between the States that make up the SAM Region and the remaining 22% corresponds to international traffic with other regions of the world.

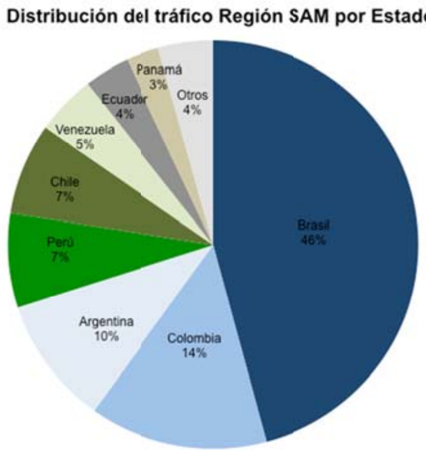
Figure 3 – Evolución of air traffic in the SAM Region





Source: IATA. Preparation: Own

Figure 4 – Configuration and annual growth of passenger by State



Source: IATA.

2.3. Status and connectivity level in the SAM Region

2.3.1. In terms of air connectivity level and quality, the SAM Region shows the following characteristics (see Appendix A for more detail):

- Brazil is the most connected country in terms of number of airports, airlines and number of direct routes. It also represents nearly half of the total number of air traffic in the region. However, taking into account its great territorial expansion and its population size, their comparative level of connectivity is smaller. Not all its territory is properly connected (airport density lower than most countries in the region. For further details see section 5.3) and even shows a great development gap in air traffic decentralization.

- The regional airport density, measured as total of airports per million inhabitants, is less than 1 in 9 from the 14 States. According to the World Economic Forum (WEF), sample of 140 countries evaluated in its "Report on the Industry Competitiveness in travel & tourism 2015", more than half have an airport density higher than 1. This situation shows that States of the Region still need to improve the amount of infrastructure available to connect its population.

- In terms of number of flights and passengers in comparison to the size of the population and PBI, the region shows an average level in comparison to other regions of the world. However, in the case of the air cargo, the level of cargo with respect to the magnitude of regional PBI is one of the smallest around the world. Proof of this situation is that according to Boeing, the SAM Region currently represents less than 2% of the total number of air commerce in the Middle East, Asia and the Pacific regions.

- The region is relatively well connected with the rest of America and some main European countries, but there are very few routes with Asia and the Pacific, Africa and Middle East. Brazil is the only country connected with the three regions. With the exception of Argentina, Chile, Peru and Panama other States are only connected with America and Europe.

Figure 5 – Destination countries connected with SAM Region through direct routes

Source: IATA.

- In the same way, air operators from these same regions have a slight presence.

- Also the region still is not fully connected within. Passengers from the smaller States such as Guyana, do not have direct routes to most connected countries in the region and are in the need to leave the region to access indirect routes.

- In terms of connectivity quality, the SAM Region still has considerable potential to develop. According to the Report on the Industry Competitiveness in travel & tourism 2015", prepared by the World Economic Forum, from a sample of 141 countries around the world, Brazil (post 28) and Panama (post 34) lead the region. In general, the report reflects that most of the Region's countries must work to improve its infrastructure and airport processes, making its bilateral agreements (ASAs) more flexible and reducing airfares and airport services charges and costs to improve global competitiveness.

2.4. Appendix A presents air traffic passenger charts by SAM Region States for the period 2010-2015 and estimation of air traffic passengers up to year 2035.

2.5. Vision for the development of air industry connectivity to year 2035

2.5.1. Worldwide recognized organization such as IATA, ATAG, Boeing and Airbus estimated that air traffic in the Region SAM will increase approximately between 4% and 6% annually on average. For this analysis, we have considered that passengers of the SAM Region level will increase from 198 million by 2015 to more than 430 million in 2035. Therefore, the vision of the region to 2035 shows a great potential for growth where air traffic will exceed twice the current value. In summation, the level of

2.5.2. regional connectivity will be extended by an increase in demand (number of passengers and cargo) and supply (number of routes, flights and frequencies offered by aircraft operators).

3. Chapter 3: Planning considerations

3.1 Introduction

3.1.1 As traffic volume increases throughout the world, the demands on air navigation service providers in a given airspace increase, and air traffic management becomes more complex. Increased traffic density brings about an increase in the number of flights that cannot fly their optimum path.

3.1.2 It is foreseen that the implementation of the components of the ATM operational concept will provide sufficient capacity to meet the growing demand, generating additional benefits in terms of more efficient flights and higher levels of safety. Nevertheless, the potential of new technologies to significantly reduce the cost of services will require the establishment of clear operational requirements.

3.1.3 Taking into account the benefits of the ATM operational concept, it is necessary to make many timely decisions for its implementation. An unprecedented cooperation will be required at both global and regional level.

3.1.4 ICAO introduced the Aviation System Block Upgrades (ASBU) methodology as a systemic manner to achieve a harmonized implementation of the air navigation services.

3.2 Planning Methodology

3.2.1 After identifying ATM Systems with homogeneous areas and the main traffic flows, GREPECAS conducted a study of the current and foreseen fleet of aircraft and their capabilities, the forecast traffic figures and ATM System infrastructure, including human resource availability and requirements, amongst other elements. The methodology used for the analysis phase is shown in Figure 1, hereunder.

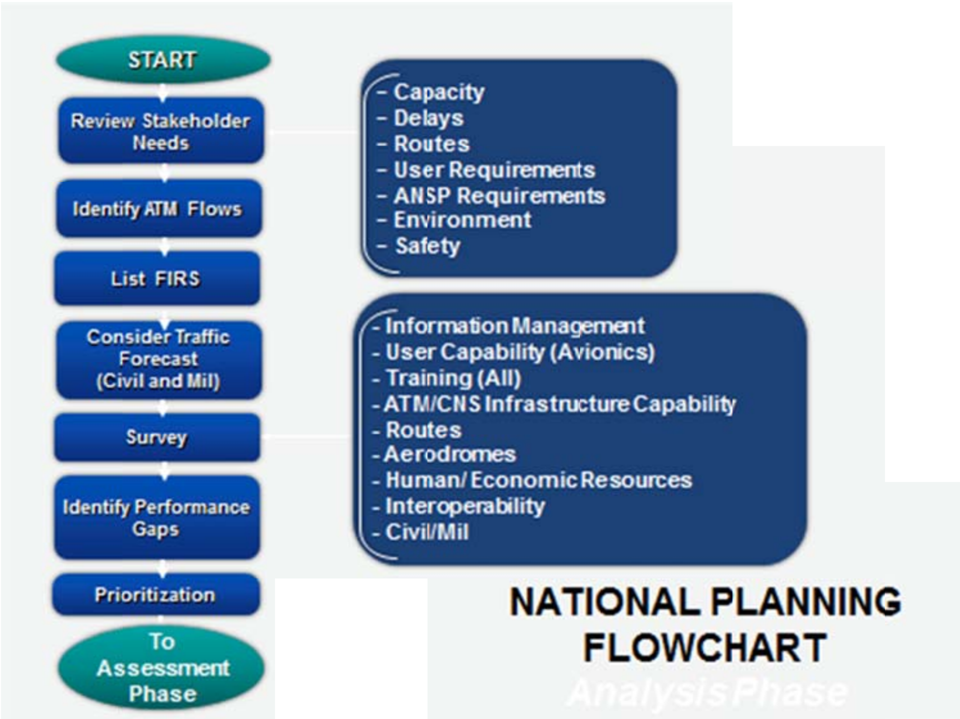


Figure 1 – Planning process (analysis)

3.2.2 An assessment made to the data obtained in the analysis phase enabled the identification of opportunities for the improvement of the operational performance. The ASBU modules and respective elements were analysed upon and selected with the aim of meeting the operational increases considered as necessary. The evaluation process used in indicated in Figure 2, hereunder:

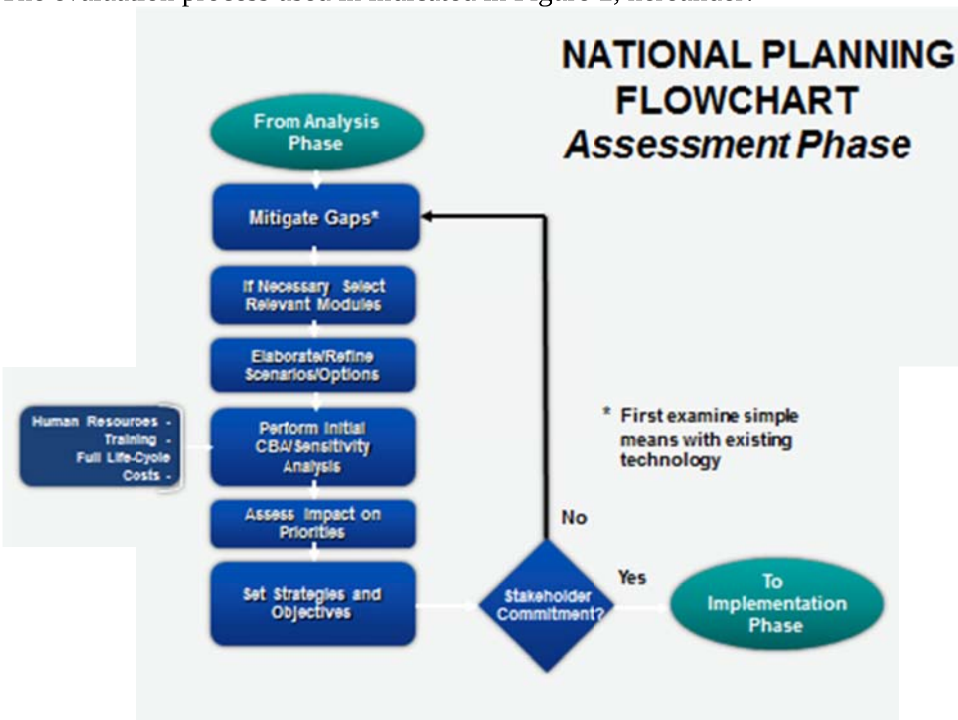


Figure 2 – Planning process (assessment)

3.2.3 The work for the SAM Region is organised based on project management techniques and clearly defined performance objectives to support the Global Plan strategic objectives aligned with the ICAO strategic plan.

3.2.4 All of the activities listed in the performance objectives will be designed based on strategies, concepts, action plan models and roadmaps that may be shared in order to align the inter-regional work with the main objective of maximising interoperability and transparency.

3.2.5 Planning of all the activities should ensure an efficient use of resources, avoiding duplicated or unnecessary activities or tasks, so as to make sure that such activities/tasks can be easily adjusted to the SAM Region. Planning must also encourage the optimisation of human resources, financial savings, and the use of electronic media, such as the Internet, videoconferences, teleconferences, e-mail, telephone and others.

3.2.6 The new processes and work methods must make sure that performance objectives can reflect based on timetables and regional progress reports to Regional Civil Aviation Authorities, GREPECAS, the ICAO Council and the ICAO Air Navigation Commission.

3.2.7 Based on this Implementation Plan, the States should develop their own national plan, containing the work programme, timetable, responsible parties and status of implementation, in order to monitor and report on the progress made in such activities. Additionally, it should also consider detailed information about the activities required for implementation, the means to provide feedback on the progress made through an annual reporting process, which will help administrations to prioritise the required actions and support, and identify annual assistance requirements of each ICAO Region.

3.2.8 The development of work programmes is based on the experience gained and lessons learned during the previous cycle of the CNS/ATM implementation process. Consequently, this Implementation Plan is aimed at maintaining a uniform regional harmonisation and improving implementation efficiency, taking advantage of infrastructure capacity and existing regional applications.

3.3 Planning tools: Implementation strategy within ASBU framework

3.3.1 An ASBU designates a set of improvements that can be implemented globally from a defined point in time to enhance the capacity and performance of the ATM system. There are four components of a block upgrade.

3.3.2 Module – is a deployable package (performance) or capability. A module will offer an understandable performance benefit, related to a change in operations, supported by procedures, technology, regulations/standards as necessary, and a business case. A module will be also characterized by the operating environment within which it may be applied. The date allocated to a module in a block is that of the initial operating capability (IOC).

3.3.3 Of some importance is the need for each of the modules to be both flexible and scalable to the point where their application could be managed through any set of regional plans and still realize the intended benefits. The preferential basis for the development of the modules relied on the applications being adjustable to fit many regional needs as an alternative to being made mandated as a one-size-fits-all application. Even so, it is clear that many of the modules developed in the block upgrades will not be necessary to manage the complexity of air traffic management in many parts of the world.

3.3.4 Thread – describes the evolution of a given capability through the successive block upgrades, from basic to more advanced capability and associated performance, while representing key aspects of the global ATM concept

3.3.5 Block – is made up of modules that when combined enable significant improvements and provide access to benefits.

3.3.6 The notion of blocks introduces a form of date segmentation in five year intervals. However, detailed considerations will call for more accurate implementation dates, often not at the exact assigned block date. The purpose is not to indicate when a module implementation must be completed unless dependencies among modules logically suggest such a completion date.

3.3.7 Performance improvement area (PIA) – sets of modules in each block are grouped to provide operational and performance objectives in relation to the environment to which they apply, thus forming an executive view of the intended evolution. The PIAs facilitate comparison of ongoing programmes.

3.3.8 The four PIAs are as follows:

a) airport operations;
b) globally interoperable systems and data – through globally interoperable system-wide information management;
c) optimum capacity and flexible flights – through global collaborative ATM; and
d) efficient flight paths – through trajectory-based operations.

3.3.9 Figure 3 illustrates the relationships between the modules, threads, blocks, and PIAs. Figure 4 explains the concept of the thread.

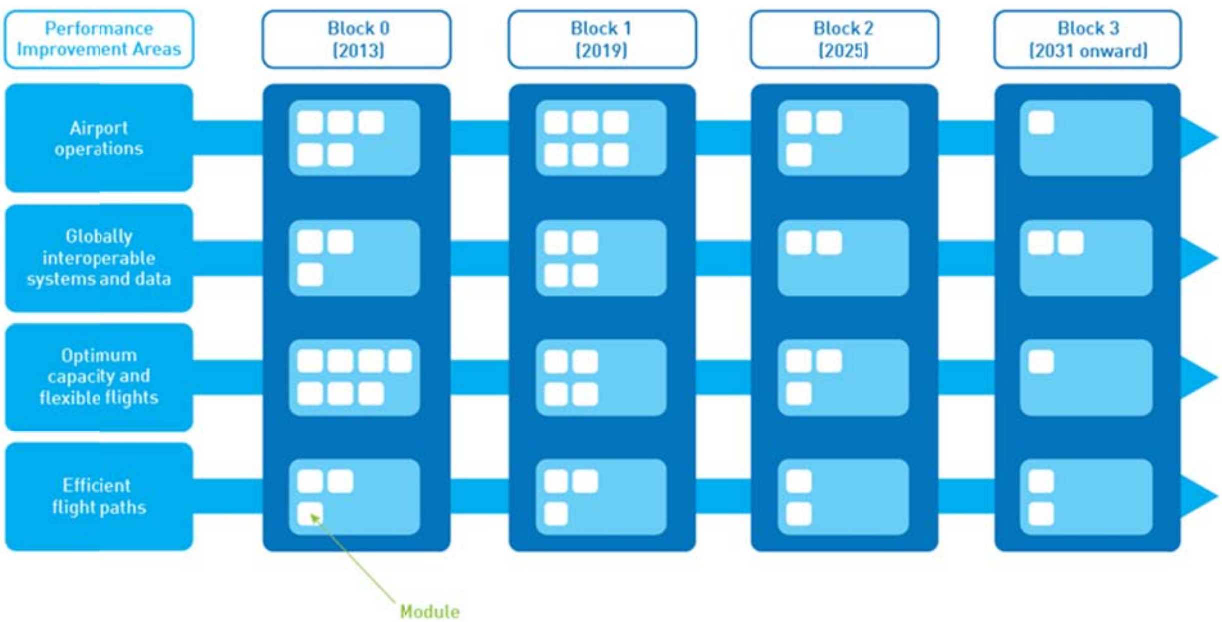


Figure 3. Summary of blocks mapped to performance improvement areas

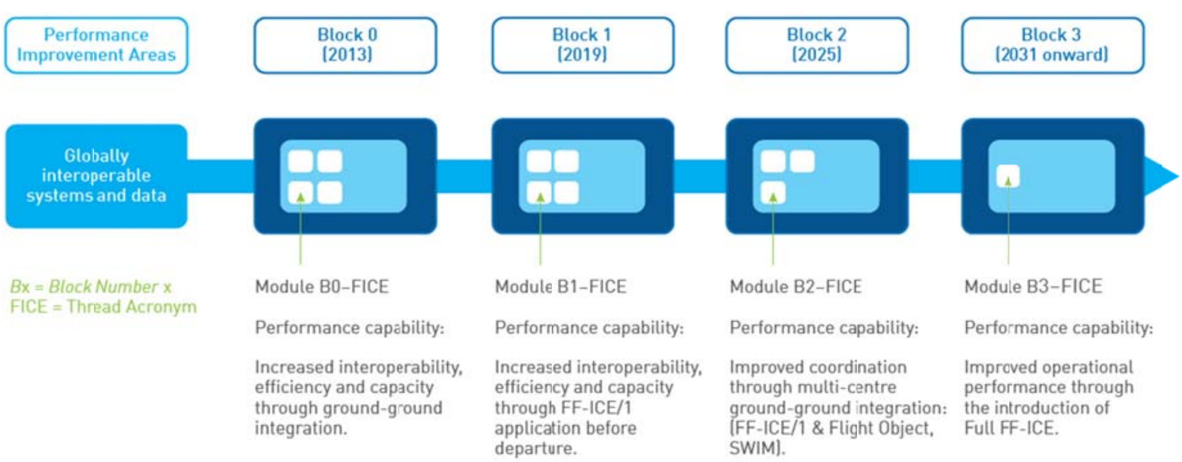


Figure 4. Module thread associated to a specific performance improvement area

3.3.10 In Figure 4, the modules under each block carry the same module number indicating that they are a part of the same thread.

3.3.11 Note that each block includes a target date reference for its availability. Each of the modules that form the Blocks must meet a readiness review that includes the availability of standards (to include performance standards, approvals, advisory/guidance documents, etc.), avionics, infrastructure, ground automation and other enabling capabilities. In order to provide a community perspective, each module should have been fielded in two regions and include operational approvals and procedures. This allows States wishing to adopt the Blocks to draw on the experiences gained by those already employing those capabilities.

3.3.12 Figure 5 illustrates the timing of each block relative to each other. Note that early lessons learned are included in preparation for the IOC date. For the Conference it is recognized that Blocks 0 and 1 represent the most mature of the modules. Blocks 2 and 3 provide the necessary vision to ensure that earlier implementations are on the path to the future.

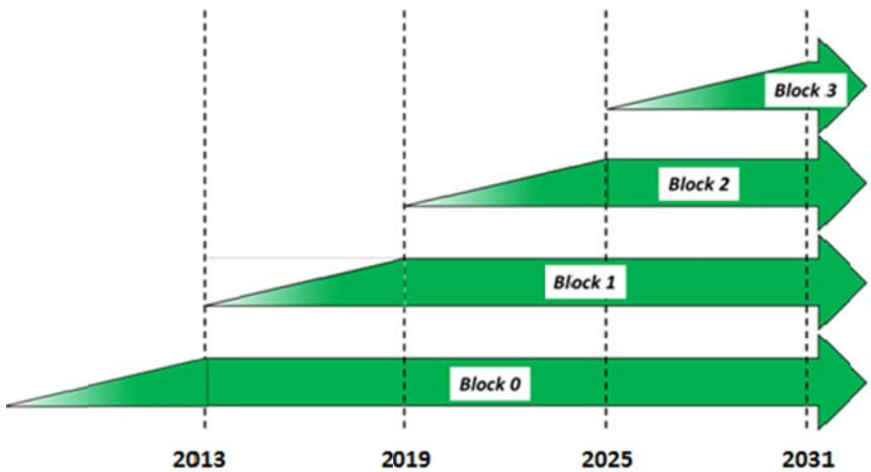


Figure 5. Timing relationships between blocks

3.3.13 An illustration of modules ASBU Block 0 for the different phases of flight considered in the SAM Region is presented in Figure 6. It highlights that the modules apply to all flight phases, as well as the network as a whole including information management and infrastructure.

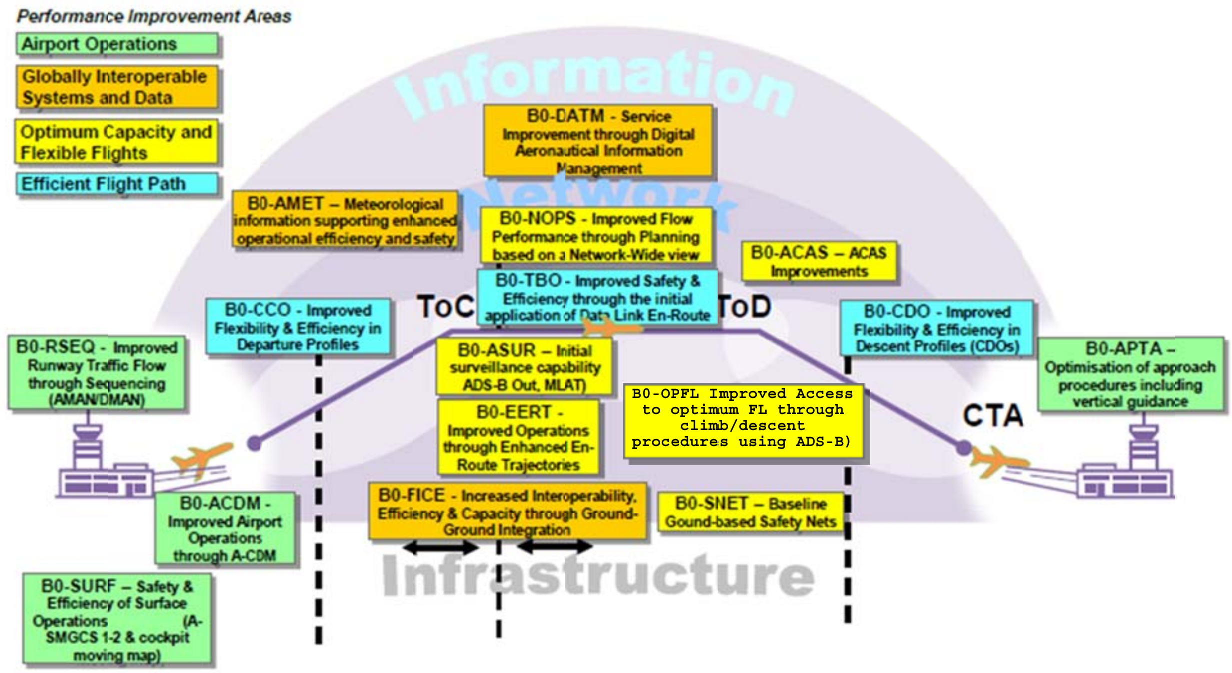


Figure 6. Block 0 in perspective

3.4 ASBU modules under consideration in the SAM Region

3.4.1 The Fourth Edition of the *Global Air Navigation Plan* introduces ICAO's ASBU methodology and supporting technology roadmaps based on a rolling fifteen-year planning horizon. Although the GANP has a global perspective, it is not intended that all ASBU modules are to be applied around the globe. Some of the ASBU modules contained in the GANP are specialized packages that should be applied where specific operational requirements or corresponding benefits exist.

3.4.2 Although some modules are suitable for entirely stand-alone deployment, an overall integrated deployment of a number of modules could generate additional benefits. The benefits from an integrated implementation of a number of modules may be greater than the benefits from a series of isolated implementations. Similarly, the benefits from the coordinated deployment of one module simultaneously across a wide area (e.g. a number of proximate airports or a number of contiguous airspaces/flight information regions) may exceed the benefits of the implementations conducted on an ad hoc or isolated basis.

3.4.3 An example of a need for global applicability would be performance-based navigation (PBN). Assembly Resolution A37-11 urges all States to implement approach procedures with vertical guidance in accordance with the PBN concept. Therefore, the ASBU modules on PBN approaches should be seen as required for implementation at all airports. In the same way, some modules are well suited for regional or sub-regional deployment and should take this into account when considering which modules to implement regionally and in what circumstances and agreed timeframes.

Block 0

3.4.4 Based on the above paragraphs, it is important to clarify how each ASBU module fits into the framework of the SAM regional air navigation system. To assist in this regard, a module categorization and prioritization system has been developed below with the objective of ranking each module in terms of implementation priority. On the basis of operational requirements and taking into consideration benefits associated, SAM Region has chosen 16 out of 18 Block 0 Module for implementation as they respond to air navigation capacity and efficiency requirements for the Region.

Performance Improvement Areas (PIA)	Performance Improvement Area Name	Module	Module Name
PIA 1	Airport Operations	RSEQ	Improve Traffic flow through Runway Sequencing (AMAN/DMAN)
		APTA	Optimization of Approach Procedures including vertical guidance
		SURF	Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)
		ACDM	Improved Airport Operations through Airport-CDM
PIA 2	Globally Interoperable Systems and Data - Through Globally Interoperable System Wide Information Management	FICE	Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration
		DATM	Service Improvement through Digital Aeronautical Information Management
		AMET	Meteorological information supporting enhanced operational efficiency and safety
PIA 3	Optimum Capacity and Flexible Flights – Through Global Collaborative ATM	FRTO	Improved Operations through Enhanced En-Route Trajectories
		NOPS	Improved Flow Performance through Planning based on a Network-Wide view
		ASUR	Initial capability for ground surveillance
		ACAS	ACAS Improvements
		SNET	Increased Effectiveness of Ground-Based Safety Nets
		OPFL	Improved FL optimum access through ascending/descending procedures using ADS-B
PIA 4	Efficient Flight Path – Through Trajectory-based Operations	CDO	Improved Flexibility and Efficiency in Descent Profiles (CDO)
		TBO	Improved Safety and Efficiency through the initial application of Data Link En-Route
		CCO	Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)

3.4.5 The categories of 15 Block 0 Modules are as follows:

- **Essential (E)**: These are the ASBU modules that provide substantial contribution towards global interoperability, safety or regularity. The (3) modules for SAM Region are FICE, DATM and ACAS
- **Desirable (D):** These are the ASBU modules that, because of their strong business and/or safety case, are recommended for implementation almost everywhere. The (9) modules for SAM Region are APTA, ACDM, NOPS, ASUR, SNET, AMET, TBO, CDO, and CCO

- **Specific (S):** These are the ASBU modules that are recommended for implementation to address a particular operational environment or mitigate identified risks. The modules for SAM Region are NIL
- **Optional (O):** These are the ASBU modules that address particular operational requirements and provide additional benefits that may not be common everywhere. The (4) modules for SAM Region are SURF, RSEQ, OPFL and FRTO

Block 1

3.4.6 Based on operational requirements and considering the benefits associated, the SAM Region has chosen for implementation 10 from 17 Modules of Block 1, as it respond to the air navigation capacity and efficiency requirements for the Region.

3.4.7 Modules selected are: In PIA 1: B1 RSEQ, in PIA 2: B1 FICE, B1 DATM, B1 SWIM, B1 MET, in PIA 3: B1 NOPS, B1 SNET and in PIA 4: B1 CDO, B1 TBO and B1 RPAS).

Performance Improvement Area (PIA)	Name of the Performance Improvement Area	Module	Name of Module
PIA 1	Airport Operations	B1-RSEQ	Improved Airport operations through Departure, Surface and Arrival Management
PIA2	System and Data Global Interoperability through the management of whole system information with global interoperability	B1-FICE	Increased Interoperability, Efficiency and Capacity though FF-ICE, STEP 1 application before departure
		B1- DATM	Service Improvement through Integration of all Digital ATM Information
		B1-AMET	Improved operational performance through the joined meteorological information (planning and service short-term)
		B1-SWIM	Performance Improvement through the Application of SWIM
PIA 3	Optimum Capacity and Flexible Flights by means of an global cooperative ATM	B1-NOPS	Enhanced Flow Performance through Network Operational Planning
		B1-SNET	Ground based Safety Nets on Approach
PIA 4	Efficient flight path by means of flight path-based operations	B1-CDO	Improved Flexibility and Efficiency in Descent Profiles (CDOs) using VNAV
		B1-TBO	Improved Traffic synchronization and Initial Trajectory Based Operation
		B1-RPAS	Initial Integration of Remotely Piloted Aircraft (RPA) into Non Segregated Airspace .

3.5 Transition from PFFs to ANRFs

3.5.1 With the introduction of the ASBU methodology to the Global Air Navigation Plan, 4th edition, it is expected that the Performance Framework Form (PFF) will be restructured and aligned with the ASBU modules, and renamed as Air Navigation Report Form (ANRF).

3.5.2 Nevertheless, these two forms will continue to be included in this Plan, as well as their inter-relationship, in order to serve as reference during the transition phase to ANRF.

4. Chapter 4: Air Traffic Management (ATM)

4.1 Introduction

4.1.1 Currently, the challenge facing the ATM community consists of how to create conditions so that all users and stakeholders to improve the performance of the air navigation system using the cost-effective deployment of operational improvements and, at the same time, meet the global, regional and local needs.

4.1.2 The Global Plan air navigation plan (GANP) is the strategic guide that lead the States and stakeholders towards interoperability of systems and the harmonization of procedures. As part of the GANP, the Aviation system blocks upgrades framework (ASBU) describes enablers to allow operational improvements and also provides guidance and tools to determine optimized solutions for the local and regional requirements.

4.1.3 According to the Global ATM Operational Concept, the general objective of ATM is to achieve a global, inter-operational air traffic management system for all users during all flight phases, that meets the agreed levels of safety, provides optimum operations, is environmental sustainable, and meets national security requirements.

4.1.4 In this line, the PBN operational concept for the SAM Region 2018-2020 (CONOPS) has been developed, which prioritizes safety and describes required capabilities to improve efficiency, increase capacity and to protect the environment, and defining the specifications of air navigation that will be needed to implement uniformly in the airspace of the SAM Region. The texts of the CONOPS are incorporated into this Plan in attachment H, so is considered a complementary to this chapter document.

4.1.5 The system must evolve from the current system so as to, inasmuch as possible, meets the needs of the users, according to clearly established operational requirements. The reality is that migration and integration are the most difficult institutional issues facing ATM system designers.

4.1.6 Airspace boundaries and divisions might not restrict the development of the airspace structure. Planning should be coordinated, in the regional and interregional scope, as well as between adjacent areas in order to achieve a seamless airspace, in which the user does not perceive any division. The airspace should be free of operational discontinuities and inconsistencies, and should be organised in such as way as to accommodate the requirements of the different types of users. The migration between areas should be seamless to users at all times.

4.1.7 Human intervention within the human factors and training aspects is taken under consideration in all aviation improvement modules.

4.1.1 La consideración de la actuación humana en el marco de los factores humanos y el entrenamiento está considerada en todos los módulos de mejoras de la aviación en forma transversal.

4.1.8 Some of the benefits that are expected from the implementation of these components are improved safety, reduced operating fuel costs for users, reduced delays and gas emissions, and increased system capacity.

4.1.9 The evolution of air traffic management in the SAM Region has been carefully planned to avoid the degradation of the performance of the existing system. The safety level attained to date must be preserved during the transition, as a minimum, gradually improving air navigation efficiency.

Consideration has also been given to avoiding an unnecessary overloading of aircraft with multiple CNS equipment, both existing and new, during the extended transition period.

4.2 **General principles**

4.2.1 Unrestricted access to air navigation services listed in this document must be foster and pushed for all SAM States.

4.2.2 The need for SAM States, to follow the guidance of this document in order to develop their National Plans oriented to implement the performance based navigation, arranging resources to fully comply with such national plans, as well as with the standards governing the use of the new systems, is acknowledged.

4.2.3 SAM States must accept the global nature of the ATM Operational Concept and the objective of providing integration mechanisms for its timely implementation.

4.2.4 CNS infrastructure must be carefully planned based on the requirements identified for the appropriate level of air traffic management in the SAM Region.

4.2.5 In the early stages, the new CNS elements were planned to be gradually introduced, taking into account the benefits to be derived by the ATM community. In that sense, in the period 2013-2017 it was achieve a progress in the implementation of the advanced elements of the CNS and ATM automation in several areas of the SAM Region, which leads to a new scenario related to CNS/ATM systems that must be considered obsolete or must be dismantled. These elements are referred in this document as the "legacy of air navigation".

4.2.6 However, a solution to the legacy of air navigation, which somewhat hampers the capacity and air traffic growth, aims to build a fully harmonized air navigation system that is supported by performance-based technologies and procedures. Planners of communications, navigation and surveillance/air traffic management (CNS/ATM) have pursued this goal for many years. Given that the technology is not a static discipline, it has proved difficult to mark a strategic line leading to harmonized worldwide system.

4.3 **Analysis of the current situation (2017)**

Gaps of the current ATM system in the SAM Region

4.3.1 The ATM system available in the SAM Region remains some gaps, including the following:

a) Insufficient implementation of Performance-Based Navigation (PBN) and, in general, absence of airspace management (ASM);
b) The lack of a systematic use of cost-benefit analyses for the implementation of new airspace structures causes difficulties in the definition of air navigation infrastructure implementation priorities, and prevents measuring the benefits obtained by the ATM community;
c) The lack of implementation of the policy and procedures for the flexible use of airspace hinders airspace design and management, blocking the implementation of an optimum airspace structure and the use of optimum flight paths;

d) The lack of air traffic flow management (ATFM) in most airspaces of the SAM Region causes congestion in some airspaces and airports, and prevents optimum use of ATC and airport capacity, thus affecting users;
e) The lack of coordination in the provision of the existing CNS/ATM services sometimes generates a duplication of resources and services;
f) Operations still rely on voice radio-communications for air-ground exchanges, that should became congested in the peak hours;
g) The lack of an ATS surveillance service in some portions of the airspace of the Region prevents a harmonised optimization of aircraft spacing, due to the application of different separation criteria in FIR boundaries (with and without ATS surveillance), thus restricting the use of optimum flight profiles;
h) The lack of harmonisation of automated ATM systems in the SAM Region, as well as the scarce sharing of ATS surveillance data, generates discontinuity in ATS services; and
i) Limited facilities for real-time exchange of information between ATM, aerodromes and aircraft operators, leading to a weak response to changes made in the operational requirements of users.

4.3.2 In some airspace segments and some aerodromes, a complete and integrated ATM system implementation has not been accomplished, resulting in inefficient operations. These limitations include:

a) The requirement to fly circling patterns in departure and arrival procedures;
b) Existence of airspaces of a permanent nature reserved for military purposes mainly;
c) Inadequate airspace planning prevents direct flights between the origin-destination airports and/or city pairs, and also operations at incorrect flight levels and/or speeds that make it difficult for aircraft to maintain optimum flight profiles;
d) Excessive ground and en-route delays related to the system;
e) Insufficient flexibility to properly address disturbances in airline operations caused by meteorological conditions, unexpected failures in CNS systems and airport services interruption;
f) Weak manage of the ATS and airspace capacity
g) Lack of harmonization in aeronautical publications, mainly instrumental procedures.

4.4 Strategy for the implementation of performance objectives

4.4.1 ATM evolution in the SAM Region has been planned taking into account the ASBU that could be applied in the short and medium term. ATM performance objectives, in addition to the requirements for the implementation of ATM improvements, determine the implementation dates of planned improvements, as well as the performance objectives.

4.4.2 The planning period considered is 2017 to 2023.

4.4.3 ATM evolution is based on:

a) En-route operations;
b) TMA operations; and
c) Air operations in general.

4.4.4 ATM Planning is based on following performance objectives, as shown in **Attachment C**, and as listed below:

a) En-route airspace optimisation (SAM ATM/01 PFF);
b) TMA airspace structure optimisation (SAM ATM/02 PFF);
c) Implementation of RNP approaches (SAM ATM/03 PFF);
d) Flexible use of the airspace (SAM ATM/04 PFF);
e) ATFM implementation (SAM ATM/05 PFF);
f) Improvement of ATM situational awareness (SAM ATM/06 PFF).

4.4.5 It should be noted that the different specialties (CNS, AIS; MET; AGA/AOP; SAR) developed in this Implementation Plan support ATM development and, in turn, constitute *per-se* an integrated, indivisible system. In particular, this Implementation Plan contains some cross-cutting issues that the States must especially address, namely:

a) Development of human resources and competence management (see Chapter 10); and
b) Safety management – SMS (see Chapter 11).

4.5 **En-route operations**

4.5.1 The evolution of ATM for en-route operations took into account the ASBU Block 0 modules applicable to the SAM Region and was planned in order to permit optimum airspace management and organisation. The implementation of versions of ATS routes network, based on PBN, will continue to be the main feature of the optimisation of enroute airspace for the SAM region, in order to foster the implementation of advanced navigation specifications of the aircraft which, combined with ATM tools, an adequate ATC sectorization and traffic flow management, allows ATS routing that, whenever possible, meet the needs of airspace users, reduce the workload of controllers and pilots and avoid the concentration of aircraft in portions of airspace that may cause congestion of the system.

4.5.2 The concepts and guidelines for the implementation of the PBN enroute operations, for the short and medium term, including specifications of navigation and aircraft separation criteria, are detailed in Chapter 7 of the CONOPS.

Situational awareness and en-route data relationship applications

4.5.3 The use of ADS-C and CPDLC in oceanic airspaces will foster the necessary conditions for using 30-NM horizontal separation minima in the EUR/SAM Corridor and in the Santiago-Lima route segment. The need for Aeronautical Mobile Satellite Service (AMSS) will be assessed to ensure such separation. Furthermore, in other oceanic airspaces with less traffic density, ADS-C and CPDLC will provide reliable surveillance and communication media, reducing the workload of controllers and pilots.

4.5.4 In the continental airspace, the use of enhanced surveillance techniques (ADS-B and/or multilateration) will help reduce horizontal separation minima, enhance safety, increase capacity, and improve the cost-effectiveness of flights. The use of CPDLC instead of voice communications could bring significant benefits in terms of safety and pilot and controller workload; however its use must be assessed taking into account that it might not be feasible due to the characteristics of ATC interventions.

4.5.5 These benefits may be achieved by providing surveillance in areas that lack primary or secondary radar when so warranted by cost-benefit analyses. In airspaces where radar is used, improved surveillance may help enhance the quality and reliability of surveillance information both on the ground and in the air. The States shall conduct a consistent cost-benefit analysis to determine if, when the time comes, PSR and/or SSR systems should be replaced by ADS-B systems or multilateration.

4.5.6 The gradual implementation of ATS inter-facility data communication (AIDC) will enhance airspace safety and reduce coordination errors between ATS units.

4.5.7 The implementation of ATS surveillance systems and data Relationship applications should take into account the corresponding automation aspects, mainly with respect to the need for harmonisation between the systems applied, with a view to ensuring system interoperability.

4.5.8 Furthermore, the implementation of ATS surveillance systems and data relationship applications should consider ATM automation tools (minimum safe altitude warning; conflict prediction; conflict alert; conflict resolution advisory; path conformance control; functional integration of ground and airborne systems, etc.).

4.5.9 Amongst others, the following applications that may assist with an improvement of the situational awareness, are identified:

a) TFMS - SYNCHROMAX or similar;
b) Surveillance tools to identify the boundaries of the airspace sector;
c) Use of A-SMGC at specific aerodromes, as required;
d) Availability of SIGMET in graphical format;
e) Dissemination of AIS; and
f) Implementation of D-VOLMET.

4.6 **TMA operations**

4.6.1 The evolution of air traffic management in terminal areas shall be harmonised with the evolution of ATM for en-route operations, providing for a harmonious and integrated ATM system.

4.6.2 The evolution of ATM for TMA operations took into account the ASBU Block 0 modules applicable to the SAM Region, and was planned so as to permit an optimum airspace management and organisation.

4.6.3 The TMA structure optimisation is supplementary related to the optimisation of the routes, through the use of approach procedures, SIDs, STARs, based on PBN, the application of TMA design and management techniques, and the functional integration of ground and airborne systems.

4.6.4 As regards situational awareness and implementation of data link applications, the close relationship between the implementation of enhanced surveillance techniques (ADS-B and/or MLAT) and the use of data link applications is taken into account.

4.6.5 There are many factors that should be taken into account when planning the requirements for a TMA air navigation service infrastructure. In addition to traffic volume, consideration should be given to other factors, such as: number and location of aerodromes, traffic characteristics, terrain, meteorological conditions, etc. Therefore, the States should analyse each particular TMA and determine, in coordination with the users, the requirements for the implementation of the corresponding air navigation services.

TMA structure optimisation

4.6.6 TMA airspace structure optimisation will be achieved through the following measures:

a) PBN implementation, which includes the implementation of SIDs and STARs with RNP and/or RNAV, and RNP approach procedures;
b) Implementation of continuous descent operations (CDO) and continuous climb operations (CCO);
c) The functional integration of ground and airborne systems; and
d) The use of improved design and management techniques.

Implementation of PBN for TMA operations

4.6.7 TMA operations have specific characteristics, taking into account the separation minima applicable between aircraft, and between aircraft and obstacles. This also involves the diversity of aircraft, including low-performance aircraft that carry out arrival and departure procedures on the same path as, or close to the paths of, high-performance aircraft.

4.6.8 In this sense, the States shall develop their own national TMA PBN implementation plans, based on the the Action Plan Model developed by SAMIG meetings. They shall seek harmonisation of aircraft separation criteria and the applicable RNAV and/or RNP criteria, in order to avoid the need for multiple approvals for intra- and inter-regional operations.

4.6.9 The efficiency of TMA operations in a PBN environment depends on aerodrome design and management and runway operations, taking into account that any air traffic flow increase in TMA operations shall be absorbed by airport infrastructure.

4.6.10 The implementation of PBN, in main TMA in the region giving priority to the implementation on the basis of the traffic volume and considering an appropriate integration with the route network, will continue. Is expected that non PBN-approved aircraft operations will remain, the establishment of exclusionary PBN TMA will depend on the complexity and density of traffic.

4.6.11 The concepts and guidelines for the implementation of the PBN operations in Terminal Areas, for the short and medium term, including specifications of navigation and aircraft separation criteria, are detailed in Chapter 7 of the CONOPS.

Functional integration of ground and airborne systems

4.6.12 The optimisation of TMA efficiency will depend on a maximum use of automation. Likewise, aircraft will be increasingly equipped with time of arrival calculation. Thus, functional integration of ground and on-board systems will enable identification of times of arrival at specific fixes. These schedules should help in the landing sequencing process, allowing aircraft to remain close to their preferred 4D path, contributing to the application of one of the components of the ATM Operational Concept, which is Air Traffic Synchronisation.

Use of improved design and management techniques

4.6.13 Airspace planners should apply design techniques, based on PBN criteria, for TMA restructuring, with a view to:

a) Validating the proposed airspace structure;
b) Assessing the impact of PBN implementation, including RNAV, GLS procedures and/or RNP SID and STAR procedures, and FMS-based arrival procedures, using ATC simulations as needed;
c) Ensuring a favourable cost-benefit ratio; and
d) Optimising sectoring so as to make it seamless for users and balanced in terms of workload.

Situational awareness and data relationship applications for TMA

4.6.14 In addition to the considerations contained in the section on en-route operations, which also apply to TMA operations, the States should consider the following aspects for the implementation of ATS surveillance services and data Relationship applications in the TMA.

4.6.15 The implementation of surveillance systems (ADS-B and/or multilateration) at the TMAs will provide the conditions required for the integration of en-route and TMA operations.

4.6.16 The use of ATS surveillance systems (SSR, ADS-B and/or multilateration) will permit the use of RNAV-based navigation specifications, taking into account that surveillance will permit flight monitoring for the detection of any path deviation. Thus, it will be possible to include in TMA operations those users that would not be approved for RNP operations.

4.6.17 The implementation of improved surveillance systems will facilitate the operation of aircraft not approved for RNAV/RNP, taking into account that the controller will be able to vector them to the final approach.

4.6.18 The implementation of CPDLC in the TMA is not expected, taking into account the characteristics of ATC intervention in these airspaces. However, other data Relationship applications will reduce the workload of controllers and pilots, such as: D-ATIS and digital flight plan clearance (DCL).

4.6.19 It should be noted that TMA users might not be equipped with data Relationship systems, since there is a significant number of low performance aircraft that fly in this airspace and might not be capable of being properly equipped. In that case, procedures must be developed to allow non-equipped aircraft to fly, unless air traffic density warrants the use of exclusionary airspaces.

Air operations in general

4.6.20 This part of the Plan includes aspects contributing towards efficiency and capability applicable to general air operations.

Flexible Use of Airspace (FUA)

4.6.21 The optimum, balanced and equitable use of airspace by civil and military users, facilitated by strategic coordination and dynamic interaction, will permit the establishment of optimum flight paths, while reducing the operating cost of airspace users.

4.6.22 SAM States should establish policies for temporary or permanent use of restricted airspaces, in order to avoid the adoption of airspace restrictions inasmuch as possible, and also consider and integrate in its air navigation system unmanned aircraft systems (UAS), a new component of the aeronautical system.

4.6.23 The implementation of the flexible use of airspace should start with an assessment of hazardous, restricted and prohibited airspaces that affect or could affect traffic flow.

4.6.24 The establishment of letters of agreement between ATS and military units or other users for the dynamic and flexible use of airspace should avoid restrictions to the use of airspace, thus accommodating the needs of all airspace users.

4.6.25 In those cases in which airspace reserved is inevitable, the letters of agreement should stipulate that the activation of reserved airspace should not exceed the time required. To that end, it will be necessary to develop paths for dynamic re-routing of aircraft to avoid such airspaces.

4.6.26 The cited paths should be published in the AIP to let users know of the need to take into account such possible deviations in flight planning.

4.6.27 FUA implementation requires convincing the reserved airspaces users, mainly military authorities of the States involved, assuring them that their needs will be met whether or not airspace restrictions are applied. Consequently, seminars/meetings with such authorities will be required to demonstrate the importance of an optimised use of airspace.

RPAS systems

4.6.28 The technological advancement of remotely piloted aircraft systems (RPAS) and its fast expansion in various applications of civil aeronautics and in various sciences and arts, observed in the countries of the Region, point to initiate the planning and studies for the implementation of requirements for the operation of these systems in non-segregated airspace. It is expected that this activity will have a direct impact on the concepts of planning airspace and ATS services.

Air Traffic Flow Management (ATFM)

4.6.29 In view of significantly increased number of air operations in some areas and international airports of SAM Region, in a scenario in which is observed, at least in certain periods of the day, capacity gaps in the facilities and ATM/CNS infrastructure and airports, SAM States must seek for an adequate balance between demand and capacity, ensuring that in normal operational conditions, the ATM system is able to attend the existing demand of air traffic.

4.6.30 The implementation of timely measures for demand/capacity balancing, in case of events that reduce system capacity, for example adverse weather conditions and/or temporary problems in airport infrastructure or ATC, will avoid an overload of the ATM system and will create the conditions for maximising airport and ATC capacity. This should increase significantly airspace capacity and operational efficiency.

4.6.31 States has initiated the application of air traffic flow management measures and the implementation of FMP/FMU hosted in the main ACC of the Region, and also performing the calculation and maximisation of ATC and airport capacity, particularly runway capacity.

4.6.32 ATFM implementation in the SAM Region should take into account the objective and principles established in Appendix AL to Item 3 of the GREPECAS/13 meeting, noting that ATFM measures must foster a maximum use of existing capacity without compromising safety.

4.6.33 The ATFM Operational Concept establishes a simple strategy that should be developed in stages, maximising available capacity and allowing the parties involved to gain sufficient experience.

4.6.34 The experience gained in other Regions and by some SAM States permits the application of basic ATFM procedures at airports.

4.6.35 Thus, ATFM in the SAM Region will be implemented by stages, based on the established operational requirements, in keeping with the SAM ATFM Operational Concept.

4.6.36 So as to reconcile national plans with the SAM ATFM Regional Plan, civil aviation administrations must take required measures and carry out a close follow-up of the regional development of ATFM, and draft an ATFM implementation programme, where implementation needs are determined, the impact it will have in the national ATC system, in airspace, air traffic services and in airport services, and pertinent coordination is established, to make feasible a harmonious and timely integral regional implementation.

4.6.37 Is highlighted that, while the idea of a single entity ATFM serving a Region in a centrally model has been properly implementing in Europe and North America, and in Brazil at the sub regional level, is observed that this orientation in the short term is not feasible in SAM region. Therefore the works for ATFM implementation have progressed on a *State by State* approach, based on flow management units or posts (FMU/FMP).

4.6.38 In that sense, in order to maximise its efficiency in a long-term, the feasibility of implementing a centralised ATFM that should be responsible for delivering the service in as much airspace as possible, provided it is homogeneous, should be assessed.

4.6.39 Besides, the SAM States must focus their efforts to improve the coordination of their FMP/FMU with sectors and dependencies in the associated ACC, and emphasising coordination with the FMP/FMU of adjacent States, to eliminate the application of "Flow Control" that pretends to separate aircraft within a FIR following a precarious method, under a unilateral scheme. To do this, it is essential to provide human resources and procedures to the FMP/FMU's defining their competence and authority, as well as to promote the signing ATFM letters of agreement between concerned authorities.

4.7 **Alignment with ASBU**

4.7.1 Of the ASBU Block 0 and Block 1 modules taken under consideration of the SAM Region, the ATM area contributes to modules B0-RSEQ y B1-RSEQ (Runway sequencing), B0-APTA (Airport Accessibility), B0-SURF (Surface Operations) regarding the PIA 1, modules B0-FRTO (Free route operations), B0-NOPS, B1-NOPS (Network operations), B0-ASUR (Alternative Surveillance), B0-SNET, B1-SNET (Ground based safety nets) y B0-OPFL (Optimum flight levels) regarding the PIA 3, and modules B0-CDO y B1-CDO (Continuous descent operation) , B0-CCO (Continuous Climb operation), B0-TBO (Trajectory Based Operations) y B1-RPAS (Remotely piloted aircraft system) connected to PIA 4.

4.7.2 Following are the ATM PFF indicated in paragraph 4.4.4 reflected on the following ASBU Block 0 modules indicated in paragraph 4.7.1:

a) PFF SAM ATM/01 - *Optimization of the en-route airspace structure*, with modules B0-FRTO and B0-OPFL;
b) PFFSAM ATM/02 - *TMA airspace structure optimization*, with modules B0- CDO, B1-CDO and B0-CCO and B1-RPAS;
c) PFF SAM ATM/03 - *Implementation of RNP and A-RNP approaches*, with module B0-APTA;
d) PFF SAM ATM/04 - *Flexible use of airspace*, with module B0-FRTO;
e) PFF SAM ATM/05 - *ATFM implementation*, with modules B0-RSEQ, B1-RSEQ, B0-ACDM, and B0-NOPS and B1-NOPS; and
f) PFF SAM ATM/06 - *Improve ATM situational awareness*, with modules B0-SURF, B0-ASUR and B0-SNET, B1-SNET.

5. Chapter 5: Communications, Navigation and Surveillance (CNS)

5.1 Introduction

5.1.1 When implementing CNS systems, SAM States must consider the ATM operational requirements contained in this Plan.

5.1.2 In view of the requirements derived from the implementation of the ATM Operational Concept, SAM States shall consider planning improvements to, and the strengthening of, aeronautical communication, navigation and surveillance services, taking into account ASBU modules of the Global Air Navigation Plan.

Communications

5.1.3 Communication systems contemplated in this plan respond to short- and medium-term expectations of the operational requirements in the Region. Accordingly, this plan has taken into account the following communication systems:

a) Aeronautical message handling system (AMHS);
b) ATS inter-facility data communication (AIDC);
c) Controller/pilot data Relationship communications (CPDLC);
d) Data link automatic terminal information service (D-ATIS);
e) Voice meteorological information for aircraft in flight (VOLMET) and data link (D-VOLMET);
f) Voice clearance delivery (CLRD) and data clearance (DCL); and
g) SAM Aeronautical Telecommunications network (ATN).

Navigation

5.1.4 The function of navigation systems is to support en-route, terminal, approach and landing operations and surface movements.

5.1.5 The navigation systems contemplated in this plan respond to short- and medium-term operational requirements of the Region. In this respect, this plan for navigation systems has taken into account continuing with the ground navigation infrastructure (VOR, ILS DME and NDB) remaining the gradual deactivation of NDBs and the GNSS requirements (ABAS multi-constellation, multi-frequency and GBAS CAT 1) concerning the operations foreseen in the CAR/SAM PBN Roadmap.

Surveillance

5.1.6 The function of surveillance systems is to provide aircraft position information to air traffic service units (ATS).

5.1.7 The surveillance systems contemplated in this plan respond to short- and medium-term operational requirements in the Region. Accordingly, this plan considers the following:

a) ADS-B;
b) ADS-C;
c) MLAT and WAM;
d) SSR; and
e) The integration of the aforementioned.

5.2 **Analysis of the current situation (2017)**

5.2.1 The current SAM communication, navigation and surveillance services situation in support of air navigation is described below, as per information provided in FASID CNS tables.

Communications - Aeronautical fixed service

5.2.2 AFTN service: The circuits foreseen have been fully implemented and gradually migrating to AMHS.

5.2.3 ATS speech service: The circuits foreseen have been fully implemented. Circuits are analogue and operate without any major problem.

5.2.4 AMHS service: This service has been implemented in almost all SAM States and Territories.

5.2.5 Memoranda of Understanding (MoU) have been drafted for the interconnection of AMHS systems between States.

5.2.6 *AIDC*: Implemented in most all automated systems in the States' ACCs.

5.2.7 AIDC operation between ACCs and ACCs with other ATS units is only implemented between few SAM Region States. At regional level some States have already implemented it or in pre-operational phase.

Information delivery network

5.2.8 A satellite digital network (REDDIGII) is available in the region. It is based on IP technology and formed by satellite and ground networks. The REDDIG II supports current and future aeronautical fixed services required as well as additional navigation and surveillance services.

Aeronautical mobile service

5.2.9 *VHF*: Services have been implemented as indicated in FASID Table CNS 2A, ensuring coverage in most of the selected areas, with problems at lower levels in selected airspaces. In the case of terminal areas and aerodromes, many facilities do not follow the recommendation of having different frequencies for APP and TWR services. The clearance delivery (CLRD) service has not been implemented at the level required.

5.2.10 *HF*: Although required in FASID Tables CNS 2 A and 2B, the HF service is not being operationally used in many States of the Region. It is mainly provided at some States that have oceanic areas in their FIRs.

5.2.11 ATIS: Implemented according to Table CNS 2A, but in an insufficient number. Use is made of conventional audio recorders and analogue VHF transmitters for dissemination.

5.2.12 *CPDLC*:

a) Continental airspace: Not yet implemented; and
b) Oceanic airspace: Service implemented at some oceanic FIRs, for FANS equipped aircraft.

5.2.13 *CLRD*: Implemented in very few airports for terminal area/aerodrome.

5.2.14 D-ATIS: Implemented in two States from the Region.

5.2.15 D-VOLMET: Implemented in only one State of the Region.

Navigation

5.2.16 Radio aids: All conventional radio navigation aid systems (NDB, VOR, DME and ILS) have been implemented and fully installed pursuant to Table CNS 3 (radio navigation aids). Regarding NDBs, a deactivation process is underway, starting with those stations where the NDB is installed next to a VOR/DME.

5.2.17 ABAS is being implemented in most States of the Region for en-route, terminal area and NPA operations.

Surveillance

5.2.18 Radar systems: Conventional surveillance systems (PSR and SSR) have been implemented and installed almost entirely in the SAM Region according to Table CNS 4 A (surveillance system). The surveillance systems specified in this table cover most of the terminal areas of the States in the Region. However, not all the routes in the Region are covered.

5.2.19 Radar data exchange: It only exists in very few States of the Region.

5.2.20 ADS-B and MLAT: No services have been enabled to date.

5.2.21 ADS-C: Service provided by several oceanic FIRs, with FANS-equipped aircraft.

5.3 **Strategy for the implementation of performance objectives**

5.3.1 CNS implementation shall be based on a harmonised strategy for the SAM Region, with action plans and consistent timetables, taking into account operational requirements and the corresponding cost-benefit analyses, comparing the current structure with the improvements to be achieved when the new systems are implemented. Consideration should also be given to analysing the existence of two or more technologies to meet the same operational requirement.

5.3.2 Planning has been based on four global aspects, as shown in **Attachment C**, and as listed below:

a) aeronautical fixed service in the SAM Region (PFF SAM CNS/01);

b) aeronautical mobile service in the SAM Region (PFF SAM CNS/02);
c) navigation systems in the SAM Region (PFF SAM CNS/03); and
d) air surveillance service in the SAM Region (PFF SAM CNS/04).

5.3.3 A cross-cutting issue is the management of ANS personnel competencies of the air navigation system (PFF SAM HR/01). In this sense, States must pay special attention to meet ICAO requirements (see Chapter 10).

Communications

Aeronautical fixed service

5.3.4 AMHS: During this period, it is expected that each one of the AMHS systems installed will be interconnected to its respective AMHS systems.

5.3.5 Communication services for the ATFM: States must make the necessary efforts to implement communication services that effectively support ATFM.

5.3.6 AIDC: The States must make efforts to install automated systems in all their ACCs, with AIDC capability, and use them for the automatic transfer of flight plans between adjacent ACCs.

5.3.7 Improvement of the regional and national ATN network: In order to implement all the new services in a harmonised manner, the current Aeronautical Telecommunication Network (REDDIG II) requires updating. States that have not yet completed or began their national IP network implementation shall do so.

Aeronautical mobile service

5.3.8 VHF: States must ensure coverage of continental VHF communications for lower flight levels when so required by the operations. Likewise, separate VHF channels must be implemented for TWR and APP services in the terminal area.

5.3.9 HF: The HF service must be maintained in keeping with the requirements listed in Table CNS 2B, “HF network designators for CAR/SAM aeronautical stations”.

5.3.10 CPDLC: States that have oceanic areas in their FIRs must make efforts for the provision of CPDLC services in the corresponding ACCs. Likewise, for the continental area, a technical/operational study should has been completed out within the planning period, to permit its later implementation in some States.

5.3.11 DATIS: The States must start providing DATIS services to replace similar conventional services or where they do not exist.

5.3.12 VOLMET/D-VOLMET: In attention to the MET requirement, States should start providing VOLMET services through speech communications systems and data links.

5.3.13 **AEROMAC:** Airports with more congestion shall begin the implementation of aeronautical mobile communications (data links with great capacity) to support fixed and mobile communications related to safety and regular flights in airports surface.

5.3.14 Protection of the radio frequency spectrum: The States must make the necessary efforts to ensure the protection and proper use of the radio frequency spectrum assigned to aviation for radiocommunication services.

Navigation

Navigation systems

5.3.15 NDB: States must continue with the NDB phase-out plan, as defined by GREPECAS/14 (April 2007). It is estimated that, during the period defined in the plan, most NDB will be deactivated.

5.3.16 VOR/DME: During the period defined in the plan, it is felt that, as part of the transition to the GNSS, VOR/DME systems must be maintained in selected TMAs, completing the deactivation of en-route VOR systems.

5.3.17 DME/DME: Taking into account en route PBN and TMA implementation, as well as the use of DME/DME navigation as a back-up to the GNSS system, States should maintain the current DME systems coverage and, if necessary, States should carry out studies permitting the coverage extension of selected airspaces.

5.3.18 ILS: It is foreseen that, within the planning period, ILS systems will remain operative.

5.3.19 GLS: Approaches based on CATI GLS will begin at airports that have an operational demand that warrants them.

5.3.20 Flight trial support systems: The States must consider modernising their in-flight and ground trial elements so as to be prepared for a PBN environment.

5.3.21 Protection of the radio frequency spectrum: The States must make the necessary efforts to ensure protection and proper use of the radio frequency spectrum assigned to aviation for radionavigation services.

Surveillance

Improvements to the air surveillance service

5.3.22 ADS-B and MLAT: ADS-B (ES Mode S receivers) will be implemented on the ground to cover en-route and terminal areas in all States. Strengthening surveillance in the form of SSR radars will continue being used in TMA services en-route, and Mode S in high density TAMs. Most aircraft will have ADS-B surveillance capacity (ES Mode S receivers). MLAT will be implemented in main airports selected to carry out surface aircraft surveillance.

5.3.23 A-SMGCS: It is foreseen that surface movement guidance and control systems A-SMGCS will be implemented at principal airports where previous studies have identified this requirement.

5.3.24 ADS-C: All States responsible of an oceanic FIR shall make operational use of ADS-C surveillance.

5.3.25 Protection of the radio frequency spectrum: The States must make the necessary efforts to ensure protection and proper use of the radio frequency spectrum assigned to aviation for air surveillance services.

5.4 Alignment with ASBU

5.4.1 Of the ASBU Block 0 modules taken under consideration of the SAM Region, the CNS area contributes to PIA 1 modules B0-APTA and B0-SURF, PIA 2 module B0-FICE, PIA 3 modules B0-NOPS, B0-ASUR and B0-SNET and PIA 4 module B0-TBO.

5.4.2 Regarding Block 1 modules considered by the SAM Region, the CNS area contributes to PIA 2 module B1-FICE, PIA 3 modules B1-NOPS and B1-SNET and PIA 4 module B1-TBO.

5.4.3 Following are the CNS PFF indicated in paragraph 5.3.2 contributing with ASBU Block 0 modules indicated in paragraph 5.4.1 and Block 1 modules indicated in paragraph 5.4.2:

a) PFF SAM CNS/01 – *Aeronautical fixed service*, with modules B0-FICE and B0-NOPS, B1-FICE and B1-NOPS;
b) PFF SAM CNS/02 – *Aeronautical mobile service*, with module B0- TBO and B1-TBO;
c) PFF SAM CNS/03 – *Navigation*, with module B0-APTA; and
d) PFF SAM CNS/04 – *Surveillance*, with modules B0-NOPS, B0-SURF, B0-ASUR, B0-SNET and B1-NOPS and B1-SNET.

Chapter 6: Meteorology

6.1 Introduction

6.4.1 The fifth edition of the Global Air Navigation Plan (Doc 9750, GANP) maintains the aviation system block upgrade (ASBU) strategy and proposes that future air navigation technology and procedure improvements are organized and based on a consultative strategic approach that coordinates specific global performance capabilities and the flexible upgrade timelines associated with each component.

6.4.2 Meteorological information is an integral component of the tomorrow's system-wide information management (SWIM) environment, alongside aeronautical information, flight and flow information and other information sources. As meteorological information transitions from today's predominantly gridded, binary, alphanumeric and graphical formats to interoperable, non-proprietary code forms (such as XML/GML) within the SWIM environment using exchange models like the weather exchange model (WXXM), tremendous potential exists to enhance the safety and the efficiency of the global air traffic management (ATM) system through enhanced availability and use of meteorological information. With this in mind, a planning threads promoting usage of integrated meteorological information to enhance operational decision making.

6.2 Meteorological information supporting enhanced operational efficiency and safety

6.2.1 Within Block 0, improved utilization by ATM of products from world area forecast centres, volcanic ash advisory centres and tropical cyclone advisory centres would support dynamic and flexible management of airspace, dynamically optimized flight trajectory planning, improved situational awareness and collaborative decision making. A focus on local arrangements is intended to enhance utilization of aerodrome warnings as well as wind shear warnings and alerts.

6.2.2 Meteorological challenges in routine operations often arise as a result of adverse and rapidly changing meteorological conditions. The proposed dynamic integration of ATM and meteorological (MET) information is expected to provide timely meteorological information to enable real-time identification, increased predictability and deployment of operationally effective ATM solutions to accommodate changing conditions, as well as facilitate tactical avoidance of hazardous meteorological conditions. Increasing use of airborne capabilities to detect and report meteorological parameters, and enhanced cockpit displays of meteorological information to enhance situational awareness, are additional elements of the strategy.

6.2.3 The Block 1 deployment includes initial ATM-MET integration, and actual and forecast meteorological information is compared with pre-characterized meteorological constraints on airspace or aerodrome threshold events using an ATM impact conversion process to identify near term capacity constraints. Total ATM-MET integration is required in order to incorporate meteorological information into the decision-making rationale and to automatically identify, understand and take into account the impact of meteorological conditions. ATM decision makers are increasingly assisted by decision support tools using integrated meteorological information, consisting of automated systems and processes that create ranked mitigation strategies for consideration and execution. It is also recognized that there is a need for space weather information in Block 1 for the sake of safety and efficiency of international air navigation, due to the sustained growth in the number of flights on transpolar routes where space weather, which affects the surface or the atmosphere of the earth (such as solar radiation storms), represents a hazard to communication and navigation systems and, perhaps, a radiation risk to crew members and passengers.

6.2.4 For the implementation of B1-AMET, the establishment of standards for global exchange of MET information in line with other types of information and using a single reference (ICAO-AIRM) shall be encouraged. The enhancement of meteorological information on different aspects related to service quality, such as data accuracy and standardization, when used in interrelated operational decision-making processes, shall also be encouraged.

6.2.5 It is very important to become aware that, for the transition to the implementation of B1-AMET, States will have to invest in software infrastructure that is compatible with AMHS in order to translate OPMET messages—currently in alphanumeric format—to an interoperable format (XML/GML).

6.2.6 The Block 3 stage, far greater reliance is placed on airborne capabilities to provide meteorological awareness and drive tactical decision making including avoidance of hazardous meteorological conditions. Enhanced meteorological information is dynamically available to support the evolution of 4D trajectory operations. The 4D representations of meteorological information that have replaced traditional gridded, binary, alphanumeric and graphic formats provide wide benefits including increased access to meteorologically constrained airspace. ATM decision-making processes make extensive use of decision support tools that dynamically integrate meteorological information and propose mitigation strategies for consideration. Enhanced interpretation and mitigation of hazardous meteorological conditions results in extended pre-flight and flow planning capabilities.

6.2.7 The technology requirements include the progressive establishment of an integrated 4D database capability of global meteorological information (observations and forecasts), as well as the deployment of automated systems to enable:

a) translation of raw meteorological data into predefined ATM constraints on airspace and aerodromes;

b) use of translated data to assess the impact on ATM operations, for traffic flows and individual flights; and

c) decision support tools, for both air navigation service providers (ANSPs) and users, which use ATM impact information to generate proposed mitigation strategies.

6.2.8 In the medium term, the availability of SWIM will enable further integration of meteorological information into both airborne and ground based tactical decision support tools.

6.2.9 The realization of globally interoperable, exchangeable meteorological information, including enhanced ground-to-air, air-to-ground and aircraft-to-aircraft meteorological reporting and exchange capabilities will be a significant undertaking.

6.2.10 The transition to integrated meteorological information will require agreement to, and development of, global standards for meteorological information exchange with an emphasis on the exchange of 4D (latitudinal, longitudinal, vertical and temporal) digitized meteorological information. Agreements are also necessary on what will constitute required meteorological information and graphical presentation in the digital information exchange era, to supersede the traditional gridded, binary, alphanumeric and graphic formats. Standardized meteorological information translation parameters and ATM impact conversion parameters will also require global agreement and development. Ensuring the accurate, reliable and wide availability of meteorological information remains a continuing challenge.

6.2.11 Meteorological information is recognized as a component of, ASBU modules concerning airport capacity, SWIM, flight and flow – information for a collaborative environment (FF-ICE), aeronautical information management (AIM), network operations, airborne separation, remotely-piloted aircraft (RPA), trajectory-based operations (TBO), continuous climb operations/continuous descent operations (CCO/CDO) and the global navigation satellite system (GNSS). Deployments from the meteorological information planning thread will need to take account of these wide interdependencies, therefore, States and users are urged to give due consideration to the potential added benefits which could result from the integration of a number of modules across a number of threads.

6.2.12 In this regard, the ASBU describe the way to apply the concepts defined in the Global Air Traffic Management Operational Concept (Doc 9854) in order to achieve local and regional performance improvements. The final target is to achieve global interoperability. Safety and efficiency require this level of interoperability and harmonization, which should be achieved at a reasonable cost and provide proportional benefits. This module promotes the establishment of standards for global exchange of MET information in line with other types of information and using a single reference (ICAO-AIRM). It also encourages the enhancement of meteorological information in various aspects related to service quality, such as data accuracy and standardization, when used in interrelated operational decision-making processes.

6.3 **Analysis of the current situation (2017)**

6.3.1 SAM States provide an aeronautical meteorological service that has been gradually improving in recent years. However, to ensure the availability accurate, reliable and comprehensive weather information, not all States have the necessary equipment, properly installed and / or maintained. In this respect it is essential that States have automated systems for data verification in accordance with the requirements set out in Annex 3 (thresholds). While quality management systems are in a good implementation process, the process that should have been the basis for Block 0 will need to be adjusted to the new requirements of ISO 9001:2015.

6.3.2 Likewise, the lack of compliance with ICAO and WMO standards and recommendations referred to personnel involved in MET units is a deficiency that should be corrected by the States of the Region.

6.3.3 ICAO, together with the World Meteorological Organization, has made a significant effort to accompany and support the States in the implementation of the MET/QMS, hoping it would bear good results. However, there are still some States that have not yet completed MET/QMS implementation. In order to achieve this goal, it is imperative that top management in the administrations and aeronautical meteorological service providers be committed and in compliance.

6.3.4 Regarding SIGMETs on meteorological phenomena at regional level, there is lack of continuity, homogeneity, and harmonization in FIR surveillance. There have been cases in which the availability of severe en-route weather information for the user has been disrupted, thus affecting safety and flight planning.

6.3.5 Regarding OPMET messages, there has been an improvement in data availability, in addition to a significant reduction of formatting errors. The implementation and use of AMHS templates has significantly improved formatting. The implementation of OPMET messages in XML/GML format is still in an early stage, and initial data exchange testing in this format is just starting.

6.3.6 An element that cuts across all these areas is personnel competency management (PFF SAM/HR 01), in accordance with the requirements of the World Meteorological Organization (WMM).

6.4 **Alignment with ASBU**

6.4.1 Of the ASBU Block 0 modules taken under consideration of the SAM Region, the MET area contributes to PIA 1 modules B0-ACDM and B0-DATM, and PIA 3 module B0-AMET. Within Block 1, the MET area contributes to modules B1-ACDM, B1-SURF, B1-DATM, B1-AMET, and B1-SWIM.

6.4.2 Following are the MET PFF indicated in paragraph 6.3.2 contributing with ASBU Block 0 modules indicated in paragraph 5.4.1:

a) SAM MET/01 PFF - *Implementation of the MET information quality management system*, with module B0-AMET and B1-AMET;
b) SAM MET/02 PFF - *Improvements in MET facilities*, with modules B0-ACDM, B1-ACDM, and B0-SURF;
c) SAM MET/03 PFF - *Improvements in the implementation of the international airways volcano watch (IAVW), in the surveillance of the accidental release of radioactive material, and in the issuance of SIGMET(s)*, with modules B0-ACDM, B0-AMET, B1-ACDM, and B1-AMET; and
d) SAM/MET 04 PFF - *Improvements in OPMET data exchange; follow-up of the evolution of WAFS; and implementation of MET and AIM data interoperability*, with modules B0-DATM, B0-ACDM, B0-AMET, B1-DATM, B1-ACDM, B1-AMET, and B1-SWIM.

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7. Chapter 7: Search and Rescue (SAR) Services

7.1 Introduction

7.1.1 The mission of SAR services is to find people in danger, help them and transport them to a safe place to receive proper care. The key for organising and having successful SAR services lies in top management, whose mission is to perform managerial tasks that will result in improved SAR operations, that is, the availability of an organised, trained and available SAR system capable of effectively helping people in danger.

7.1.2 The availability of SAR resources is often a critical initial capacity for responding and providing assistance to safe lives during the first stages of a disaster caused by natural causes or by the aviation activity *per se*. Accordingly, SAR services are sometimes part of an emergency management system.

7.1.3 SAR activities are an excellent means to encourage cooperation among States and organisations at the local, national and international level, since they involve missions that rarely create conflicting situations. Cooperation in this field may also lead to cooperation in other spheres. Such activities protect goods that may have a high value, which contributes to justify the existence of SAR services.

7.1.4 Close coordination between civil and military organisations is essential. National SAR coordination committees are a means for the establishment of such cooperation. The legislation should provide for the use of military and other public resources in support of search and rescue.

7.2 Analysis of the current situation (2017)

SAR requirements

7.2.1 The basic requirements for the establishment of an effective SAR system are:

a) The establishment of a regional framework concerning the need for availability of the SAR services that have jurisdiction over the different Search and Rescue Regions of the SAM Region;
b) Measures for using the available resources and procuring others as necessary;
c) The designation of the geographical areas of responsibility of the associated RCCs and RSCs;
d) Staffing, training and other personnel resources to manage and maintain the system in operation;
e) The appropriate and available means of communication; and
f) Agreements, plans, and related documents aimed at meeting the objectives and defining work relationships.

Note.- Paragraph 7.4 is referred to the operational concept of the global system GADSS, which is in development and which incorporate new SARPS for ICAO documents, including the Annex 12.

7.2.2 The periodic assessment of SAR requirements at regional level is very important for planning SAR resources and personnel in a coordinated manner, taking into account the respective SAR regions of the SAM States.

7.2.3 These updated and regionally harmonised requirements include, *inter alia*, the timely establishment of agreements between the different SAR services of SAM States for the provision of a regional search and rescue service, in keeping with the characteristics and needs of the aircraft fleet operating in the Region**.**

7.3 Implementation strategy of performance objectives

Risk management in practice

7.3.1 The use of risk management techniques gives some order to the uncertainty surrounding SAR organisations. It is an extremely useful tool for determining future work priorities and improving the capacity to meet the objective of the organisation, which is to find people in distress and take them to a safe location.

7.3.2 Risk analysis is a useful tool for those responsible for SAR organisations, since it can help in the assignment of resources that have priority for the organisation, and its results may be used to raise awareness amongst independent parties about the importance of search and rescue. SAR organisations should conduct a risk analysis and use the information thus obtained to increase their possibilities of saving lives. Planning has been based mainly on cooperation and Coordination of SAR services at a Regional level (SAM/SAR 01 PFF).

Quality management

7.3.3 Initiatives aimed at improving the quality of SAR services will substantially improve the results and reduce costs, mainly by eliminating the causes of unnecessary expenditures. These are important objectives for any administration, regardless of the volume of resources available.

7.3.4 The top management of a SAR system that assigns importance to quality tends to conduct more activities, make fewer mistakes, enjoy good reputation, and attract the resources necessary for the growth and better performance of the system.

7.3.5 In contrast, SAR organisations that do not pay attention to quality are subject to mistakes that may result in a reduced number of lives saved, the adoption of wrong or late operational decisions that create confusion, accidents and equipment failures, a deficient or inadequate use of resources, and unnecessary expenditure of economic resources.

7.3.6 Given the increasing air traffic activity and the use of large aircraft with a large passenger capacity, and its relationship with the responsibility of SAM States to protect human lives, it is important for SAR top management to develop a quality assurance programme for search and rescue (SAR) services, to be used as a quality management tool to ensure compliance with the objective of the national SAR plan of each SAM State.

7.3.7 This will also contribute to the provision of effective SAR services within the respective areas of SAR responsibility of each of these States, so as to foresee and particularly meet the many needs that would result from an accident with a large aircraft.

Competence of the search and rescue personnel

Training

7.3.8 Training is essential for operations and safety. The purpose of the SAR system is to save those who are in danger, and also to use training to reduce risks for the personnel and their means, which are very valuable. The training of personnel to conduct sound risk assessments will help ensure that the professionals who have received such training and the valuable means continue to be available for future operations.

Qualification

7.3.9 The purpose of the qualification is to validate the capacity of individuals to carry out certain tasks. They must demonstrate that they have a minimum level of knowledge and skills. This validation may be conducted in a specific position, through maintenance activities by a given team, or as a member of a group within a unit.

7.3.10 Qualification methods demonstrate the capacity of an individual to carry out concrete tasks. A qualification programme will cover the essential knowledge required to perform the functions in a given position and will test individuals in the use of the systems that they will have to manage or maintain.

Certification

7.3.11 The term certification is used in ICAO and other organisations within the context of authorising the personnel or the means to carry out certain functions. The term is also used to officially leave on record that an individual is duly trained and qualified to perform the tasks entrusted.

7.3.12 Thus, the objective of the certification is to authorise an individual to serve in a given capacity. Certificates should be issued to applicants that meet the conditions required for the service, as well as age, physical fitness, training, qualification, exam and maturity requirements. The certification must be issued in writing before the individual assumes his/her responsibilities in the surveillance service.

7.3.13 Training can only provide knowledge and skills at a basic level. Qualification and certification procedures help to demonstrate that sufficient experience, maturity and good judgment have been achieved. During the qualification process, the individual, upon showing his/her skill, should demonstrate that he/she is physically and mentally fit to be part of a group. Thus, the certification is the official acknowledgment by the organisation that it trusts the individual in the use of such skill.

7.3.14 The specific certification requirements vary according to the type of work location (ship, aircraft or RCC). The applicant to the title or certification may be assigned to a SAR specialist, who will observe how he/she carries out each of the tasks, and who will attest to his/her competence. A detailed knowledge of the geographical area of operation shall also be demonstrated. Certain tasks may require a periodic certification renewal.

7.3.15 Those responsible for managing the SAR service in general perform administrative functions; consequently, it is advisable that they participate in training courses on the following topics:

a) Planning;
b) Organisation;
c) Personnel;
d) Budget; and
e) Performance assessment

7.3.16 The use of means and personnel in search and rescue operations under severe weather or in rough terrain will require a special ability that is not generally learned through normal courses. Consequently, consideration should be given to the conduction of specialised courses for personnel training.

7.3.17 The SAM SAR/01 PFF reflects the short and medium term implementation strategy.

7.4 **GADSS concept development**

7.4.1 As a result of flights MH370 and AF447 accidents, aeronautical community identified a number of limitations in the current alert and aeronautical search and rescue system, which barred to carry out effectively the tasks of the SAR service and the recovery of aircraft black boxes.

7.4.2 ICAO is developing the operational concept of the Global Aeronautical distress and safety system - GADSS, which is essentially a system of systems. The GADSS functions are based on efficient aircraft tracking, primarily in oceanic areas, autonomous tracking of hazards and the post - location of the flight and recovery of wreckages. Also, is supported by a concept of information management and procedures that feed the alert stages and, later, the investigation of the accident/incident.

7.4.3 In addition, ICAO is reviewing the SARPS of Annexes 2, 6, 8, 10, 11, 12 and 13, as well as other documents and related PANS, in view of the implementation of the provisions of Annex 6 to the period 2018-2021.

7.4.4 You need to plan and promote, in the SAR services of the Region, the implementation of the operational concept GADSS currently in development, expected that, from 2018, ICAO will issue the corresponding technical guides.

7.5 **Alignment with ASBU**

7.5.1 SAR planning aspects are not taken under consideration in ASBU.

Chapter 8: Aeronautical Information Services / Aeronautical Information Management

8.1 Introduction

8.1.1 SAM States must consider the operational requirements of this Plan when implementing aeronautical information services.

8.1.2 In view of the requirements derived from the implementation of the ATM Operational Concept and the AIS-AIM Transition Roadmap, SAM States shall consider planning for improvements to, and the strengthening of, Aeronautical Information Services, taking into account the initiatives of the Global Air Navigation Plan, as well as new provisions and requirements for short and medium-term implementation, and the related components of the aforementioned concept.

8.2 Analysis of the current situation (2017)

8.2.1 The AIS system, currently available in the SAM Region presents improvement opportunities in some States on issues that involve aeronautical information management, *inter alia:*

a) information with assurance of quality, integrity, and timely distribution of AIS products;
b) data-oriented activities, and in the provision of electronic information with quality assurance, in real time and with the capability of combining statistical and dynamic information in the same presentation;
c) use of standard models for the creation of integrated aeronautical, terrain and obstacle information data bases;
d) use of English language in AIS publications;
e) topographic and land relief information in instrument approach charts;
f) implementation of quality control systems;
g) implementation of automated systems;
h) provision of pre-flight information bulletin (PIB);
i) inclusion of area minimum altitudes (AMA) in route navigation charts;
j) use of English in plain-language in NOTAMs;
k) provision of post-flight information services;
l) training for AIS personnel in the new requirements of the Annexes and Documents related to AIM and ATM operational concept;
m) provision of aerodrome obstacle charts;
n) provision of 1:500,000 aeronautical charts and 1:1,000,000 global chart;
o) minor difficulties in the use of the AIRAC system; and
p) coordination between AIS/MET units for consistency between the NOTAM/ASHTAM and the volcanic ash SIGMET and for updating MET information in the AIP.

8.3 Strategy for the implementation of performance objectives

8.3.1 Planning has been based on two main axes, which are shown in Attachment C, and listed below:

a) Improving the quality, integrity and availability of aeronautical information (SAM AIM/01 PFF); and
b) Transition to the provision of electronic aeronautical information (SAM AIM/02 PFF).

Improving the quality, integrity and availability of aeronautical information

8.3.2 Full compliance with SARPs on quality assurance, integrity and timely availability of aeronautical information is a prerequisite for the transition to AIM.

8.3.3 In this sense, an action plan must be drafted and carried out to resolve current deficiencies as a prerequisite for the migration to AIM.

Aeronautical information regulation and control (AIRAC)

8.3.4 According to the AIS-AIM Transition Roadmap, the States must comply with the aeronautical information regulation and control (AIRAC) process, since the quality of Aeronautical Information Services depends on the efficacy of the mechanisms for distribution, synchronisation and timing of said information.

Quality management system (QMS)

8.3.5 Quality management systems covering all the functions of aeronautical information services will be implemented and maintained.

8.3.6 The use of data sets on airborne equipment (FMS), automated systems for ATC, ground proximity warning systems (GPWS) and other systems related to an improved situational awareness make it absolutely necessary to implement processes to ensure the quality and integrity of the aforementioned data. These processes should be organised in a quality management system (QMS) applicable to all activities performed by the AIS.

8.3.7 The quality management system should be consistent with the ISO 9000 series and be certified by an accredited certification body. This certification is sufficient measure of compliance.

Monitoring of integrity in the data supply chain

8.3.8 Quality management systems should evolve until they are applied to all the data supply chain, starting at their origin.

8.3.9 In order to guarantee raw data integrity, service level agreements (SLA) must be established with the originators.

8.3.10 These SLAs will serve as a regulatory framework for the provision of data by the originators, and will contain details, *inter alia*, on: services to be provided, related indicators, acceptable and unacceptable levels of service, commitments and responsibilities of the parties, action to be taken in face of given events or circumstances, agreed data transmission formats, etc.

8.3.11 The SLAs are also a tool for measuring service performance, through the use of key performance indicators (KPIs).

Use of WGS-84

8.3.12 GNSS implementation requires the use of a common geodetic reference system. The SARPs determine that this common reference system must be WGS-84.

8.3.13 Consequently, the objective should be to express all coordinates in the WGS-84 reference system in an effective and verifiable manner. This requirement will also apply to future data products.

8.3.14 SAM States have completely implemented WGS-84.

Transition to the provision of electronic aeronautical information

8.3.15 The transition to aeronautical information management (AIM) implies--as already stated--a data-oriented product. This transition to a digital format must be based on standard models and products that permit the exchange at a global level.

8.3.16 Based on this standardisation, the implementation of products and models will be done in a coordinated manner, at a global level, and in keeping with SARP updates resulting from new specifications.

Integrated aeronautical information database

8.3.17 For the design of the aeronautical information database, it is necessary to establish a conceptual model that defines the semantics of aeronautical information in terms of common data structures and takes into consideration the new requirements derived from the ATM Operational Concept.

8.3.18 The implementation of a conceptual model fosters interoperability and should serve as a reference in the design of the specified database.

8.3.19 Use will be made of an integrated aeronautical information database that integrates the digital aeronautical data of a State or Region and will serve to generate AIM products or services.

8.3.20 Use of database engines with spatial characteristics (geo-database) is highly advisable, since it enables data processing in geographical information systems (GIS).

8.3.21 Although it is not necessary for the design of these databases to be identical in all States or Regions, their modelling according to a common conceptual model would facilitate the subsequent exchange of data.

8.3.22 Database management may be carried out by a State or through regional initiatives.

Aeronautical Information Exchange Model (AIXM)

8.3.23 An exchange model is essential for interoperability, since it establishes aeronautical data syntax for names and characteristics.

8.3.24 They have been established based on open standards (XML, GML), facilitating their incorporation into pre-existing or future systems.

8.3.25 It shall contemplate, for a medium term, the exchange of dynamic information (NOTAM), enabling the extension of the traditional NOTAM format to give way to the digital NOTAM digital.

Terrain and obstacle database (e-TOD)

8.3.26 Ground proximity warning systems (GPWS), like the GIS-based procedure design and optimisation tools, require the electronic availability of high-quality terrain and obstacle data products.

8.3.27 To respond to this need, terrain and obstacle databases will be established according to common definitions that will be incorporated into the SARPs.

Electronic aeronautical information publication (e-AIP)

8.3.28 The eAIP must be considered as the evolution from the traditional paper-based AIP to the digital medium. States shall ensure to present the AIP, in the electronic environment, in two formats: one digital format, suited for printing and the other will be accessible only through web browsers.

8.3.29 The eAIP must maintain a standard format, just like its predecessor, facilitating the exchange and preventing the proliferation of different presentations.

Electronic mapping and aerodrome mapping

8.3.30 Taking into account the technology available on board and in order to improve situational awareness, new digital mapping products suited to these devices will be established.

8.3.31 The use of the exchange model will allow these products to incorporate dynamic information in real time.

AIS-MET interoperability

8.3.32 The Aeronautical Information Services and Aeronautical Meteorology should implement the information exchange standard models. Once an information exchange model has been implemented, it will be necessary to implement processes that promote AIM-MET interoperability and thus permit information integration.

8.4 **Alignment with ASBU**

8.4.1 Of the ASBU Block 0 modules taken under consideration of the SAM Region, the AIM area contributes to PIA 2 module B0-DATM and module B0-AMET. From ASBU Block 1 modules, modules B1-DATM, B1-AMET and B1-SWIM are considered.

8.4.2 Following are the AIM PFF indicated in paragraph 8.3.1 that are reflected with the following ASBU Block 0 modules indicated in paragraph 8.4.1:

a) SAM AIM/01 PFF - *Improving the quality, integrity and availability of aeronautical information*) with modules B0-DATM and B1-DATM; and
b) SAM AIM/02 PFF - *Transition to the provision of electronic aeronautical information*) with modules B0-DATM, B1-DATM, B0-AMET, B1-AMET and B1-SWIM.

9. Chapter 9: Aerodromes and Ground Aids / Aerodrome Operational Planning (AGA/AOP)

9.1 Introduction

9.1.1 SAM States must take into account the operational requirements of this Plan in their aerodrome planning, including their ground aids, infrastructure, procedures and operational systems.

9.1.2 In view of the new requirements derived from the implementation of the ATM Operational Concept, SAM States shall consider the planning of improvements and strengthening of aerodrome services, pointing out that the ATM community includes as members the aerodromes, aerodromes operators and other parties contributing to the supply and operation of the physical infrastructure and surface processes necessary for take-offs, landings and aircrafts on-ground services, taking into account the Global Air Navigation Plan (GANP) initiatives as well as new provisions and requirements that require implementation in the short and medium term, and the related components of the cited concept.

9.2 Analysis of the current situation (2017)

Gaps on SAM Region aerodromes for the implementation of operational improvements

9.2.1 During the analysis of the current situation, it has been identified the following gaps in relation to aerodrome services:

a) Lack of adequate physical infrastructure needed to fit the airport operations growth, especially in connection centres (hubs) and high density traffic airports, due to the lack of adequate planning of the airport facilities;
b) Low situational awareness on the ground airport operations processes due to the lack of real time strategic and tactic information sharing agreements between ATM, aerodrome operators and airlines, resulting in a poor response to changes on the operational requirements of users, especially in adverse conditions;
c) Insufficient application of aerodrome certification and continuous safety oversight requirements, in hand with safety management systems at the aerodrome operators;
d) Insufficient trained and competent staff in safety oversight at both regulators and operators;
e) Lack of implementation of airport capacity calculations that includes aerodrome elements (taxiways, aprons, etc.) and its sharing with ATM;
f) Lack of collaborative decision making procedures, based on precise information, shared at the right time between the right partners at the operation;
g) Difficulty to ensure and provide with the required quality, aeronautical and safety data;
h) Shortage of information regarding terrain characteristics and sites that may constitute an obstacle to air navigation.

9.3 Strategy for the implementation of performance objectives

9.3.1 The implementation of operational improvements at aerodromes should be based on an harmonized strategy for the SAM Region with coherent action plans and schedules, taking into account operational requirements and corresponding cost-benefit analysis, comparing current situation and the improvement achieved with the implementation of these new systems.

9.3.2 As a result of the assessment of factors that directly affect aerodrome capacity in response to the increase in the flow of operations within the framework of safety management, strategies for achieving AGA/AOP objectives are identified, as summarised in three Performance Framework Formats (PFFs).

9.3.3 It's important to highlight that in comparison to the previous version of the plan (v1.4, 2013), the PFF review has resulted in important changes. PFF SAM/AGA03 "Safe aerodrome operations that to not meet ICAO SARPs" was integrated to PFF SAM/AGA02 due to its direct relation to the aerodrome certification process; PFF SAM/AGA05 "Runway Safety" was also integrated to PFF SAM/AGA02 and PFF SAM/AGA04 was renamed to "Provision of physical capacity and operational improvements to aerodrome" in order to make more emphasis on the performance objective.

9.3.4 Planning has been based on main axes, which are shown in Attachment D, as listed below:

a) Quality assurance and availability of aeronautical data (PFF SAM AGA/01);
b) Aerodrome certification (PFF SAM AGA/02);
c) Provision of physical capacity and operational improvements to aerodrome (PFF SAM AGA/03).

9.3.5 It's important to highlight that the different areas (CNS, AIS, MET, AGA/AOP, SAR) that are developed on this Implementation Plan support ATM development and, at the same time, constitute an integrated system. In particular, this Implementation Plan has some aspects that States should consider in a special way, in which there are:

a) Development of Human Resources and Competence Management (see Chapter 10); and
b) Safety Management (see Chapter 11).

Quality assurance and availability of aeronautical data

9.3.6 To achieve more efficient operations at aerodromes and reduce the risk of air accidents, it is necessary to ensure the quality and availability of aeronautical data by standardizing procedures and protocols of aeronautical data update, implementation and maintenance verification of the quality management systems covering all functions of aeronautical information services.

9.3.7 The tasks required to attain this performance objective includes the establishment of mechanisms, such as letter of agreements and protocols with AIM, in order to ensure the quality of aerodrome information, and also to update aerodrome obstacle data in the WGS-84 system through e-TOD.

9.3.8 Other task of special importance for the implementation of PBN is the adoption of systems by the States to ensure the control of emplacements near the aerodromes and the permanent monitoring to prevent irregular constructions and installations that affect negatively air navigation.

Aerodrome certification

9.3.9 SAM Region States should make all the possible efforts to ensure that their international aerodromes are certified under the national applicable regulation, adjusted to ICAO's standards and recommended practices (SARPS) and harmonized to the Latin American Regulations (LAR) developed by the SRVSOP.

9.3.10 Likewise, these processes should ensure that in case that the aerodrome can't comply completely with all SARPS due to geographical or physical problems, that the discrepancies or deficiencies can be solved by the imposition of conditions that limit, control or compensate, thru exceptions, based on a safety assessment or aeronautical study when corresponding.

9.3.11 In cases where the State cannot overcome in the short term the difficulties for the certification of airports, it is necessary to establish multinational teams of experts of the region under the coordination of the SRVSOP that will carry out evaluations using the regulations harmonized with the LARs and guidance material from the Regional System. Nevertheless, for the State to benefit with the provision of this service, their national regulation should be harmonized with SRVSOP's LAR AGA set.

9.3.12 The strategy to achieve this performance objective is based on stimulating States to the harmonization of their regulations and procedures with the LAR, which are compatible with ICAO's SARPS and Procedures for Air Navigation (PANS) Aerodromes, so that those States without a complete mix of specialists could be supported by LAR regional inspectors to push aerodrome initial certification and continuous oversight.

Provision of physical capacity and operational improvements to aerodrome

9.3.13 The SAM Region accounts for 8 of the 10 busiest Latin-American airports, and most of these airports continue to experience year by year growth over the world average. The increase in operations is affected in an important way due to the lack of available infrastructure and lack of collaborative processes that may support to increase the situational awareness, especially on peak hours, which inevitably generate delays and level of service reduction, thus affecting all the flight process.

9.3.14 In term of Air Traffic Flow Management ATFM, conceptual changes of the aerodrome physical and operational characteristics should be introduced, taking into account ATFM in the strategic and tactical phase, airport operators should be conscious about airport capacity and its impact in the ATFM.

9.3.15 Some issues that should be considered in the structure are:

a) the new airport infrastructure must be delivered on time to satisfy demand;
b) the design should contemplate the reduction of runway occupancy time;
c) safe manoeuvring under every meteorological conditions without capacity decrease;
d) precise guide of surface movements to and from a runway under every condition;
e) position should be known (under an adequate level of precision) and the intention of all vehicles and aircrafts that carry out operations in the movement area, and these data should be available to the ATM community members; and
f) collaborative processes to improve situational awareness to all operational partners

involved on ground operations.

9.3.16 The State should ensure that the aerodrome operator delivers the needed infrastructure on time, included among other elements, visual aids, taxiways, runways and their rapid exits, as well as a precise guide of surface movements to improve safety and elevate to maximum the capacity of the aerodrome under every meteorological condition, based on an adequate cost-benefit analysis.

9.3.17 The capacity obtained through the aforementioned strategies relates to the installed infrastructure and its utilisation, understood as capacity with respect to the required demand. Accordingly, aerodrome capacity must be assessed before saturation under current and expected traffic conditions. Therefore, it is very important for the Region to identify airports that are close to this saturation condition in order to propose the development of manuals that contemplate, as a first objective, capacity improvements in runways, turning apron, taxiways and apron, based on the existing infrastructure and, as a second objective, the implementation of new infrastructure.

9.3.18 Accordingly, it is necessary to assess the aerodromes of the Region that are close to the point of saturation, and the development of the movement area capacity optimisation procedures based on collaborative schemes and, as second measure, it is necessary to implement competences in the States related to the planning of aerodrome new infrastructure in harmony with the environment.

9.4 **Alignment with ASBU**

9.4.1 From ASBU Block 0 modules taken under consideration of the SAM Region, the AGA area contributes to PIA 1 modules B0-RSEQ, B0-SURF and B0-ACDM and PIA 2 module B0-DATM.

9.4.2 Following are the AGA PFF indicated in paragraph 9.3.3 contributing with ASBU Block 0 modules indicated in paragraph 9.4.1:

a) PFF SAM/AGA01 - *Quality assurance and availability of aeronautical data*, related to modules B0 ACDM and B0 DATM.
b) PFF SAM/AGA 02 - *Aerodrome Certification*, related to modules B0 ACDM, B0 SURF and B0 DATM.
c) PFF SAM/AGA 03 - *Provision of physical capacity and operational improvements to aerodrome*, related to modules B0 ACDM, B0 SURF, B0 RSEQ, B0 DATM, and B1 SWIM.

10. Chapter 10: Development of Human Resources and Competence Management

10.1 Introduction

10.1.1 The new requirements for the implementation of the ATM Operational Concept and the Global Air Navigation Plan should be taken under consideration by SAM States to plan the Development of Human Resources and Competence Management, taking into account ASBU Block 0 and Block 1 modules.

10.1.2 The Air Navigation system allows for the collaborative integration of human resources, information, technology, facilities and services with the support of communications, navigation and surveillance. The provision of ATM services in the SAM Region will depend on the performance of individuals and the development of new competencies, making possible their interrelationship with the operational and technical environment. Each system is developed, maintained and operated by human beings that continue to be the most flexible and critical element to manage threats and errors in ATM operations. A seamless navigation scope will be required in the future. An international team prepared to perform its functions in that new operational scenario. To achieve this, the members of this team must receive a uniform and high quality level of training.

10.1.3 The role of the individual and his contribution to the Air Navigation System will mutate according to the changes presented in the Operational Concepts and the structure of the system. The proper provision of air navigation services will depend on the management of the competencies of technical and operational personnel, as well as on their availability in sufficient numbers to cover the different services. It will also demand a redefinition of the profile of the personnel required for the system.

10.1.4 The Civil Aviation Training Centres (CATCs) and instructors of the SAM Region have accompanied the evolution of the concepts and technologies incorporated into the air navigation systems, through the establishment of refined training methodologies and tools in order to provide updated training to air navigation personnel during the last five years. However, the evolution of technology and its use in aviation requires a constant review of teaching methodologies, as well as of the new concepts, which represents a constant challenge for CATCs.

10.1.5 Accompanying this constant evolution within the ATM system will make planning rise to the level of a critical element and its efficient development will have a big impact on all aeronautical personnel, including the managerial levels. That is why competence management is one of the key issues for a successful transition.

10.1.6 As a result of this constant evolution of the components of the ATM Operational Concept, new aeronautical disciplines have emerged. From the point of view of human resource planning, it will be necessary to redistribute, reconvert and train the personnel. The need has been clearly identified for a continuous integration of human resources into safety management, the design and implementation of new ATM systems, as well as for operational training, and for the introduction of new professional profiles for working in the digital environment.

10.1.7 The planning of personnel competence management for continuous implementation of the ATM Operational Concept components shall take into account the specific requirements of all the implementation activity of the different areas that make up this document. The development and implementation of the expertise of human resources, the guidelines, standards, methods and the tools for human error management, the friendly use of the new technology and operational training have been, and shall continue to be, the basis for ATM success in the Region.

10.1.8 The planning of training in the SAM Region shall be done in standardised manner and coordinated with CATCs where the required courses would be given.

10.1.9 ICAO has adopted a training policy that includes a process to support training organisations and courses. This training policy covers all safety and security aspects and supplements the work of the special team on the new generation of aviation professionals (NGAP). The civil aviation training policy of ICAO permits the implementation of an integral framework that ensures that all training provided by ICAO or third parties is subject to assessment to make sure it complies with the stringent standards concerning the design and development of training courses (EB2010/40).

10.2 **Analysis of the current situation (2017)**

10.2.1 The CAR/SAM e-ANP, within its planning parameters, takes into account human resources and their training. The high level of automation and interdependence of the current system gives rise to several problems related to human resources and human factors and the interaction with their environment and other persons. The experience gained in this are indicates that the human element should be considered as the critical part of any plan for the implementation of new technologies. Achievement of the ATM operational concept will be dependent on the competence of the human resources.

10.2.2 The challenges posed by the development of human resources will continue to multiply as we get closer to the implementation of ASBU Block 1, which seeks to consolidate the ATM Operational Concept. Since the existing and emerging air navigation technologies will work in parallel for some time, civil aviation personnel will have to develop new skills while maintaining those necessary for the operation and maintenance of the existing systems, using a collaborative approach for civil aviation training.

10.2.3 The analysis of the current situation reveals existing weaknesses and emerging threats.

10.2.4 Weaknesses include, *inter alia*:

a) Lack of sufficient personnel;
b) Lack of and duly trained personnel;
c) Legal and budgetary limitations of the States;
d) High cost of training (initial, specialised, recurrent, remedial);
e) Personnel that do not comply with English language proficiency requirements;
f) Personnel with inadequate knowledge to manage operate and maintain the systems;
g) Replication of courses at regional institutes;
h) Absence of training centre assessment to meet the requirements set forth in EB/2010/40;
i) Migration of professionals due to lack of financial incentives;
j) No advantage is taken of the knowledge acquired through training and experience;
k) Lack of motivation for personal initiatives; and
l) Unsuitable mindset.

10.2.5 Emerging threats include *inter alia*,

a) New technologies;
b) Increased and complex traffic volume;
c) Change of mindset to embrace a collaborative approach; and
d) Lack of communication among the various disciplines and the whole of the aeronautical community.

10.2.6 Currently, the South American Region has a regional mechanism made up by the Directors of Civil Aviation Training Centres, which meets on an annual basis. These events are aimed at analysing human resource planning and training, cooperation amongst training centres, the creation of introductory courses to the new systems, the need to professionalise training centres in order to face the new demands of the new systems, promote the TRAINAIR programme through the incorporation of new centres into the programme, and the development of courses under this methodology. This mechanism should reflect the new requirements, and establish a programme in keeping with current requirements.

10.2.7 In order to obtain a holistic view, the CATCs should incorporate training in the areas of aeronautical meteorology, aeronautical information management, safety, and the environment.

10.3 **Strategies for the implementation of performance objectives**

10.3.1 All the areas involved in ATM have participated in the planning of the development of human resources and training requirements, including operations and airworthiness personnel of the aeronautical authority of each State. The starting point was the absence of a full integration and the need to become aware of the role of each individual within the ATM Operational Concept, taking into account the guidelines of Document 9750 – Global Air Navigation Plan, the Global ATM Operational Concept (Doc. 9854) and other related ICAO documents.

10.3.2 In a first phase, the starting point was made known by performing an analysis of the situation, to later develop a roadmap that included concrete activities to face the challenges of the new concepts, with duly trained and updated personnel.

10.3.3 During the last five years, the air navigation system has been designed to reduce potential errors, optimizing their detection and mitigation through the application of a fair culture that included a voluntary incident reporting system enabling organisational learning.

10.3.4 ICAO programmes concerning the training of the new generation of aviation professionals (NGAP) must continue being taken into account, using the results of this panel for planning the courses.

10.3.5 The establishment of annual CATC meetings has facilitated international cooperation for the development of training programmes and material in the SAM Region. In order to build this cooperation, a strategy was applied that involved the early identification of training needs and priorities of Air Navigation Systems personnel, and coordination and planning of training for Air Navigation Systems personnel at regional level. It is important to continue applying this methodology to consolidate the results of personnel competence management, and use them to ensure the training of staff with appropriate profiles to facilitate the implementation of Block 1 requirements.

10.3.6 The civil aviation training centres, based on a specific profile, have trained their instructors in the ATM Operational Concept and the supporting systems for its implementation, such as

ASBU. However, it is necessary to continue strengthening their knowledge on the basis of Block 1 requirements.

10.3.7 When planning specialized training for Block 1, provisions should be made for inclusion of basic training in other areas, so that there will be acknowledgement of the work carried out in other units, and awareness of the impact of the task in the consideration of the global ATM. The strategy applied for personnel competence management in Block 0 shall be maintained, but introducing the competencies required for understanding the new concepts and requirements for implementation of Block 1. The planning should be kept in three stages, as follows:

a) Recurrent and consolidation training: This stage will reinforce knowledge on ATM system concepts, the new communications, navigation and surveillance systems, the new aeronautical information vision, the meteorology system, safety, as well as the environment, which was introduced by Block 0 to reinforce knowledge;
b) Training for those who plan and implement: Training is required at the top management level in order to provide decision makers the necessary information on the new requirements of Block 1. This type of training is required for the ATM systems implementation planners; and
c) Block 1 task-specific training: The third category is that required to allow for ongoing system management, operation and maintenance, in order to consolidate the systems under Block 0, and for continuous implementation of the requirements and services under Block 1. This category accounts for most of the training needs and is the most difficult to develop and implement.

10.3.8 Planning has been based on a main axis, which is shown in **Attachment D**, and listed below:

a) Planning training to develop air navigation systems personnel skills (SAM HR/01 PFF).

10.3.9 CATCs should continue actively accompanying the planning and development of update and training courses on the ATM Operational Concept to comply with the roadmap outlined as per the ASBU methodology recommended by ICAO and the States.

10.4 **Alignment with ASBU**

10.4.1 The development of human resources and competency management is an essential element for the implementation of all the ASBU modules taken under consideration (see Chapter 3). Therefore, SAM HR/01 PFF is related with the 15 Block 0 and 10 Block 1 modules selected for the SAM Region.

11. Chapter 11: Safety Management

11.1 Introduction

The Global Aviation Safety Plan

11.1.1 The Global Aviation Safety Plan (GASP) (Doc. 10004) establishes a strategy supporting the prioritization and continuous improvement of civil aviation air navigation safety. The purpose of GASP is to continuously reduce the global accident rate through a structured and progressive approach which comprises short, medium and long term objectives, that adjusts to the ICAO requirements for the application of the States' State Safety Programmes (SSP), as well as the providers' Safety Management Systems (SMS).

11.1.2 The regional aviation safety groups (RASG) and the regional safety oversight organizations (RSOO) should actively participate in the coordination and, as possible, in the harmonization of all activities undertaken to solve regional aviation safety problems.

11.1.3 GASP continues prioritizing global action within the three aviation safety areas: runway safety reinforcement, reduction of the controlled flight into terrain accidents, and reduction of the loss of control in-flight accidents. Initiatives in these areas contribute in the decrease of world-wide accidents.

South American Region Safety Plan (SAMSP)

11.1.4 To achieve GASP objectives, the South American Region Safety Plan (SAMSP) is being developed, which encompasses the SAM Region Flight Information Regions (FIR) and takes into consideration safety management implementation in accordance with the GASP objectives established for 2022, 2025, 2028 and 2030.

11.1.5 In addition, the Plan indicates the role of the organizations involved in air navigation safety improvement, establishes regional objectives and, also, the strategy to achieve these objectives through the appropriate road map.

Relationship with the Regional Aviation Safety Groups

11.1.6 The Pan-American States created the Regional Aviation Safety Group — Pan-America (RASG-PA) in 2008 in response to Resolution A 36-7. This Group was established as a focal point to ensure harmonisation and coordination of safety efforts aimed at reducing aviation risks in the North American, Central American and Caribbean (NACC) and South American (SAM) Regions, and the promotion, by all the stakeholders, of the implementation of the resulting safety initiatives.

11.1.7 Regionally, RASG-PA plays a strategic role for the implementation of air navigation improvements. In this sense, RASG-PA will be able to provide information on air navigation safety, so as to reinforce regional plans and provide implementation priorities.

Relationship with the Regional Safety Oversight Cooperation System (SRVSOP)

11.1.8 SRVSOP is a regional safety oversight organization (RSOO) established in 1998 through the signature of a memorandum of understanding between ICAO and the Latin American Civil Aviation Commission (LACAC), which started operations in 2002. One of SRVSOP's main activities is the regional development and harmonization of the Latin American Regulations (LAR) and its supporting documentation.

11.1.9 SRVSOP plays a tactical role at regional level and is the organization the will provide support in the implementation of the new air navigation capacities as regards any activities involving new standards, procedures and training for approvals or authorizations from civil aviation authorities' oversight bodies.

11.2 **Analysis of the current situation (2017)**

11.2.1 Currently, the Region has a 76.12% effective implementation (EI) level, well over the global average of 64.50%, but under the regional objective of 80%, which was the regional commitment through the Declaration of Bogota. In addition, two of the areas with lesser EI are ANS (68.99%) and AGA (70.17%). The SAMSP will establish the strategy to improve the implementation levels in these areas.

11.2.2 RASG-PA supervises the areas on: reinforcement of runway safety, reduction of the controlled flight into terrain accidents, and reduction of the loss of control in-flight accidents. The Group has created working groups to analyse the data and develop various strategies to reduce these types of accidents. This information is important for its sharing with the SAM Implementation Group, with the aim of coordinating actions and/or prioritizing the implementation activities of these new capacities. To date, this has happened very rarely, for which the coordination levels need to be improved.

11.2.3 As to the support to the implementation of standards and process to accompany the new air navigation capacities, there has been a very good coordination with SRVSOP to carry out these activities, for which we will continue in this sense.

11.3 **Strategy for the Implementation of Performance Objectives**

11.3.1 Planning has been based on a main axis, as shown in **Attachment C**, called 'Safety" (SAM SM/01 PFF), as follows:

11.3.1.1 Safety Management (SAM SM/01 PFF).

Chapter 12: Environment Protection

12.1 Introduction

12.1.1 The primary objective of the United Nations Framework Convention on Climate Change (UNFCCC) is to achieve stabilization of concentrations of greenhouse gases in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system.

12.1.2 In this context, the Kyoto Protocol, adopted by the Conference of the Parties to the UNFCCC in December 1997 and entered into force on 16 February 2005, calls on developed countries (Annex I Parties) to limit or reduce greenhouse gases from fuel used by international aviation and those efforts are directed through ICAO (Article 2.2).

12.1.3 However, it is necessary to recognize the key role of international aviation in global economic and social development and the need to ensure that international aviation continues to develop sustainably; acknowledging the progress made by ICAO in the implementation of the United Nations Neutral Climate Initiative and the significant support provided by ICAO to the initiative, in particular through the development of a common methodology for calculating GHG emissions from air travel.

12.1.4 The 37th ICAO Assembly has recognized that a global average annual improvement of 2% in fuel efficiency to 2020 would not be sufficient to stabilize and then reduce the contribution of total aviation emissions to climate change and that the objectives of increased ambition should be considered for sustainable development.

12.1.5 In order to assist in the achievement of the climate change targets, the 37th Assembly encourages States to present their CO2 reduction action plans, which are a voluntary tool for planning and reporting to ICAO. The level of detail of the information contained in an action plan will ultimately enable ICAO to gather global progress towards meeting the goals set out in A37-19 Assembly Resolution and reaffirmed by A38-18 and A39-2, describing their respective policies and actions. In addition, to invite States that wish to prepare their action plans to submit them to ICAO as soon as possible, so that ICAO can compile information on the achievement of global aspiration objectives and action plans should include information on the range of measures considered by States, reflecting their respective national capacities and circumstances, and information on any specific assistance needs.

12.1.6 According to Doc 9988 - Guidance on the development of State action plans for activities to reduce CO_2 emissions, the development of an action plan resembles the implementation of any project, which may involve activities such as obtaining of resources, build a team and the planning and execution of various tasks. Under clauses 11 and 12 of Resolution A38-18, an action plan may assist the State and ICAO in the manner indicated:

According to paragraphs 11 and 12 of Resolution A38-18, an action plan contributes to the:

(1) States:

(a) submit reports to ICAO on CO_2 emissions from international aviation;
b) describe their respective policies and actions;

(c) provide information on the range of measures they have considered, making known their respective national capacities and circumstances, as well as their specific assistance needs; y

2) ICAO:

(a) compile information on the achievement of the global aspirational goals;
(b) to facilitate the dissemination of economic and technical studies and best practices in relation to the goals sought;
(c) provide guidance and other technical assistance for States to prepare their action plans; and
(d) identify and address the technical and financial assistance needs of States with a view to providing an adequate response by developing a process and mechanism for the provision of assistance to States.

12.1.7 In addition, a State action plan can facilitate communication with financial institutions and international or multilateral organizations that could assist the State in overcoming the barriers identified through the provision of financial resources, technology transfer and assistance for the creation capacity.

12.1.8 The 38th and 39th ICAO Assembly have urged States to present their action plans to reduce CO_2 emissions and update them every three years.

12.2 Current situation analysis

12.2.1 The protection to the environment can be analyzed considering four factors, which are:

- Noise attenuation.
- Management the land adjacent to the airports/aerodrome.
- Effect of aviation on local air quality.
- Greenhouse gases emission from international aviation offsetting o reduction.

12.2.2 This chapter will deal with the last point. In this regard, the preparation of the CO2 Emission Reduction Action Plan is a fundamental first step towards achieving the objective designed by ICAO to collaborate with the United Nations initiative to achieve a Neutral Climate. About the presentation of action, in the SAM Region, according to the ICAO environment website, the current situation of the implementation of this recommendation is as follows:

States	Submitted	Updated date
Argentina	Yes	Feb/2013
Brazil	Yes	Set/2016
Bolivia	No	
Chile	No	
Colombia	Yes	Aug/2012
Ecuador	Yes	Oct/2016
French Guyana	Yes	Jun/2015
Guyana	No	
Paraguay	No	
Panama	No	
Peru	No	
Suriname	No	
Uruguay	No	
Venezuela	Yes	Jun/2012

Source: http://www.icao.int/environmental-protection/Pages/ClimateChange_ActionPlan.aspx

12.2.3 The 39th ICAO Assembly approved Resolution 39-3, which will implement a carbon offsetting and reduction scheme for international aviation (CORSIA). The key activity included in this Resolution was a Market-Based Measures Implementation Global Plan (MBM) Global Plan to offset CO_2 emissions from international aviation. This Plan consists of three phases, which are:

(a) **pilot phase** shall apply from 2021 to 2023 to those States that have voluntarily opted in to participate in the plan. States involved in this phase may choose the basis for calculating the compensation requirements of their aircraft operators from the options indicated in ICAO Resolution 39-3, paragraph 11 (e) (i);

(b) **first phase** shall apply from 2024 to 2026 to States which have participated voluntarily in the pilot phase, as well as to any other State wishing to participate voluntarily in this phase, and the compensation requirements shall be calculated as indicated in paragraph previous;

(c) **second phase** shall apply from 2027 to 2035 to all States individually having a relative share in international civil aviation activity, measured in RTK, in excess of 0.5 %of total RTKs or whose cumulative the list of States mandated from highest to lowest amount of RTK reaches 90 % of total RTK, except the least developed countries (LDCs), small island developing States (SIDS) and landlocked developing countries (LLDCs), unless they wish to participate in it voluntarily.

12.2.4 In response to ICAO's request, by letter (SL) ENV 6 / 1-16 / 87 sent by ICAO seeking adherence to CORSIA, so far, any SAM Region States has same in any of the phases.

12.3 Strategy of implementation of the performance objectives

12.3.1 The Secretariat will work with States to develop a plan to achieve the preparation, updating, and submission of the CO_2 Reduction Action Plans. States should work internally to achieve multilateral labor between the aeronautical community (authority, service providers, and operators) and other governmental institutions involved in the areas of Environment, Climate Change, Transport, Energy Management and Fossil Fuels. Also, it will be important to prepare a Strategic Plan in order to ensure that the Aviation Action Plans are aligned with the State policy concerning the mitigation of the effects of GHGs.

12.3.2 Working together with the State for the implementation of the MRV will be a significant step for the implementation of CORSIA. The Secretariat should coordinate with States the socialization of Market-Based Measures for their better understanding.

12.4 Alignment with ASBUs

12.4.1 The Environment Protection Development is closely related to aerodrome and air traffic management modules, as operational improvements and improvements in aerodrome capacity and platform management directly affect fuel consumption. Therefore, the modules B0-RSEQ, B0-APTA, B0-ACDM, B0-FICE, B0-FRTO, B0.NOPS, B0-CCO y B0-CDO, of Block 0, and the modules B1-RSEQ, B1-AMET, B1- NOPS y B1-CDO collaborate to PFF SAM ENV/01.

Chapter 13: Performance Improvement Areas (PIA), modules and Air Navigation Report Forms (ANRF)

13.1 Introduction

13.1.1 This Chapter describes the Performance Improvement Areas (PIA) with the respective modules taken under consideration in ASBU Block 0 for the SAM Region. In addition, it presents a standard format for each of the modules considered, for the monitoring in their implementation. The format receives the name of Air Navigation Report Form (ANRF).

13.2 Performance Improvement Area (PIA)

13.2.1 Sets of modules in each block are grouped to provide operational and performance objectives in the environment to which they apply, thus forming executive high-level view of the intended evolution. The PIAs facilitate comparison of ongoing programmes.

13.2.2 The four performance improvement areas are as follows:

a) Airport operations
b) Globally Interoperable Systems and Data - Through Globally Interoperable System Wide Information Management
c) Optimum Capacity and Flexible Flights – Through Global Collaborative ATM
d) Efficient Flight Path – Through Trajectory-based Operations

Performance Improvement Area 1: Airport operations

13.2.3 In relation to airport operations, taking advantage of technical developments in air navigation and aircraft systems may assist in improving airport capacity and efficiency. In order to contribute to an overall strategy enhancing airport capacity, four related significant modules, were selected for inclusion in the ASBU framework:

a) B0-15 - *Improve Traffic Flow through Runway Sequencing (AMAN/DMAN)*;
b) B0-65 - *Optimization of Approach Procedures including Vertical Guidance*;
c) B0-75 - *Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)*; and
d) B0-80 - *Improved Airport Operations through Airport-CDM*.

13.2.4 The initial steps on these modules implement a combination of approach procedures making optimal usage of GNSS-based performance-based navigation (PBN) approaches and traffic flow improvements through the management of arrival and departure runway sequencing. New technology is already available to enhance the surveillance of aircraft surface movement, and may also provide information on suitably equipped vehicles. Improved processes are offered to support CDM involving all stakeholders on the airport.

13.2.5 Many of the operational improvements relating to airport capacity are local by essence and may only result in benefits at individual airports. Accordingly, improvements in airport capacity should be made on the basis of local decisions that take into account current and future aircraft operations and the level and type of equipage on board the aircraft. However, in cases where interdependencies in terms of traffic flows, airspace management and so forth exist between airport pairs, the full benefit of arrival/departure/surface management may only be achieved on a harmonized regional basis. The description of the modules chosen for this performance improvement area is presented as **Attachment D**.

Performance Improvement Area 2: Globally Interoperable Systems and Data - Through Globally Interoperable System Wide Information Management

13.2.6 The Global ATM Operational Concept envisages an integrated, harmonized and globally interoperable system for all users in all phases of flight. The aim is to increase user flexibility and maximize operating efficiencies while increasing system capacity and improving safety levels in the future ATM system.

13.2.7 In relation to globally interoperable systems and data two related significant modules, were selected for inclusion in the ASBU framework:

a) B0-25 - *Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration*;
b) B0-30 - *Service Improvement through Digital Aeronautical Information Management;* and
c) B0-105 - *Meteorological information supporting enhanced operational efficiency and safety*.

13.2.8 At the first stage, these selected modules include the usage of automated ATS interfacility data communications (AIDC) messages as the basis of ground-ground coordination between neighboring ATS units contributing directly to safety improvements such as reductions in coordination errors and supports performance improvements such as reduced separation and enhanced efficiency.

13.2.9 Additionally the introduction of digital processing and management of information, through aeronautical information service (AIS)/aeronautical information management (AIM) implementation, use of aeronautical information exchange model (AIXM), migration to electronic aeronautical information publication (AIP) and better quality and availability of data contributes to the global interoperable systems and data. The description of the modules chosen for this performance improvement area is presented as Attachment D.

Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

13.2.10 This performance improvement area is referred to the Optimum Capacity and Flexible Flights and in this sense 5 Modules were selected to be implemented in the SAM Region.

13.2.11 The modules are:

a) B-010 - *Improved Operations through Enhanced En-Route Trajectories*;
b) B-035 - *Improved Flow Performance through Planning based on a Network-Wide view*;
c) B-084 - *Initial capability for ground surveillance*;

d) B0-101 - *ACAS Improvements*; and
e) B-102 - *Increased Effectiveness of Ground-Based Safety Nets*.

13.2.12 These set of modules intend to optimize the use of airspace which would otherwise be segregated (i.e. special use airspace) along with flexible routing adjusted for specific traffic patterns managing Air Traffic Flow Management (ATFM) to minimize delay and maximize the use of the entire airspace.

13.2.13 It also considers the initial capability for lower cost ground surveillance supported by new technologies such as ADS-B OUT and wide area multilateration (MLAT) systems. This capability will be expressed in various ATM services, e.g. traffic information, search and rescue and separation provision.

13.2.14 In addition ground safety nets as short-term conflict alert, area proximity warnings and minimum safe altitude warnings are proposed as well as the MET information to support flexible airspace management, improved situational awareness and collaborative decision making, and dynamically- optimized flight trajectory planning.

Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations

13.2.15 This performance improvement area is referred to the Efficient Flight Path and in this sense 3 Modules were selected to be implemented in the SAM Region.

13.2.16 The Modules are:

a) B0-05 - *Improved Flexibility and Efficiency in Descent Profiles (CDO)*;
b) B0-20 - *Improved Flexibility and Efficiency in Departure Profiles (CCO)*, and;
c) B0-40 - *Improved Safety and Efficiency through the initial application of Data Link En-Route*.

13.2.17 The cost impact for the selected modules is expected to be minimal and are anticipated to be borne predominantly by the air navigation service providers (ANSPs) on the basis that facilitating operator capabilities, such as performance-based navigation (PBN) and controller-pilot data link communications (CPDLC), are attributable to those programs rather than to CCO and CDO. Based on preliminary indications, the benefits of implementing these modules could be substantial for overall global system performance and, when implemented, the benefits are expected to far outweigh the costs.

13.3 Air Navigation Report Forms (ANRF)

13.3.1 This form provides a standardized approach to implementation monitoring and performance measurement of Aviation System Block Upgrades (ASBU) Modules. The Planning and Implementation Regional Groups (PIRGs) and States could use this report format for their planning, implementation and monitoring framework for ASBU Modules. Also, other reporting formats that provide more details may be used but should contain as a minimum the elements described below. The Reporting and monitoring results will be analysed by ICAO and aviation partners and then utilized in developing the Annual Global Air Navigation Report. The Global Air Navigation Report conclusions will serve as the basis for future policy adjustments aiding safety practicality, affordability and global harmonization, amongst other concerns. **Attachment E** presents the ANRF for each of the ASBU Block 0 modules taken under consideration in the SAM Region.

ATTACHMENT A

TRAFFIC FORECASTS IN THE SAM REGION

Historical information on total passengers in 2010-2015 provided by IATA for each State of the SAM Region is presented below, together with the respective annual growth. This traffic includes all routes that have a given State as point of origin or of destination.

It should be noted that the total number of passengers in the SAM Region has been calculated on the basis of the summation of traffic of each State, adjusted for traffic in common. That is to say, passengers appearing as traffic originating in one SAM State and as traffic o destination in another SAM State have not ben accounted for. This adjustment has been made to avoid double counting of the same group of passengers at regional level.

Passenger air traffic – SAM Region

	2010	2011	2012	2013	2014	2015
Argentina	16,319,509	17,436,931	18,058,511	18,737,910	19,338,394	20,770,021
Bolivia	2,836,376	3,352,284	2,954,029	3,701,704	4,440,596	4,803,394
Brasil	71,448,804	85,301,511	89,155,178	93,784,107	96,438,277	93,932,069
Chile	10,009,292	11,454,156	12,390,847	13,657,477	14,201,523	14,870,794
Colombia	18,074,070	19,868,015	22,113,532	24,879,988	26,680,339	28,839,549
Ecuador	6,508,169	7,462,168	7,735,513	8,139,512	7,457,336	7,367,168
Guyana	439,888	439,063	471,846	420,971	461,383	493,054
Guyana Francesa	409,202	401,589	405,396	382,870	370,856	386,953
Panamá	7,005,031	8,271,459	10,174,870	11,586,681	12,782,167	13,434,673
Paraguay	815,181	907,272	909,994	871,746	893,764	894,262
Perú	8,567,601	9,261,953	11,196,661	13,262,078	13,618,677	15,238,719
Surinam	381,617	405,063	449,517	508,565	473,040	457,100
Uruguay	1,653,818	1,782,312	1,849,428	1,742,513	1,814,937	1,772,847
Venezuela	8,291,745	8,990,852	10,313,336	12,455,533	11,371,479	9,687,743
Región SAM	**140,270,932**	**161,530,677**	**173,815,809**	**189,789,145**	**195,957,076**	**198,385,611**

Annual growth of passenger air traffic – SAM Region

	2011	2012	2013	2014	2015
Argentina	6.8%	3.6%	3.8%	3.2%	7.4%
Bolivia	18.2%	-11.9%	25.3%	20.0%	8.2%
Brasil	19.4%	4.5%	5.2%	2.8%	-2.6%
Chile	14.4%	8.2%	10.2%	4.0%	4.7%
Colombia	9.9%	11.3%	12.5%	7.2%	8.1%
Ecuador	14.7%	3.7%	5.2%	-8.4%	-1.2%
Guyana	-0.2%	7.5%	-10.8%	9.6%	6.9%
Guyana Francesa	-1.9%	0.9%	-5.6%	-3.1%	4.3%
Panamá	18.1%	23.0%	13.9%	10.3%	5.1%
Paraguay	11.3%	0.3%	-4.2%	2.5%	0.1%
Perú	8.1%	20.9%	18.4%	2.7%	11.9%
Surinam	6.1%	11.0%	13.1%	-7.0%	-3.4%
Uruguay	7.8%	3.8%	-5.8%	4.2%	-2.3%
Venezuela	8.4%	14.7%	20.8%	-8.7%	-14.8%
Región SAM	15.2%	7.6%	9.2%	3.2%	1.2%

Passenger air traffic forecast, per State

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Argentina	21,803	21,900	23,047	24,803	26,266	27,358	28,304	29,163	29,832	30,485	31,249	32,150	33,129	34,164	35,252	36,399	37,591	38,832	40,132	41,493
Bolivia	5,150	5,550	5,917	6,299	6,680	7,060	7,461	7,881	8,373	8,849	9,356	9,901	10,490	11,126	11,803	12,521	13,278	14,081	14,933	15,838
Brazil	89,885	88,126	90,599	95,457	101,937	108,387	114,397	119,659	123,984	127,443	130,673	133,939	137,426	141,131	144,895	149,004	153,381	157,982	162,762	167,714
Chile	16,856	17,819	18,948	20,041	20,981	21,803	22,594	23,367	24,056	24,683	25,330	26,025	26,779	27,593	28,472	29,401	30,355	31,344	32,374	33,448
Colombia	31,188	32,848	34,898	37,172	39,439	41,683	43,989	46,392	48,882	51,379	53,964	56,428	59,032	61,786	64,702	67,792	70,753	73,860	77,142	80,616
Ecuador	7,513	7,890	8,333	8,813	9,295	9,749	10,227	10,763	11,334	11,980	12,552	13,160	13,816	14,500	15,194	15,931	16,678	17,464	18,285	19,146
Guyana	552	573	605	638	667	693	715	737	760	788	814	839	866	895	925	955	989	1,025	1,064	1,103
Guy. Francesa	395	403	415	427	442	458	474	490	507	525	543	562	582	602	624	645	668	691	716	741
Panama	14,756	16,430	17,996	20,073	21,907	23,499	24,903	26,224	27,508	28,817	30,071	31,290	32,555	33,904	35,329	36,827	38,300	39,846	41,473	43,179
Paraguay	1,050	1,113	1,210	1,322	1,433	1,533	1,629	1,720	1,800	1,886	1,952	2,020	2,093	2,171	2,253	2,340	2,431	2,528	2,629	2,736
Peru	16,612	17,297	18,037	18,905	19,747	20,586	21,464	22,425	23,396	24,410	25,444	26,517	27,656	28,855	30,115	31,444	32,772	34,182	35,672	37,247
Suriname	505	580	650	713	774	828	884	940	993	1,042	1,064	1,075	1,084	1,095	1,108	1,123	1,140	1,158	1,178	1,197
Uruguay	1,972	2,157	2,379	2,614	2,842	3,036	3,214	3,360	3,496	3,609	3,745	3,921	4,120	4,254	4,357	4,488	4,642	4,811	4,992	5,181
Venezuela	8,718	8,411	8,196	8,678	9,223	9,822	10,312	10,814	11,286	11,680	12,050	12,409	12,770	13,138	13,512	13,893	14,277	14,673	15,083	15,508

Passenger air traffic growth rate, per State

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Argentina	4.8%	0.4%	5.2%	7.6%	5.9%	4.2%	3.5%	3.0%	2.3%	2.2%	2.5%	2.9%	3.0%	3.1%	3.2%	3.3%	3.3%	3.3%	3.3%	3.4%
Bolivia	5.6%	7.8%	6.6%	6.5%	6.0%	5.7%	5.7%	5.6%	6.2%	5.7%	5.7%	5.8%	6.0%	6.1%	6.1%	6.1%	6.0%	6.0%	6.1%	6.1%
Brazil	-8.1%	-2.0%	2.8%	5.4%	6.8%	6.3%	5.5%	4.6%	3.6%	2.8%	2.5%	2.5%	2.6%	2.7%	2.7%	2.8%	2.9%	3.0%	3.0%	3.0%
Chile	10.7%	5.7%	6.3%	5.8%	4.7%	3.9%	3.6%	3.4%	2.9%	2.6%	2.6%	2.7%	2.9%	3.0%	3.2%	3.3%	3.2%	3.3%	3.3%	3.3%
Colombia	8.5%	5.3%	6.2%	6.5%	6.1%	5.7%	5.5%	5.5%	5.4%	5.1%	5.0%	4.6%	4.6%	4.7%	4.7%	4.8%	4.4%	4.4%	4.4%	4.5%
Ecuador	1.2%	5.0%	5.6%	5.8%	5.5%	4.9%	4.9%	5.2%	5.3%	5.7%	4.8%	4.8%	5.0%	4.9%	4.8%	4.9%	4.7%	4.7%	4.7%	4.7%
Guyana	7.5%	3.7%	5.5%	5.5%	4.5%	3.9%	3.3%	3.0%	3.2%	3.6%	3.4%	3.1%	3.2%	3.3%	3.4%	3.3%	3.5%	3.6%	3.7%	3.7%
Guy. Francesa	2.0%	2.0%	3.0%	3.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Panama	9.8%	11.3%	9.5%	11.5%	9.1%	7.3%	6.0%	5.3%	4.9%	4.8%	4.4%	4.1%	4.0%	4.1%	4.2%	4.2%	4.0%	4.0%	4.1%	4.1%
Paraguay	9.7%	6.0%	8.7%	9.3%	8.3%	7.0%	6.2%	5.6%	4.7%	4.8%	3.5%	3.5%	3.6%	3.7%	3.8%	3.9%	3.9%	4.0%	4.0%	4.1%
Peru	8.3%	4.1%	4.3%	4.8%	4.5%	4.2%	4.3%	4.5%	4.3%	4.3%	4.2%	4.2%	4.3%	4.3%	4.4%	4.4%	4.2%	4.3%	4.4%	4.4%
Suriname	8.1%	14.8%	12.1%	9.8%	8.5%	7.0%	6.7%	6.3%	5.7%	4.9%	2.2%	1.0%	0.8%	1.0%	1.2%	1.4%	1.5%	1.6%	1.7%	1.7%
Uruguay	10.4%	9.4%	10.3%	9.9%	8.7%	6.8%	5.9%	4.6%	4.0%	3.2%	3.8%	4.7%	5.1%	3.3%	2.4%	3.0%	3.4%	3.6%	3.8%	3.8%
Venezuela	-11.5%	-3.5%	-2.6%	5.9%	6.3%	6.5%	5.0%	4.9%	4.4%	3.5%	3.2%	3.0%	2.9%	2.9%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%

ATTACHMENT B

GLOBAL PLAN INITIATIVES AND THEIR RELATIONSHIP WITH THE MAIN GROUPS

GPI		En-route	Terminal Area	Aerodrome	Ancillary Infrastructure	Associated component of the Operational Concept
GPI-1	Flexible use of airspace	X	X			AOM, AUO
GPI-2	Reduced vertical separation minima	X				AOM, CM
GPI-3	Harmonisation of level systems	X				AOM, CM, AUO
GPI-4	Alignment of upper airspace classifications	X				AOM, CM, AUO
GPI-5	RNAV and RNP (Performance-based navigation)	X	X	X		AOM, AO, TS, CM, AUO
GPI-6	Air traffic flow management	X	X	X		AOM, AO, DCB, TS, CM, AUO
GPI-7	Dynamic and flexible ATS route management	X	X			AOM, AUO
GPI-8	Collaborative airspace design and management	X	X			AOM, AUO
GPI-9	Situational awareness	X	X	X	X	AO, TS, CM, AUO
GPI-10	Terminal area design and management		X			AOM, AO, TS, CM, AUO
GPI-11	RNP and RNAV SIDs and STARs		X			AOM, AO, TS, CM, AUO
GPI-12	Functional integration of ground and airborne systems		X		X	AOM, AO, TS, CM, AUO
GPI-13	Aerodrome design and management			X		AO, CM, AUO
GPI-14	Runway operations			X		AO, TS, CM, AUO
GPI-15	Match IMC and VMC operating capacity		X	X	X	AO, CM, AUO
GPI-16	Decision support and alerting systems	X	X	X	X	DCB, TS, CM, AUO

GPI		En-route	Terminal Area	Aerodrome	Ancillary Infrastructure	Associated component of the Operational Concept
GPI-17	Implementation of data Relationship applications	X	X	X		DCB, AO, TS, CM, AUO, ATMSDM
GPI-18	Aeronautical information	X	X	X	X	AOM, DCB, AO, TS, CM, AUO, ATMSDM
GPI-19	Meteorological systems	X	X	X	X	AOM, DCB, AO, AUO
GPI-20	WGS-84	X	X	X	X	AO, CM, AUO
GPI-21	Navigation systems	X	X	X	X	AO, TS, CM, AUO
GPI-22	Communication infrastructure	X	X	X	X	AO, TS, CM, AUO
GPI-23	Aeronautical radio spectrum	X	X	X	X	AO, TS, CM, AUO, ATMSDM

ATTACHMENT C

PERFORMANCE FRAMEWORK FORM (PFF)

1. This outcome and management form is applicable to both regional and national planning, and includes references to the Global Plan. Other formats may be appropriate, but they must contain, at least, the elements described below.

1.1 Performance objective: Regional/national performance objectives should be defined, using the performance-based approach that best reflects the activities required to support ATM systems at regional/national level. Along their life cycle, performance objectives may change, depending on the evolution of the ATM system; therefore, during the implementation process, they should be coordinated with all the stakeholders in the ATM community and be at their disposal. The establishment of joint decision-making processes ensures that all stakeholders are involved and agree on the requirements, tasks and timetables.

1.2 Regional performance objectives: Regional performance objectives are the improvements required by the air navigation system to support global performance objectives, and are related to the operational environments and the priorities applicable at regional level.

1.3 National performance objectives: National performance objectives are the improvements required by the air navigation system in support of regional performance objectives, and are related to the operational environments and priorities applicable at State level.

1.4 Benefits: Regional/national performance objectives should meet the expectations of the ATM community, as described in the operational concept; they should generate benefits for the parties involved; and should be attained through operational activities and techniques aligned with each performance objective.

1.5 Metrics: Metrics permit to measure the objectives achieved. The monitoring and measurement of the performance of ATM systems may require metrics in areas such as access, capacity, cost-effectiveness, efficiency, environment, flexibility, prediction capacity, and safety.

1.6 **Strategy:** ATM evolution requires a clearly-defined gradual strategy that includes the tasks and activities that best represent the national and regional planning processes, in keeping with the global planning framework. The goal is to achieve a harmonised implementation process that evolves towards a global and seamless ATM system. Accordingly, it is necessary to develop short- and medium-term work programmes focused on system improvements that reflect a clear work commitment of the parties involved.

1.7 **Components of the ATM operational concept:** Each strategy or set of tasks should be associated to components of the ATM operational concept. The designators of the ATM components are as follows:

- AOM – Airspace organisation and management
- DCB – Demand/capacity balancing
- AO – Aerodrome operations

- TS – Traffic synchronisation
- CM – Conflict management
- AUO – Airspace user operations
- ATM SDM – ATM service delivery management

1.8 **Tasks:** The regional/national work programmes, based on these PFF templates, should define the tasks required to attain said performance objective while maintaining a direct relationship with the components of the ATM system. The following principles should be taken into account when developing a work programme:

- Work should be organised using project management techniques and performance-based objectives, in line with ICAO strategic objectives.
- All tasks related to the compliance with the performance objectives should be carried out based on strategies, concepts, action plans and roadmaps that may be shared amongst the parties, with the main objective of attaining transparency through interoperability and harmonisation.
- Task planning should include the optimisation of human resources, as well as the promotion of the dynamic use of electronic communication amongst the parties (for example, Internet, video-conferences, tele-conferences, e-mail, telephone and fax). Likewise, resources should be used efficiently, avoiding duplication of work or unnecessary tasks.
- The process and work methods should ensure the possibility of measuring the performance objectives, comparing them with timetables, and easy reporting of the progress made at national and regional level to the PIRGs and ICAO Headquarters, respectively.

1.9 **Period:** Indicates the start and end of that task in particular.

1.10 **Responsibility:** Indicates the organisation/entity/individual responsible for the fulfilment or management of the associated tasks.

1.11 **Status:** The status basically monitors progress in the fulfilment of said task as it proceeds to the date of completion. For the classification of the status of implementation, the words VALID, COMPLETED, REPLACED and CONTINUOUS will be used.

1.12 **Link with the global plan initiatives (GPIs)*:*** The 23 GPIs, as described in the Global Plan, provide a global strategic framework for the planning of air navigation systems, and are designed to contribute to the achievement of regional/national performance objectives. Each performance objective should be related with the corresponding GPIs. The goal is to make sure that the evolutionary work process at State and regional level is integrated within the global planning framework.

2. The PFFs prepared for the performance objectives concerning ATM, CNS, MET, SAR, AIS, AGA/AOP, personnel competence management and SMS are presented below. In addition, a matrix with the inter-relationship amongst the PFFs in included.

REGIONAL PERFORMANCE OBJECTIVE: SAM ATM/01
OPTIMISATION OF THE EN-ROUTE AIRSPACE STRUCTURE

Benefits

Safety	• Reduces the complexity of the airspace structure, by reinforcing safety
Environmental protection and sustainable development of air transport	• Reduces fuel consumption and, consequently, CO^2 emissions into the atmosphere, due to reduction of miles flown and to continuous descent and ascent operations • Increases airspace capacity and foster the use of optimum flight levels. • Takes advantage of aircraft RNAV and ADS-B capacity

Metrics

- Reduction of air traffic incidents each 100,00 operations per year
- Increase ATC sector capacity
- Reduction of CO^2 emissions each 100,00 operations per year

- (*) - 2023
Strategy

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
	a) Carry out the implementation of Version 04 of the SAM ATS route network, and evaluate the implementation of RNAV 5 exclusionary space.	(*) - 2023	States	Valid
	b) Optimise oceanic routes through the implementation of RNAV10 (RNP10) routes.	(*) - 2023	States	Valid
	c) Review and update the SAM PBN Roadmap and the ATS route network optimisation programme.	2018	Regional Project States	Valid
	d) Assess the status of implementation of the en-route PBN action plan.	2018	States	Valid
	e) Prepare Version 03 of the ATS route network, including RNP4 application for oceanic routes and RNP2 in continental airspace.	2019 – 2020	Regional Project States	Valid
	f) Implement random routes in defined continental airspaces.	2020+	States	Valid
	g) Asses and implement longitudinal separation methods based on ITP, for selected airspace.	2020 – 2023	States	VAlid
	h) Monitor implementation progress.	(*) - 2020 +	GREPECAS	Valid
Relation-ship with GPIs	GPI/5: performance-based navigation, GPI/7: management of dynamic and flexible ATS routes, GPI/8: collaborative airspace design and management.			

(*) Indicates that the task has started before the date contemplated in this planning.

REGIONAL PERFORMANCE OBJECTIVE: SAM ATM/02
TMA AIRSPACE STRUCTURE OPTIMISATION

Benefits

Safety	• Implementation of continuous descent (CDO) operations • Increased safety during landing and reduced CFIT incidence • Reduction of airspace complexity, by reinforcing safety
Environmental protection and sustainable development of air transport	• Reduces fuel consumption and, consequently, CO^2 emissions into the atmosphere, due to reduction of miles flown and continuous descent and ascent operations (CDO/CCO); • Reduces aeronautical noise, through continuous descent operations (CDO); • Increases airspace capacity, since it permits the establishment of separate arrival/departure flows, and even the segregation of IFR from VFR flights; • Takes advantage of aircraft RNAV capacity; • Airport arrival/departure under any meteorological condition.

Metrics

- Percentage of international aerodromes with SIDs/STARs, RNAV and/or RNP implemented, when required.
- Percentage of aerodromes that have implemented continuous descent and ascent operations.
- Reduction of air traffic incidents each 100,00 operations per year
- Reduction of tons of CO^2 emissions each 100,00 operations per year
- Reduction of aeronautical noise.

(*) - 2023
Strategy

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
AOM AUO CM	a) Assess the progress made in the terminal area PBN action plan.	2012	States	Valid
	b) Implement RNAV 1 and/or RNP 1 standard arrival/departure routes in all the TMAs of international airports.	20 (*) – 2020	States	Valid
	c) Implement CDO/CCO operations in all the TMAs of international airports and implement application of VNAV for CDO in slected TMA	(*) - 2023	States	Valid
	d) Implement RNAV1/RNP1 exclusionary airspace in high-density TMAs.	(*)– 2023 +	States	Valid
	e) Monitor progress during implementation.	(*) - 2023	GREPECAS	Valid
	f) Evaluate and implement basic procedures for RPAS operation, within selected TMA.	2018 - 2023	States	Valid
Relation-ship with GPIs	GPI/1: Flexible use of airspace, GPI/5: performance-based navigation, GPI/7: management of dynamic and flexible ATS routes, GPI/8: collaborative airspace design and management, GPI/10: terminal area design and management, GPI/11: RNP and RNAV SIDs and STARs, and GPI/12: functional integration of ground and airborne systems.			

(*) Indicates that the task has been started before the period contemplated in this planning.

REGIONAL PERFORMANCE OBJECTIVE: SAM ATM/03
IMPLEMENTATION OF RNP APPROACHES

Benefits

Safety	• Increases safety during landing, reducing the incidence of CFIT • Permits the establishment of safe approach procedures at airports with limitations due to rough terrain.
Environmental protection and sustainable development of air transport	• Reduces miles flown and/or permits optimum descent flights, decreasing fuel consumption, and thus CO^2 emissions into the atmosphere; • Takes advantage of aircraft capacity for flying optimum paths; • Improved airport operational minima.

Metrics

- Percentage of RNP APCH procedures that have been implemented, including APV Baro VNAV and LNAV implemented only at runway ends with instrument operations, according to the 37th Assembly Resolution 37/11.

(*) - 2023
Strategy

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
AOM **AUO** **AO** **CM**	a) Assess progress of PBN action plan on approach procedures.	2018	SAMIG	Valid
	b) Implement RNP APCH procedures (or RNP AR APCH when operationally advantageous), including APV BARO VNAV, and LNAV only, in conformity with ICAO Assembly Resolution A37/11.	(*) – 2023+	States	Valid
	c) Start-up of studies for the implementation of GLS procedures (GBAS) CAT I landing at selected airports.	2023 +	States	Valid
	d) Monitor the progress made during implementation.	(*) - 2023+	GREPECAS	Valid
Relation-ship with GPIs	GPI/1: Flexible use of airspace, GPI/5: performance-based navigation, GPI/8: collaborative airspace design and management, GPI/12: functional integration of ground and airborne systems and GPI/14; runway operations.			

(*) Indicates that the task has been started before the period contemplated in this planning.

REGIONAL PERFORMANCE OBJECTIVE: <u>SAM ATM/04</u>
FLEXIBLE USE OF AIRSPACE

Benefits

Safety	• Improvement of coordination and civil/military cooperation grants airspace safety.
Environmental protection and sustainable development of air transport	• Permits a more efficient ATS route structure, by reducing miles flown, fuel consumption and, consequently, CO^2 emissions into the atmosphere. • Increases airspace capacity. • Greater availability of reserved airspace aviation at times when there is no activity from those airspace users

Metrics

- Percentage of committees or similar civil/military coordination bodies implemented
- Number of civil/military coordination and cooperation agreements implemented
- Permanent reduction of reserved airspaces

(*) - 2023
Strategy

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
AOM AUO CM	a) Develop guidance material on civil/military coordination and cooperation, for the definition of policies, procedures and national standards;	(*) - 2020	Regional Project States	Valid
	b) Carry out an assessment of the amount and extension of reserved airspaces	(*) - 2020	States	Valid
	c) Establish committees or similar civil/military coordination bodies;	(*) - 2020	States	Valid
	d) Make arrangements to have a permanent relationship and close cooperation between ATS civil units and the appropriate military units, as well as other reserved airspace users;	(*) - 2020	States	Valid
	e) Elaborate Regional guidance documents for implementing in States the procedures for coordination of temporary reservation of airspace (TRA) through issuance of NOTAMs or specific real time reserved airspace activation procedures. Foster the use of automated tools accepted by ICAO.	2018 - 2020	States	Valid
	f) Monitor progress during implementation.	(*) - 2023	GREPECAS	Valid
Relation-ship with GPIs	GPI/1: Flexible use of airspace; GPI/18: Aeronautical information.			

(*) Indicates that the task has been started before the date contemplated in this planning.

REGIONAL PERFORMANCE OBJECTIVE: SAM ATM/05 **ATFM IMPLEMENTATION**	
Benefits	
Safety	• Avoids ATC and airport system overload, by granting safety
Environmental protection and sustainable development of air transport	• Less delays caused by meteorological and traffic conditions, leading to a reduced consumption of fuel and emission of pollutants • Improved management of the demand that exceeds service in ATC sectors and aerodromes • Allows planning and managing the capacity gaps.
Metrics	
• Percentage of flights delayed due to measures implemented by ATC	
(*) - 2023 ***Strategy***	

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
DCB **AO** **AOM** **CM**	a) Assess the progress made in the ATFM implementation work programme	(*) – 2018	States	Valid
	b) Develop a regional method for establishing demand/capacity forecasts	(*) - 2020	States	Valid
	c) Develop and implement regional procedures for an efficient and optimum use of aerodrome and runway capacity	(*) - 2020	States	Valid
	d) Develop and implement methods for improving efficiency, as required, through airspace management in selected TMA.	(*) - 2020	States	Valid
	e) Develop and implement operational coordination procedures between States ATFM units; in order to endorse the competency and authority of those units	(*) – 2020+	States	Valid
	f) Monitor progress during implementation.	(*) – 2023+	GREPECAS	Valid
Relation-ship with GPIs	GPI/1: Flexible use of airspace; GPI/6: air traffic flow management; GPI/7: dynamic and flexible management of ATS routes; GPI/9: situational awareness; GPI/13 aerodrome design and management; GPI/14: runway operations; and GPI/16: decision support and alerting systems.			

(*) Indicates that the task has been started before the date contemplated in this planning.

REGIONAL PERFORMANCE OBJECTIVE: SAM ATM/06 IMPROVE ATM SITUATIONAL AWARENESS	
Benefits	
Safety	• Improved situational awareness provides data that facilitate operational decision-making, enhancing safety.
Environmental protection and sustainable development of air transport	• Improved air traffic demand allows a reduction in aircraft separation, optimizing the use of runways and manouver area, enabling a best air traffic flow management and ATC capacity. • Contributes to collaboration between the flight crew and the ATM system • Contributes to collaborative decision-making (CDM) through the sharing of aeronautical data • Reduced workload for pilots and controllers
Metrics	
• Reduction of CFIT accidents • Reduction of operational errors including LHDs events • ATS capacity enhances.	
2012 - 2018 ***Strategy***	

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
ATM-SDM **AO** **CM**	a) Develop and implement an action plan for improving situational awareness of pilots and controllers.	(*) - 2023	Regional Project	Valid
	b) Implement flight plan data processing systems (new FPL format) and data automated communication tools between ACCs.	(*) – 2020	States	Valid
	c) Implement ATS surveillance technologies and their automated applications as required.	(*)– 2023+	States	Valid
	d) Implement air-ground communication systems through Data link (ADS-C/CPDLC in oceanic airspaces ADS-B, D-ATIS, DCL, D-VOLMET, etc.	(*) – 2023+	States	Valid
	e) Implement advanced automation support tools to contribute to aeronautical information sharing.	(*) – 2023+	States	Valid
	f) Monitor the implementation	(*) – 2023+	GREPECAS	Valid
Relation-ship with GPIs	GPI/1: Flexible use of airspace; GPI/6: air traffic flow management; and GPI/7: dynamic and flexible ATS route management; GPI/9: situational awareness; GPI/13: aerodrome design and management; GPI/14: runway operations; y GPI/16: decision support and alerting systems; GPI/17: implementation of Data link applications; GPI/18: aeronautical information; GPI/19: meteorological systems, GPI/22: communication infrastructure.			

(*) Indicates that the task has been started before the date contemplated in this planning.

<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM CNS/01</u>
IMPROVEMENTS TO THE AERONAUTICAL FIXED SERVICE IN THE SAM REGION</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Reduction of operational coordination errors between adjacent ACCs;
• Increased ATM situational awareness; and
• Reduced pilot and controller workload.</td></tr>
<tr><td>Environmental protection and sustainable development of air transport</td><td colspan="4">• Increased capacity and availability of aeronautical fixed service in support of ATS, MET, AIS and SAR applications; and
• Support to ATFM / CDM.</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Number of AMHS interconnections implemented; Table CNS II CAR/SAM 2,
• Number of AIDC interconnections implemented; Table CNS II-3
• Number of centralised ATFM communication links implemented;
• Percentage of updated REDDIG II, and
• Number of national IP networks implemented.</td></tr>
<tr><td colspan="5">2018 – 2023
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="7">AOM
ATM-SDM
DCB
CM
AUO</td><td>a) Complete the implementation of AMHS systems in those States that do not have such systems yet</td><td>(*) - 2018</td><td>States</td><td>Valid</td></tr>
<tr><td>b) Complete the AMHS interconnection between adjacent States</td><td>(*) - 2020</td><td>States</td><td>Valid</td></tr>
<tr><td>c) Complete the implementation of communication services for the centralised ATFM</td><td>2020</td><td>States</td><td>Valid</td></tr>
<tr><td>d) Implement AIDC in the automated centres of the SAM Region</td><td>(*) - 2018</td><td>States</td><td>Valid</td></tr>
<tr><td>e) Operational implementation of AIDC between adjacent ACCs</td><td>(*) - 2023</td><td>States</td><td>Valid</td></tr>
<tr><td>f) Modernization of regional digital network (REDDIG II)</td><td>2022 -2023</td><td>States</td><td>Valid</td></tr>
<tr><td>g) Monitor implementation progress</td><td>2018-2023</td><td>GREPECAS</td><td>Valid</td></tr>
<tr><td>Relation-ship with GPIs</td><td colspan="4">GPI/6: ATFM, GPI/9: situational awareness, GPI/ 16: decision support and alerting systems, GPI/18: aeronautical information, GPI/17: data link applications, GPI/19: meteorological systems, GPI/22: communication infrastructure.</td></tr>
</table>

(*) Indicates that the task has been started before the date contemplated in this planning.

<table>
<tr><th colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM CNS/02</u>
IMPROVEMENTS TO THE AERONAUTICAL MOBILE SERVICES
IN THE SAM REGION</th></tr>
<tr><th colspan="5">Benefits</th></tr>
<tr><td>Safety</td><td colspan="4">• Reduction of operational coordination errors between adjacent ACCs, making ATS coordination more efficient; and
• Reduction of pilot and controller workload.</td></tr>
<tr><td>Environmental protection and sustainable development of air transport</td><td colspan="4">• Assured coverage and quality of communications in ATS service;
• Increased availability of communications for the ATS service;
• Support to AIM/MET service; and
• Assured radio frequency spectrum assigned to aviation for the communication service.</td></tr>
<tr><th colspan="5">Metrics</th></tr>
<tr><td colspan="5">• Percentage of compliance with VHS oral communication channels requirements; Table CNS II CAR/SAM 2;
• Number of CPDLC systems implemented;
• Number of DCL systems implemented;
• Number of D-ATIS systems implemented
• Number of D-VOLMET systems implemented; and
• Number if AEROMAC systems implemented.</td></tr>
<tr><th colspan="5">2018 - 2023
Strategy</th></tr>
<tr><th>ATM OC COMPONENTS</th><th>TASKS</th><th>PERIOD</th><th>RESPONSIBILITY</th><th>STATUS</th></tr>
<tr><td rowspan="11">AOM
ATM-SDM
DCB
CM</td><td>a) Complete the implementation of the services required in Table CNS II CAR/SAM 2</td><td>(*) - 2018</td><td>States</td><td>Valid</td></tr>
<tr><td>b) Continental en-route: Complete coverage of VHF communications in the lower airspace, when operations so require</td><td>2020</td><td>States</td><td>Valid</td></tr>
<tr><td>c) Complete implementation of oceanic area CPDLC, maintaining HF service as back-up</td><td>(*) – 2020</td><td>States</td><td>Valid</td></tr>
<tr><td>d) Complete implementation of CPDLC in selected continental area</td><td>2023</td><td>States</td><td>Valid</td></tr>
<tr><td>e) Terminal area: Complete Implementation of different VHF channels for control tower and APP services at all airports where a single channel is used for APP and control tower services</td><td>(*) – 2023</td><td>States</td><td>Valid</td></tr>
<tr><td>f) Complete implementation of DCL services at selected aerodromes</td><td>(*)2023</td><td>States</td><td>Valid</td></tr>
<tr><td>g) Complete implementation of D-ATIS services at selected aerodromes.</td><td>(*)2023</td><td>States</td><td>Valid</td></tr>
<tr><td>h) Complete implementation of VOLMET services (voice and data)</td><td>(*) - 2023</td><td>States</td><td>Valid</td></tr>
<tr><td>i) Complete implementation of AEROMAC systems for airdromes designated</td><td>2020-2023</td><td>States</td><td>Valid</td></tr>
<tr><td>j) Guarantee protection of the radio frequency spectrum used for current and foreseen communication services</td><td>(*)2023</td><td>States
ICAO</td><td>Valid</td></tr>
<tr><td>k) Monitor implementation progress</td><td>2018-2023</td><td>GREPECAS
SAM/IG</td><td>Valid</td></tr>
</table>

Relation-ship with GPIs	GPI/6: ATFM, GPI/9: Situational awareness, GPI/17: Data link applications, GPI/19: Meteorological systems, GPI/22: Communication infrastructure, GPI 23: Aeronautical radio spectrum.

(*) Indicates that the task has been started before the date contemplated in this planning.

REGIONAL PERFORMANCE OBJECTIVE: <u>SAM CNS/03</u> **IMPROVEMENTS TO NAVIGATION SYSTEMS IN THE SAM REGION**	
Benefits	
Safety	• Support to aircraft spacing; • Reduced pilot and controller workload; and • Increased landing safety, avoiding CFIT
Environmental protection and sustainable development of air transport	• Increased airspace capacity and structure; • Increased integrity of the GNSS system; • Support to PBN implementation; and • Reduced costs.
Metrics	
• Number of deactivated NDBs; Table CNS II CAR/SAM 3; • Number of DME equipment implemented; • Number of modernized flight trial platforms; and • Number of GBAS CAT I implemented at airports with sufficient operational demand.	
2018 - 2023 ***Strategy***	

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
AOM **ATM-SDM** **TS** **AUO**	a) Complete NDB phase-out	(*) 2020	States	Valid
	b) Complete implementation of necessary DME systems in support of en route operations where the PBN plan so considers it	(*) 2023	States ICAO	Valid
	c) Complete implement of GBAS CAT 1 at airports with sufficient operational demand	(*)2023	States	Valid
	d) Complete modernisation of flight trial platforms for GNSS applications	(*) 2020	States	Valid
	e) Guarantee the protection of the radio frequency spectrum used for current and future radio navigation services	(*) 2023	States ICAO	Valid
	f) Monitor implementation progress	2012-2018	GREPECAS	Valid
Relation-ship with GPIs	GPI/5: RNAV and RNP; GPI/6: ATFM; GPI/7: dynamic and flexible ATS route management; GPI/10: terminal area design and management; GPI/11: RNP and RNAV SIDs and STARs; GPI/12: functional integration of ground and airborne systems; GPI/13: aerodrome design and management; GPI/14: runway operations; GPI/21: navigation systems; GPI 23: aeronautical radio spectrum.			

(*) Indicates that the task has been started before the date contemplated in this planning.

REGIONAL PERFORMANCE OBJECTIVE: <u>SAM CNS/04</u>
IMPROVEMENTS TO THE ATS SURVEILLANCE SERVICE IN THE SAM REGION

Benefits

Safety	• Increased ATM situational awareness; • Improved ATS coordination, reducing coordination errors between adjacent ACCs; and • Reduction of pilot and controller workload.
Environmental protection and sustainable development of air transport	• Facilitates ATS planning; • Increased airspace capacity; • Supports the implementation of PBN and random routes; and • Optimisation of information sharing resources.

Metrics

- Number of ADS-C systems implemented in oceanic FIRs;
- Number of adjacent ACCs with exchange of ATS surveillance data,
- Percentage of ensure airspace for upper levels with ADS-B coverage, and
- Number of A-SMGS systems implemented.

2018 – 2023
Strategy

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
AOM **AO** **TS** **CM** **ATM-SDM**	a) Implement ADS-B and/or MLAT systems to cover en-route areas	(*) 2023	States	Valid
	b) Implement ADS-B and/or MLAT systems to cover terminal areas	(*) 2023 +	States	Valid
	c) Implement a surveillance system for airdromes surfaces in designated airports	(*) 2023 +	States	Valid
	d) Implement surface movement guidance and control systems (A-SMGCS) at airports where previous study indicates its requirement	(*) 2023	States	Valid
	e) Implement the ADS-C service in all States with responsibility over an oceanic FIR	(*) 2020	States	Valid
	f) Complete automation in all ACCs	(*) 2023 +	States	Valid
	g) Implement the exchange of ATS surveillance data between adjacent ACCs	(*) 2023	States	Valid
	h) Guarantee the protection of the radio frequency spectrum used for current and future radio navigation services	(*) 2023	States ICAO	Valid
	i) Monitor implementation progress	2018-2023	GREPECAS	Valid
Relation-ship with GPIs	GPI/5: RNAV and RNP; GPI/6: ATFM; GPI/9: situational awareness; GPI/10: terminal area design and management; GPI/11: RNP and RNAV SIDs and STARs with; GPI/12: functional integration of ground and on-board systems; GPI/13: aerodrome design and management; GPI/14: runway operations; GPI/17: data link applications, GPI/22: communication infrastructure, GPI 23: aeronautical radio spectrum.			

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<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM MET/01</u>
IMPLEMENTATION OF THE MET INFORMATION QUALITY MANAGEMENT SYSTEM</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Ensure the quality of meteorological data and products provided to all the users of the ATM community
• Improve the trust of the user with respect to meteorological data used for flight planning and re-planning.</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Number of international aerodromes with QMS/MET implemented and updated to ISO 9001:2015.
• Number of international aerodromes with QMS/MET certified under ISO 9001:2015.</td></tr>
<tr><td colspan="5">2017 – 2020
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="3"></td><td>a) Ensure the implementation and updating of the MET information quality management system QMS/MET)</td><td>2017-2020</td><td>Regional Project
States</td><td>Valid</td></tr>
<tr><td>b) Certify and maintain the certification of the QMS/MET quality management system by an approved organisation in all AOP aerodromes.</td><td>(*) 2019</td><td>States</td><td>Valid</td></tr>
<tr><td>c) Monitor the process of QMS/MET implementation and updating process</td><td>2017-2020</td><td>GREPECAS</td><td>Valid</td></tr>
<tr><td>Relationship with GPIs</td><td colspan="4">GPI/18: Aeronautical information and GPI/19: Meteorological systems.</td></tr>
</table>

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REGIONAL PERFORMANCE OBJECTIVE: SAM MET/02 IMPROVEMENTS IN MET FACILITIES				
Benefits				
Safety	• Provide more reliable MET information to all the ATM community. • Assistance in decision-making for ATM. • Assurance of availability of MET information for the user • Contribute to situational awareness of aeronautical users for all weather operations (AWO).			
Metrics				
• Number of international aerodromes with operative AWOS. • Number of MWOs with the required equipment and systems. • Number of AOP aerodromes with updated summaries and climatological tables.				
2017 - 2018 ***Strategy***				
ATM OC COMPONENTS	**TASKS**	**PERIOD**	**RESPONSIBILITY**	**STATUS**
AOM **DCB** **AO** **AUO** **ATM-SDM** **CM**	a) Monitor the regional plan for the automation of meteorological data at all AOP aerodromes.	2017-2019	Regional Project States	Valid
	b) Establish a regional plan to strengthen Meteorological Watch Offices (MWOs) with the infrastructure required for the effective watch in the FIRs.	2017-2020	Regional Project States	Valid
	c) Establish a regional plan to give continuity, spatial homogeneity, and harmonization to FIR surveillance.	2018-2021	States	Valid
	d) Monitor the programme for the update of the Summaries and climatological tables of AOP aerodromes.	2017-2019	States	Valid
	e) Monitor the implementation of the different programmes	2017-2020	GREPECAS States	Valid
Relationship with GPIs	GPI/9: Situational awareness, GPI/14: Runway operations, GPI/18: Aeronautical information and GPI/19: Meteorological systems.			

REGIONAL PERFORMANCE OBJECTIVE: SAM MET/03 IMPROVEMENTS IN THE IMPLEMENTATION OF INTERNATIONAL AIRWAYS VOLCANO WATCH (IAVW), SURVEILLANCE OF THE ACCIDENTAL RELEASE OF RADIOACTIVE MATERIAL AND THE ISSUANCE OF SIGMETs	
Benefits	
Safety	• Increased flight safety with the provision of information on volcanic ash and severe phenomena
Environmental protection and sustainable	• Support pre-flight planning, optimising air routes with respect to volcanic ash and the accidental release of radioactive material. • Support the planning of new air routes in a safe and sustainable manner.
Metrics	
• Number of States with IAVW and their implemented evolutions. • Number of States with contingency plan for volcanic ash and accidental release of radioactive material, approved.	
2016 – 2022 ***Strategy***	

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
	a) Update the Guide for IAVW implementation in the Region, based on ICAO Document 9766.	2017-2019	Regional Project States	Valid
	b) Update the letters of agreement between CAAs/MET/State vulcanologic bodies, describing the responsibilities of each institution (including VONA format)	(*) 2018	States	Valid
	c) Where applicable, develop written agreements with national meteorological services (NMS) in case of accidental release of radioactive material.	(*) 2018	States	Valid
	d) Update the letters of operational agreement between ATS/MET units,	(*) 2018	States	Valid
	e) Monitor the implementation of the regional contingency plan for cases of volcanic activity	(*) 2020	Regional Project	Valid
	f) Develop a regional contingency plan for cases of accidental release of radioactive material.	2017-2020	Regional Project	Valid
	g) Update the procedures in MWOs and VAACs according to Amendments 77 and 78 of Annex 3	2017-2020	States	Valid
Relationship with GPIs	GPI/9: Situational awareness, GPI/14: Runway operations, GPI/16: Decision support and alerting systems, GPI/18: Aeronautical information and GPI/19: Meteorological systems.			

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REGIONAL PERFORMANCE OBJECTIVE: SAM MET/04
IMPROVEMENTS IN OPMET INFORMATION EXCHANGE,
FOLLOW-UP OF WAFS EVOLUTION AND IMPLEMENTATION OF MET AND AIM DATA INTEROPERABILITY

Benefits

Safety	• Timely provision of duly coded OPMET information to the ATM community • Increased regional use of meteorological forecasts (upper wind, turbulence, icing, convective clouds and others).
Environmental protection and development of air transport	• Increased efficiency of operations and reduced carbon emissions.

Metrics

- Increased availability of OPMET information (in percentage) at regional and international level.
- Number of States that have implemented WAFS and its evolutions.
- Number of States where meteorological services are involved in CDM and A-CDM processes.
- Number of States that transmit OPMET data in XML/GML format.
- Number of States with data available for interoperability.

2017 - 2024
Strategy

ATM OC COMPONENTS	TASKS	PERIOD	RESPONSIBILITY	STATUS
AOM **DCB** **AO** **AUO** **ATMSDM** **CM**	a) Update the regional procedure according to Amendments 77 and 78 to ensure timely availability of duly coded OPMET information	(*) 2018	States / Brasilia OPMET database	Valid
	b) Develop contingency procedures for the dissemination of OPMET information through the Internet in case of communication system failure.	2017 - 2019	States	Valid
	c) Develop and implement a transition plan for OPMET information coding in XML format	2017 - 2019	Regional Project States	Valid
	d) Develop and implement regional procedures in support of ATM	2017 - 2019	ICAO States	Valid
	e) Establish a plan to implement the participation of meteorological services in CDM and A-CDM processes.	2018 -2021	Regional Project State	Valid
	f) Develop together with COM units, a migration plan to make WAFS products compatible with the NextGEN/SESAR environment in the future.	2017 – 2019	Regional Project	Valid
	g) Establish a programme for the implementation of standards and recommended practices and IT infrastructure related to OPMET exchange in an interoperable format so that the OPMET data generated and coded by the States may access the SWIM environment.	2018 - 2021	Regional Project States	Valid
Relationship with GPIs	GPI/9: Situational awareness, GPI/14: Runway operations, GPI/18: Aeronautical information and GPI/19: Meteorological systems.			

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<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM MET/05</u>
IMPLEMENTATION OF SPACE WEATHER SURVEILLANCE</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Provision of information on space weather conditions
• Availability of OPMET messages related to space weather on aeronautical meteorological information networks.</td></tr>
<tr><td>Environmental protection and sustainable development of air transport</td><td colspan="4">• Increased efficiency of operations and reduced carbon emissions.</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Percentage increase in availability of both regional and international OPMET information.
• Number of States that have implemented WAFS and its evolutions.
• Number of States that prepare space weather forecasts, after 2020.
• Number of States where meteorological services are involved in CDM and A-CDM processes.
• Number of States that transmit OPMET data in XML/GML format.
• Number of States with data available for interoperability.</td></tr>
<tr><td colspan="5">2018 – 2022
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="5">AOM
DCB
AO
AUO
ATMSDM
CM</td><td>a) Insert everything related to space weather surveillance in the Guide for drafting and dissemination of SIGMET messages.</td><td>2018-2020</td><td>Regional Project
State</td><td>Valid</td></tr>
<tr><td>b) Develop and implement a space weather forecast interpretation training plan for MET personnel.</td><td>2018 - 2022</td><td>Regional Project
State</td><td>Valid</td></tr>
<tr><td>c) Develop and implement a training plan on coding of OPMET space weather information in XML format</td><td>2019 - 2021</td><td>Regional Project
State</td><td>Valid</td></tr>
<tr><td>d) Conduct space weather event drills to check codings and response by States</td><td>2019-2022</td><td>Regional Project
State</td><td>Valid</td></tr>
<tr><td>e) Establish a programme for the implementation of standards and recommended practices and IT structure related to space weather so that the data generated and coded by the States may access a SWIM environment .</td><td>2020-2022</td><td>Regional Project
States</td><td>Valid</td></tr>
<tr><td>Relationship with GPIs</td><td colspan="4">GPI/9: Situational awareness, GPI/18: Aeronautical information and GPI/19: Meteorological systems</td></tr>
</table>

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<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM SAR/01</u>
COOPERATION AND COORDINATION OF SAR SERVICES AT REGIONAL LEVEL</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Favours the application of practical risk management principles</td></tr>
<tr><td>Environmental protection and development of air transport</td><td colspan="4">• Ensure cooperation and coordination amongst the interested parties</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Number of letters of agreement implemented for SAR
• Number of SAR exercises conducted</td></tr>
<tr><td colspan="5">2017 - 2022
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="7">N/A</td><td>a) Assess SAR requirements at regional level</td><td>2017</td><td>ICAO-States</td><td>Valid</td></tr>
<tr><td>b) Adopt SAR requirements at regional level and development of GADSS system concept</td><td>2017 - 2022</td><td>States</td><td>Valid</td></tr>
<tr><td>c) Comply with risk and quality management practical principles</td><td>(*) - 2022</td><td>States</td><td>Valid</td></tr>
<tr><td>d) Develop, update, establish and ratify SAR agreements between States</td><td>(*) - 2022</td><td>States</td><td>Valid</td></tr>
<tr><td>e) Harmonise SAR training plans</td><td>(*) - 2018</td><td>CATC</td><td>Valid</td></tr>
<tr><td>f) Conduct annual SAR exercises at regional level</td><td>(*) - 2019</td><td>States</td><td>Valid</td></tr>
<tr><td>g) Monitor implementation progress</td><td>(*) - 2022</td><td>GREPECAS</td><td>Valid</td></tr>
<tr><td>Relation-ship with GPIs</td><td colspan="4">Not applicable</td></tr>
</table>

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<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM AIM/01</u>
IMPROVEMENT OF QUALITY, INTEGRITY AND AVAILABILITY OF AERONAUTICAL INFORMATION</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Assures data integrity and resolution
• Favours information traceability</td></tr>
<tr><td>Environmental protection and development of air transport</td><td colspan="4">• Assures timely awareness of significant changes in information</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Number of States that meet the AIRAC calendar
• Number of States that have implemented and certified QMS
• Number of corrected deficiencies
• Number of States establish SLA agreements</td></tr>
<tr><td colspan="5">2012 - 2018
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="6">AOM
AO
DCB
AUO</td><td>a) Action plan to resolve AIS/AIM deficiencies.</td><td>(*) 2019</td><td>States</td><td>Valid</td></tr>
<tr><td>b) Assess the status of implementation and update of the AIM Action Plan</td><td>2018 - 2020</td><td>ICAO - States</td><td>Valid</td></tr>
<tr><td>c) Establish and certify an AIM Quality Management System (QMS)</td><td>(*) 2018</td><td>States</td><td>Valid</td></tr>
<tr><td>d) Follow up to the application of guidelines on service level agreements (SLAs) between data originators and AIM</td><td>*2018-2021</td><td>GREPECAS</td><td>Valid</td></tr>
<tr><td>e) Establish agreements with data originators (SLAs)</td><td>2017 - 2019</td><td>States</td><td>Valid</td></tr>
<tr><td>f) Monitor the implementation of the AIM Action Plan</td><td>2016 - 2021</td><td>GREPECAS</td><td>Valid</td></tr>
<tr><td>Relation-ship with GPIs</td><td colspan="4">GPI/9: Situational awareness, GPI/16: Decision support and alerting systems, GPI/18: Aeronautical information, GPI/20: WGS-84, GPI/21: Navigation systems.</td></tr>
</table>

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<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM AIM/02</u>
TRANSITION TO THE PROVISION OF ELECTRONIC AERONAUTICAL INFORMATION</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Support to ground proximity warning systems (GPWS) and procedure design and optimisation tools.</td></tr>
<tr><td>Environmental protection and development of air transport</td><td colspan="4">• Integration of dynamic and static information into a single display to facilitate situational awareness.
• Access to information during all flight phases.</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Number of States that have implemented the transition plan to the provision of electronic information
• Number of States that have implemented the GIS action plan
• Number of States that have implemented the e-TOD action plan</td></tr>
<tr><td colspan="5">2017 - 2021
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="6">AOM
AO
CM
DCB
TS
AUO
ATM-SDM</td><td>a) Implement the transition plan for the provision of electronic aeronautical information</td><td>2017 - 2021</td><td>States</td><td>Valid</td></tr>
<tr><td>b) Prepare a training programme for AIM personnal with the new profiles for the performance of the aeronautical inormation management in the digital environment</td><td>2017 - 2021</td><td>States - ICAO</td><td>Valid</td></tr>
<tr><td>c) Develop and establish a programme to facilitate AIS - MET interoperability</td><td>2017 - 2019</td><td>ICAO</td><td>Valid</td></tr>
<tr><td>d) Follow up the Action Plan for implementation of a GIS</td><td>2017 - 2019</td><td>ICAO</td><td>Valid</td></tr>
<tr><td>e) Follow up the Action Plan for e-TOD implementation</td><td>2017 - 2019</td><td>ICAO</td><td>Valid</td></tr>
<tr><td>f) Monitor the implementation of the transition plan for the provision of electronic aeronautical information</td><td>2017 - 2019</td><td>GREPECAS</td><td>Valid</td></tr>
<tr><td>Relationship with GPIs</td><td colspan="4">GPI/9: Situational awareness, GPI/16: Decision support and alerting systems, GPI/18: Aeronautical information, GPI/19: Meteorological systems, GPI/20: WGS-84.</td></tr>
</table>

<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM AGA/01</u>
QUALITY AND AVAILABILITY OF AERONAUTICAL DATA</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Less aircraft accidents at the aerodrome;
• Improved aircraft safety at the aerodrome;</td></tr>
<tr><td>Environmental protection and development of air transport</td><td colspan="4">• Efficient aerodrome operations based on aeronautical data quality assurance.</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Number of deficiencies related to non-compliance of the information contained in Table AOP 1. Doc. 8733, Vol. II
• Number of aerodromes with processes defined and implemented with AIM
• Number of aerodromes with updated data e-TOD</td></tr>
<tr><td colspan="5">2017 - 2023
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="4">AO
CM
AUO</td><td>a) Develop a regional action plan to update the information contained in Document 8733 CAR/SAM Navigation Plan, Vol. II, Table AOP1</td><td>(*) - 2018</td><td>Regional Project/ GREPECAS</td><td>Finished</td></tr>
<tr><td>b) Establish and implement a process to assure the provision of aeronautical data to AIM by the airport operator with the corresponding quality requirements.</td><td>(*) - 2021</td><td>Regional Project/States</td><td>Valid</td></tr>
<tr><td>c) Update aerodrome obstacle data in the WGS-84.</td><td>(*) – 2018</td><td>Regional Project/ GREPECAS</td><td>Finished</td></tr>
<tr><td>d) Availability of e-TOD data for areas 3 and 4</td><td>2017-2023</td><td>States</td><td>Valid</td></tr>
<tr><td>Relationship with GPIs</td><td colspan="4">GPI/9: situational awareness, GPI/10: terminal area design and management, GPI/13: aerodrome design and management; GPI/14: runway operations, GPI/18: aeronautical information, GPI/20: WGS-84.</td></tr>
</table>

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<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM AGA/02</u>
AERODROME CERTIFICATION</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Less aircraft accidents at the aerodrome
• Increase of operational safety in the aerodrome</td></tr>
<tr><td>Environmental protection and development of air transport</td><td colspan="4">• Efficient aerodrome operations based on compliance with the SARPs;</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• Number of certified aerodromes
• Number of trained inspectors
• Number of aerodromes with a certification validated under LAR AGA.</td></tr>
<tr><td colspan="5">2017 - 2023
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="7">AO
CM
AUO
DCB</td><td>a) Harmonise national regulations of States with LAR-AGA</td><td>2013 – 2019</td><td>States</td><td>Valid</td></tr>
<tr><td>b) Train regional aerodrome inspectors with the MIAGA</td><td>(*) – 2021+</td><td>Regional Project</td><td>Valid</td></tr>
<tr><td>c) Train regional aerodrome inspectors in auditing techniques</td><td>2014 – 2019+</td><td>Regional Project</td><td>Valid</td></tr>
<tr><td>d) Conduct multinational audit (certification) trials in the aerodromes of the Region</td><td>2014 – 2019+</td><td>Regional Project/States</td><td>Valid</td></tr>
<tr><td>e) Certification of aerodromes</td><td>(*) - 2021</td><td>States</td><td>Valid</td></tr>
<tr><td>f) Validate aerodrome certificates granted before harmonization with LAR AGA</td><td>2015 – 2021+</td><td>States</td><td>Valid</td></tr>
<tr><td>g) Surveillance of the certification process</td><td>2012 – 2021+</td><td>GREPECAS</td><td>Valid</td></tr>
<tr><td>Relationship with GPIs</td><td colspan="4">GPI/9: situational awareness, GPI/10: terminal area design and management, GPI/13: aerodrome design and management. GPI/14: Runway operations.</td></tr>
</table>

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<table>
<tr><td colspan="5">REGIONAL PERFORMANCE OBJECTIVE: <u>SAM AGA/03</u>
PROVISION OF PHYSICAL CAPACITY AND OPERATIONAL IMPROVEMENTS TO AERODROME</td></tr>
<tr><td colspan="5">Benefits</td></tr>
<tr><td>Safety</td><td colspan="4">• Increases safe aircraft operations.
• Increase in situational awareness to all partners involved</td></tr>
<tr><td>Environmental protection and development of air transport</td><td colspan="4">• Increase in aerodrome capacity
• Reduction of emissions in aerodromes
• Fuel savings
• Traffic fluidity in the movement areas.</td></tr>
<tr><td colspan="5">Metrics</td></tr>
<tr><td colspan="5">• States with at least one specialist trained in airport planning
• Percentage of States with national strategic airport development plans
• Number of international aerodromes with approved and current master plans
• Percentage of international aerodromes with reported runway and apron capacity
• Number of high density aerodromes with implemented collaboration mechanisms</td></tr>
<tr><td colspan="5">2017 - 2023
Strategy</td></tr>
<tr><td>ATM OC COMPONENTS</td><td>TASKS</td><td>PERIOD</td><td>RESPONSIBILITY</td><td>STATUS</td></tr>
<tr><td rowspan="8">AO
CM
AUO</td><td>a) Develop airport planning capabilities within States</td><td>2017 - 2021</td><td>Regional Project</td><td>Valid</td></tr>
<tr><td>b) Prepare national airport development strategic plans</td><td>2017-2023+</td><td>States</td><td>Valid</td></tr>
<tr><td>c) Review airport master plans</td><td>2018 – 2023+</td><td>States</td><td>Valid</td></tr>
<tr><td>d) Develop procedures to measure and optimize runway and apron capacity in aerodromes</td><td>(*) - 2020</td><td>Regional Project</td><td>Valid</td></tr>
<tr><td>e) Apply procedures to measure and optimize runway and apron capacity in aerodromes</td><td>2020 - 2023</td><td>States</td><td>Valid</td></tr>
<tr><td>f) Elaborate a project/framework for the implementation of ACDM</td><td>2017 – 2018</td><td>Regional Project</td><td>Valid</td></tr>
<tr><td>g) ACDM implementation in high density traffic airports</td><td>2019 – 2020</td><td>Regional Project/States</td><td>Valid</td></tr>
<tr><td>h) Surveilance of tasks</td><td>(*) – 2023+</td><td>GREPECAS</td><td>Valid</td></tr>
<tr><td>Relationship with GPIs</td><td colspan="4">GPI/6: ATFM, GPI/7: management of dynamic and flexible ATS routes, GPI/9: situational awareness; GPI/13: aerodrome design and management; GPI/14: Runway operations, GPI/ 16: decision support and alerting systems.</td></tr>
</table>

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REGIONAL PERFORMANCE OBJECTIVE: SAM HR/01
Planning of training for development of personnel competencies in air navigation systems

Benefits	
Safety	• Reinforces safety
Environmental protection and sustainable development of air transport	• Information available with a level of quality that is appropriate to the requirements. • Personnel duly trained as instructors in the ATM operational concept. • Personnel duly trained to manage, operate and maintain the air navigation system. • Increases situational awareness of the personnel. • Provides for quality air navigation services.

Metrics

- Number of CATCs applying training programmes to meet air navigation system requirements.

2017 - 2024
Strategy

ATM OC COMPONENTS	TASKS	PERIOD START-END	RESPONSIBILITY	STATUS
AOM, AO AUO DCB ATM-SDM CM TS	a) Follow-up the training programme for air navigation service personnel to introduce the ASBU methodology and ATN operational concept, in order to respond to the new challenges, taking into account ICAO documentation.	2017-2021	States	Valid
	b) Monitor the activities of the New Generation of Aviation Professionals (NGAP) Special Team and implement the results in the region.	2017-2024	States/ICAO	Valid
	c) Prepare specific training programmes accompanying the ASBU Block 1 modules selected by States, taking in consideration the information on reference documents and guidance materials, as well as the competency requirements described in ASBU modules (PBIP Attachment D).	2017-2022	States	Valid
	d) Encourage States to ensure that the instructors of the Region trained in the ASBU methodology prepare staff from the various air navigation areas on the priority activities of ASBU modules, especially for the implementation of Block 1.	2017-2022	Regional Project	Valid
	e) Strengthen Civil Aviation Training Centres (CATCs) of the Region.	2017–2022	States	Valid
	f) Conduct the courses on training, planning of ASBU Block 1 modules within the ATM Operational Concept	2018-2022	States	Valid
	g) Monitor the training and updating of air navigation personnel	2017-2024+	GREPECAS Regional group States	Valid
Relationship with GPIs	*The updating and training of aeronautical personnel is a cross-cutting issue for all ATM system areas.*			

REGIONAL PERFORMANCE OBJECTIVE: SAM SM/01 SAFETY				
Benefits				
Safety	• Strengthens safety			
Metrics				
• N° of EI for ANS and AGA • Number of priorities identified per safety data				
2012 - 2018 ***Strategy***				
ATM OC COMPONENTS	**TASKS**	**PERIOD**	**RESPONSIBILITY**	**STATUS**
AOM **AUO**	a) Coordination with RASG-PA to share information on air navigation safety and systems, as a reference for the activities of the Region.	(*) – 2024+	States	Valid
	b) Assess and assist States in the effective implementation of actions, in order to improve safety.	(*) - 2024	GREPECAS	Valid
	c) Coordinate supplementary actions with SRVSOP to standardize safety requirements and procedures needing implementation	(*) - 2024	Regional project	Valid
Relation-ship with GPIs	The systemic safety approach is holistic, applied to the whole ANS system.			

(*) Indicates that the task has been started before the date contemplated in this planning.

REGIONAL PERFORMANCE OBJECTIVE: SAM ENV IMPLEMENTATION OF THE ACTION PLAN FOR THE REDUCTION OF CO_2 AND OF THE CO_2 OFFSETTING AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION (CORSIA)				
Benefits				
Environmental Protection	• Ensure that aeronautical operations are environmentally friendly. • Improve international community confidence in the measures applied by States to mitigate international aviation effects on the environment.			
Metrics				
• Number of States with Action Plan for the Reduction of CO_2 submitted to ICAO and updated every three years. • Number of States adhered to CORSIA for 2024.				
Strategy 2017 – 2024				
ATM OC COMPONENTS	**TASKS**	**PERIOD STAR-END**	**RESPONSIBILITY**	**STATUS**
AOM DCB AO AUO ATM-SDM	a) Promote multilateral journeys inside the civil aviation authority to raise awareness and promote environmental protection measures to mitigate the effects of international aviation activity in this regard.	2018-2019	States	Valid
	b) Establish and develop a technical assistance plan for States that have not completed their Action Plan for the Reduction of CO_2.	2018-2019	Regional Project States	Valid
	c) Submit the Action Plan for the Reduction of CO_2 to ICAO and update it every three years.	2018-2024	States	Valid
	d) Follow up on compliance of the measures proposed in the Action Plans submitted by the States.	(*) 2017- 2024	ICAO	Valid
	e) Establish and develop a technical assistance plan for States to implement the Measurement, Report and Verification (MRV) systems of CO_2 emissions originated by international aviation.	2019-2021	Regional Project States	Valid
	f) Promote participation of SAM Region States in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).	2019-2023	ICAO	Valid
Vínculo con las GPI	Environmental protection is referred to measures related with ATM procedures and airport procedures, which require for their application communication infrastructures for the exchange of aeronautical and meteorological information, thus, this PFF is related to all the GPI.			

(*) Indicates that the task has been initiated before the period considered for this planning.

RELACIÓN OF ACTIVITIES BETWEEN PFFs

<table>
<tr><th>AREA</th><th>ATM</th><th colspan="2">AGA/AOP</th><th colspan="2">AIM</th><th colspan="2">CNS</th><th colspan="2">MET</th></tr>
<tr><td rowspan="7">ATM</td><td rowspan="7"></td><td>ATM/2-AGA/AOP/1</td><td>c – c
d – c</td><td>ATM/2-AIM/1</td><td>b – d, e
c – d, e
d – d, e
e – d, e</td><td>ATM/1-CNS/2</td><td>b – a, c
e – c, d
f – a, b, c, d</td><td>ATM/1-MET/3</td><td>a – e, g</td></tr>
<tr><td>ATM/3-AGA/AOP/1</td><td>a – a, b
b – c
c - c</td><td rowspan="4">ATM/2-AIM/2</td><td rowspan="4">b – a, b, d, e
c – a, b, d, e
d – a, b, d, e
e – a, b, d, e</td><td rowspan="4">ATM/1-CNS/3</td><td rowspan="4">a – b
f - b</td><td>ATM/1-MET/4</td><td>a – g</td></tr>
<tr><td>ATM/3-AGA/AOP/4</td><td>b – a, b, c, d, e, f</td><td rowspan="2">ATM/2-MET/3</td><td rowspan="2">b – e, f, g
c – e, f, g
d - e, f, g
e - e, f, g</td></tr>
<tr><td rowspan="2">ATM/3-AGA/AOP/5</td><td rowspan="2">b – a, b</td></tr>
<tr><td>ATM/3-MET/3</td><td>b – e, f, g
c – e, f, g</td></tr>
<tr><td rowspan="2">ATM/5-AGA/AOP/4</td><td rowspan="2">c – a, b, c, d, e, f
d - a, b, c, d, e, f</td><td rowspan="2">ATM/3-AIM/1</td><td rowspan="2">b – d, e
c – d, e</td><td>ATM/1-CNS/4</td><td>b – c
e – c
f – a, c, d
g – a, c, d</td><td>ATM/5-MET/1</td><td>b – a, c</td></tr>
<tr><td>ATM/2-CNS/3</td><td>b – b</td><td>ATM/5-MET/2</td><td>b – a, b, c, d</td></tr>
</table>

AREA	ATM	AGA/AOP		AIM		CNS		MET	
							c - b		
						ATM/3 CNS/3	c - c	ATM/5-MET/3	b – a, c, d, e, g, h
						ATM/5-CNS/1	f -c	ATM/5-MET/4	b – a, b, c, g
						ATM/6-CNS/1	b – a, b, c, d, e d – c, d, f, g, h	ATM/7-MET/1	c – a d - a
				ATM/3-AIM/2	e – b			ATM/7-MET/4	c – d d - d
				ATM/4-AIM/1	e – c, d, e	ATM/6-CNS/4	c – a, b, c, d d – a, c		
				ATM/6-AIM/2	b – a, b, d, e c – a, b, d, e				
AGA/AOP				AGA/AOP/1-AIM/1	b – d g - e	AGA/AOP/4-CNS/4	g - b	AGA/AOP/5-MET/2	a - a
				AGA/AOP/1-AIM/2	b – d, e				
CNS				CNS/1-AIM/2	a – a, b f – a, b			CNS/2-MET/4	h – a, c. g

AREA	ATM		AGA/AOP		AIM		CNS		MET	
MET					MET/1-AIM/1	a - g				
					MET/3-AIM/2	f – c g – c				
					MET/1-AIM/2	a-g				
SAR	SAR/1-ATM/4	f - d								
RRHH	All area of PFF/1		All area of PFF/1		All area of PFF/1		All area of PFF/1		All area of PFF/1	
SM	All area of PFF/1		All area of PFF/1		All area of PFF/1		All area of PFF/1		All area of PFF/1	

PFF RELATIONSHIP WITH ASBU BLOCK 0 AND BLOCK1 MODULES SELECTED FOR THE SAM REGION
RELACIÓN DE LOS PFFCON LOS MÓDULOS DEL ASBU DEL BLOQUE 0 Y DEL BLOQUE 1 SELECCIONADO PARA LA REGIÓN SAM

PFF AND BLOCK 0 MODULES/ PFF Y MODULOS BLOQUE 0

ASBU / PFF	PIA1				PIA2			PIA3						PIA4		
	B0 RSEQ	B0 APTA	B0 SURF	B0 ACDM	B0 FICE	B0 DATM	B0 AMET	B0 FRTO	B0 NOPS	B0 ASUR	B0 SNET	B0 OPFL	B0 ACAS	B0 CDO	B0 CC0	B0 TBO
PFF SAM ATM/01								X				X				
PFFSAMATM/02														X	X	
PFFSAM ATM/03		X														
PFF SAM ATM/04								X								
PFF SAM ATM/05	X			X					X							
PFF SAM ATM/06			X							X	X					
PFF SAM CNS/01					X		X		X							
PFFSAM CNS/02																X
PFF SAM CNS/03		X														
PFF SAM CNS/04			X							X	X					
PFFSAM MET/01							X									
PFF SAM MET/02			X	X			X									
PFF SAM MET/03				X			X									
PFF SAM MET/04				X		X	X									
PFFSAM SAR/01																
PFF SAM AIM/01						X										
PFF SAM AIM/02						X	X									
PFF SAM AGA/01				X		X										
PFF SAM AGA/02			X	X		X										
PFF SAM AGA/03	X		X	X		X										
PFF SAM HHRR/01	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PFF SAM SM/01																
PFF SAM ENV/01	X	X		X			X	X	X					X	X	

PFF AND BLOCK 1 MODULES/ PFF Y MODULOS BLOQUE 1

ASBU / PFF	PIA1	PIA2				PIA3		PIA4		
	B1 RSEQ	B1 FICE	B1 DATM	B1 AMET	B1 SWIM	B1 NOPS	B1 SNET	B1 CDO	B1 TBO	B1 RPAS
PFF SAM ATM/01										
PFFSAMATM/02								X		X
PFFSAM ATM/03										
PFF SAM ATM/04										
PFF SAM ATM/05	X					X				
PFF SAM ATM/06							X			
PFF SAM CNS/01		X	X	X	X	X			X	
PFFSAM CNS/02										
PFF SAM CNS/03										
PFF SAM CNS/04	X						X		X	
PFFSAM MET/01				X						
PFF SAM MET/02				X						
PFF SAM MET/03				X						
PFF SAM MET/04			X	X	X					
PFFSAM SAR/01										
PFF SAM AIM/01			X							
PFF SAM AIM/02			X	X	X					
PFF SAM AGA/01										
PFF SAM AGA/02										
PFF SAM AGA/03					X					
PFF SAM HHRR/01	X	X	X	X	X	X	X	X	X	X
PFF SAM SM/01										
PFF SAM ENV/01	X			X		X		X		

ATTACHMENT D

DESCRIPTION OF MODULES CONSIDERED FOR THE SAM REGION

PERFORMANCE IMPROVEMENT AREA 1: AIRPORT OPERATIONS

1. **B0-15 RSEQ: Improve Traffic Flow through Runway Sequencing (AMAN/DMAN)**

Introduction

1.1 This module introduces system capabilities to provide assistance for sequencing and metering to manage arrivals and departures (including time-based metering) to and from a multi-runway aerodrome or locations with multiple dependent runways at closely proximate aerodromes, to efficiently utilize the inherent runway capacity.

Baseline

1.2 Currently, sequencing is the manual process by which the air traffic controller uses local procedures and his expertise to sequence departures or arrivals in real time. This is generally leading to sub-optimal solutions both for the realized sequence and the flight efficiency, in particular in terms of taxi times and ground holding for departures, and in terms of holding for arrivals.

Change brought by the module

1.3 For departures, the sequence will allow improved start/push-back clearances, reducing the taxi time and ground holding, delivering more efficient departure sequences, reducing surface congestion and effectively and efficiently making use of terminal and aerodrome resources.

1.4 Departure management tools maximize the use of airspace capacity and assure full utilization of resources. They have the additional benefit of fuel efficient alternatives to reduce airborne and ground holding in an era in which fuel continues to be a major cost driver and emissions are a high priority. The use of these tools to assure facility of more efficient arrival and departure paths is a main driver in some modules of Block 0.

Necessary procedures (air and ground)

1.5 It is necessary to develop the systems and operational procedures for AMAN/DMAN. In particular, procedures for the extension of metering into en-route airspace will be necessary. RNAV/RNP for arrival will also be crucial as well.

Element 1: AMAN and time-based metering

1.6 Arrival management (AMAN) sequences the aircraft, based on the airspace state, wake turbulence, aircraft capability, and user preference. The established sequence provides the time that aircraft may have to lose before a reference approach fix, thereby allowing aircraft to fly more efficiently to the that fix and to reduce the use of holding stacks, in particular at low altitude. The smoothed sequence allows increased aerodrome throughput.

1.7 Time-based metering is the practice of separation by time rather than distance. Typically, the relevant ATC authorities will assign a time in which a flight must arrive at the aerodrome. This is known as the control time of arrival (CTA). CTAs are determined based on aerodrome capacity, terminal airspace capacity, aircraft capability, wind and other meteorological factors. Time-based metering is the primary mechanism in which arrival sequencing is achieved.

Element 2: Departure management

1.8 Departure management (DMAN), like its arrival counterpart, serves to optimize departure operation to ensure the most efficient utilization of aerodrome and terminal resources. Slots assignment and adjustments will be supported by departure management automations like departure management (DMAN) or departure flow management (DFM). Dynamic slot allocation will foster smoother integration into overhead streams and help the airspace users to better meet metering points and comply with other ATM decisions. Departure management sequences the aircraft, based on the airspace state, wake turbulence, aircraft capability, and user preference, to fit into the overhead en-route streams without disrupting the traffic flow. This will serve to increase aerodrome throughput and compliance with allotted departure time.

Intended performance operational improvement

1.9 In terms of Capacity improvements, time-based metering will optimize usage of terminal airspace and runway capacity. The utilization of terminal and runway resources will be optimized.

1.10 Efficiency is positively impacted as reflected by increased runway throughput and arrival rates. Efficiency is achieved through:

a) harmonized arriving traffic flow from en-route to terminal and aerodrome. Harmonization is achieved via the sequencing of arrival flights based on available terminal and runway resources; and
b) streamlined departure traffic flow and smooth transition into en-route airspace. Decreased lead time for departure request and time between call for release and departure time. Automated dissemination of departure information and clearances.

1.11 In terms of predictability it decreases uncertainties in aerodrome/terminal demand prediction and in terms of flexibility it enables dynamic scheduling.

1.12 Just as a reference to take into account, a detailed business case has been built for the time-based flow management programme in the United States. The business case has proven the benefit/cost ratio to be positive. Implementation of time-based metering can reduce airborne delay. This capability was estimated to provide over 320 000 minutes in delay reduction and $28.37 million in benefits to airspace users and passengers over the evaluation period.

Necessary system capability

Avionics

1.13 No avionics capability is required in support of the time-based metering for departure. For approach, time-based metering is mainly achieved through ATC speed clearance to adjust the aircraft sequence in the AMAN. This operation can be facilitated by requiring the aircraft to meet a CTA at a metering fix, relying on the aircraft required time of arrival function from current flight management system (FMS).

Ground systems

1.14 The key technological aspects include automation support for the synchronization of arrival sequencing, departure sequencing, and surface information; improve predictability of arrival flow, further hone sector capacity estimates, and management by trajectory. Less congested locations might not require extensive automation support to implement.

1.15 Both TBFM and arrival/departure management (AMAN/DMAN) application and existing technologies can be leveraged, but require site adaptation and maintenance.

Human factors considerations

1.16 ATM personnel responsibilities will not be affected directly. However, human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

1.17 Automation support is needed for air traffic management in airspace with high demands. Thus, training is needed for ATM personnel.

1.18 Training in the operational standards and procedures are required for this module. Likewise, the qualifications requirements which form an integral part to the implementation of this module.

Reference documents and guidance materials

- European ATM Master Plan, Edition 1.0, March 2009, update in progress
- SESAR Definition Phase Deliverables
- TBFM Business Case Analysis Report
- NextGen Midterm Concept of Operations v.2.0
- RTCA Trajectory Operations Concept of Use

Module summary

Title of the Module: **B0-15 RSEQ: Improve Traffic Flow Through Runway Sequencing (AMAN/DMAN)**					
Elements: 1. AMAN 2. DMAN		Equipage/Air - Nil		Equipage/Ground - Automation support	
Implementation monitoring and intended performance impact					
Implementation progress Indicator: *Percentage of international aerodromes with AMAN/DMAN*	Qualitative performance benefits associated with five main KPAs only				
	KPA-Access/Equity Not Applicable	KPA-Capacity Time-based metering will optimize usage of terminal airspace and runway capacity.	KPA-Efficiency Efficiency is positively impacted as reflected by increased runway throughput and arrival rates.	KPA-Environment Not Applicable	KPA-Safety Not Applicable

2. <u>**B0-65 APTA: Optimization of Approach Procedures including Vertical Guidance**</u>

Introduction

2.1 This module complements other airspace and procedures elements (continuous descent operations (CDO), PBN and airspace management) to increase efficiency, safety, access and predictability. The use of performance-based navigation (PBN) and ground-based augmentation system (GBAS) landing system (GLS1) procedures will enhance the reliability and predictability of approaches to runways, thus increasing safety, accessibility and efficiency. This is possible through the application of Basic global navigation satellite system (GNSS), Baro vertical navigation (VNAV), satellite-based augmentation system (SBAS) and GLS. The flexibility inherent in PBN approach design can be exploited to increase runway capacity.

Baseline

2.2 Conventional navigation aids (e.g. Instrument landing system (ILS), VHF omnidirectional radio range (VOR), non-directional radio beacon (NDB)) have limitations in their ability to support the lowest minima to every runway. In the case of ILS, limitations include cost, the availability of suitable sites for ground infrastructure and an inability to support multiple descent paths to multiple runway ends. VOR and NDB procedures do not support vertical guidance and have relatively high minima that depend on siting considerations.

Change brought by the module

2.3 With the exception of ground-based augmentation system (GBAS) for GLS, performance-based navigation (PBN) procedures require no ground-based navaids and allow designers complete flexibility in determining the final approach lateral and vertical paths. PBN approach procedures can be seamlessly integrated with PBN arrival procedures, along with continuous descent operations (CDO), thus reducing aircrew and controller workload and the probability that aircraft will not follow the expected trajectory.

2.4 States can implement GNSS-based PBN approach procedures that provide minima for aircraft equipped with basic GNSS avionics with or without Baro VNAV capability, and for aircraft equipped with SBAS avionics. GLS, which is not included in the PBN Manual, requires aerodrome infrastructure but a single station can support approaches to all runways and GLS offers the same design flexibility as PBN procedures. This flexibility provides benefits when conventional aids are out of service due to system failures or for maintenance. Regardless of the avionics fit, each aircraft will follow the same lateral path. Such approaches can be designed for runways with or without conventional approaches, thus providing benefits to PBN-capable aircraft, encouraging equipage and supporting the planning for decommissioning of some conventional aids.

2.5 The key to realizing maximum benefits from these procedures is aircraft equipage. Aircraft operators make independent decisions about equipage based on the value of incremental benefits and potential savings in fuel and other costs related to flight disruptions. Experience has shown that operators typically await fleet renewal rather than equip existing aircraft; however retrofits providing RNP/LPV capability are available and have been applied to many bizjet aircraft.

2.6 Metrics *to determine success of the module are proposed in the Manual on Global Performance of the Air Navigation System (Doc 9883).*

Intended performance operational improvement

2.7 In contrast with ILS, the GNSS-based approaches (PBN and GLS) do not require the definition and management of sensitive and critical areas resulting in potentially increased runway capacity.

2.8 Cost savings related to the benefits of lower approach minima: fewer diversions, overflights, cancellations and delays. Cost savings related to higher airport capacity in certain circumstances (e.g. closely spaced parallels) by taking advantage of the flexibility to offset approaches and define displaced thresholds.

2.9 This implementation contributes to safety with stabilized approach paths and to environment benefits through reduced fuel burn increasing airport accessibility as well.

2.10 In terms of cost benefit analysis Aircraft operators and air navigation service providers (ANSPs) can quantify the benefits of lower minima by using historical aerodrome weather observations and modelling airport accessibility with existing and new minima. Each aircraft operator can then assess benefits against the cost of any required avionics upgrade. Until there are GBAS (CAT I/III) Standards, GLS cannot be considered as a candidate to globally replace ILS. The GLS business case needs to consider the cost of retaining ILS or MLS to allow continued operations during an interference event.

Necessary procedures (air and ground)

2.11 The following documents provide background and implementation guidance for ANSPs, aircraft operators, airport operators and aviation regulators:

2.12 The Performance-based Navigation (PBN) Manual (Doc 9613), the Global Navigation Satellite System (GNSS) Manual (Doc 9849) Annex 10 — Aeronautical Telecommunications and the Procedures for Air Navigation Services — Aircraft Operations, Volume I — Flight Procedures and Volume II — Construction of Visual and Instrument Flight Procedures (PANS-OPS, Doc 8168) provide guidance on system performance, procedure design and flight techniques necessary to enable PBN approach procedures.

2.13 The World Geodetic System — 1984 (WGS-84) Manual (Doc 9674) provides guidance on surveying and data handling requirements. The Manual on Testing of Radio Navigation Aids (Doc 8071) (Doc 8071), Volume II — Testing of Satellite-based Radio Navigation Systems provides guidance on the testing of GNSS. This testing is designed to confirm the ability of GNSS signals to support flight procedures in accordance with the standards in Annex 10.

2.14 ANSPs must also assess the suitability of a procedure for publication, as detailed in PANS-OPS, Volume II, Part I, Section 2, Chapter 4, Quality Assurance. The Quality Assurance Manual for Flight Procedure Design (Doc 9906), Volume 5 –Validation of Instrument Flight Procedures provides the required guidance for validation of instrument flight procedures including PBN procedures. Flight validation for PBN procedures is less costly than for conventional aids for two reasons: the aircraft used do not require complex signal measurement and recording systems; and there is no requirement to check signals periodically.

Necessary system capability

Avionics

2.15 PBN approach procedures can be flown with basic instrument flight rules (IFR) GNSS avionics that support on board performance monitoring and alerting; these support lateral navigation (LNAV) minima. Basic IFR GNSS receivers may be integrated with Baro VNAV functionality to support vertical guidance to LNAV/vertical navigation (VNAV) minima. In States with defined SBAS service areas, aircraft with SBAS avionics can fly approaches with vertical guidance to LPV minima, which can be as low as ILS CAT I minima when flown to a precision instrument runway, and as low as 250 ft minimum descent altitude (MDA) when flown to an instrument runway. Within an SBAS service area, SBAS avionics can provide advisory vertical guidance when flying conventional non-directional beacon (NDB) and very high frequency omnidirectional radio range (VOR) procedures, thus providing the safety benefits associated with a stabilized approach. Aircraft require avionics to fly GBAS land system (GLS) approaches.

Ground systems

2.16 SBAS-based procedures do not require any infrastructure at the airport served, but SBAS elements (e.g. reference stations, master stations, geostationary (GEO) satellites) must be in place such that this level of service is supported. The ionosphere is very active in equatorial regions, making it very technically challenging for the current generation of SBAS to provide vertically guided approaches in these regions. A GLS station installed at the aerodrome served can support vertically guided CAT I approaches to all runways at that aerodrome.

Human performance

2.17 The implementation of approach procedures with vertical guidance enables improved cockpit resource management in times of high and sometime complex workload. By allowing crew procedures to be better distributed during the conduct of the procedure, exposure to operational errors is reduced and human performance is improved. This results in clear safety benefits over procedures that lack guidance along a vertical path. Additionally, some simplification and efficiencies may be achieved in crew training as well.

2.18 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures, however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues identified during implementation be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

2.19 Training in the operational standards and procedures are required for this module and can be found in the “Reference documents and guidance material” section hereunder. Likewise, the qualification requirements are identified in the “Regulatory/standardization needs and approval plan (air and ground)” section which forms an integral part to the implementation of this module.

Regulatory/standardization needs and approval plan (air and ground)

a) Regulatory/standardization: use current published criteria as given in Section 8.4 as no new or updated regulatory guidance or standards documentation is needed at this time.
b) Approval plans: no new or updated approval criteria are needed at this time. Implementation plans should reflect available aircraft, ground systems and operational approvals.

Reference documents and guidance material

- ICAO Annex 10 — *Aeronautical Telecommunications*, Volume I — *Radio Navigation Aids*. As of 2011 a draft Standards and Recommended Practices (SARPs) amendment for GLS to support CAT II/III approaches is completed and is being validated by States and industry.
- ICAO Annex 11 — *Air Traffic Services*
- ICAO Doc 4444, *Procedures for Air Navigation Services — Air Traffic Management*
- ICAO Doc 8168, *Procedures for Air Navigation Services — Aircraft Operations*
- ICAO Doc 9674, *World Geodetic System — 1984 (WGS-84) Manual*
- ICAO Doc 9613, *Performance-based Navigation (PBN) Manual*
- ICAO Doc 9849, *Global Navigation Satellite System (GNSS) Manual*
- ICAO Doc 9906, *Quality Assurance Manual for Flight Procedure Design*, Volume 5 -*Validation of Instrument Flight Procedures*
- ICAO Doc 8071, *Manual on Testing of Radio Navigation Aids,* Volume II — *Testing of Satellite-based Radio Navigation Systems*
- ICAO Doc 9931, *Continuous Descent Operations (CDO) Manual*
- FAA AC 20-138, TSO-C129/145/146

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-65 APTA: Optimization of Approach Procedures Including Vertical Guidance</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. APV with Baro VNAV
2. APV with SBAS
3. APV with GBAS</td><td colspan="2"><u>Equipage/Air</u>
- Basic IFR GNSS avionics integrated with Baro VNAV functionality
- SBAS avionics
- GBAS avionics</td><td colspan="2"><u>Equipage/Ground</u>
- SBAS (reference stations, master stations, GEO satellites)
- GBAS</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
Indicator:
Percentage of international aerodromes having instrument runways provided with APV on the basis of Baro VNAV/SBAS/ GBAS</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Increased aerodrome accessibility</td><td><u>KPA-Capacity</u>
Increased runway capacity</td><td><u>KPA-Efficiency</u>
Reduced fuel burn due to lower minima, fewer diversions, cancellations, delays</td><td><u>KPA-Environment</u>
Reduced emissions due to reduced fuel burn.</td><td><u>KPA-Safety</u>
Increased safety through stabilized approach paths.</td></tr>
</table>

3. B0-75 SURF: Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)

Introduction

3.1 This module builds upon traditional surface movement guidance and control system (SMGCS) implementation (visual surveillance, aerodrome signage, lighting and markings) by the introduction of capabilities enhancing air traffic control (ATC) situational awareness through:

a) display to the aerodrome controller of the position of all aircraft on the aerodrome movement area;
b) display to the aerodrome controller of all vehicles on the aerodrome manoeuvring area; and
c) generation of runway incursion alerts (where local operational, safety and cost-benefit analyses so warrant).

3.2 This level of implementation, corresponding to levels 1 and 2 of the A-SMGCS concept and being associated to the provision of ATS, is independent of aircraft equipage beyond that associated with cooperative surveillance equipage (e.g. SSR Mode S or A/C transponders).

3.3 For automatic dependent surveillance—broadcast (ADS-B) APT the facilities and procedures will be the same with the performance levels associated to conventional SMGCS. The B0 level of implementation is dependent of aircraft/vehicle ADS-B Out equipage.

Baseline

3.4 Surface operations historically have been managed by use of visual scanning by both ANSP personnel and flight crew, both as the basis for taxi management as well as aircraft navigation and separation. These operations are significantly impeded during periods of reduced visibility (weather obscuration, night) and high demand, e.g. when a large proportion of aircraft are from the same operator and/or of the same aircraft type.

3.5 In addition, remote areas of the aerodrome surface are difficult to manage if out of direct visual surveillance. As a result, efficiency can be significantly degraded, and safety services are unevenly provided. Complementary to such historical means of aerodrome traffic management, enhanced surface situational awareness has been based upon use of an aerodrome surface movement primary radar system and display (SMR). This permits the surveillance of all aircraft and ground vehicles without any need for cooperative surveillance equipment installed on the aircraft/vehicles. This improvement allows ANSP personnel to better maintain awareness of ground operations during periods of low visibility. In addition, the presence of safety logic allows for limited detection of runway incursions.

Change brought by the module

3.6 This module implements:

a) additional capabilities to the aerodrome surveillance environment by taking advantage of cooperative surveillance that provides the means to establish the position of all aircraft and vehicles and to specifically identify targets with individual flight/vehicle identification. Ground vehicles operating on the manoeuvring area will be equipped with cooperative surveillance transponders compatible with the specific A-SMGCS equipment installed so as to be visible to tower ground surveillance display systems; and
b) SMR-like capabilities by implementing ADS-B APT at those aerodromes where surveillance is not available.

Element 1 – Surveillance

3.7 In the case of A-SMGCS, this element enhances the primary radar surface surveillance with the addition of at least one cooperative surface surveillance system. These systems include multi-lateration, secondary surveillance radar Mode S, and ADS-B. As with TMA and en-route secondary surveillance radars/ADS-B, the cooperative aspect of the surveillance allows for matching of equipped surveillance targets with flight data, and also reduces clutter and degraded operation associated with primary surveillance. The addition of cooperative surveillance of aircraft and vehicles adds a significant positive benefit to the performance of safety logic, as the tracking and short-term trajectory projection capabilities are improved with the higher quality surveillance. The addition of this capability also provides for a marginal improvement in routine management of taxi operations and more efficient sequencing of aircraft departures.

3.8 In the case of ADS-B APT, as an element of an A-SMGCS system, it provides controllers with traffic situational awareness on movement areas. The provision of surveillance information to the controller will allow the deployment of SMGCS procedures, augmenting the controller's situational awareness and helping the controller to manage the traffic in a more efficient way. In this respect, the ADS-B APT application does not aim to reduce the occurrence of runway incursions, but may reduce the occurrence of runway collisions by assisting in the detection of the incursions.

Element 2 – Alerting

3.9 In the case of A-SMGCS, where installed and operated, alerting with flight identification information also improves the ATC response to situations that require resolution such as runway incursion incidents and improved response times to unsafe surface situations. Levels of sophistication as regards this functionality currently vary considerably between the various industrial solutions being offered. B0 implementations will serve as important initial validation for improved algorithms downstream.

3.10 In the case of ADS-B APT, system generated alerting processes and procedures have not been defined (as this is considered premature at this development stage). It is possible that future variations of the ADS-B APT application will assess the surveillance requirements necessary to support alerting functions.

Intended performance operational improvement

3.11 The A-SMGCS improves access to portions of the manoeuvring area obscured from view of the control tower for vehicles and aircraft. It also sustains an improved aerodrome capacity during periods of reduced visibility and ensures equity in ATC handling of surface traffic regardless of the traffic's position on the aerodrome.

3.12 The ADS-B APT as an element of an A-SMGCS system, provides traffic situational awareness to the controller in the form of surveillance information and potentially improves capacity. The availability of the data is dependent on the aircraft and vehicle level of equipage.

3.13 In terms of efficiency A-SMGCS reduce taxi times through diminished requirements for intermediate holdings based on reliance on visual surveillance only and ADS-B APT potentially reduces taxi times by providing improved traffic situational awareness to controllers.

3.14 Cost benefit analysis is positive taking into consideration the improved levels of safety and improved efficiencies in surface operations leading to significant savings in aircraft fuel usage. As well, aerodrome operator vehicles will benefit from improved access to all areas of the aerodrome, improving the efficiency of aerodrome operations, maintenance and servicing.

3.15 This implementation reduces ATC workload and improve ATC efficiency.

Necessary system capability

Avionics

3.16 Existing aircraft ADS-B and/or SSR transponder systems, including correct setting of aircraft identification.

Vehicles

3.17 Vehicle cooperative transponder systems, type as a function of the local A-SMGCS installation. Industry solutions readily available.

Ground systems

3.18 A-SMGCS: the surface movement radar should be complemented by a cooperative surveillance means allowing tracking aircraft and ground vehicles. A surveillance display including some alerting functionalities is required in the tower.

3.19 ADS-B APT: cooperative surveillance infrastructure deployed on the aerodrome surface; installation of a tower traffic situational awareness display.

Human performance

Human factors considerations

3.20 Workload analyses will be necessary to ensure ATC can cope with increased aerodrome capacities in reduced visual conditions using A-SMGCS. ATC response to A-SMGCS generated runway incursion alarms and warnings will require human factors assessments to ensure that ATC performance in this regard does in fact improve and not diminish. Human factors assessments will also be necessary for the assessment of the compatibility of A-SMGCS tower display installations with other tower surveillance display systems.

3.21 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

3.22 Training in the operational standards and procedures are required for this module and can be found in the links to the documents in the "Reference documents and guidance material" section in this module. Likewise, the qualifications requirements are identified in the "Regulatory/standardization needs and approval plan (Air and Ground)" section, which forms an integral part to the implementation of this module.

Regulatory/standardization needs and approval plan (air and ground)

3.23 Standards approved for aerodrome multilateration, ADS-B and safety logic systems exist for use in Europe, the United States and other Member States. Standards for surface movement radar (SMR) exist for use globally.

Reference documents and guidance material

- Community Specification on A-SMGCS Levels 1 and 2
- ICAO Doc 4444, *Procedures for Air Navigation Services — Air Traffic Management*
- ICAO Doc 7030, *Regional Supplementary Procedures* (EUR SUPPS)
- ICAO Doc 9924, *Aeronautical Surveillance Manual*
- ICAO Doc 9871, *Technical Provisions for Mode S Services and Extended Squitter*
- ICAO Doc 9830, *Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual*
- ICAO Doc 7030/5, (EUR/NAT) *Regional Supplementary Procedures*, Section 6.5.6 and 6.5.7
- FAA Advisory Circulars
- AC120-86 Aircraft Surveillance Systems and Applications
- AC120-28D Criteria for approval of Category III Weather Minima for Take-off, Landing, and Rollout
- AC120-57A Surface Movement Guidance and Control System
- Avionics standards developed by RTCA SC-186/Eurocae WG-51 for ADS-B
- Aerodrome map standards developed by RTCA SC-217/Eurocae WG-44
- EUROCAE ED 163 Safety, Performance and Interoperability Requirements document for ADS-B Airport Surface surveillance application (ADS-B APT)
- FAA NextGen Implementation Plan
- European ATM Master Plan

Module summary

<table>
<tr><td colspan="3"><u>Title of the Module:</u>
B0-75 SURF: Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)</td></tr>
<tr><td><u>Elements</u>
1. Surveillance
2. Alerting systems
3. (Not included in the Module but added here as they are closely linked to this Module) Visual aids for navigation and Wild life strike hazard reduction</td><td><u>Equipage/Air</u>
- ADS-B / SSR transponder system</td><td><u>Equipage/Ground</u>
- SMR/SSR Mode S/ ADS B/ Multilateration
- Surveillance display with alerting functionalities in the tower.
- A cooperative transponder system for vehicles
- Visual aids for navigation</td></tr>
<tr><td colspan="3">Implementation monitoring and intended performance impact</td></tr>
<tr><td><u>Implementation</u></td><td colspan="2">Qualitative performance benefits associated with five main KPAs only</td></tr>
</table>

progress 1. Indicator: *Percentage of international aerodromes with SMR/ SSR Mode S/ ADS-B Multilateration* 2. Indicator: *Percentage of international aerodromes with a cooperative transponder systems on vehicles* 3. Indicator: *Percentage of international aerodromes complying with visual aid requirements as per Annex 14*	KPA-Access/Equity Improves KPA-Access/Equity to portions of the manoeuvring area obscured from view of the control tower for vehicles and aircraft. Ensures equity in ATC handling of surface traffic regardless of the traffic's position on the international aerodrome.	KPA-Capacity Sustained level of aerodrome capacity during periods of reduced visibility	KPA-Efficiency Reduced taxi times through diminished requirements for intermediate holdings based on reliance on visual surveillance only. Reduced fuel burn.	KPA-Environment Reduced emissions due to reduced fuel burn	KPA-Safety Reduced runway incursions. Improved response to unsafe situations. Improved situational awareness leading to reduced ATC workload.

4. **B0-80 ACDM: Improved Airport Operations through Airport-CDM**

Introduction

4.1 This module is designed to implement collaborative applications that will allow the sharing of surface operations data among the different stakeholders on the airport. This will improve surface traffic management reducing delays on movement and manoeuvring areas and enhance safety, efficiency and situational awareness.

Baseline

4.2 Surface operations, especially for the turnaround phase, involve all operational stakeholders at an airport. They each have their own processes that are conducted as efficiently as possible. However, by relying on separated systems and not sharing all relevant information, they currently do not perform as efficiently as they could.

4.3 The baseline will be operations without airport collaboration tools and operations.

Change brought by the module

4.4 Implementation of airport collaborative decision making (A-CDM) will enhance surface operations and safety by making airspace users, ATC and airport operations better aware of their respective situation and actions on a given flight.

4.5 Airport-CDM is a set of improved processes supported by the interconnection of various airport stakeholders information systems. Airport-CDM can be a relatively simple and low cost programme.

Intended performance operational improvement

4.6 In terms of capacity this module enhanced use of existing infrastructure of gate and stands (unlock latent capacity) and reduced workload, and assure a better organization of the activities to manage flights.

4.7 It also increases efficiency of the ATM system for all stakeholders. In particular for aircraft operators: improved situational awareness (aircraft status both home and away); enhanced fleet predictability and punctuality; improved operational efficiency (fleet management); and reduced delay.

4.8 Environmental benefits are achieved with this implementation reducing taxi time, fuel and carbon emissions and lower aircraft engine run time.

4.9 The business case has proven to be positive due to the benefits that flights and the other airport operational stakeholders can obtain. However, this may be influenced depending upon the individual situation (environment, traffic levels investment cost, etc.).

Necessary procedures (air and ground)

4.10 The existing procedures need to be adapted to the collaborative environment in order to provide full benefits. These changes will affect the way the pilot, controller, airlines operations and ATFM unit will exchange information and manage the departing queue. The pushback and engine start-up are just in time taking in account assigned runway, taxiing time, runway capacity, departure slot and departure constraints.

Necessary system capability

Avionics

4.11 No airborne equipment is required.

Ground systems

4.12 Collaborative decision-making (CDM) does not require specific new functionalities. The difficulty is more to interconnect ground systems depending on the systems in place locally but experience has proven that industrial solutions/support exist. Where available, shared surveillance information may enhance operations.

Human factors considerations

4.13 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

4.14 Training in the operational standards and procedures are required for this module and can be found in the links to the documents in the "Reference documents and guidance material" section of this module. Likewise, the qualifications requirements are identified in the regulatory requirements in "Regulatory/standardization needs and approval plan (air and ground)" section hereunder, which forms an integral part to the implementation of this module.

Regulatory/standardization needs and approval plan (air and ground)

4.15 Regulatory/standardization: updates are required to the following current published criteria:

- ICAO Doc 4444, *Procedures for Air Navigation Services — Air Traffic Management*
- ICAO *CDM Manual*

4.16 Approval plans: updates are required for:

- EUROCONTROL, A-CDM Implementation Manual
- FAA NextGen Implementation Plan

Reference documents and guidance material

- ICAO CDM Manual (being finalized)
- European Union, OJEU 2010/C 168/04: Community Specification ETSI EN 303 212 v.1.1.1: European Standard (Telecommunications series) Airport Collaborative Decision Making (A-CDM)
- EUROCAE ED-141: Minimum Technical Specifications for Airport Collaborative Decision Making (Airport-CDM) Systems
- EUROCONTROL A-CDM Programme documentation, including an Airport - CDM Implementation Manual
- FAA NextGen Implementation Plan 2011

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-80 ACDM: Improved Airport Operations through Airport-CDM</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. Airport –CDM
2.(Not included in the Module but added here as they are closely linked to this Module) Aerodrome certification, Aerodrome emergency planning, Airport planning and Heliport operations</td><td colspan="2"><u>Equipage/Air</u>
- Nil</td><td colspan="2"><u>Equipage/Ground</u>
- Interconnection of ground systems of different partners for Airport-CDM
- Rescue and Fire Fighting (RFF) Equipment as per Annexe 14</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1. Indicator: percentage of international aerodromes with Airport-CDM

2. Indicator: Percentage of certified international aerodromes

3. Indicator: Percentage of international aerodromes with RFF equipment as per Annex 14</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Enhances equity on the use of aerodrome facilities.</td><td><u>KPA-Capacity</u>
Enhanced use of existing Implementation of gate and stands (unlock latent capacity). Reduced workload, better organization of the activities to manage flights.</td><td><u>KPA-Efficiency</u>
Improved operational efficiency (fleet management); and reduced delay. Reduced fuel burn due to reduced taxi time and lower aircraft engine run time.</td><td><u>KPA-Environment</u>
Reduced emissions due to reduced fuel burn</td><td><u>KPA-Safety</u>
Not Applicable</td></tr>
</table>

PERFORMANCE IMPROVEMENT AREA 2: GLOBALLY INTEROPERABLE SYSTEMS AND DATA

5. B0-25 FICE: Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration

Introduction

5.1 This module was designed to improve coordination between air traffic service units (ATSUs) by using ATS interfacility data communication (AIDC) defined by the ICAO Manual of Air Traffic Services Data Link Applications (Doc 9694). The transfer of communication in a data link environment improves the efficiency of this process particularly for oceanic ATSUs.

Baseline

5.2 The baseline for this module is the traditional coordination by phone, and procedural and/or radar distance/time separations.

5.3 Flights which are being provided with air traffic services are transferred from one air traffic services (ATS) unit to the next in a manner designed to ensure safety. In order to accomplish this objective, it is a standard procedure that the passage of each flight across the boundary of the areas of responsibility of the two units is coordinated between them beforehand and that the control of the flight is transferred when it is at, or adjacent to, the said boundary.

5.4 Where it is carried out by telephone, the passing of data on individual flights as part of the coordination process is a major support task at ATS units, particularly at area control centres (ACCs). The operational use of connections between flight data processing systems (FDPSs) at ACCs replacing phone coordination (on-line data interchange (OLDI)) is already proven in Europe.

5.5 This is now fully integrated into the ATS interfacility data communications (AIDC) messages in the *Procedures for Air Navigation Services — Air Traffic Management,* (PANS-ATM, Doc 4444) which describes the types of messages and their contents to be used for operational communications between ATS unit computer systems. This type of data transfer (AIDC) will be the basis for migration of data communications to the aeronautical telecommunication network (ATN).

5.6 Information exchanges between flight data processing systems are established between air traffic services units for the purpose of notification, coordination and transfer of flights and for the purpose of civil/military coordination.

5.7 These information exchanges rely upon appropriate and harmonized communication protocols to secure their interoperability and apply to:

a) communication systems supporting the coordination procedures between air traffic services units using a peer-to-peer communication mechanism and providing services to general air traffic; and
b) communication systems supporting the coordination procedures between air traffic services units and controlling military units, using a peer-to-peer communication mechanism.

Change brought by the module

5.8 The module makes available a set of messages to describe consistent transfer conditions via electronic means across boundaries of ATS units. It consists of the implementation of the set of AIDC messages in the flight data processing systems (FDPS) of the different ATS units involved and the establishment of a Letter of Agreement (LoA) between these units to set the appropriate parameters.

5.9 Prerequisites for the module, generally available before its implementation, are an ATC system with flight data processing functionality and a surveillance data processing system connected to each other. This module is a first step towards the more sophisticated 4D trajectory exchanges between both ground/ground and air/ground according to the ICAO *Global Air Traffic Management Operational Concept* (Doc 9854).

Intended performance operational improvement

5.10 Metrics to determine the success of the module are proposed in the *Manual on Global Performance of the Air Navigation System* (Doc 9883).

5.11 In terms of capacity this implementation reduced controller workload and increased data integrity supporting reduced separations translating directly to cross sector or boundary capacity flow increases.

5.12 This reduced separation can also be used to more frequently offer aircraft flight levels closer to the flight optimum; in certain cases, this also translates into reduced en-route holding contributing to efficiency.

5.13 Additionally in terms of safety the Air Traffic Controllers also, have a better knowledge of more accurate flight plan information reducing errors in the ATC loop coordination.

5.14 Increase of throughput at ATS unit boundary and reduced ATCO workload will outweigh the cost of FDPS software changes. The business case is dependent on the environment.

Necessary procedures (air and ground)

5.15 Required procedures exist. They need local analysis of the specific flows and should be spelled out in a Letter of Agreement between ATS units; the experience from other regions can be a useful reference.

Avionics

5.16 No specific airborne requirements.

Ground systems

5.17 Technology is available. It consists in implementing the relevant set of AIDC messages in flight data processing and could use the ground network standard AFTN-AMHS or ATN. Europe is presently implementing it in ADEXP format over IP wide area networks.

5.18 The technology also includes for oceanic ATSUs a function supporting transfer of communication via data link.

Human factors considerations

5.19 Ground interoperability reduces voice exchange between ATCOs and decreases workload. A system supporting appropriate human-machine interface (HMI) for ATCOs is required.

5.20 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the HMI has been considered from both a functional and ergonomic perspective (see Section 6 for examples). The possibility of latent failures, however, continues to exist and vigilance is required during all implementation activity. In addition it is important that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

5.21 To make the most of the automation support, training in the operational standards and procedures will be required and can be found in the links to the documents in the "Reference documents and guidance material" section of this module. Likewise, the qualifications requirements are identified in the regulatory requirements in the "Regulatory/standardization needs and approval plan (air and ground)" section which are integral to the implementation of this module**.**

Regulatory/standardization needs and approval plan (air AND ground)

5.22 Regulatory/standardization: use current published criteria that include:

a) ICAO Doc 4444, *Procedures for Air Navigation Services — Air Traffic Management*; and
b) EU Regulation, EC No 552/2004.

5.23 Approval plans: to be determined based on regional consideration of ATS interfacility data communications (AIDC).

Reference documents and guidance material

- ICAO Doc 4444, *Procedures for Air Navigation Services - Air Traffic Management,* Appendix 6 - *ATS Interfacility Data Communications (AIDC) Messages*
- ICAO Doc 9880, *Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols*, Part II — *Ground-Ground Applications — Air Traffic Services Message Handling Services (ATSMHS).*
- ICAO Doc 9694, *Manual of Air Traffic Services Data Link Applications;* Part 6;
- GOLD Global Operational Data Link Document (APANPIRG, NAT SPG), June 2010;
- Pan Regional Interface Control Document for Oceanic ATS Interfacility Data Communications (PAN ICD) Coordination Draft Version 0.3. 31 August 2010;
- Asia/Pacific Regional Interface Control Document (ICD) for ATS Interfacility Data Communications (AIDC) available at http://www.bangkok.icao.int/edocs/icd_aidc_ver3.pdf, ICAO Asia/Pacific Regional Office.
- EUROCONTROL Standard for On-Line Data Interchange (OLDI); and EUROCONTROL Standard for ATS Data Exchange Presentation (ADEXP).

Procedures

5.24 To be determined.

Module summary

Title of the Module: **B0-25 FICE: Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration**					
Elements: 1.AIDC 2. (Not included in the Module but added here as they are closely linked to this Module) AMHS/IPS		Equipage/Air - Nil		Equipage/Ground - A set of AIDC messages in FDPS - AFTN (AMHS/IPS)	
Implementation monitoring and intended performance impact					
Implementation progress	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: *Percentage of ATS units with AIDC* 2. Indicator: *States implementing AMHS/IPS*	KPA-Access/Equity Not Applicable	KPA-Capacity Reduced controller workload and increased data integrity supporting reduced separations translating directly to cross sector or boundary capacity flow increases.	KPA-Efficiency The reduced separation can also be used to more frequently offer aircraft flight levels closer to the optimum; in certain cases, this also translates into reduced en-route holding.	KPA-Environment Not Applicable	KPA-Safety Better knowledge of more accurate flight plan information. .

6. **B0-30 DATM: Service Improvement through Digital Aeronautical Information Management**

Introduction

6.1 The Eleventh Air Navigation Conference (2003) recommended the urgent adoption of a common aeronautical exchange model which took into account operational systems and concepts of data interchange, including specifically aeronautical information conceptual model/aeronautical information exchange model (AICM/AIXM), and addressed their mutual interoperability.

6.2 The move from aeronautical information service (AIS) to aeronautical information management (AIM), and from paper to electronic media, is already well supported by standardized formats based on widely used information technology standards (UML, XML/GML) operating on commonplace technology products and electronic storage.

6.3 The expectations are that the transition to AIM will not involve many changes in terms of the scope of information to be distributed. The major change will be the increased emphasis on data distribution, which should place the future AIM in a position to better serve airspace users and air traffic management (ATM) in terms of their information management requirements.

6.4 This module describes the planning to initial introduction of digital processing and management of information, through aeronautical information service (AIS)/aeronautical information management (AIM) implementation, use of aeronautical information exchange model (AIXM), migration to electronic aeronautical information publication (AIP) and better quality and availability of data.

6.5 In the short- to medium-term, the focus is on the continuing transition of the services provided by aeronautical information services (AIS) from a product-centred, paper-based and manually- transacted focus to a digitally-enabled, network-centred and service-oriented aeronautical information management (AIM) focus. AIM envisages a migration to a data centric environment where aeronautical data will be provided in a digital form and in a managed way.

Baseline

6.6 The baseline is the traditional provision of aeronautical information, based on paper publications and NOTAMs.

6.7 AIS information provided by SAM States has traditionally been based on paper documents and text messages (NOTAM) and maintained and distributed as such. In spite of manual verifications, this did not always prevent errors or inconsistencies. In addition, the information had to be transcribed from paper to automated ground and airborne systems, thus introducing additional risks. Finally, the timeliness and quality of required information updates could not always be guaranteed.

Change brought by the module

6.8 This module continues the transition of AIS from traditional product provision to a digitally enabled service oriented environment with information exchange utilizing standardized formats based on widely used information technology standards (UML, XML/GML). This will be supported by industrial products and stored on electronics devices. Information quality is increased, as well as that of the management of aeronautical information in general. The AIP moves from paper to electronic support.

Intended performance operational improvement

6.9 Metrics to determine the success of the module are proposed in the *Manual on Global Performance of the Air Navigation System* (Doc 9883).

6.10 This implementation reduces costs in terms of data inputs and checks, paper and post, especially when considering the overall data chain, from originators, through AIS to the end users. It also reduces the time necessary to promulgate information concerning airspace status that allow for more effective airspace utilization and allow improvements in trajectory management.

6.11 There is an essential contribution to interoperability and safety also, due to the reduction in the number of possible inconsistencies, reducing a several number of manual entries and ensures consistency among data through automatic data checking based on commonly agreed business rules.

6.12 The business case for the aeronautical information conceptual model (AIXM) has been conducted in Europe and in the United States and has shown to be positive. The initial investment necessary for the provision of digital AIS data may be reduced through regional cooperation and it remains low compared with the cost of other ATM systems. The transition from paper products to digital data is a critical pre-requisite for the implementation of any current or future ATM or air navigation concept that relies on the accuracy, integrity and timeliness of data.

Necessary procedures (air and ground)

6.13 No new procedures for air traffic control are required, but the process for AIS needs to be revisited. To obtain the full benefit, new procedures will be required for data users in order to retrieve the information digitally, for example, to allow airlines provide digital AIS data to on-board devices, in particular electronic flight bags (EFBs).

Avionics

6.14 No avionics requirements.

Ground systems

6.15 The aeronautical information is made available to AIS through digital processes and to external users via either a subscription to an electronic access or physical delivery; the electronic access can be based on Internet protocol services. The physical support does not need to be standardized. The main automation functions that need to be implemented to support provision of electronic AIS are the national aeronautical data, NOTAM (both national and international) and meteorological management including data collection, verification and distribution.

Human factors considerations

6.16 The automated assistance is well accepted and proven to reduce errors in manual transcription of data.

6.17 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failure however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

6.18 Training is required for AIS/AIM personnel.

Regulatory/standardization needs and approval plan (air and ground)

- Regulatory/standardization: current published requirements
- Approval plans: to be determined, based upon regional applications.

Reference documents and guidance material

- ICAO Doc 8126, *Aeronautical Information Services Manual,* including AIXM and eAIP as per Third Edition
- ICAO Doc 8697, *Aeronautical Chart Manual*
- *Roadmap for the Transition from AIS to AIM*
- Manuals on AIM quality system and AIM training.

Note: Further changes to ICAO Annex 15 – *Aeronautical Information Services* are in preparation.

Procedures

6.19 In preparation.

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-30 DATM: Service Improvement through Digital Aeronautical Information Management</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. AIXM
2. eAIP
3. Digital NOTAM
4.(Not included in the Module but added here as they are closely linked to this Module)
WGS-84; eTOD; and QMS for AIM</td><td colspan="2"><u>Equipage/Air</u>
- Nil</td><td colspan="2"><u>Equipage/Ground</u>
AIXM; eAIP and Digital NOTAM
WGS-84; eTOD; QMS for AIM
The aeronautical information is made available to external users via either a subscription to an electronic access or physical delivery; The electronic access can be based on Internet protocol services.</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1. Indicator:
States implementing AIXM; eAIP, Digital NOTAM WGS-84; eTOD; QMS for AIM</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Not Applicable</td><td><u>KPA-Capacity</u>
Not Applicable</td><td><u>KPA-Efficiency</u>
Not Applicable</td><td><u>KPA-Environment</u>
Reduced amount of paper for promulgation of information</td><td><u>KPA-Safety</u>
Reduction in the number of possible inconsistencies</td></tr>
</table>

7. **<u>B0-105 AMET: Meteorological information supporting enhanced operational efficiency and safety</u>**

General

7.1 Elements 1 to 3 of this module illustrate the meteorological information made available by world area forecast centers (WAFC), volcanic ash advisory centers (VAAC) and tropical cyclone advisory centers (TCAC) that can be used by the air traffic management (ATM) community to support dynamic and flexible management of airspace, improved situational awareness and collaborative decision making, and (in the case of WAFS forecasts) dynamically-optimized flight trajectory planning.

7.2 Elements 4 and 5 of this module illustrate the meteorological information issued by aerodrome meteorological offices in the form of aerodrome warnings, wind shear warnings and alerts (including those generated by automated meteorological systems) that contribute to improving safety and maximizing runway capacity. In some instances, the systems used for the detection of wind shear (such as ground based LIDAR) have proven utility in wake turbulence detection and tracking/monitoring, and thus also support the improving safety and maximizing runway capacity from a wake turbulence encounter prevention perspective. Additionally Element 6 of this module describes SIGMET which is meteorological information provided by a Meteorological Watch Office (WMO) on severe observed or expected events of turbulence, icing thunderstorm, volcanic ash, etc. that are considered an immediate hazard to aircraft en-route.

7.3 It should be recognized that elements 1 to 6 herein represent a subset of all available meteorological information that can be used to support enhanced operational efficiency and safety. Other such meteorological information that is not described here includes, for example, meteorological observations, reports and forecasts, aircraft observations and reports, and aeronautical climatological information.

Baseline

7.4 WAFCs within the framework of the world area forecast system (WAFS) prepare global gridded forecasts of upper wind, upper-air temperature and humidity, geopotential altitude of flight levels, flight level and temperature of tropopause, direction, speed and flight level of maximum wind, cumulonimbus clouds, icing, and clear-air and in-cloud turbulence. These global gridded forecasts are issued 4-times per day, with fixed time validity T+0 to T+36 at 3-hour time-steps. In addition, the WAFCs prepare global forecasts of significant weather (SIGWX) phenomena in binary code form. These global forecasts of SIGWX phenomena are issued 4-times per day, with validity at T+24. The United Kingdom and United States are designated as WAFC provider States. Accordingly, WAFCs London and Washington make available the aforementioned forecasts on the ICAO Aeronautical Fixed Service (AFS).

7.5 VAACs within the framework of the International Airways Volcano Watch (IAVW) respond to a notification that a volcano has erupted, or is expected to erupt or volcanic ash is reported in its area of responsibility. The VAACs monitor relevant satellite data to detect the existence and extent of volcanic ash in the atmosphere in the area concerned, and activate their volcanic ash numerical trajectory/dispersion model in order to forecast the movement of any ash cloud that has been detected or reported. In support, the VAACs also use surface-based observations and pilot reports to assist in the detection of volcanic ash. The VAACs issue advisory information (in plain language textual form and graphical form) concerning the extent and forecast movement of the volcanic ash cloud, with fixed time validity T+0 to T+18 at 6-hour time-steps. The VAACs issue these forecasts at least every six hours until such time as the volcanic ash cloud is no longer identifiable from satellite data, no further reports of volcanic ash are received from the area, and no further eruptions of the volcano are reported. The VAACs maintain a 24-hour watch. Argentina, Australia, Canada, France, Japan, New Zealand, the United Kingdom and the United States are designated (by regional air navigation agreement) as the VAAC provider States. Accordingly, VAACs Buenos Aires, Darwin, Montreal, Toulouse, Tokyo, Wellington, London, Anchorage and Washington make available the aforementioned advisories on the ICAO AFS.

7.6 TCACs monitor the development of tropical cyclones in their area of responsibility, using relevant satellite data, meteorological radar data and other meteorological information. The TCACs are meteorological centres designated by regional air navigation agreement on the advice of the World Meteorological Organization (WMO). The TCACs issue advisory information (in plain language textual form and graphical form) concerning the position of the tropical cyclone center, its direction and speed of movement, central pressure and maximum surface wind near the center, with fixed time validity T+0 to T+24 at 6-hour time-steps. The TCACs issue updated advisory information for each tropical cyclone, as necessary, but at least every six hours. Australia, Fiji, France, India, Japan and the United States are designated (by regional air navigation agreement) as TCAC provider States. Aforementioned advisories are made available on the ICAO AFS, through TCACs located in Darwin, Nadi, La Reunion, New Delhi, Tokyo, Honolulu and Miami.

7.7 Aerodrome warnings provide concise information of observed or expected meteorological conditions that could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services.

7.8 Wind shear warnings are prepared for aerodromes where wind shear is considered a factor. Wind shear warnings give concise information on the observed or expected existence of wind shear which could adversely affect aircraft on the approach path or take-off path or during circling approach between runway level and 500 m (1 600 ft) above that level and aircraft on the runway during the landing roll or take-off run. Note that where local topography has been shown to produce significant wind shears at heights in excess of 500 m (1 600 ft) above runway level, then 500 m (1,600 ft) is not to be considered restrictive.

7.9 SIGMETs are information that describes the location of specified en-route weather phenomena which may affect the safety of aircraft operations. SIGMETs are issued by MWOs for such phenomena as thunderstorms, turbulence, icing, mountain wave, radiation, volcanic ash and tropical cyclone. The latter two categories of SIGMETs are based on information provided in the appropriate advisories from the respective VAACs and TCACs.

Change brought by the module

7.10 The global availability of meteorological information as provided with the framework of the WAFS and IAVW enhances the pre-tactical and/or tactical decision making for aircraft surveillance, air traffic flow management and flexible/dynamic aircraft routing. Similar information is also provided by TCACs and MWOs in support of ATM decisions. The locally-arranged availability of aerodrome warnings, wind shear warnings and alerts (where wind shear is considered a factor), contributes to improved safety and maximized runway capacity during adverse meteorological conditions. Wind shear detection systems can, in some instances, be utilized for wake turbulence detection and tracking/monitoring.

Element 1: WAFS

7.11 The WAFS is a worldwide system within which two designated WAFCs provide aeronautical meteorological en-route forecasts in uniform standardized formats. The grid point forecasts are prepared by the WAFCs in a regular grid with a horizontal resolution of 1.25 degrees of latitude and longitude, and issued in binary code form using the GRIB code form as prescribed by WMO. The significant weather (SIGWX) forecasts are issued by the WAFCs in accordance with the provisions in Annex 3 — Meteorological Service for International Air Navigation (Chapter 3 and Appendix 2) in binary code form using the BUFR code form prescribed by WMO and in PNG-chart form as formalized backup means. ICAO administers the WAFS with the cooperation of the WAFC provider States and concerned international organizations through the World Area Forecast System Operations Group (WAFSOPSG).

Element 2: IAVW

7.12 The IAVW ensures international arrangements for monitoring and providing advisories to MWOs and aircraft operators of volcanic ash in the atmosphere. The advisories support the issuance of SIGMET on these events by the respective MWOs. The IAVW is based on the cooperation of aviation and non-aviation operational units using information derived from observing sources and networks that are provided by States for the detection of volcanic ash in the atmosphere. The forecasts issued by the nine designated VAACs are in plain language text and PNG chart form. The advisory information on volcanic ash is prepared by VAACs in accordance with Annex 3 (Chapter 3 and Appendix 2). ICAO administers the IAVW with the cooperation of the VAAC provider States and concerned international organizations through the International Airways Volcano Watch Operations Group (IAVWOPSG). Additionally, ICAO recognizes the importance of State volcano observatories as part of the world organization of volcano observatories in their role or providing information on the pre-eruption and eruption of volcanoes.

Element 3: Tropical cyclone watch

7.13 TCAC, per regional air navigation agreement, monitor the formation, movement and degradation of tropical cyclones. The forecasts issued by the TCACs are in plain language text and graphical form. The advisory information on tropical cyclones is prepared by TCACs in accordance with Annex 3 (Chapter 3 and Appendix 2). The advisories support the issuance of SIGMET on these events by the respective MWOs.

Element 4: Aerodrome warnings

7.14 Aerodrome warnings give concise information of meteorological conditions that could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services. Aerodrome warnings are issued in accordance with Annex 3 (Chapter 7 and Appendix 6) where required by operators or aerodrome services. Aerodrome warnings should relate to the occurrence or expected occurrence of one or more of the following phenomena: tropical cyclone, thunderstorm, hail, snow, freezing precipitation, hoar frost or rime, sandstorm, dust-storm, rising sand or dust, strong surface wind and gusts, squall, frost, volcanic ash, tsunami, volcanic ash deposition, toxic chemicals, and other phenomena as agreed locally. Aerodrome warnings are issued usually for validity periods of not more than 24 hours. Aerodrome warnings are disseminated within the aerodrome in accordance with local arrangements to those concerned, and should be cancelled when the conditions are no longer occurring and/or no longer expected to occur at the aerodrome.

Element 5: Wind shear warnings and alerts

7.15 Wind shear warnings are prepared for aerodromes where wind shear is considered a factor, issued in accordance with Annex 3 (Chapter 7 and Appendix 6) and disseminated within the aerodrome in accordance with local arrangements to those concerned. Wind shear conditions are normally associated with the following phenomena: thunderstorms, microbursts, funnel cloud (tornado or waterspout), and gust fronts, frontal surfaces, strong surface winds coupled with local topography; sea breeze fronts, mountain waves (including low-level rotors in the terminal area) and low-level temperature inversions.

7.16 At aerodromes where wind shear is detected by automated, ground-based, wind shear remote-sensing or detection equipment, wind shear alerts generated by these systems are issued (updated at least every minute). Wind shear alerts give concise, up-to-date information related to the observed existence of wind shear involving a headwind/tailwind change of 7.5 m/s (15 kt) or more which could adversely affect aircraft on the final approach path or initial take-off path and aircraft on the runway during the landing roll or take-off run.

7.17 In some instances, the systems used for the detection of wind shear have proven utility in wake turbulence detection and tracking/monitoring. This may prove especially beneficial for congested and/or complex aerodromes (e.g. close parallel runways) since ground-based LIDAR at an aerodrome can serve a dual purpose – i.e. wake vortices are an issue when wind shear is not.

Element 6: SIGMET

7.18 SIGMETs are information issued by each State‘s MWO for their respective FIR and/or CTA. SIGMETs are messages that describe the location of specified en-route weather phenomena which may affect the safety of aircraft operations. SIGMETs are typically issued for thunderstorms, turbulence, icing, mountain wave, volcanic ash, tropical cyclones and radiation.

Intended performance operational improvement/metric to determine success

7.19 Optimized usage of airspace capacity, thus achieving arrival and departure rates.

7.20 Reduction in costs through reduced arrival and departure delays (viz. reduced fuel burn).

7.21 Harmonized arriving air traffic (en-route to terminal area to aerodrome) and harmonized departing air traffic (aerodrome to terminal area to en-route) will translate to reduced arrival and departure holding times and thus reduced fuel burn.

7.22 Reduced fuel burn through optimized departure and arrival profiling/scheduling.

7.23 Supports pre-tactical and tactical arrival and departure sequencing and thus dynamic air traffic scheduling.

7.24 Gate-to-gate seamless operations through common access to, and use of, the available WAFS, IAVW and tropical cyclone watch forecast information.

7.25 Common understanding of operational constraints, capabilities and needs, based on expected (forecast) meteorological conditions.

7.26 Decreased variance between the predicted and actual air traffic schedule.

7.27 Increased situational awareness and improved consistent and collaborative decision-making.

Necessary procedures (air and ground)

7.28 No new procedures necessary.

Necessary system capability

Avionics

7.29 No new or additional avionics requirements and brought about by this module.

Ground systems

7.30 ANSPs, airport operators and airspace users may want to implement functionalities allowing them to display in plain text or graphical format the available meteorological information. For Block 0, airspace users may use their AOC data link connection to the aircraft to send the meteorological information where appropriate

Human factors considerations

7.31 General statements on the impact on operational functions.

7.32 This module will not necessitate significant changes in how air navigation service providers and users access and make use of the available meteorological information today.

Training and qualification requirements

7.33 No new or additional training and qualification requirements are brought about by this module.

Reference documents

- ICAO and Industry Standards (i.e. MOPS, MASPS, SPRs)
- ICAO and World Meteorological Organization (WMO) international standards for meteorological information (including, content, format, quantity, quality, timeliness and availability)

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-105 AMET: Meteorological information supporting enhanced operational efficiency and safety</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. WAFS-IAVW-TCW
2. Aerodrome warning, wind shear warning and alerts
3. SIGMET information</td><td colspan="2"><u>Equipage/Air</u>
- Nil</td><td colspan="2"><u>Equipage/Ground</u>
- Connection to the AFS satellite and public Internet distribution systems
- Connection to the AFTN
- Local arrangements for reception of aerodrome warning ,wind shear warning and alerts</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1 Indicator:
States implementation of SADIS 2G satellite broadcast and/or Secure SADIS FTP service.

2. Indicator:
States implementation of WAFS Internet File Service (WIFS)</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Not Applicable</td><td><u>KPA-Capacity</u>
Optimized usage of airspace and aerodrome capacity due to MET support</td><td><u>KPA-Efficiency</u>
Reduced arrival/departure holding time, thus reduced fuel burn due to MET support</td><td><u>KPA-Environment</u>
Reduced emissions due to reduced fuel burn due to MET support</td><td><u>KPA-Safety</u>
Reduced incidents/accidents in flight and at international aerodromes due to MET support</td></tr>
</table>

PERFORMANCE IMPROVEMENT AREA 3: OPTIMUM CAPACITY AND FLEXIBLE FLIGHTS – THROUGH GLOBAL COLLABORATIVE ATM

8. **B0-10 FRTO: Improved Operations through Enhanced En-Route Trajectories**

Introduction

8.1 This module is applicable to en-route and terminal airspace. Benefits can start locally. The larger the size of the concerned airspace the greater the benefits, in particular for flex track aspects. Benefits accrue to individual flights and flows. This will allow greater routing possibilities, reducing potential congestion on trunk routes and busy crossing points, resulting in reduced flight length and fuel burn.

8.2 In many areas, flight routings offered by air traffic services (ATS) are static and are slow to keep pace with the rapid changes of users operational demands, especially for long-haul city-pairs. In certain parts of the world, legacy regional route structures have become outdated and are becoming constraining factors due to their inflexibility.

8.3 The navigational capabilities of modern aircraft make a compelling argument to migrate away from the fixed route structure towards a more flexible alternative. Constantly changing upper winds have a direct influence on fuel burn and, proportionately, on the carbon footprint. Therein lies the benefit of daily flexible routings. Using what is already available on the aircraft and within air traffic control (ATC) ground systems, the move from fixed to flex routes can be accomplished in a progressive, orderly and efficient manner.

Baseline

8.4 The baseline for this module is varying from a State/region to the next. However, while some aspects have already been the subject of local improvements, the baseline generally corresponds to an airspace organization and management function which is at least in part characterized by: individual State action, fixed route network, permanently segregated areas, conventional navigation or limited use of area navigation (RNAV), rigid allocation of airspace between civil and military authorities. Where it is the case, the integration of civil and military ATS has been a way to eliminate some of the issues, but not all.

8.5 In many areas, flight routings offered by air traffic services (ATS) are static and are slow to keep pace with the rapid changes of users operational demands, especially for long-haul city-pairs. In certain parts of the region, regional route structures have become outdated and are becoming constraining factors due to their inflexibility that affect inclusive other States.

Change brought by the module

8.6 This module is aimed at improving the profiles of flights in the en-route phase through the deployment and full application of procedures and functionalities on which solid experience is already available, but which have not been systematically exploited and which are of a nature to make better use of the airspace.

8.7 The module is the opportunity to exploit performance-based navigation (PBN) capabilities in order to eliminate design constraints and operate more flexibly, while facilitating the overall handling of traffic flows.

8.8 The module is made of the following elements:

a) airspace planning: possibility to plan, coordinate and inform on the use of airspace. This includes collaborative decision-making (CDM) applications for en-route airspace to anticipate on the knowledge of the airspace use requests, take into account preferences and inform on constraints;
b) flexible use of airspace (FUA) to allow both the use of airspace otherwise segregated, and the reservation of suitable volumes for special usage; this includes the definition of conditional routes; and
c) flexible routing (flex tracking): route configurations designed for specific traffic pattern.

8.9 This module is a first step towards more optimized organization and management of the airspace but which would require more sophisticated assistance. Initial implementation of PBN, RNAV for example, takes advantage of existing ground technology and avionics and allows extended collaboration of air navigation service providers (ANSPs) with partners: military, airspace users, neighbouring States.

Element 1: Airspace planning

8.10 Airspace planning entails activities to organize and manage airspace prior to the time of flight. Here it more specifically refers to activities to improve the strategic design by a series of measures to better know the anticipated use of the airspace and adjust the strategic design by pre-tactical or tactical actions.

Element 2: Flexible use of airspace (FUA)

8.11 Flexible use of airspace is an airspace management concept according to which airspace should not be designated as either purely civil or purely military airspace, but should be considered as one continuum in which all users‘ requirements have to be accommodated to the maximum extent possible. There are activities which require the reservation of a volume of airspace for their exclusive or specific use for determined periods, owing to the characteristics of their flight profile or their hazardous attributes and the need to ensure effective and safe separation from non-participating air traffic. Effective and harmonized application of FUA needs clear and consistent rules for civil/military coordination which should take into account all users‘ requirements and the nature of their various activities. Efficient civil/military coordination procedures should rely on rules and standards to ensure efficient use of airspace by all users. It is essential to further cooperation between neighbouring States and to take into account cross border operations when applying the concept of FUA.

8.12 Where various aviation activities occur in the same airspace but meet different requirements, their coordination should seek both the safe conduct of flights and the optimum use of available airspace.

8.13 Accuracy of information on airspace status and on specific air traffic situations and timely distribution of this information to civil and military controllers has a direct impact on the safety and efficiency of operations.

8.14 Timely access to up-to-date information on airspace status is essential for all parties wishing to take advantage of airspace structures made available when filing or re-filing their flight plans.

8.15 The regular assessment of airspace use is an important way of increasing confidence between civil and military service providers and users and is an essential tool for improving airspace design and airspace management.

8.16 FUA should be governed by the following principles:

a) coordination between civil and military authorities should be organized at the strategic, pre-tactical and tactical levels of airspace management through the establishment of agreements and procedures in order to increase safety and airspace capacity, and to improve the efficiency and flexibility of aircraft operations;
b) consistency between airspace management, air traffic flow management and air traffic services should be established and maintained at the three levels of airspace management in order to ensure, for the benefit of all users, efficiency in airspace planning, allocation and use;
c) the airspace reservation for exclusive or specific use of categories of users should be of a temporary nature, applied only during limited periods of time-based on actual use and released as soon as the activity having caused its establishment ceases;
d) States should develop cooperation for the efficient and consistent application of the concept of FUA across national borders and/or the boundaries of flight information regions, and should in particular address cross-border activities; this cooperation shall cover all relevant legal, operational and technical issues; and
e) ATS units and users should make the best use of the available airspace.

Element 3: Flexible routing

8.17 Flexible routing is a design of routes (or tracks) designed to match the traffic pattern and other variable factors such as meteorological conditions. The concept, used over the North-Atlantic since decades can be expanded to address seasonal or week end flows, accommodate special events, and in general better fit the meteorological conditions, by offering a set of routes which provide routings closer to the user preferences for the traffic flows under consideration.

8.18 When already in place, flex tracks systems can be improved in line with the new capabilities of ATM and aircraft, such as PBN and automatic dependent surveillance (ADS).

8.19 Convective meteorological conditions, particularly deep convection associated with towering cumulus and/or cumulonimbus clouds, causes many delays in today‘s system due to their hazardous nature (severe icing, severe turbulence, hail, thunderstorms, etc.), often-localized nature and the labor intensive voice exchanges of complex reroutes during the flight. New data communications automation will enable significantly faster and more efficient delivery of reroutes around such convective activity. This operational improvement will expedite clearance delivery resulting in reduced delays and miles flown during convective meteorological conditions.

Intended Performance Operational Improvement

8.20 Metrics to determine the success of the module are proposed in the Manual on Global Performance of the Air Navigation System (Doc 9883).

8.21 This module supports a better access to airspace by a reduction of the permanently segregated volumes.

8.22 In terms of capacity the availability of a greater set of routing possibilities allows reducing potential congestion on trunk routes and at busy crossing points. The flexible use of airspace gives greater possibilities to separate flights horizontally. PBN helps to reduce route spacing and aircraft separations. This in turn allows reducing controller workload by flight.

8.23 The different elements concur to trajectories closer to the individual optimum by reducing constraints imposed by permanent design. In particular the module will reduce flight length and related fuel burn and emissions. The potential savings are a significant proportion of the ATM related inefficiencies. The module will reduce the number of flight diversions and cancellations. It will also better allow avoiding noise sensitive areas.

8.24 Some of the benefits include: reduced flight operating costs, reduced fuel consumption, more efficient use of airspace (access to airspace outside of fixed airway structure), reduced carbon footprint, and reduced controller workload.

Necessary procedures (air and ground)

8.25 Required procedures exist for the main. They may need to be complemented by local practical guidance and processes; however, the experience from other regions can be a useful reference source to be customized to the local conditions.

8.26 The development of new and/or revised ATM procedures is automatically covered by the definition and development of listed elements. However, given the interdependencies between some of the modules, care needs to be taken so that the development of the required ATM procedures provides for a consistent and seamless process across these modules.

8.27 The airspace requirements (RNAV, RNP and the value of the performance required) may require new ATS procedures and ground system functionalities. Some of the ATS procedures required for this module are linked with the processes of notification, coordination and transfer of control, supported by messages exchange (Module B0-25).

Element 1: Airspace planning

8.28 See general remarks above.

Element 2: FUA

8.29 The ICAO Civil/Military Cooperation in Air Traffic Management (Cir 330) offers guidance and examples of successful practices of civil and military cooperation. It realizes that successful cooperation requires collaboration that is based on communication, education, a shared relationship and trust.

8.30 FUA regional guidance developed for SAM Region.

Element 3: Flexible routing

8.31 A number of operational issues and requirements will need to be addressed to enable harmonized deployment of flex route operations in a given area such as:

a) some adaptation of letters of agreement;
b) revised procedures to consider the possibility of transfer of control at other than published fixes;
c) use of latitude/longitude or bearing and distance from published fixes, as sector or flight information region (FIR) boundary crossing points;
d) review of controller manuals and current operating practices to determine what changes to existing practices will need to be developed to accommodate the different flows of traffic which would be introduced in a flex route environment;
e) specific communication and navigation requirements for participating aircraft will need to be identified;

f) developing procedures that will assist ATC in applying separation minima between flights on the fixed airway structure and flex routes both in the strategic and tactical phases;
g) procedure to cover the transition between the fixed network and the flex route airspace both horizontally and vertically. In some cases, a limited time application (e.g. during night) of flex route operations could be envisaged. This will require modification of ATM procedures to reflect the night traffic patterns and to enable the transition between night flex route operations and daytime fixed airway operations; and
h) training package for ATC.

Necessary system capability

Avionics

8.32 Deployment of PBN is ongoing. The benefits provided to flights can facilitate its dissemination, but it will remain linked to how aircraft can fly.

8.33 Dynamic re-routing can require aircraft connectivity (Aircraft communication addressing and reporting system (ACARS)) to its flight operating center for flight tracking and the up-load of new routes computed by the FOC flight planning system (FPS), and possibly FANS 1/A capability for the exchange of clearance with ATC.

Ground systems

8.34 Technology is available. Even CDM can be supported by a form of internet portal. However, since aviation operations are global, standardization of the information and its presentation will be increasingly required (see thread 30 on SWIM).

8.35 Basic FUA concept can be implemented with the existing technology. Nevertheless for a more advanced use of conditional routes, a robust collaborative decision system will be required including function for the processing and display of flexible or direct routes containing latitude/longitude. In addition to published fixes a coordination function is also needed and may need specific adaptations to support transfer of control over non published points.

8.36 Enhanced FPS today is predicated on the determination of the most efficient flight profile. The calculations of these profiles can be driven by cost, fuel, time, or even a combination of the factors. All airlines deploy FPS at different levels of sophistication and automation in order to assist flight dispatchers/planners to verify, calculate and file flight plans.

8.37 Additionally, the flight dispatcher would need to ensure the applicability of over-flight permissions for the over-flown countries. Regardless of the route calculated, due diligence must always be exercised by the airline in ensuring that NOTAMs and any restrictive flight conditions will always be checked and validated before a flight plan is filed. Further, most airlines are required to ensure a flight following or monitoring program to update the crews with any changes in the flight planning assumptions that might have changed since the first calculation was made.

Human factors considerations

8.38 The roles and responsibilities of controller/pilot are not affected. However, human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

8.39 The required training is available and the change step is achievable from a human factors perspective. Training in the operational standards and procedures required for this module, are described in the “Reference documents and guidance material” section hereunder. Likewise, the qualifications requirements are identified in the “Regulatory/standardization needs and approval plan (air and ground)” section hereunder.

Regulatory/standardization needs and approval plan (air and ground)

8.40 Regulatory/standardization: use current published requirements.

8.41 Approval plans: to be determined, based upon regional applications.

Element 1: Airspace planning

8.42 See general remarks above.

Element 2: FUA

8.43 Until today, the Article 3 of the Chicago Convention expressly excludes the consideration of State aircraft from the scope of applicability.

8.44 Exemption policies for specific State aircraft operations and services are currently used as a method to cope with the discrepancy of civil and military aviation needs. Some States already realize that for State aircraft a solution lays in an optimum compatibility to civil aviation, although military requirements have to be met.

8.45 ICAO provisions related to coordination between civil and military in support to the flexile use of airspace can be found in several annexes, PANS and manuals.

8.46 Annex 11 — Air Traffic Services allows States to delegate responsibility for the provision of ATS to another State. However, States retain sovereignty over the airspace so delegated, as confirmed by their adherence to the Chicago Convention. This factor may require additional effort or coordination in relation to civil/military cooperation and an appropriate consideration in bilateral or multilateral agreements.

Element 3: Flexible routing

8.47 LoA: Letters of agreement (LoA) might be revised to reflect the specificities of flex route operations. Local hand-off procedures, timings and frequency allocations must be clearly detailed. Allocation schemes are also useful in designing major unidirectional flows, such as the EUR-Caribbean flows.

Common enabler: PBN procedures

8.48 Within an airspace concept, PBN requirements will be affected by the communication, surveillance and ATM environments, the navaid infrastructure, and the functional and operational capabilities needed to meet the ATM application. PBN requirements also depend on what reversionary, non-RNAV means of navigation are available and what degree of redundancy is required to ensure adequate continuity of functions.

8.49 The selection of the PBN specification(s) for a specific area or type of operation has to be decided in consultation with the airspace users. Some areas need only a simple RNAV to maximize the benefits, while other areas such as nearby steep terrain or dense air traffic may require the most stringent RNP. International public standards for PBN are still evolving. International PBN is not widespread. According to the ICAO/IATA Global PBN Task Force, international air traffic management and state flight standards rules and regulations lag behind airborne capability.

8.50 There is a need for worldwide harmonization of RNP requirements, standards, procedures and practices, and common flight management system functionality for predictable and repeatable RNP procedures, such as fixed radius transitions, radius-to-fix legs, required time of arrival (RTA), parallel offset, VNAV, 4D control, ADS-B, data link, etc.

8.51 A safety risk management document may be required for every new or amended procedure. That requirement will extend the time required to implement new procedures, especially PBN-based flight procedures.

Reference documents and guidance material

- ICAO Doc 4444, Procedures for Air Navigation Services -Air Traffic Management, Chapter 5
- ICAO Doc 9426, Air Traffic Services Planning Manual
- ICAO Doc 9554, Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations
- ICAO Doc 9613, Performance-based Navigation (PBN) Manual
- ICAO Doc 9689, Manual on Airspace Planning Methodology for the Determination of Separation Minima
- ICAO CDM and ATFM (under development) Manual
- ICAO Doc 9554, Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations
- ICAO Circular 330 AN/189, Civil/Military Cooperation in Air Traffic Management

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-10 FRTO: Improved Operations through Enhanced En-Route Trajectories</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. Airspace planning
2. Flexible Use of airspace
3. Flexible Routing</td><td colspan="2"><u>Equipage/Air</u>
- FANS 1/A and ACARS</td><td colspan="2"><u>Equipage/Ground</u>
- CDM through Internet portal</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1. Indicator: Percentage of time segregated airspaces are available for civil operations in the State

2. Indicator: Percentage of PBN routes implemented</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Better access to airspace by a reduction of the permanently segregated volumes of airspace.</td><td><u>KPA-Capacity</u>
Flexible routing reduces potential congestion on trunk routes and at busy crossing points. The flexible use of airspace gives greater possibilities to separate flights horizontally. PBN helps to reduce route spacing and aircraft separations.</td><td><u>KPA-Efficiency</u>
In particular the module will reduce flight length and related fuel burn and emissions. The module will reduce the number of flight diversions and cancellations. It will also better allow avoiding noise sensitive areas.</td><td><u>KPA-Environment</u>
Fuel burn and emissions will be reduced.</td><td><u>KPA-Safety</u>
Not Applicable</td></tr>
</table>

9. **<u>B0-35 NOPS: Improved Flow Performance through Planning based on a Network-Wide view</u>**

General

9.1 The techniques and procedures brought by this module capture the experience and state-of-the-art of the current air traffic flow management (ATFM) systems in place in some regions, and which have developed as they were facing demand-capacity imbalances. Global ATFM seminars and bi-lateral contacts have allowed the dissemination of good practices.

9.2 Experience clearly shows the benefits related to managing flows consistently and collaboratively over an area of a sufficient geographical size to take into account sufficiently well the network effects. The concept for ATFM and demand and capacity balancing (DCB) should be further exploited wherever possible. System improvements are also about better procedures in these domains, and creating instruments to allow collaboration among the different actors.

9.3 Overall, to meet the objectives of balancing demand and capacity, keeping delays to a minimum and avoiding congestion, bottlenecks and overload, ATFM undertakes flow management in three broad phases. Each flight will usually have been subjected to these phases, prior to being handled operationally by ATC.

9.4 Strategic ATFM activity takes place during the period from several months until a few days before a flight. During this phase, comparison is made between the expected air traffic demand and the potential ATC capacity. Objectives are set for each ATC unit in order for them to provide the required capacity. These objectives are monthly reviewed in order to minimize the impact of the missing capacity on the airspace users. In parallel, an assessment of the number and routings of flights, which aircraft operators are planning, enables ATFM to prepare a routing scheme, balancing the air traffic flows in order to ensure maximum use of the airspace and minimize delays.

9.5 Pre-tactical ATFM is action taken during the few days before the day of operation. Based on the traffic forecasts, the information received from every ATC center covered by the ATFM service, statistical and historical data, the ATFM notification message (ANM) for the next day is prepared and agreed through a collaborative process. The ANM defines the tactical plan for the next (operational) day and informs aircraft operators (AOs) and ATC units about the ATFM measures that will be in force on the following day. The purpose of these measures is not to restrict but to manage the flow of traffic in a way that minimizes delay and maximizes the use of the entire airspace.

9.6 Tactical ATFM is the work carried out on the current operational day. Flights taking place on that day receive the benefit of ATFM, which includes the allocation of individual aircraft departure times, re-routings to avoid bottlenecks and alternative flight profiles to maximize efficiency.

9.7 ATFM has also progressively been used to address system disruptions and evolves into the notion of management of the performance of the Network under its jurisdiction, including management of crises provoked by human or natural phenomena.

Baseline

9.8 The need for ATFM has emerged as traffic densities increased, and it took form progressively. It is observed that this need is now spreading progressively over all continents, and that even where overall capacity is not an issue, the efficient management of flows through a given volume of airspace deserves a specific consideration at a scale beyond that of a sector or an ACC, in order to better plan resources, anticipate on issues and prevent undesired situations.

Change brought by the module

9.9 ATFM has developed progressively over the last thirty years. It is noticeable that key steps have been necessary to be able to predict traffic loads for the next day with a good accuracy, to move from measures defined as rate of entry into a given piece of airspace (and not as departure slots) to measures implemented before take-off and taking into account the flows/capacities in a wider area.

9.10 More recently the importance of proposing alternative routings rather than only a delay diagnosis has been recognized, thereby also preventing over-reservations of capacity. ATFM services offer a range of web-based or business to business services to ATC, airports and aircraft operators, actually implementing a number of CDM applications.

9.11 In order to regulate flows, ATFM may take measures of the following nature:

a) departure slots ensuring that a flight will be able to pass the sectors along its path without generating overflows;
b) rate of entry into a given piece of airspace for traffic along a certain axis;
c) requested time at a way-point or an FIR/sector boundary along the flight;
d) miles-in-trail figures to smooth flows along a certain traffic axis;
e) re-routing of traffic to avoid saturated areas;
f) sequencing of flights on the ground by applying departure time intervals (MDI);

g) level capping; and
h) delaying of specific flights on the ground by a few minutes ("take-off not before").

Intended performance operational improvement

9.12 Metrics to determine the success of the module are proposed in the *Manual on Global performance of the Air Navigation System* (Doc 9883).

9.13 This module improved access by avoiding disruption of air traffic in periods of demand higher than capacity and ATFM processes take care of equitable distribution of delays.

9.14 It provides a better utilization of available capacity, network-wide; in particular the trust of ATC not being faced by surprise to saturation tends to let it declare/use increased capacity levels; ability to anticipate difficult situations and mitigate them in advance.

9.15 Reduced fuel burn due to better anticipation of flow issues; a positive effect to reduce the impact of inefficiencies in the ATM system or to dimension it at a size that would not always justify its costs (balance between cost of delays and cost of unused capacity). It also reduces block times and times with engines on.

9.16 The reduced fuel burn as delays are absorbed on the ground, and the predictability of schedules as the ATFM algorithms tends to limit the number of large delays impact positively in environment.

9.17 The reduced occurrences of undesired sector overloads improve safety.

9.18 The business case has proven to be positive due to the benefits that flights can obtain in terms of delay reduction.

Necessary procedures (air and ground)

9.19 An ICAO guidance material on ATFM is being developed and need to be completed and approved. US/Europe experience is enough to help initiate application in other regions.

9.20 New procedures are required to link much closer the ATFM with ATS in the case of using miles-in-trail or Arrival management or Departure management (see Module B0-15).

Necessary system capability

Avionics

9.21 No avionics requirements.

Ground systems

9.22 When serving several FIRs, ATFM systems are generally deployed as a specific unit, system and software connected to the ATC units and airspace users to which it provides its services. Regional ATFM units have been the subject of specific developments. The main functions for ATFM systems are: demand and capacity balancing, performance measurements and monitoring, network operations plan management and traffic demand management.

Human factors considerations

9.23 Controllers are protected from overloads and have a better prediction of their workload. ATFM does not interfere in real-time with their ATC tasks. However, human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

9.24 Flow managers in the flow management unit and controllers in area control centres (ACCs) using the remote flow management information or applications needs specific training and airline dispatchers using the remote flow management information or applications need training.

9.25 Training in the operational standards and procedures are required for this module and can be found in the links to the documents in indicated in the section “Reference documents and guidance material”. Likewise, the qualifications requirements are identified in the “Regulatory/standardization needs and approval plan (air and ground)” which form an integral part to the implementation of this module.

Regulatory/standardization needs and approval plan (air and ground)

9.26 Regulatory/standardization: new standards and requirements is required for standard ATFM messages.

9.27 Approval plans: to be determined.

Reference documents and guidance material

- CAR/SAM ATFM and CDM Manual.
- ICAO CDM and ATFM (under development) Manual.

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-35 NOPS: Improved Flow Performance through Planning based on a Network-Wide view</td></tr>
<tr><td colspan="2"><u>Elements:</u>
Air Traffic Flow Management</td><td colspan="2"><u>Equipage/Air</u>
- Nil</td><td colspan="2"><u>Equipage/Ground</u>
- System software for ATFM</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1. Indicator:
Percentage of ATS units using ATFM services.</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Improved Access and equity in the use of airspace or aerodrome by avoiding disruption of air traffic. ATFM processes take care of equitable distribution of delays.</td><td><u>KPA-Capacity</u>
Better utilization of available capacity, ability to anticipate difficult situations and mitigate them in advance.</td><td><u>KPA-Efficiency</u>
Reduced fuel burn due to better anticipation of flow issues; Reduced block times and times with engines on.</td><td><u>KPA-Environment</u>
Reduced fuel burn as delays are absorbed on the ground, with shut engines; or at optimum flight levels through speed or route management.</td><td><u>KPA-Safety</u>
Reduced occurrences of undesired sector overloads</td></tr>
</table>

10. **<u>B0-84 ASUR: Initial capability for ground surveillance</u>**

General

10.1 The surveillance service delivered to users may be based on a mix of three main types of surveillance as defined in the ICAO *Aeronautical Surveillance Manual* (Doc 9924):

a) independent non-cooperative surveillance: The aircraft position is derived from measurement not using the cooperation of the remote aircraft;
b) independent cooperative surveillance: The position is derived from measurements performed by a local surveillance subsystem using aircraft transmissions. Aircraft-derived information (e.g. pressure altitude, aircraft identity) can be provided from those transmissions; and
c) dependent cooperative surveillance: The position is derived on board the aircraft and is provided to the local surveillance subsystem along with possible additional data (e.g. aircraft identity, pressure altitude). 1.1.2 The module describes the dependent/cooperative and independent/cooperative surveillance services.

Baseline

10.2 Currently, air to ground aircraft position and surveillance is accomplished through the use of primary, secondary radar surveillance, voice position report, ADS-C and CPDLC, etc. The primary surveillance radar derives aircraft position based on radar echo returns. The secondary radar is used to transmit and receive aircraft data for barometric altitude, identification code. However, current primary and secondary radars cannot be easily sited in oceanic locations, or rough terrain such as in mountainous regions, and have a heavy reliance on mechanical components with large maintenance requirements.

Change brought by the module

10.3 This module introduces the opportunity to expand ATC radar equivalent service with two new surveillance techniques that can be used, separately or jointly: ADS-B and MLAT. These techniques provide alternatives to classic radar technology at a lower implementation and maintenance cost, thereby allowing the provision of surveillance services in areas where they are currently not available for geographical or cost reasons. These techniques also allow, in certain conditions, a reduction of separation minima thereby potentially increasing the ability to accommodate larger volumes of traffic.

Element 1: ADS-B

10.4 Dependent surveillance with accurate position sources such ADS-B is recognized as one of the important enablers of several of the ATM operational concept components including traffic synchronization and conflict management (Recommendation 1/7, AN-Conf/11, 2003). The transmission of ADS-B information (ADS-B OUT) is already used for surveillance in some non-radar areas (Block 0).

10.5 Dependent surveillance is an advanced surveillance technology that allows avionics to broadcast an aircraft’s identification, position, altitude, velocity, and other information. The broadcast aircraft position is more accurate than with conventional secondary surveillance radar (SSR) because it is normally based on the global navigation satellite system (GNSS) and transmitted at least once per second. The inherent accuracy of the GPS determined position and the high update rate will provide service providers and users improvements in safety, capacity, and efficiency.

Note.– ADS-B is dependent upon having a source of required positional accuracy (such as global navigation satellite system (GNSS) today).

10.6 Operationally, the lower costs of dependent surveillance ground infrastructure in comparison to conventional radars support business decisions to expand radar equivalent service volumes and the use of radar-like separation procedures into remote or non-radar areas. In addition to lower costs, the non-mechanical nature of the ADS-B ground infrastructure allows it to be sited in locations that are difficult for radar installations.

10.7 Use of dependent surveillance also improves the search and rescue support provided by the surveillance network. In non-radar areas, ADS-B's positional accuracy and update rate allows for improved flown trajectory tracking allowing for early determination of loss of contact and enhances the ability for search and rescue teams to pinpoint the related location.

10.8 Additionally, dependent surveillance information can be an enabler for sharing of surveillance data across FIR boundaries and significantly improves the performance of predictive tools using aircraft derived velocity vector and vertical rate data. This is particularly useful to support safety net tools. It also downlinks other useful ATC relevant data similar to Mode S DAPS.

10.9 ADS-B OUT Standards and Recommended Practices (SARPs) (ICAO Annex 10 — *Aeronautical Telecommunications* , Volume IV — S*urveillance and Collision Avoidance Systems* and the *Manual on Technical Provisions for Mode S Services and Extended Squitter* (Doc 9871)) and MOPS (RTCA-DO260-B/Eurocae ED102-A) are available. AN-Conf/11 recommended ADS-B on 1090MHz for international use and this is happening. Equipage rate is growing together with Mode S, airborne collision avoidance system (ACAS) and ADS-B OUT mandates. ADS-B OUT, Version 2 also provides for ACAS RA DOWNLINK information in support of monitoring activities currently only possible in secondary surveillance radar (SSR) Mode S coverage.

Element 2: Multilateration (MLAT)

10.10 MLAT technique is a new technique providing independent cooperative surveillance. Its deployment is made easier by the use of airborne mode S equipment capability with the spontaneous transmission of messages (squitters). In this case the signal transmitted by aircraft is received by a network of receivers located at different places. The use of the different times of arrival at the different receivers allows an independent determination of the position of the source of signals. In theory this technique can be passive and use the existing transmissions made by the aircraft or be active and trigger replies in the manner of Mode S SSR interrogations. Conventional Mode A/C transponders respond when they are interrogated.

10.11 MLAT systems were initially deployed on main airports to make the surveillance of aircraft on the surface. The technique is now used to provide surveillance over wide area (wide area MLAT system - WAM). MLAT requires more ground stations than ADS-B and reliable linked network and has large geometric requirements than ADS-B, but has the early implementation advantage of using current Mode A/C aircraft equipage.

Intended performance operational improvement/metric to determine success

10.12 This module contributes to Safety reducing the number of major incidents and support to search and rescue services. It also contributes to the capacity in areas of traffic density compared to procedural minima.

10.13 Improved coverage, capacity, velocity vector performance and accuracy can improve ATC performance in both radar and non-radar environments. Terminal area surveillance performance improvements are achieved through high accuracy, better velocity vector and improved coverage.

10.14 Comparison between procedural minima and 5 NM separation minima would allow an increase of traffic density in a given airspace; or comparison between installing/renewing SSR Mode S stations using Mode S transponders and installing ADS-B OUT (and/or MLAT systems) could be used in cost benefit analysis.

Necessary procedures (air and ground)

10.15 The relevant *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) provisions are available.

Necessary system capability

Avionics

10.16 For ADS-B surveillance services, aircraft must be equipped with ADS-B OUT. Accuracy and integrity are reported from the avionics. Users of the data decide on the required accuracy and integrity for the application.

10.17 For MLAT, aircraft need to be equipped with Mode S radar transponders.

Ground systems

10.18 Units providing surveillance services must be equipped with a ground-based surveillance data processing system able to process and display the aircraft positions. Connection to a flight data processing system allows positive identification by correlating positions and flight data.

10.19 Units may provide ADS-B surveillance in environments where there is full or partial avionics equipage depending on the capabilities and procedures of the air traffic control (ATC) system.

10.20 ATC systems must also be designed to enable the delivery of separation services between ADS-B-to-ADS-B and ADS-B-to-radar and fused targets.

Human factors considerations

10.21 The air traffic controller has a direct representation of the traffic situation, and reduces the task of controllers or radio operators to collate position reports.

Training and qualification requirements

10.22 Controllers must receive specific training for separation provision, information service and search and rescue based on the ADS-B and WAM systems in use.

10.23 Training in the operational standards and procedures are required for this module, which can be found in the documents listed in the "Reference documents and guidance material" section hereunder. Likewise, the qualifications requirements are identified in the regulatory requirements.

Reference documents and guidance material

- ICAO Annex 10 — *Aeronautical Telecommunications*, Volume IV — *Aeronautical Radio*
- *Frequency Spectrum Utilization*
- ICAO Doc 9828, *Report of the Eleventh Air Navigation Conference (2003)*
- ICAO Doc 9871, *Technical Provisions for Mode S Services and Extended Squitter*

- RTCA MOPS DO260 and DO260A EUROCAE ED102 and ED102A.
- ICAO Doc 4444, *Procedures for Air Navigation Services — Air Traffic Management*
- ICAO Doc 9924, *Aeronautical Surveillance Manual*
- ICAO *Assessment of ADS-B and Multilateration Surveillance to Support Air Traffic Services and Guidelines for Implementation* (Circular 326)
- ICAO Asia Pacific: ADS-B Implementation and Operations Guidance Document.

Module summary

Title of the Module: **B0-84 ASUR: Initial capability for ground surveillance**					
Elements: 1. ADS-B 2. Multilateration		Equipage/Air - ADS-B OUT. - Mode S radar transponders for Multilateration		Equipage/Ground - FDPS and SDPS - ADS-B - Multilateration	
Implementation monitoring and intended performance impact					
Implementation progress	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: *Percentage of international aerodromes with ADS-B/MLAT*	KPA-Access/Equity Not Applicable	KPA-Capacity Typical separation minima are 3 NM or 5 NM enabling an increase in traffic density compared to procedural minima. TMA surveillance performance improvements are achieved through high accuracy, better velocity vector and improved coverage.	KPA-Efficiency Not Applicable	KPA-Environment Not Applicable	KPA-Safety Reduction of the number of major incidents. Support to search and rescue

11. **B0-101 ACAS: ACAS improvement**

General

11.1 This module is dealing with the short term improvements to the performance of the existing airborne collision avoidance system (ACAS). ACAS is the last resort safety net for pilots. Although ACAS is independent from the means of separation provision, ACAS is part of the ATM system.

Baseline

11.2 ACAS is subject to global mandatory carriage for airplanes with a MTCM greater than 5.7 tons. The current version of ACAS II is 7.0.

Change brought by the module

11.3 This module implements several optional improvements to airborne collision avoidance system in order to minimize “nuisance alerts” while maintaining existing levels of safety. The traffic alert and collision avoidance system (TCAS) version 7.1 introduces significant safety and operational benefits for ACAS operations.

11.4 Safety studies indicate that ACAS II reduces risk of mid-air collisions by 75% – 95% in encounters with aircraft that are equipped with either a transponder (only) or ACAS II respectively. ACAS II Standards and Recommended Practices (SARPs) are aligned with RTCA/EUROCAE MOPS.The SARPs and the MOPS have been upgraded in 2009/2010 to resolve safety issues and to improve operational performance. The RTCA DO185B and EUROCAE ED143 include these improvements also known as TCAS, v7.1.

11.5 The TCAS, v7.1 introduces new features namely the monitoring of own aircraft's vertical rate during a resolution advisory (RA) and a change in the RA annunciation from "Adjust Vertical Speed, Adjust" to "Level Off". It was confirmed that the new version of the CAS logic would definitely bring significant safety benefits, though only if the majority of aircraft in any given airspace are properly equipped. ICAO agreed to mandate the improved ACAS (TCAS, v7.1) for new installations as of 1/1/2014 and for all installations no later than 1/1/2017.

11.6 During a TCAS encounter, prompt and correct response to RAs is the key to achieve maximum safety benefits. Operational monitoring shows that pilots do not always follow their RA accurately (or do not follow at all). Roughly 20% of RAs in Europe are not followed.

11.7 TCAS safety and operational performance highly depends on the airspace in which it operates. Operational monitoring of TCAS shows that unnecessary RAs can occur when aircraft approach their cleared flight level separated by 1 000 ft with a high vertical rate. Roughly 50% of all RAs in Europe are issued in 1000 ft level-off geometries. AN-Conf/11 recognized the issue and requested to investigate automatic means to improve ATM compatibility.

11.8 In addition, two optional features can enhance ACAS performance:

a) coupling TCAS and auto-pilot/flight director to ensure accurate responses to RAs either automatically or manually thanks to flight director (APFD function); and
b) introduce a new altitude capture law to improve TCAS compatibility with ATM (TCAP function).

Intended Performance Operational Improvement

11.9 Metrics to determine the success of the module are proposed in the *Manual on Global Performance of the Air Navigation System* (Doc 9883).

11.10 *Efficiency* ACAS improvement will reduce unnecessary resolution advisory (RA) and then reduce trajectory deviations.

11.11 *Safety* ACAS increases safety in the case of breakdown of separation.

11.12 *Cost Benefit Analysis* TBD

Necessary Procedures (Air and Ground)

11.13 ACAS procedures are defined in PANS-ATM, Doc 4444 and in PANS-OPS, Doc 8168.

11.14 This evolution does not change procedures.

Necessary System Capability

Avionics

- RTCA DO185B / EUROCAE DO143 MOPS are available for TCAS implementation.
- RTCA DO325 Annex C is being modified to accommodate the 2 functions (APFD and TCAP).

Human Performance

Human factors considerations

11.15 ACAS performance is influenced by human behaviour. ACAS is a last resort function implemented on aircraft with a flight crew of two pilots. The operational procedures (PANS-OPS and PANS-ATM) have been developed and refined for qualified flight crews. Airbus has been able to certify the APFD function, which includes human factors aspects, on A380.

11.16 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human machine interface has been considered from both a functional and ergonomic perspective (See Section 6 for examples). The possibility of latent failures however, continues to exist and vigilance is required during all implementation activity. It is further requested that human factor issues identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

11.17 Training in the operational standards and procedures are required for this module and can be found in the links to the documents in Section 8 to this module. Likewise, the qualifications requirements are identified in the regulatory requirements in Section 6 which are integral to the implementation of this module. Training guidelines are described in the *Airborne Collision Avoidance System (ACAS) Manual* (Doc 9863). Recurrent training is recommended.

Regulatory/standardization needs and Approval Plan (Air and Ground)

11.18 Regulatory/standardization: use current published requirements that include the material given in the “Reference documents” section hereunder. Approval plans: must be in accordance with application requirements e.g. EASA NPA 2010-03 requirement of 1/3/2012 for new installations and 1/12/2015 for all installations, or ICAO mandate of 1/1/2014 for new installations and 1/1/2017 for all installations.

Reference documents

Standards

- ICAO Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport Aeroplanes*
- *ICAO* Annex 10 — *Aeronautical Telecommunications,* Volume IV - *Surveillance Radar and Collision Avoidance Systems* (Including Amendment 85- July 2010)
- EUROCAE ED-143/RTCA DO-185B, Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance System II (TCAS II)
- RTCA DO-325, Minimum Operational Performance Standards (MOPS) for Automatic Flight
- Guidance and Control Systems and Equipment. Appendix C estimated 2013
- RTCA DO185B/EUROCAE DO143 MOPS for TCAS implementation

Procedures

- ICAO Doc 4444, *Procedures for Air Navigation Services - Air Traffic Management*
- ICAO Doc 8168, *Procedures for Air Navigation Services — Aircraft Operations*, Volume I — *Flight*.

Guidance material

- ICAO Doc 9863, *Airborne Collision Avoidance System (ACAS) Manual*

Approval documents

- FAA TSO-C119c.
- EASA ETSO-C119c.
- FAA AC120-55C.
- FAA AC20-151a.
- RTCA DO-185B, MOPS for TCAS II
- RTCA DO-325, Appendix C, for APFD and TCAP
- EUROCAE ED-143, MOPS for TCAS II

Title of the Module: **B0-101 ACAS: ACAS Improvements**					
Elements: ACAS II (TCAS version 7.1)		Equipage/Air - TCAS V7.1		Equipage/Ground Nil	
Implementation monitoring and intended performance impact					
Implementation progress 1. Indicator: *Percentage of aircraft with ACAS, logic Version 7.1*	Qualitative performance benefits associated with five main KPAs only				
	KPA-Access/Equity Not Applicable	KPA-Capacity Not Applicable	KPA-Efficiency ACAS improvement will reduce unnecessary resolution advisory (RA) and then reduce trajectory deviations.	KPA-Environment Not Applicable	KPA-Safety ACAS increases safety in the case of breakdown of separation.

12. **B0-102 SNET: Increased Effectiveness of Ground-Based Safety Nets**

General

12.1 This module aims to implement a baseline set of ground-based safety nets. Ground-based safety nets are intended to assist the air traffic controller in generating, in a timely manner, alerts of an increased risk to flight safety (collision, unauthorized airspace penetration and controlled flight into terrain), which may include resolution advice.

Change brought by the module

12.2 Ground-based safety nets are functionalities of ATM systems that have the sole purpose of monitoring the environment of operations, during airborne phases of flight, in order to provide timely alerts of an increased risk to flight safety. Ground-based safety nets make an essential contribution to safety and remain required as long as the operational concept remains human centered.

12.3 Ground-based safety nets have been in use since the 1980s. Provisions for ground-based safety nets were introduced in PANS-ATM, Doc 4444 in the early 2000s. This module corresponds to a baseline version of the safety nets as already implemented or being implemented in many areas.

12.4 This element is intended to assist the controller, in preventing collision between aircraft by generating, in a timely manner, an alert of a potential or actual infringement of separation minima. STCA must alert when the separation provision layer has been compromised but must also provide sufficient warning time to allow for corrective action, i.e. thus avoiding an airborne collision avoidance system (ACAS) resolution advisory (RA) will be generated. In some environments this necessitates the use of separation minima in STCA that are significantly lower than the separation minima used in the separation provision layer. STCA is only effective when each alert causes the controller to immediately assess the situation and if necessary take appropriate action.

12.5 There is presently no system compatibility between STCA (which advises of pending conflict to ATC only) and ACAS (which provides both advisory and mandatory resolution to the pilot only). However, both systems can complement each other and procedures need to be in place, that takes into account the limitations and advantages of each system.

Element 2: Area proximity warning (APW)

12.6 This element is intended to warn the controller, about unauthorized penetration of an airspace volume by generating, in a timely manner, an alert of a potential or actual infringement of the required spacing to that airspace volume. APW can be used to protect static, fixed airspace volumes (e.g. danger areas) but increasingly also dynamic, modular airspace volumes to enable flexible use of airspace.

Element 3: Minimum safe altitude warning (MSAW)

12.7 This element is intended to warn the controller, about increased risk of controlled flight into terrain accidents by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles. MSAW is only effective when each alert causes the controller to immediately assess the situation and if necessary take appropriate action.

Intended performance operational improvement/metric to determine success

12.8 In terms of safety this module contributes to the significant reduction of the number of major incidents. The business case for this element is entirely made around safety and the application of ALARP (as low as reasonably practicable) in risk management.

12.9 The relevant PANS-ATM provisions exist. In addition they must regularly analyze the data and circumstances pertaining to each alert in order to identify and correct any shortcomings pertaining to ground-based safety nets, airspace design and ATC procedures.

Necessary system capability

Avionics

12.10 Aircraft should support cooperative surveillance using existing technology such as Mode C/S transponder or ADS-B out.

Ground systems

12.11 ATS units providing surveillance services must be equipped with the ground-based safety nets that are appropriate and optimized for their environment. Appropriate offline tools should be available to support the analysis of every safety alerts.

Human factors considerations

12.12 The generated alerts should normally be appropriate and timely, and the controller should understand under which circumstances interactions can occur with normal control practices or airborne safety nets. The two main issues from human performance are related to nuisance alerts which should be kept to a minimum and warning time for a genuine alert which should be high enough to support the completion of the procedure.

12.13 The use of ground-based safety nets will depend on the controller's trust. Trust is a result of many factors such as reliability and transparency. Neither mistrust nor complacency is desirable; training and experience is needed to develop trust at the appropriate level.

Training and qualification requirements

12.14 Controllers must receive specific ground-based safety nets training and be assessed as competent for the use of the relevant ground-based safety nets and recovery techniques.

Reference documents and guidance material

- PANS-ATM (Doc 4444), section 15.7.2 and 15.7.4
- EUROCONTROL Specifications for STCA, APW, MSAW and APM, available at http://www.EUROCONTROL.int/safety-nets

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-102 SNET: Increased Effectiveness of Ground-Based Safety Nets</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. Short Term Conflict Alert (STCA)
2. Area Proximity Warning (APW)
3. Minimum Safe Altitude Warning (MSAW)</td><td colspan="2"><u>Equipage/Air</u>
- SSR Mode C/S transponder
- ADS-B OUT</td><td colspan="2"><u>Equipage/Ground</u>
- Short Term Conflict Alert,
- Area Proximity Warnings and
- Minimum Safe Altitude Warnings</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1. Indicator:
Percentage of ATS units with ground based safety nets</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Not Applicable</td><td><u>KPA-Capacity</u>
Not Applicable</td><td><u>KPA-Efficiency</u>
Not Applicable</td><td><u>KPA-Environment</u>
Not Applicable</td><td><u>KPA-Safety</u>
Significant reduction of the number of major incidents.</td></tr>
</table>

PERFORMANCE IMPROVEMENT AREA 4: EFFICIENT FLIGHT PATH – THROUGH TRAJECTORY-BASED OPERATIONS

13. B0-05 CDO: Improved Flexibility and Efficiency in Descent Profiles (CDO)

Introduction

13.1 This module integrates with other airspace and procedures (continuous descent operations (CDO), performance-based navigation (PBN) and airspace management) to increase efficiency, safety, access and predictability.

13.2 As traffic demand increases, the challenges in terminal areas center on volume, hazardous meteorological conditions (such as severe turbulence and low visibility), adjacent airports and special activity airspace in close proximity whose procedures utilize the same airspace, and policies that limit capacity, throughput, and efficiency.

13.3 Traffic flow and loading (across ingress and egress routes) are not always well-metered, balanced or predictable. Obstacle and airspace avoidance (in the form of separation minima and criteria), noise abatement procedures, as well as wake encounter risk mitigation, tend to result in operational inefficiencies (e.g. added time or distance flown, thus more fuel).

13.4 Inefficient routing can also cause under-use of available airfield and airspace capacity. Finally, challenges are presented to States by serving multiple customers (international and domestic with various capabilities): the intermingling of commercial, business, general aviation and many times military traffic destined to airports within a terminal area that interact and at times inhibit each other‘s operations.

Baseline

13.5 The baseline for this module may vary from one State, to the next. Noted is the fact that some aspects of the movement to PBN have already been the subject of local improvements in many areas; and these areas and users are already realizing benefits.

Change brought by the module

13.6 Flight operations in many terminal areas precipitate the majority of current airspace delays in many States. Opportunities to optimize throughput, improve flexibility, enable fuel-efficient climb and descent profiles, and increase capacity at the most congested areas should be a high-priority initiative in the near-term.

13.7 The core capabilities that should be leveraged are RNAV; RNP where needed; CDO; where possible, increased efficiencies in terminal separation rules in airspace; effective airspace design and classification; air traffic control (ATC) flow and ATC surveillance. Opportunities to reduce emissions and aircraft noise impacts should also be leveraged where possible.

13.8 Aircraft equipage is a significant contributor and the reliance on area navigation (RNAV) and required navigation performance (RNP) capabilities requires the continued development of PBN provisions as well as increased PBN implementation worldwide. ICAO provisions and guidance material are also necessary to support trajectory modelling and trajectory information exchange, and enhanced provisions for data link applications and messages will support exchange of trajectory data.

Element 1: Continuous descent operations

13.9 Continuous descent is one of several tools available to aircraft operators and ANSPs to benefit from existing aircraft capabilities and reduce noise, fuel burn and the emission of greenhouse gases. Over the years, different route models have been developed to facilitate CDO and several attempts have been made to strike a balance between the ideal of environmentally friendly procedures and the requirements of a specific airport or airspace.

13.10 CDO can provide for a reduction in fuel burn and emissions, while increasing flight stability and the predictability of flight path to both controllers and pilots, without compromising the optimal airport arrival rate (AAR).

13.11 CDO is enabled by airspace design, procedure design and facilitation by ATC, in which an arriving aircraft descends continuously, to the greatest possible extent, by employing minimum engine thrust, ideally in a low drag configuration, prior to the final approach fix/final approach point (FAF/FAP). An optimum CDO starts from the top-of-descent (TOD) and uses descent profiles that reduce controller-pilot communications and segments of level flight.

13.12 Furthermore it provides for a reduction in noise, fuel burn and emissions, while increasing flight stability and the predictability of flight path to both controllers and pilots.

Element 2: Performance-based navigation

13.13 PBN is a global set of area navigation standards, defined by ICAO, based on performance requirements for aircraft navigating on departure, arrival, approach or en-route.

13.14 These performance requirements are expressed as navigation specifications in terms of accuracy, integrity, continuity, availability and functionality required for a particular airspace or airport.

13.15 PBN will eliminate the regional differences of various required navigation performance (RNP) and area navigation (RNAV) specifications that exist today. The PBN concept encompasses two types of navigation specifications:

a) RNAV specification: navigation specification-based on area navigation that does not include the requirement for on-board performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1; and

b) RNP specification: navigation specification based on area navigation that includes the requirement for on-board performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4.

Intended performance operational improvement

13.16 Metrics to determine the success of the module are proposed in the Manual on Global Performance of the Air Navigation System (Doc 9883).

13.17 In terms of Efficiency cost savings and environmental benefits through reduced fuel burn and optimal management of the top-of-descent in the en-route airspace have a positive impact as well as the positive contribution on environment.

13.18 There is more predictability in more consistent flight paths and stabilized approach paths reducing the need for vectors and contributing on the ATC workload.

13.19 In addition the reduction in the incidence of controlled flight into terrain (CFIT) added to separation with the surrounding traffic and the reduction of number of conflicts contribute to safety also.

13.20 In terms of potential savings as a result of CDO implementation, it is important to consider that CDO benefits are heavily dependent on each specific ATM environment. Nevertheless, if implemented within the ICAO CDO manual framework, it is envisaged that the benefit/cost ratio (BCR) will be positive.

Necessary procedures (air and ground)

13.21 The ICAO Continuous Descent Operations (CDO) Manual (Doc 9931) provides guidance on the airspace design, instrument flight procedures, ATC facilitation and flight techniques necessary to enable continuous descent profiles.

13.22 It therefore provides background and implementation guidance for:

a) air navigation service providers (ANSPs);
b) aircraft operators;
c) airport operators; and
d) aviation regulators.

13.23 The ICAO Performance-based Navigation (PBN) Manual (Doc 9613) provides general guidance on PBN implementation. This manual identifies the relationship between RNAV and RNP applications and the advantages and limitations of choosing one or the other as the navigation requirement for an airspace concept.

13.24 It also aims at providing practical guidance to States, ANSPs and airspace users on how to implement RNAV and RNP applications, and how to ensure that the performance requirements are appropriate for the planned application.

Necessary system capability

Avionics

13.25 CDO is an aircraft operating technique aided by appropriate airspace and procedure design and appropriate ATC clearances enabling the execution of a flight profile optimized to the operating capability of the aircraft, with low engine thrust settings and, where possible, a low drag configuration, thereby reducing fuel burn and emissions during descent.

13.26 The optimum vertical profile takes the form of a continuously descending path, with a minimum of level flight segments only as needed to decelerate and configure the aircraft or to establish on a landing guidance system (e.g. ILS).

13.27 The optimum vertical path angle will vary depending on the type of aircraft, its actual weight, the wind, air temperature, atmospheric pressure, icing conditions and other dynamic considerations.

Ground systems

13.28 Within an airspace concept, PBN requirements will be affected by the communication, surveillance and ATM environments, the NAVAID infrastructure and the functional and operational capabilities needed to meet the ATM application.

13.29 PBN performance requirements also depend on what reversionary, non-RNAV means of navigation are available and what degree of redundancy is required to ensure adequate continuity of functions. Ground automation needs initially little changes to support CDO: potentially a flag on the display. For better integration the ground trajectory calculation function will need to be upgraded.

Human factors considerations

13.30 The decision to plan for RNAV or RNP has to be decided on a case by case basis in consultation with the airspace user. Some areas need only a simple RNAV to maximize the benefits, while other areas such as nearby steep terrain or dense air traffic may require the most stringent RNP.

13.31 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, are reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

13.32 Since required navigation performance authorization required (RNP AR) approaches also require significant training, ANSPs should work closely with airlines to determine where RNP AR approach should be implemented. In all cases PBN implementation needs to be an agreement between the airspace user, the ANSP and the regulatory authorities.

13.33 Training in the operational standards and procedures are required for this module and can be found in the links to the documents indicated in the “Reference documents and guidance material” section hereunder. Likewise, the qualifications requirements are identified in the regulatory requirements described in paragraph 13.34.

Regulatory/standardization needs and approval plan (air and ground)

13.34 Regulatory/standardization: use current published requirements that include the material given below. Approval plans: must be in accordance with application requirements e.g. airspace design, air traffic operations, PBN requirements for fixed radius transitions, radius-to-fix legs, required time of arrival (RTA), parallel offset, etc.

Reference documents and guidance material

- For flight plan requirements in Amendment 1, ICAO Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444).
- ICAO Doc 9613, Performance-based Navigation (PBN) Manual
- ICAO Doc 9931, Continuous Descent Operations (CDO) Manual
- SAM Advisory Circulars.

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-05 CDO: Improved Flexibility and Efficiency in Descent Profiles (CDO)</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. CDO
2. PBN STARs</td><td colspan="2"><u>Equipage/Air</u>
- Nil</td><td colspan="2"><u>Equipage/Ground</u>
- Nil</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1. Indicator: Percentage of international aerodromes with CDO implemented

2. Indicator: Percentage of international aerodromes/TMAs with PBN STARs implemented</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Not Applicable</td><td><u>KPA-Capacity</u>
Not Applicable</td><td><u>KPA-Efficiency</u>
Cost savings through reduced fuel burn.
Reduction in the number of required radio transmissions.</td><td><u>KPA-Environment</u>
Reduced emissions as a result of reduced fuel burn</td><td><u>KPA-safety</u>
More consistent flight paths and stabilized approach paths.
Reduction in the incidence of controlled flight into terrain (CFIT)</td></tr>
</table>

14. **<u>B0-20 CCO: Improved Flexibility and Efficiency in Departure Profiles (CCO)</u>**

Introduction

14.1 This module integrates with other airspace and procedures (PBN, continuous descent operations (CDO), and airspace management) to increase efficiency, safety, access and predictability; and minimize fuel use, emissions, and noise.

14.2 As traffic demand increases, the challenges in terminal areas center on volume, hazardous meteorological conditions (such as severe turbulence and low visibility), adjacent airports and special activity airspace in close proximity whose procedures utilize the same airspace, and policies that limit capacity, throughput, and efficiency.

14.3 Traffic flow and loading (across arrival and departure routes) are not always well metered, balanced or predictable. Obstacle and airspace avoidance (in the form of separation minima and criteria), noise abatement procedures and noise sensitive areas, as well as wake encounter risk mitigation, tend to result in operational inefficiencies (e.g. added time or distance flown, thus more fuel).

14.4 Inefficient routing can also cause under-use of available airfield and airspace capacity. Finally, challenges are presented to States by serving multiple customers (international and domestic with various capabilities): the intermingling of commercial, business, general aviation and many times military traffic destined to airports within a terminal area that interact and at times inhibit each other’s operations.

Baseline

14.5 Flight operations in many terminal areas precipitate the majority of current airspace delays in many States. Opportunities to optimize throughput, improve flexibility, enable fuel-efficient climb and descent profiles, and increase capacity at the most congested areas should be a high-priority initiative in the near-term.

14.6 The baseline for this module may vary from one State, region or location to the next. Noted is the fact that some aspects of the movement to PBN have already been the subject of local improvements in many areas; these areas and users are already realizing benefits.

14.7 The lack of ICAO PBN operational approval guidance material and subsequently the emergence of States or regional approval material, which may differ or be even more demanding than intended, is slowing down implementation and is perceived as one of the main roadblocks for harmonization.

14.8 There is still some work to be done to harmonize PBN nomenclature, especially in charts and States/regional regulations (e.g. most of European regulations still make use of basic area navigation (B-RNAV) and precision area navigation (P-RNAV).

14.9 Efficiency of climb profiles may be compromised by level off segments, vectoring, and an additional overload of radio transmissions between pilots and air traffic controllers. Existing procedure design techniques do not cater for current FMS capability to manage the most efficient climb profiles. There is also excessive use of radio transmissions due to the need to vector aircraft in an attempt to accommodate their preferred trajectories.

Change brought by the module

14.10 The core capabilities that should be leveraged are RNAV; RNP where possible and needed; continuous climb operations (CCO), increased efficiencies in terminal separation rules; effective airspace design and classification; and air traffic flow. Opportunities to reduce flight block times, fuel/emissions and aircraft noise impacts should also be leveraged where possible.

14.11 This module is a first step towards harmonization and a more optimized organization and management of the airspace. Many States will require knowledgeable assistance to achieve implementation. Initial implementation of PBN, RNAV for example, takes advantage of existing ground technology and avionics and allows extended collaboration of air navigation service providers (ANSPs) with partners: military, airspace users, and neighbouring States. Taking small and required steps and only performing what is needed or required allows States to rapidly exploit PBN.

Other remarks

14.12 Operating at the optimum flight level is a key driver to improve flight fuel efficiency and minimizing atmospheric emissions. A large proportion of fuel burn occurs in the climb phase and for a given route length, taking into account aircraft mass and the meteorological conditions for the flight, there will be an optimum flight level, which gradually increases as the fuel on-board is used up and aircraft mass therefore reduces. Enabling the aircraft to reach and maintain its optimum flight level without interruption will therefore help to optimize flight fuel efficiency and reduce emissions.

14.13 CCO can provide for a reduction in noise, fuel burn and emissions, while increasing flight stability and the predictability of flight path to both controllers and pilots.

14.14 CCO is an aircraft operating technique aided by appropriate airspace and procedure design and appropriate air traffic control (ATC) clearances enabling the execution of a flight profile optimized to the operating capability of the aircraft, thereby reducing fuel burn and emissions during the climb portion of flight.

14.15 The optimum vertical profile takes the form of a continuously climbing path, with a minimum of level flight segments only as needed to accelerate and configure the aircraft.

14.16 The optimum vertical path angle will vary depending on the type of aircraft, its actual weight, the wind, air temperature, atmospheric pressure, icing conditions and other dynamic considerations.

14.17 A CCO can be flown with or without the support of a computer-generated vertical flight path (i.e. the vertical navigation (VNAV) function of the flight management system (FMS)) and with or without a fixed lateral path. The maximum benefit for an individual flight is achieved by allowing the aircraft to climb on the most efficient climb profile along the shortest total flight distance possible.

Intended performance operational improvement

14.18 Metrics to determine the success of the module are proposed in the Manual on Global Performance of the Air Navigation System (Doc 9883).

14.19 An optimal management and efficient aircraft operating profiles with reduction in the number of required radio transmissions and lower pilot and air traffic control workload have a positive impact in terms of efficiency.

14.20 It is important to consider that CCO benefits are heavily dependent on each specific ATM environment. Nevertheless, if implemented within the ICAO CCO manual framework, it is envisaged that the benefit/cost ratio (BCR) will be positive.

Necessary procedures (air and ground)

14.21 The ICAO *Performance-based Navigation (PBN) Manual* (Doc 9613) provides general guidance on PBN implementation.

14.22 This manual identifies the relationship between RNAV and RNP applications and the advantages and limitations of choosing one or the other as the navigation requirement for an airspace concept.

14.23 It also aims at providing practical guidance to States, ANSPs and airspace users on how to implement RNAV and RNP applications, and how to ensure that the performance requirements are appropriate for the planned application.

14.24 The ICAO *Continuous Climb Operations (CCO) Manual* (Doc xxxx – under development) provides guidance on the airspace design, instrument flight procedures, ATC facilitation and flight techniques necessary to enable continuous descent profiles.

14.25 It therefore provides background and implementation guidance for:

a) air navigation service providers;
b) aircraft operators;
c) airport operators; and d) aviation regulators.

Necessary system capability

Avionics

14.26 CCO does not require a specific air or ground technology. It is an aircraft operating technique aided by appropriate airspace and procedure design, and appropriate ATC clearances enabling the execution of a flight profile optimized to the operating capability of the aircraft, in which the aircraft can attain cruise altitude flying at optimum air speed with climb engine thrust settings set throughout the climb, thereby reducing total fuel burn and emissions during the whole flight. Reaching cruise flight levels sooner where higher ground speeds are attained can also reduce total flight block times. This may allow a reduced initial fuel upload with further fuel, noise and emissions reduction benefits.

14.27 The optimum vertical profile takes the form of a continuously climbing path. Any level or non-optimal reduced climb rate segments during the climb to meet aircraft separation requirements should be avoided. Achieving this whilst also enabling CDO is critically dependent upon the airspace design and the height windows applied in the instrument flight procedure. Such designs need an understanding of the optimum profiles for aircraft operating at the airport to ensure that the height windows avoid, to greatest extent possible, the need to resolve potential conflicts between the arriving and departing traffic flows through ATC height or speed constraints.

Ground systems

14.28 Controllers would benefit from some automation support to display aircraft capabilities in order to know which aircraft can do what.

Human factors considerations

14.29 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

14.30 Training in the operational standards and procedures are required for this module and can be found in the links to the documents below.

Regulatory/standardization needs and approval plan (air and ground)

14.31 Regulatory/standardization: use current published requirements that include the guidance material

14.32 Approval plans: must be in accordance with application requirements.

14.33 Understanding the policy context is important for making the case for local CCO implementation and ensuring high levels of participation. CCO may be a strategic objective at international, State, or local level, and as such, may trigger a review of airspace structure when combined with CDO.

14.34 For example, noise contour production may be based on a specific departure procedure (noise abatement departure procedure 1 (NADP1) or NADP2-type). Noise performance can be improved in some areas around the airport, but it may affect existing noise contours elsewhere. Similarly CCO can enable several specific strategic objectives to be met and should therefore be considered for inclusion within any airspace concept or redesign. Guidance on airspace concepts and strategic objectives is contained in the Performance-based Navigation (PBN) Manual (Doc 9613).

14.35 Objectives are usually collaboratively identified by airspace users, ANSPs, airport operators as well as by government policy. Where a change could have an impact on the environment, the development of an airspace concept may involve local communities, planning authorities and local government, and may require formal impact assessment under regulations.

14.36 Such involvement may also be the case in the setting of the strategic objectives for airspace. It is the function of the airspace concept and the concept of operations to respond to these requirements in a balanced, forward-looking manner, addressing the needs of all stakeholders and not of one of the stakeholders only (e.g. the environment). Doc 9613, Part B, Implementation Guidance, details the need for effective collaboration among these entities.

14.37 In the case of a CCO, the choice of a departure procedure (NADP1 or NADP2-type), requires a decision of the dispersion of the noise. In addition to a safety assessment, a transparent assessment of the impact of CCO on other air traffic operations and the environment should be developed and made available to all interested parties.

Reference documents and guidance material

- *ICAO Doc 8168, Procedures for Air Navigation Services — Aircraft Operations*
- ICAO Doc 4444, *Procedures for Air Navigation Services — Air Traffic Management Guidance Material*
- ICAO Doc 9613, *Performance-based Navigation (PBN) Manual*
- ICAO Doc xxxx, *Continuous Climb Operations (CCO) Manual* (only in English yet)

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-20 CCO: Improved Flexibility and Efficiency in Departure Profiles (CCO)</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. CCO
2. PBN SIDs</td><td colspan="2"><u>Equipage/Air</u>
- Nil</td><td colspan="2"><u>Equipage/Ground</u>
- Nil</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1. Indicator: Percentage of international aerodromes with CCO implemented

2. Indicator: Percentage of international aerodromes with PBN SIDs implemented</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/Equity</u>
Not Applicable</td><td><u>KPA-Capacity</u>
Not Applicable</td><td><u>KPA-Efficiency</u>
Cost savings through reduced fuel burn and efficient aircraft operating profiles.
Reduction in the number of required radio transmissions.</td><td><u>KPA-Environment</u>
Authorization of operations where noise limitations would otherwise result in operations being curtailed or restricted.
Environmental benefits through reduced emissions.</td><td><u>KPA-Safety</u>
More consistent flight paths.
Reduction in the number of required radio transmissions.
Lower pilot and air traffic control workload</td></tr>
</table>

15. B0-40 TBO: Improved Safety and Efficiency through the initial application of Data Link En-Route

Introduction

15.1 Air-ground data exchanges have been the subject of decades of research and standardization work and are an essential ingredient of the future operational concepts since they can carry reliably richer information than what can be exchanged over radio. This module covers what is available and can be used more widely now.

15.2 One element of the module is the transmission of aircraft position information, forming the automatic dependent surveillance contract (ADS-C), principally for use over oceanic and remote areas where radar cannot be deployed for physical or economic reasons.

15.3 A second element is controller pilot data link communications (CPDLC) comprising a first set of data link applications allowing pilots and controllers to exchange ATC messages concerning communications management, ATC clearances and stuck microphones. CPDLC reduces misunderstandings and controller workload giving increased safety and efficiency whilst providing extra capacity in the ATM system.

Baseline

15.4 Prior to this module, air-ground communications used voice radio (VHF or HF depending on the airspace), known for limitations in terms of quality, bandwidth and security. There are also wide portions of the region with no radar surveillance. ATC instructions, position reports and other information have to be transmitted through HF radios where voice quality is especially bad most of the time, leading to significant workload to controllers and pilots (including HF radio operators), poor knowledge of the traffic situation outside radar coverage, large separation minima, and misunderstandings. In high density airspace controllers currently spend 50% of their time talking to pilots on the VHF voice channels where frequencies are a scarce resource; this also represents a significant workload for controllers and pilots and generates misunderstandings.

Change brought by the module

15.5 The module concerns the implementation of a first package of data link applications, covering ADS-C, CPDLC and other applications for ATC. These applications provide significant improvement in the way ATS is provided as described in the next section.

15.6 At the moment, data link implementations are based on different standards, technology and operational procedures, although there are many similarities.

Element 1: ADS-C over oceanic and remote areas

15.7 ADS-C provides an automatic dependent surveillance service over oceanic and remote areas, through the exploitation of position messages sent automatically by aircraft over data link at specified time intervals. This improved situational awareness (in combination with appropriate PBN levels) is improving safety in general and allows reducing separations between aircraft and progressively moving away from pure procedural modes of control.

Element 2: Continental CPDLC

15.8 This application allows pilots and controllers to exchange messages with a better quality of transmission. In particular, it provides a way to alert the pilot when the microphone is stuck as well as a complementary means of communication. CPDLC is used as supplemental means of communications. Voice remains primary.

15.9 Over dense continental airspace, they can significantly reduce the communication load, allowing better task organization by the controller, in particular by not having to interrupt immediately to answer radio. They provide more reliability for the transmission and understanding of frequency changes, flight levels and flight information etc, thereby increasing safety and reducing the number of misunderstandings and repetitions.

Intended performance operational improvement

15.10 Metrics to determine the success of the module are proposed in the Manual on Global Performance of the Air Navigation System (Doc 9883).

Element 1: ADS-C over oceanic and remote areas

Capacity

15.11 A better localization of traffic and reduced separations allow increasing the offered capacity.

Efficiency

15.12 Routes/tracks and flights can be separated by reduced minima, allowing to apply flexible routings and vertical profiles closer to the user-preferred ones.

Flexibility

15.13 ADS-C permits to make route changes easier

Safety

15.14 Increased situational awareness; ADS-C based safety nets like cleared level adherence monitoring, route adherence monitoring, danger area infringement warning; better support to search and rescue.

Cost Benefit Analysis

15.15 The business case has proven to be positive due to the benefits that flights can obtain in terms of better flight efficiency (better routes and vertical profiles; better and tactical resolution of conflicts).

Element 2: Continental CPDLC

Capacity

15.16 Reduced communication workload and better organization of controller tasks allowing to increase sector capacity

Safety

15.17 Increased situational awareness; reduced occurrences of misunderstandings; solution to stuck microphone situations

Cost Benefit Analysis

15.18 It has to consider:

a) the benefits that flights can obtain in terms of better flight efficiency (better routes and vertical profiles; better and tactical resolution of conflicts); and
b) reduced controller workload and increased capacity.

Necessary procedures (air and ground)

15.19 Procedures have been described and are available in ICAO documents: *Manual of Air Traffic Services Data Link Applications* (Doc 9694) and the Global Operational Data Link Document (GOLD). Currently GOLD and LINK2000+ operational material is being merged, leading to an update of GOLD that allows global applicability, independent from airspace and technology.

Necessary system capability

Avionics

15.20 Standards for the enabling technology are available in ICAO documents and industry standards. Today, the existing data link implementations are based on two sets of ATS data link services: FANS 1/A and ATN B1, both will exist. FANS1/A is deployed in oceanic and remote regions whilst ATN B1 is being implemented in Europe according to European Commission legislation (EC Reg. No. 29/2009) – the data link services implementing rule.

15.21 These two packages are different from the operational, safety and performance standpoint and do not share the same technology but there are many similarities and can be accommodated together, thanks to the resolution of the operational and technical issues through workaround solutions, such as accommodation of FANS 1/A aircraft implementations by ATN B1 ground systems and dual stack (FANS 1/A and ATN B1) implementations in the aircraft.

Ground systems

15.22 For ground systems, the necessary technology includes the ability to manage ADS-C contract, process and display the ADS-C position messages. CPDLC messages need to be processed and displayed to the relevant ATC unit. Enhanced surveillance through multi-sensor data fusion facilitates transition to/from radar environment.

Human factors considerations

15.23 ADS-C is a means to provide the air traffic controller with a direct representation of the traffic situation, and reduces the task of controllers or radio operators to collate position reports. In addition to providing another channel of communications, the data link applications allow in particular air traffic controllers to better organize their tactical tasks. Both pilots and controllers benefit from a reduced risk of misunderstanding of voice transmissions.

15.24 Data communications allow reducing the congestion of the voice channel with overall understanding benefits and more flexible management of air-ground exchanges. This implies an evolution in the dialogue between pilots and controllers which must be trained to use data link rather than radio. Automation support is needed for both the pilot and the controller. Overall, their respective responsibilities will not be affected.

15.25 Human factors have been taken into consideration during the development of the processes and procedures associated with this module. Where automation is to be used, the human-machine interface has been considered from both a functional and ergonomic perspective. The possibility of latent failures however, continues to exist and vigilance is requested during all implementation actions. It is further requested that human factor issues, identified during implementation, be reported to the international community through ICAO as part of any safety reporting initiative.

Training and qualification requirements

15.26 Automation support is needed for both the pilot and the controller which therefore will have to be trained to the new environment and to identify the aircraft/facilities which can accommodate the data link services in mixed mode environments**.**

15.27 Training in the operational standards and procedures are required for this module and can be found in the links to the documents indicated in the "Reference documents and guidance material" section hereunder. Likewise, the qualifications requirements are identified in the regulatory requirements described in paragraphs 15.28 to 15.30.

Regulatory/standardization needs and approval plan (air and ground)

15.28 Regulatory/standardization: use current published requirements that include the guidance material. It should also be noted that new ICAO OPLINK OPS guidance material is under development.

15.29 Approval plans: must be in accordance with application requirements.

15.30 The GOLD ad hoc working group is working on an update of GOLD-Ed 1 in the framework of harmonization of procedures independent from airspace and technology.

Reference documents and guidance material

- ICAO Doc 9694, Manual of Air Traffic Services Data Link Applications.
- Global Operation Data Link Document (GOLD) Ed 2 (under development).
- Commission Regulation (EC) No 29/2009 of 16 January 2009 laying down requirements on data link services for the single European sky.
- EUROCAE ED-100A/RTCA DO-258A, Interoperability Requirements for ATS Applications using ARINC 622 Data Communications.
- EUROCAE ED-110B/RTCA DO-280B, Interoperability Requirements Standard for Aeronautical Telecommunication Network Baseline 1 (Interop ATN B1).
- EUROCAE ED-120/RTCA DO-290, Safety and Performance Requirements Standard for Initial Air Traffic Data Link Services In Continental Airspace (SPR IC).
- EUROCAE ED-122/RTCA DO-306, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard).
- EUROCAE ED-154A/RTCA DO-305A, Future Air Navigation System 1/A – Aeronautical Telecommunication Network Interoperability Standard (FANS 1/A – ATN B1 Interop Standard).

Module summary

<table>
<tr><td colspan="6"><u>Title of the Module:</u>
B0-40 TBO: Improved Safety and Efficiency through the initial application of Data Link En-Route</td></tr>
<tr><td colspan="2"><u>Elements:</u>
1. ADS-C over oceanic and remote areas
2. Continental CPDLC</td><td colspan="2"><u>Equipage/Air</u>
- FANS 1/A; ATN B1</td><td colspan="2"><u>Equipage/Ground</u>
- ADS-C
- VDL Mode 2/Continental CPDLC</td></tr>
<tr><td colspan="6">Implementation monitoring and intended performance impact</td></tr>
<tr><td rowspan="2"><u>Implementation progress</u>
1. Indicator: Number of ADS-C /CPDLC procedures available over oceanic and remote Areas</td><td colspan="5">Qualitative performance benefits associated with five main KPAs only</td></tr>
<tr><td><u>KPA-Access/ Equity</u>
Not Applicable</td><td><u>KPA-Capacity</u>
A better localization of traffic and reduced separation allow increased capacity. Reduced communication workload and better organization of controller tasks allowing increasing sector capacity.</td><td><u>KPA-Efficiency</u>
Routes/tracks and flights can be separated by reduced minima, allowing to apply flexible routings and vertical profiles closer to the user-preferred ones.</td><td><u>KPA-Environment</u>
Reduced emissions as a result of reduced fuel burn.</td><td><u>KPA-Safety</u>
ADS-C based safety nets supports cleared level adherence monitoring, route adherence monitoring, danger area infringement warning and improved search and rescue. Reduced occurrences of misunderstandings; solution to stuck microphone situations.</td></tr>
</table>

ATTACHMENT E

AIR NAVIGATION REPORT FORM
HOW TO USE - EXPLANATORY NOTES

1. **Air Navigation Report Form (ANRF):** This form provides a standardized approach to implementation monitoring and performance measurement of Aviation System Block Upgrades (ASBU) Modules. The Planning and Implementation Regional Groups (PIRGs) and States could use this report format for their planning, implementation and monitoring framework for ASBU Modules. Also, other reporting formats that provide more details may be used but should contain as a minimum the elements described below. The Reporting and monitoring results will be analysed by ICAO and aviation partners and then utilized in developing the Annual Global Air Navigation Report. The Global Air Navigation Report conclusions will serve as the basis for future policy adjustments aiding safety practicality, affordability and global harmonization, amongst other concerns.

2. **Regional/National Performance objective:** In the ASBU methodology, the performance objective will be the title of the ASBU module itself. Furthermore, indicate alongside corresponding Performance Improvement area (PIA). Consequently, for ASBU Block 0, a total of 18 ANRFs will need to be developed that reflects respective 18 Modules. In the SAM Region 16 modules were selected.

3. **Impact on Main Key Performance Areas:** Key to the achievement of a globally interoperable ATM system is a clear statement of the expectations/benefits to the ATM community. The expectations/benefits are referred to eleven Key Performance Areas (KPAs) and are interrelated and cannot be considered in isolation since all are necessary for the achievement of the objectives established for the system as a whole. It should be noted that while safety is the highest priority, the eleven KPAs shown below are in alphabetical order as they would appear in English. They are access/equity; capacity; cost effectiveness; efficiency; environment; flexibility; global interoperability; participation of ATM community; predictability; safety; and security. However, out of these eleven KPAs, for the present, only five have been selected for reporting through ANRF, which are Access & Equity, Capacity, Efficiency, Environment and Safety. The KPAs applicable to respective ASBU module are to be identified by marking Y (Yes) or N (No).

4. **Implementation Progress:** This section indicates status of progress in the implementation of different elements of the ASBU Module for both air and ground segments.

5. **Elements related to ASBU module:** Under this section list elements that are needed to implement the respective ASBU Module. Furthermore, should there be elements that are not reflected in the ASBU Module (example: In ASBU B0-80/Airport CDM, Aerodrome certification and data link applications D-VOLMET, D-ATIS, D-FIS are not included; Similarly in ASBU B0-30/AIM, note that WGS-84 and eTOD are not included) but at the same time if they are closely linked to the module, ANRF should specify those elements. As a part of guidance to PIRGs/States, the FASID (Volume II) of every Regional ANP will have the complete list of all 18 Modules of ASBU Block 0 along with corresponding elements, equipage required on the ground and in the air as well as metrics specific to both implementation and benefits.

6. **Implementation Status (Ground/Air):** Planned implementation date (moth/year) and the current status/responsibility for each element are to be reported in this section. Please provide as much details as possible and should cover both avionics and ground systems. If necessary, use additional pages.

7. **Implementation Roadblocks/Issues**: Any problems/issues that are foreseen for the implementation of elements of the Module are to be reported in this section. The purpose of the section is to identify in advance any issues that will delay the implementation and if so, corrective action is to be initiated by the concerned person/entity. The four areas, under which implementation issues, if any, for the ASBU Module to be identified, are as follows:

- Ground System Implementation:
- Avionics Implementation:
- Procedures Availability:
- Operational Approvals:

Should be there no issues to be resolved for the implementation of ASBU Module, indicate as “NIL”.

8. **Performance Monitoring and Measurement:** Performance monitoring and measurement is done through the collection of data for the supporting metrics. In other words, metrics are quantitative measure of system performance – how well the system is functioning. The metrics fulfil three functions. They form a basis for assessing and monitoring the provision of ATM services, they define what ATM services user value and they can provide common criteria for cost benefit analysis for air navigation systems development. The Metrics are of two types:

A. Implementation Indicators/supporting metrics: This indicator supported by the data collected for the metric reflects the status of implementation of elements of the Module. For example- Percentage of international aerodromes with CDO implemented. This indicator requires data for the metric “number of international aerodromes with CDO”.

B. Benefit Metrics: This Metric allows to asses benefits accrued as a result of implementation of the module. The benefits or expectations, also known as Key Performance Areas (KPAs), are interrelated and cannot be considered in isolation since all are necessary for the achievement of the objectives established for the system as a whole. It should be noted that while safety is the highest priority, the eleven KPAs shown below are in alphabetical order as they would appear in English. They are access/equity; capacity; cost effectiveness; efficiency; environment; flexibility; global interoperability; participation of ATM community; predictability; safety; and security. However, out of these eleven KPAs, for the present, only five have been selected for reporting through ANRF, which are Access & Equity, Capacity, Efficiency, Environment and Safety. It is not necessary that every module contributes to all of the five KPAs. Consequently, a limited number of metrics per type of KPA, serving to measure the module(s)’ implementation benefits, without trying to apportion these benefits between module, have been identified at the end of this table. This approach would facilitate States in collecting data for the chosen metrics.

On the basis of examples of Performance Indicators/supporting Metrics detailed in this document, PIRGs/States to reflect under this section the appropriate metrics that represents the monitoring of respective ASBU Module both in terms of implementation as well as benefits to five KPAs.

The impact on KPAs could be extended to more than five KPAs mentioned above if maturity of the system allows and the process is available within the State to collect the data.

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional planning for ASBU Modules

REGIONAL PERFORMANCE OBJECTIVE – B0-RSEQ: Improve Traffic Flow Through Runway Sequencing (AMAN/DMAN) **Performance Improvement Area 1: Airport Operations**					
ASBU B0-15: Impact on Main Key Performance Areas (KPA): KPA-02 – Capacity, KPA-04 – Efficiency, KPA-09 – Predictability, KPA-06 – Flexibility.					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	Y	Y	N	N

ASBU B0-RSEQ: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. AMAN and time based metering	2019
2. Departure management	2019
3. Movement Area Capacity Optimization	2023 – Airport operator

ASBU B0-RSEQImplementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. AMAN and time based metering	Lack of automation system to support synchronization	NIL	Lack of appropriate training. Lack of STARs PBN Lack of Slots assignment.	
2. Departure management	Lack of automation system to support synchronization	NIL	Lack of slots assignment. Lack of SIDs PBN Lack of appropriate training	
3. Movement Area Capacity Optimization	NIL	NIL	Lac of procedures for RWY, TWY & platform capacity calculation. Guidelines for	NIL

ASBU B0-RSEQImplementation Roadblocks/Issues				
Elements	Implementation Area			
	Ground System Implementation	Avionics Implementation	Procedures Availability	Operational Approvals
			movement area capacity optimization	

ASBU B0-RSEQ: Performance Monitoring and Measurement (Implementation)	
Elements	Performance Indicators/Supporting Metrics
1. AMAN and time based metering	Indicator: Percentage of international aerodromes with high density operations, equipped with AMAN and time based metering Supporting metric: Number of international airport with high density operations, equipped with AMAN and time based metering
2. Departure management	Indicator: Percentage of international aerodromes with high density operations, equipped with DMAN Supporting metric: Number of international airport high density operations, equipped with DMAN
3. Movement Area Capacity Optimization	Indicator: percentage of international aerodromes with Airport-capacity calculated Supporting metric: Number of international aerodromes with Airport capacity calculated.

ASBU B0-RSEQ: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	Benefits
Access & Equity	Not applicable.
Capacity	Increase airport movement area capacity through optimization.
Efficiency	Efficiency is positively impacted as reflected by increased runway throughput and arrival rates.
Environment	Not applicable.
Safety	Not applicable.

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL PERFORMANCE OBJECTIVE – B0-APTA: Optimization of Approach Procedures Including Vertical Guidance Performance Improvement Area 1: Airport Operations					
ASBU B0-APTA: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	Y	Y	Y	Y	Y

ASBU B0-APTA: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. APV with Baro VNAV	December 2020 – Service Providers and users
2. APV with SBAS	Not applicable
3. APV with GBAS	December 2023 – Initial implementation at some States (services providers)

ASBU B0-APTA: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground system Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. APV with Baro VNAV	NIL	Insufficient number of equipped aircraft	Insufficient appropriate training	Lack of appropriate training
2. APV with SBAS	Not Applicable	Not applicable	Not applicable	Not applicable
3. APV with GBAS	Lack of cost benefit analysis Adverse ionosphere	Insufficient number of equipped aircraft	Insufficient appropriate training	Lack of appropriate training Evaluation of a real operational requirement

ASBU B0-APTA: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. APV with Baro VNAV	Indicator: Percentage of international aerodromes having instrument runways provided with APV with Baro VNAV procedure implemented Supporting metric: Number of international airport having approved APV with Baro VNAV procedure implemented
2. APV with SBAS	Not Applicable

ASBU B0-APTA: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
3. APV with GBAS	Indicator: Percentage of international aerodromes having instrument runways provided with APV GBAS procedure implemented Supporting metric: Number of international airport having APV GBAS procedure implemented.

ASBU B0-APTA: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	Increased aerodrome accessibility
Capacity	Increased runway capacity
Efficiency	Reduced fuel burn due to lower minima, fewer diversions, cancellations, delays
Environment	Reduced emissions due to reduced fuel burn
Safety	Increased safety through stabilized approach paths.

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-SURF: Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2) **Performance Improvement Area 1: Airport operation**					
ASBU B0-SURF: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	Y	Y	Y	Y	Y

B0-SURF: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. Surveillance system for ground surface movement (PSR, SSR, ADS B or Multilateration)	June 2021 Service provider
2. Surveillance system on board (SSR transponder, ADS B capacity)	June 2021 Service Provider
3. Surveillance system for vehicle	June 2021 Service Provider
4. Visual aids for navigation	December 2019 Service Provider
5. Automated Runway Incursion Warning System ARIWS	December 2022 Service Provider/Aerodrome Operator
6. Display and processing information	June 2018 Service Provider

ASBU B0-SURF: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. Surveillance system for ground surface movement (PSR, SSR, ADS B or Multilateration)	NIL	NIL	Lack of procedures and training	Lack of inspector for approvals operations
2. Surveillance system on board (SSR transponder ,ADS B capacity)	NIL	Lack of surveillance system on board (ADS B capacity) On general aviation and some commercial aircraft	Lack of procedures and training	NIL

ASBU B0-SURF: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
3. Surveillance system for vehicle	NIL	NIL	Lack of procedures and training	NIL
4. Visual aids for navigation	NIL	NIL	NIL	NIL
5. Automated Runway Incursion Warning System	Integration with existing surveillance systems	NIL	Lack of procedures and training	NIL

ASBU B0-SURF: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
6. Surveillance system for ground surface movement (PSR, SSR, ADS B or Multilateration)	Indicator: Percentage of international aerodromes with SMR/ SSR Mode S/ ADS-B Multilateration for ground surface movement Supporting metric: Number of international aerodrome with SMR/ SSR Mode S/ ADS-B Multilateration for ground surface movement
7. Surveillance system on board (SSR transponder ,ADS B capacity)	Indicator: Percentage of surveillance system on board (SSR transponder, ADS B capacity) Supporting metric: Number of aircraft with surveillance system on board (SSR transponder ,ADS B capacity)
8. Surveillance system for vehicle	Indicator Percentage of international aerodromes with a cooperative transponder systems on vehicles Supporting metric: Number of vehicle with surveillance system installed
9. Visual aids for navigation	Indicator: Percentage of international aerodromes complying with visual aid requirements as per Annex 14 Supporting metric: Number of international aerodromes complying with visual aid requirements as per Annex 14
10. ARIWS (Automated Runway Incursion Warning System)	Indicator: Number of aerodromes with systems installed Supporting metric: Reduction of incursions/events after installation

ASBU B0-SURF: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	Improves portions of the manoeuvring area obscured from view of the control tower for vehicles and aircraft. Ensures equity in ATC handling of surface traffic regardless of the traffic's position on the international aerodrome
Capacity	Sustained level of aerodrome capacity during periods of reduced visibility
Efficiency	Reduced taxi times through diminished requirements for

ASBU B0-SURF: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
	intermediate holdings based on reliance on visual surveillance only. Reduced fuel burn
Environment	Reduced emissions due to reduced fuel burn
Safety	Reduced runway incursions. Improved response to unsafe situations. Improved situational awareness leading to reduced ATC workload

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL PERFORMANCE OBJECTIVE – B0-ACDM: Improved Airport Operations through Airport - CDM **Performance Improvement Area 1: Airport Operations**					
ASBU B0-ACDM: Impact on Main Key Performance Areas (KPA): KPA-02 – Capacity, KPA-04 – Efficiency, KPA-05 – Environment.					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	Y	Y	Y	N

ASBU B0-80: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. Airport –CDM	Dec. 2020 – Airport Operator
2. Aerodrome certification	Dec 2019 – State CAA
3. Airport Planning	Dec. 2023 – State CAA
4. Heliport Operations	Dec. 2023 – State CAA

ASBU B0-ACDM: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. Airport –CDM	Interconnection of ground systems of different partners for Airport-CDM	NIL	NIL	NIL
2. Aerodrome certification	NIL	NIL	LAR AGA	NIL
3. Airport Planning	NIL	NIL	NIL	NIL
4. Heliport Operations	NIL	NIL	NIL	NIL

ASBU B0-ACDM: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. Airport –CDM	Indicator: Percentage of international aerodromes with Airport-CDM Supporting metric: Number of international aerodromes with Airport-CDM
2. Aerodrome certification	Indicator: Percentage of certified international aerodromes Supporting metric: Number of certified international aerodromes
3. Airport Planning	Indicator: Percentage of international aerodromes with Master Plans Supporting metric: Number of international aerodromes with Master Plans
4. Heliport Operations	Indicator: Percentage of Heliports with operational approval Supporting metric: Number of Heliports with operational approval

ASBU B0-ACDM: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	Enhanced equity on the use of aerodrome facilities.
Capacity	Enhanced use of existing Implementation of gate and stands (unlock latent capacity). Reduced workload, better organization of the activities to manage flights. Enhanced aerodrome capacity according with the demand
Efficiency	Improved operational efficiency (fleet management); and reduced delay. Reduced fuel burn due to reduced taxi time and lower aircraft engine run time. Improved aerodrome expansion in accordance with Master Plan
Environment	Reduced emissions due to reduced fuel burn
Safety	Not applicable

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-FICE: Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration **Performance Improvement Area 2:** **Globally Interoperable Systems and Data – Through Globally Interoperable System Wide Information Management**					
ASBU B0-FICE: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	Y	Y	N	Y

ASBU B0-FICE: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. Complete AMHS implementation at States still not counting with this system	June 2018 Services provider
2. AMHS interconnection	December 2020 Services provider
3. Implement AIDC at SAM States automated centres	December 2020 Services provider
4. Implement operational AIDC between adjacent ACC´s	June 2023 Services provider
5. Modernization REDDIG II	June 2023 Services provider

ASBU B0-FICE: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. Complete AMHS implementation at States still not counting with this system	NIL	NIL	NIL	NIL
2. AMHS interconnection	Compatibility AMHS systems	NIL	NIL	NIL
3. Implement AIDC at SAM States automated centres	NIL	NIL	NIL	NIL
4. Implement operational AIDC between adjacent ACC´s	Compatibility between systems from various manufacturers	NIL	NIL	NIL
5. Modernization REDDIG II	NIL	NIL	NIL	NIL

ASBU B0-FICE: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. Complete AMHS implementation at States still not counting with this system	Indicator: Percentage of States with AMHS implemented Supporting metric: Number of AMHS installed
2. AMHS interconnection	Indicator: Percentage of States with AMHS interconnected with other AMHS Supporting metric: Number of AMHS interconnections implemented
3. Implement AIDC at SAM States automated centres	Indicator: Percentage of ATS units with AIDC Supporting metric: Number of AIDC or OLDI systems installed
4. Implement operational AIDC between adjacent ACC´s	Indicator: Percentage of ACCs with AIDC systems interconnection implemented Supporting metric: Number of AIDC interconnections implemented, as per CAR/SAM FASID Table CNS 1Bb
5. Modernization REDDIG II	Indicator: Percentage of phases completed for the modernization of REDDIG II Supporting metric: Modernisation of REDDIG II completed

ASBU B0-FICE: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	NIL
Capacity	Reduced controller workload and increased data integrity supporting reduced separations translating directly to cross sector or boundary capacity flow increases
Efficiency	The reduced separation can also be used to more frequently offer aircraft flight levels closer to the optimum; in certain cases, this also translates into reduced en-route holding
Environment	NIL
Safety	Better knowledge of more accurate flight plan information

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL PERFORMANCE OBJECTIVE – B0-DATM: Service Improvement through Digital Aeronautical Information Management **Performance Improvement Area 2: Globally Interoperable Systems and Data – Through Globally Interoperable System Wide Information Management**					
ASBU B0-30: Impact on Main Key Performance Areas					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	N	N	Y	Y

ASBU B0-30: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. QMS for AIM	Dec.2015
2. e.TOD implementation	Dec.2019
3. WGS-84 implementation	Implemented
4. AIXM implementation	Dec.2019
5. E-AIP implementation	Dec.2019
6. Digital NOTAM	Dec. 2021

ASBU B0-DATM: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. QMS for AIM 2. e-TOD implementation 3. WGS-84 implementation 4. AIXM implementation 5. e-AIP implementation 6. Digital NOTAM	Lack of electronic Database. Lack of electronic access based on Internet protocol services.	NIL	Lack of procedures to allow airlines provide digital AIS data to on-board devices, in particular electronic flight bags (EFBs). Lack of training for AIS/AIM personnel.	NIL

ASBU B0-DATM: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. QMS for AIM	Indicator: % of States QMS Certified Supporting Metric: number of States QMS Certification
2. e-TOD implementation	Indicator: % of States e-TOD Implemented Supporting Metric: number of States with e-TOD Implemented
3. WGS-84 implementation	Indicator: % of States WGS-84 Implemented Supporting Metric: number of States with WGS-84 Implemented
4. AIXM implementation	Indicator: % of States with AIXM implemented Supporting Metric: number of States with AIXM implemented

ASBU B0-DATM: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
5. e-AIP implementation	Indicator: % of States with e-AIP Implemented Supporting Metric: number of States with e-AIP Implemented
6. Digital NOTAM	Indicator: % of States with Digital NOTAM Implemented Supporting Metric: number of States with Digital NOTAM Implemented

ASBU B0-DATM: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	NA
Capacity	NA
Efficiency	NA
Environment	Reduced amount of paper for promulgation of information
Safety	Reduction in the number of possible inconsistencies

SAM AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – Module N° B0-AMET: Meteorological information supporting enhanced operational efficiency and safety Performance Improvement Area 2: Globally Interoperable Systems and Data – Through Globally Interoperable System Wide Information Management					
ASBU B0-AMET: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	Y	Y	Y	Y

ASBU B0-AMET: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. WAFS	In process of improvement
2. IAVW	In process of improvement
3. Tropical cyclone watch	In process of improvement
4. Space weather watch	In process of improvement
5. Aerodrome warnings	In process of improvement
6. Wind shear warnings and alerts	MET provider services / 2015
7. SIGMET	MET provider services / 2020
8. QMS/MET	MET provider services / 2019

ASBU B0-AMET: Meteorological information supporting enhanced operational efficiency and safety				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. WAFS	Connection to the AFS satellite and public Internet distribution systems	Nil	Prepare a contingency plan in case of public Internet failure	N/A
2. IAVW	Connection to the AFS satellite and public Internet distribution systems	Nil	Prepare a contingency plan in case of public Internet failure	N/A
3. Tropical cyclone watch	Connection to the AFS satellite and public Internet distribution systems	Nil	Prepare a contingency plan in case of public Internet failure	N/A

ASBU B0-AMET: Meteorological information supporting enhanced operational efficiency and safety				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
4. Space weather and radioactive material watch	Connection to AMHS	Nil	Prepare a contingency plan in case of failure of public Internet.	N/A
5. Aerodrome warnings	Connection to the AMHS	Nil	Local arrangements for reception of aerodrome warnings	N/A
6. Wind shear warnings and alerts	Connection to the AMHS	Nil	Local arrangements for reception of wind shear warning and alerts	N/A
7. SIGMET	Connection to the AMHS	Nil	N/A	N/A
8. QMS/MET	Nil	Commitment of top management	N/A	N/A

ASBU B0-AMET: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. WAFS	Indicator: States implementation of WAFS Internet File Service (WIFS) Supporting metric: Number of States implementation of WAFS Internet File Service (WIFS)
2. IAVW	Indicator: Percentage of international aerodromes/MWOs with IAVW procedures implemented Supporting metric: Number of international aerodromes/MWOs with IAVW procedures implemented
3. Tropical cyclone watch	Indicator: Percentage of international aerodromes/MWOs with tropical cyclone watch procedures implemented Supporting metric: Number of international aerodromes/MWOs with tropical cyclone watch
4. Space weather and radioactive material watch	Indicator: Percentage of MWO with space weather and radioactive material watch procedures implemented. Supporting metric: Number of international aerodromes with space weather and radioactive material watch.
4. Aerodrome warnings	Indicator: Percentage of international aerodromes/AMOs with Aerodrome warnings implemented Supporting metric: Number of international aerodromes/AMOs with Aerodrome warnings implemented
5. Wind shear warnings and alerts	Indicator: Percentage of international aerodromes/AMOs with wind shear warnings procedures implemented Supporting metric: Number of international aerodromes/AMOs with wind shear warnings and alerts implemented

ASBU B0-AMET: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
6. SIGMET	Indicator: Percentage of international aerodromes/MWOs with SIGMET procedures implemented Supporting metric: Number of international aerodromes/MWOs with SIGMET procedures implemented
7. QMS/MET	Indicator: Percentage of MET Provider Sates with QMS/MET implemented Supporting metric: Number of MET Provider Sates with QMS/MET certificated

ASBU B0-AMET: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	Not applicable
Capacity	Optimized usage of airspace and aerodrome capacity due to MET support
Efficiency	Reduced arrival/departure holding time, thus reduced fuel burn due to MET support
Environment	Reduced emissions due to reduced fuel burn due to MET support
Safety	Reduced incidents/accidents in flight and at international aerodromes due to MET support.

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AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – ASBU B0-FRTO: Improved Operations through Enhanced En-Route Trajectories Performance Improvement Area3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM					
ASBU B0-FRTO: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	Y	Y	Y	Y	N

ASBU B0 FRTO: Implementation Progress	
Elements	**Implementation Status Air Ground**
1. Airspace planning	Dec.2023
2. Flexible Use of airspace	Dec. 2019
3. Flexible Routing	Dec. 2023

ASBU B0-FRTO: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground system Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. Airspace planning	Lack of organize and manage airspace prior to the time of flight Lack of AIDC		Lack of procedures	
2. Flexible Use of airspace	NIL		Lack of implementation FUA Guidance	
3. Flexible Routing	ADS-C/CPDLC	Lack of FANS 1/A Lack of ACARS	Lack of LOAs and procedures	Poor percentage of fleet approvals

B0-FRTO: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. Airspace planning	Not assigned Indicator and metrics.
2. Flexible Use of airspace	Indicator: % of time segregated airspaces are available for civil operations in the State Supporting Metric: Reduction of delays in time of civil flights.
3. Flexible Routing	Indicator: % of PBN routes implemented Supporting Metric: KG of Fuel savings Supporting Metric: Tons of CO2 reduction

ASBU B0-FRTO: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	Better access to airspace by a reduction of the permanently segregated volumes of airspace.
Capacity	Flexible routing reduces potential congestion on trunk routes and at busy crossing points. The flexible use of airspace gives greater possibilities to separate flights horizontally. PBN helps to reduce route spacing and aircraft separations.
Efficiency	In particular the module will reduce flight length and related fuel burn and emissions. The module will reduce the number of flight diversions and cancellations. It will also better allow avoiding noise sensitive areas.
Environment	Fuel burn and emissions will be reduced
Safety	NA

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – ASBU B0-NOPS: Improved Flow Performance through Planning based on a Network-Wide view Performance Improvement Area3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM					
ASBU B0-NOPS: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	Y	Y	Y	Y	Y

ASBU B0-NOPS: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. Air Traffic Flow Management	Dec. 2015

ASBU B0-NOPS: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. Air Traffic Flow Management	Lack of system software for ATFM Lack of ATFM units implemented	NIL	Lack of ATFM and CDM procedures Lack of training	

ASBU B0-NOPS: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. Air Traffic Flow Management	Indicator: % of implemented FMUs Support Metric: Number of States with ATFM units implemented.

ASBU B0-NOPS: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	Improved Access and equity in the use of airspace or aerodrome by avoiding disruption of air traffic. ATFM processes take care of equitable distribution of delays
Capacity	Better utilization of available capacity, ability to anticipate difficult situations and mitigate them in advance
Efficiency	Reduced fuel burn due to better anticipation of flow issues; Reduced block times and times with engines on

ASBU B0-NOPS: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Environment	Reduced fuel burn as delays are absorbed on the ground, with shut engines; or at optimum flight levels through speed or route management
Safety	Reduced occurrences of undesired sector overloads

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – ASBU B0-ASUR: Initial capability for ground surveillance **Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM**					
ASBU B0-ASUR: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	Y	N	N	Y

ASBU B0-ASUR: Implementation Progress	
Elements	**Implementation Status (Air Ground)**
1. Implementation of ADS B	December 2023 Users and service provider
2. Implementation of Multilateration	December 2020 Users and service provider
3. Automation system (Presentation)	December 2020 Users and service provider

ASBU B0-ASUR: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. Implementation of ADS B	Lack of ADS B systems implementation due to recent implementation of conventional surveillance systems	Lack of ADS B implementation in general aviation, and old commercial fleet	Lack of procedures	Lack of inspectors with appropriate capability
2. Implementation of multilateration	Facilities at remote stations Establishment of communications networks	NIL	NIL	Lack of inspectors with appropriate capability
3. Automation system (Presentation)	Lack of any automation functionality	NIL	NIL	NIL

B0-ASUR: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. Implementation of ADS B	Indicator: Percentage of international aerodromes with ADS-B implemented Supporting metric: Number of ADS B implemented
2. Implementation of Multilateration	Indicator: Percentage of multilateration system implemented Supporting metric: Number of multilateration system implemented
3. Automation system (Presentation)	Indicator: Percentage of ATS units with automation system implemented Supporting metric: Number of automation system implemented in ATS units

ASBU B0-ASUR: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	NA
Capacity	Typical separation minima are 3 NM or 5 NM enabling an increase in traffic density compared to procedural minima TMA surveillance performance improvements are achieved through high accuracy, better velocity vector and improved coverage
Efficiency	NA
Environment	NA
Safety	Reduction of the number of major incidents. Support to search and rescue

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-ACAS: ACAS Improvements Performance Improvement Area3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM					
ASBU B0-ACAS: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	N	Y	N	Y

ASBU B0-ACAS: Implementation Progress	
Elements	**Implementation Status (Air Ground)**
1. ACAS II (TCAS Version 7.1)	

ASBU B0-ACAS: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. ACAS II (TCAS Version 7.1)				

ASBU B0-ACAS: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. ACAS II (TCAS Version 7.1)	

ASBU B0-ACAS: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	NA
Capacity	NA
Efficiency	ACAS improvement will reduce unnecessary resolution advisory (RA) and then reduce trajectory deviations
Environment	NA
Safety	ACAS increases safety in the case of breakdown of separation

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-SNET: Increased Effectiveness of Ground-Based Safety Nets **Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM**					
ASBU B0-SNET: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	N	N	N	Y

ASBU B0-SNET: Implementation Progress	
Elements	**Implementation Status (Air Ground)**
1. Short Term Conflict Alert (STCA)	June 2020 /Service Provider
2. Area Proximity Warning (APW)	June 2020 / Service Provider
3. Minimum Safe Altitude Warning (MSAW)	June 2020

ASBU B0-SNET: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. Short Term Conflict Alert (STCA)	NIL	NIL	NIL	NIL
2. Area Proximity Warning (APW)	NIL	NIL	NIL	NIL
3. Minimum Safe Altitude Warning (MSAW)	NIL	NIL	NIL	NIL

ASBU B0-SNET: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. Short Term Conflict Alert (STCA)	Indicator Percentage of ATS units with ground based safety nets (STCA,) implemented Metric Support Number of safety NET (STCA) implemented
2. Area Proximity Warning (APW)	Indicator Percentage of ATS units with ground based safety nets (APW) implemented Metric Support Number of safety NET (APW) implemented
3. Minimum Safe Altitude Warning (MSAW)	Indicator Percentage of ATS units with ground based safety nets (MSAW) implemented Metric Support: Number of Safety NET (MSAW)

ASBU B0-SNET: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	NA
Capacity	NA
Efficiency	NA
Environment	NA
Safety	Significant reduction of the number of major incidents

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-CDO: Improved Flexibility and Efficiency in Descent Profiles (CDO) Performance Improvement Area 4: Efficient Flight Path - Through Trajectory-based Operations					
ASBU B0-CDO: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	N	Y	N	Y

ASBU B0-CDO: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. CDO implementation	2020
2. PBN STARs	2020

ASBU B0-CDO: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. CDO implementaion	The ground trajectory calculation function will need to be upgraded.	CDO Function	LOAs and Training	In accordance with application requirements
2. PBN STARs	Airspace Design		LOAs and Training	

ASBU B0-CDO: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. CDO implementation	Indicator: % of International Aerodromes/TMA with CDO implemented Supporting Metric: Number of International Aerodromes/TMAs with CDO implemented
2. PBN STARs	Indicator: % of International Aerodromes/TMA with PBN STAR implemented Supporting Metric: Number of International Aerodromes/TMAs with PBN STAR implemented

ASBU B0-CDO: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	NA
Capacity	NA
Efficiency	Cost savings through reduced fuel burn. Reduction in the number of required radio transmissions
Environment	Reduced emissions as a result of reduced fuel burn
Safety	More consistent flight paths and stabilized approach paths. Reduction in the incidence of controlled flight into terrain (CFIT

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL PERFORMANCE OBJECTIVE – B0-CCO: Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO) **Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations**					
ASBU B0-20: Improved Flexibility and Efficiency in Departure Profiles (CCO)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	N	Y	N	N

ASBU B0-CCO: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. CCO implementation	2023
2. PBN SIDs implementation	2023

ASBU B0-CCO: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. CCO implementation			LOAs and Training	In accordance with application requirements
2. PBN SIDs implementation	Airspace Design		LOAs and Training	

ASBU B0-CCO: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. CCO implementation	Indicator: Percentage of international aerodromes with CCO implemented Supporting metric: Number of international airport with CCO implemented
2. PBN SIDs implementation	Indicator: Percentage of international aerodromes with PBN SIDs implemented Supporting metric: Number of international airport with PBN SIDs implemented

ASBU B0-CCO: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	
Capacity	
Efficiency	Cost savings through reduced fuel burn and efficient aircraft operating profiles. Reduction in the number of required radio transmissions
Environment	Authorization of operations where noise limitations would otherwise result in operations being curtailed or restricted. Environmental benefits through reduced emissions
Safety	More consistent flight paths. Reduction in the number of required radio transmissions. Lower pilot and air traffic control workload

AIR NAVIGATION REPORT FORM (ANRF)

SAM Regional Planning for ASBU Modules

REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-TBO: Improved Safety and Efficiency through the initial application of Data Link En-Route Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations					
ASBU B0-TBO: Impact on Main Key Performance Areas (KPA)					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	N	Y	Y	Y	Y

ASBU B0-TBO: Implementation Progress	
Elements	**Implementation Status (Ground and Air)**
1. ADS-C over oceanic and remote areas	June 2020 Service provider
2. Continental CPDLC	June 2023 Service provider

ASBU B0-TBO: Implementation Roadblocks/Issues				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. ADS-C over oceanic and remote areas	NIL	Implementation of ADS general aviation pending	Implementation of GOLD procedures pending	Lack of duly trained inspectors for approval of operations
2. Continental CPDLC	NIL	Implementation of CPDLC general aviation pending	Implementation of GOLD procedures pending	Lack of duly trained inspectors for approval of operations

ASBU B0-TBO: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
1. ADS-C over oceanic and remote areas	Indicators: Percentage of FIRs with ADS C implemented Supporting metric: Number of ADS C approved procedures over oceanic and remote areas
2. Continental CPDLC	Indicators: Percentage of CPDLC implemented at oceanic and remote area FIRs

ASBU B0-TBO: Performance Monitoring and Measurement (Implementation)	
Elements	**Performance Indicators/Supporting Metrics**
	Supporting metric: Number of CPDLC approved procedures over oceanic and remote areas

ASBU B0-TBO: Performance Monitoring and Measurement (Benefits)	
Key Performance Areas	**Benefits**
Access & Equity	NA
Capacity	A better localization of traffic and reduced separation allow increased capacity. Reduced communication workload and better organization of controller tasks allowing increasing sector capacity.
Efficiency	Routes/tracks and flights can be separated by reduced minima, allowing to apply flexible routings and vertical profiles closer to the user-preferred ones
Environment	Reduced emissions as a result of reduced fuel burn
Safety	ADS-C based safety nets supports cleared level adherence monitoring, route adherence monitoring, danger area infringement warning and improved search and rescue. Reduced occurrences of misunderstandings; solution to stuck microphone situations.

ATTACHMENT F

GLOSSARY OF ACRONYMS

ABAS	Aircraft-based augmentation system
ACC	Area control centre
A-CDM	Airport collaborative decision making
ADS	Automatic dependence surveillance
ADS-B	ADS-broadcast
ADS-C	ADS-contract
AFTN	Aeronautical fixed telecommunication network
AGA	Aerodromes and ground aids
AIDC	ATS inter-facility data communication
AIM	Aeronautical information management
AIRAC	Aeronautical information regulation and control
AIS	Aeronautical information service
AIXM	Aeronautical information exchange model
AMHS	ATS message handling system
ANP	Regional air navigation plan
ANS	Air navigation services
ANSP	Air navigation service provider
AO	Aerodrome operations
AOM	Airspace organisation and management
AOP	Aerodrome operational planning
APOC	Airport operations centre
APP	Approach control office or service
A-SMGCS	Advanced surface movement guidance and control system
ASBU	Aviation System Block Upgrades
ATC	Air traffic control
ATFM	Air traffic flow management
ATM	Air traffic management
ATMCP	Air traffic management operational concept panel
ATM SDM	ATM service delivery management
ATN	Aeronautical telecommunication network
ATS	Air traffic services
AUO	Airspace user operations
AWOS	Automated Weather Observing Systems
CAR / SAM	Caribbean and South American Regions
CDO	Continuous descent operations
CFIT	Controlled flight into terrain
CATC	Civil aviation training centre
CM	Conflict management
CMNUCC	United Nations framework convention on climate change nations
CNS	Communications, navigation and surveillance

CNS/ATM	Communications, navigation and surveillance/air traffic management
CO2	Carbon dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CPDLC	Controller-pilot Data link communications
D-ATIS	Data link-automatic terminal information service
DCB	Demand/capacity balancing
DCL	Digital flight plan clearances
DME	UHF distance-measuring equipment
eAIP	Aeronautical information publication
eTOD	Terrain and obstacle database
FANS	Future air navigation systems
FASID	Regional plan facilities and services implementation document (Document 8733)
FIR	Flight information region
FL	Flight level
FMS	Flight management system
FUA	Flexible use of airspace
GEI	Green House Gases (GHG)
GIS	Geographical information system
GLS	GPS-based *landing* system
GML	Geography markup language
GNSS	Global navigation satellite system
GPI	Global Plan initiatives
GPS	Global positioning system
GPWS	Ground proximity warning system
GREPECAS	CAR/SAM regional planning and implementation group
HF	High frequencies
HFDL	HF Data link
IAVW	International Airways Volcano Watch
IFR	Instrument flight rules
ILS	Instrument landing system
IMC	Instrument meteorological conditions
ISO	International Standards Organisation
IVATF	International Volcanic Ash Task Force
IWXXM	ICAO Meteorologic Information Exchange Model for the Exchange of Operational Meteorological
KPI	Key performance indicators
LAR	Latin American aeronautical regulations
MBM	Market-based measure
MET	Meteorological services for air navigation
METAR	Aviation routine weather report, which provides the meteorological conditions prevailing at an aerodrome.
METWSG	Meteorological Warnings Study Group
MLAT	Multilateration – Surveillance system
MRV	Monitoring, reporting and verification
MSAW	Minimum safe altitude warning

MWO	Meteorological Watch Office
NDB	Non-directional radio beacon
NGAP	New generation of aviation professionals
NM	Nautical miles
NPA	Non-precision approach
NOTAM	Notice to personnel concerned with flight operations
ICAO	International Civil Aviation Organization
OLDI	Direct data interchange
OMA	Automatic weather office
WMO	World Meteorological Organization
OPMET	Operational meteorological information
PDC	Predeparture clearance
PDSL	Landlocked Developing Countries (LLDCs)
PEID	Small Island Developing States (SIDS)
PFF	Performance Framework Form
PIRG	Planning and implementation regional group
PMA	Least developed coutries (LDCs)
PSR	Primary surveillance radar
QMS	Quality management system
RASG-PA	Regional aviation safety group - Pan-American
REDDIG	South American digital communication network
RNAV	Area navigation
RNP	Required navigation performance
RTK	Revenue tonne-kilometer
RVR	Runway visual range
RVSM	Reduced vertical separation minimum
SADIS	Satellite distribution system for information relating to air navigation
SAM	South American Region
SARPS	Standards and recommended practices
SID	Standard instrument departure
SIGMET	Significant weather
SLA	Service level agreement
AMSS	Aeronautical mobile-satellite service
SMGCS	Surface movement guidance and control system
SPECI	Special aviation weather report
SSR	Secondary surveillance radar
STAR	Standard instrument arrival
SWIM	System wide information management
TMA	Terminal control area
TRA	Temporary reservation of airspace
TS	Traffic synchronisation
TWR	Aerodrome control tower or aerodrome control
UAS	Unmanned aircraft systems
VDL	VHF digital Relation-ship

VFR	Visual flight rules
VHF	Very high frequency
VOLMET	Meteorological information for aircraft in flight
VOR	VHF omnidirectional radio range
WAFS	World area forecast system
WATRS	Western Atlantic route system
WGS-84	World geodetic system — 1984
XML	Extensible markup language

ATTACHMENT G

INTERNATIONAL CIVIL AVIATION ORGANIZATION
SOUTH AMERICAN REGIONAL OFFICE

PBN CONCEPT OF OPERATIONS FOR SAM AIRSPACE

PERIOD 2018-2020

(CONOPS 2018-2020)

Version 0.4 May 2017

PBN CONCEPT OF OPERATIONS FOR SAM AIRSPACE PERIOD 2018-2020

This document has been prepared for analysis and amendment by SAM States, as appropriate, at the SAMIG/19 meeting to be held in May 2017.

CHANGE CONTROL

Version	Date	Change	Pages
0.1	November 2016	Initial document	All
0.2	December 2016	Revision with IATA	All
0.3	December 2016	Integration of revisions and formats	All
0.4	May 2017	Harmonisation of planning dates	All

TABLE OF CONTENTS

1 Acronyms

A-RNP	Advanced RNP
ADS-B	Automatic dependent surveillance - broadcast
ADS-C	Automatic dependent surveillance - contract
AIP	Aeronautical information publication
ANSP	Air navigation service provider
AORRA	Atlantic Ocean Random Routing Area
APCH	Approach
APV	Approach procedure with vertical guidance
ASBU	Aviation system block upgrades
ATC	Air traffic control
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic service
CCO	Continuous climb operations
CDO	Continuous descent operations
CDM	Collaborative decision-making
CDR	Conditional route
CNS	Communication, navigation and surveillance
CONOPS	PBN concept of operations for the SAM Region
CPDLC	Controller-pilot data link communications
DME	Distance measuring equipment
e-ANP	Electronic air navigation plan
EDTO	Extended diversion time operations
FAF	Final approach fix
FANS	Future air navigation systems
FPL	Flight plan
FUA	Flexible use of airspace
GA	General aviation
GANP	Global air navigation plan
GBAS	Ground-based augmentation system
GLS	GBAS landing system
GNSS	Global navigation satellite system
GPS	Global positioning system
IAP	Instrument approach procedure
IFP	Instrument flight procedure
ILS	Instrument landing system
INS	Inertial navigation system
IRS	Inertial reference system
IRU	Inertial reference unit
MLAT	Multilateration
NAVAID	Air navigation aid
PBC	Performance-based communication
PBN	Performance-based navigation
PBS	Performance-based surveillance
RAAC	Meeting of civil aviation authorities of the SAM Region

RNAV	Area navigation
RCP	Required communication performance
RF	Fixed radius turn
RNP	Required navigation performance
RPAS	Remotely piloted aircraft systems
RSP	Required surveillance performance
SAM/IG	South American implementation group
SAM-PBIB	Performance-based air navigation implementation plan for the SAM Region
SARPS	Standards and recommended practices
SATVOICE	Satellite voice communications
SBAS	Satellite-based augmentation system
SID	Standard instrument departure
STAR	Standard instrument arrival
SUA	Special use airspace
VFR	Visual flight rules
VHF	Very high frequency
VNAV	Vertical navigation

2 Reference documents

The following ICAO documents are associated to the PBN concept

- GANP, fifth edition (draft)
- SAM-PBIB V1.4, 2013
- Doc 4444 Air traffic management, fifteenth edition, 7th amendment
- Doc 8168 Aircraft operations, Volume II, sixth edition
- Doc 9613 Performance-based navigation (PBN) manual, fourth edition
- Doc. 9869 Manual on required communication performance (RCP), first edition
- Doc. 9905 Required navigation performance authorization required (RNP AR) procedure design manual, first edition
- Doc. 9924 Aeronautical surveillance manual, first edition
- Doc. 9931 Continuous descent operations (CDO) manual, first edition
- Doc. 9992 Manual on the use of performance-based navigation (PBN) in airspace design, first edition
- Doc. 9993 Continuous climb operations (CCO) manual, first edition
- Doc. 9997 PBN operational approval manual, first edition
- ICAO circular 324, Guidelines for lateral separation of arriving and departing aircraft on published adjacent instrument flight procedures.

3 EXECUTIVE SUMMARY

This document, the PBN Concept of Operations (CONOPS), is an update and an extension of the PBN implementation concept, applicable in the SAM Region until December 2016 and whose main objective is to improve efficiency, increase capacity, ensure environmental protection, taking into account safety, and define air navigation specifications to be uniformly applied at regional level.

The CONOPS is aligned with the Global Air Navigation Plan (GANP) and the Aviation System Block Upgrade (ASBU) methodology. The CONOPS is a document prepared collaboratively, which contemplates the needs of all ATM community stakeholders and provides a frame of reference for PBN planning and implementation during the period 2018-2020.

The concept contemplates the use of more advanced PBN specifications en route and in terminal areas for continued optimisation of the regional airspace. It also contemplates that implementation planning will continue taking place in a collaborative manner.

It also proposes compliance objectives that will be submitted to the consideration of the States of the Region when updating the regional PBN plan and the respective national PBN plans.

4 GENERAL INTRODUCTION

Continuous growth of aviation imposes increasing demands in terms of airspace capacity and efficiency and poses the need for a performance-based system.

The transition to a performance-based airspace system is a critical aspect of the evolution towards a globally safe and efficient air traffic management (ATM) environment. As ATM evolves, it will be necessary to ensure an acceptable operational performance, taking into account the evolving technologies.

ICAO has concentrated its efforts on developing and implementing performance-based navigation (PBN), focusing on implementation in ATS routes and in terminal areas (TMAs), using techniques such as continuous descent operations (CDO) and continuous climb operations (CCO). Likewise, through Assembly Resolution A37-11, it has prioritised the implementation of instrument approach with vertical guidance at all international airports.

In addition to these efforts, the South American Region has established goals in the Declaration of Bogota that shall be pursued until fulfilment within the framework of this Concept of Operations, which sets directions, guidelines, and principles, as well as metrics and indicators to be applied in airspace planning and design, both en route as well as in the terminal area.

4.1 Objective

The PBN Concept of Operations (CONOPS) of the SAM Region prioritises safety and describes the functionalities required for improving efficiency, capacity and environmental protection, and defines the air navigation specifications that will need to be implemented uniformly in SAM airspace.

4.2 Background

The SAM Region works in a coordinated manner, through the meetings of the SAM Implementation Group (SAM/IG), in the fulfilment of tasks and actions leading to a sustained evolution towards the implementation of the global ATM concept of operations.

Accordingly, implementation programmes are developed, which have initially focused on the following:

a) ATS optimisation in the SAM Region
b) Implementation of performance-based navigation (PBN) for en-route, terminal area and approach operations
c) Air traffic flow management (ATFM)
d) CNS system enhancement, and
e) ATM automation

The SAM/IG/10 meeting, held in October 2012, analysed the SAM ATS route network optimisation action plan and felt it advisable to extend it to include the optimisation of all flight phases within South American airspace, with a view to integrating ATS routes with terminal areas and instrument approaches.

PBN implementation has high priority in the ATM Work Programme of the South American Regional Office and many of its activities, such as PBN workshops, PANS-OPS courses and workshops, have been promoted by Regional Project RLA/06/901 in support of PBN planning and implementation in the Region.

The thirteenth meeting of Civil Aviation Authorities of the South American Region (RAAC/13), held in Bogota, Colombia, on 4-6 December 2013, established in the Declaration of Bogota the indicators and safety and air navigation goals for the SAM Region to be attained by December 2016. The goals that were not met by the States on the defined date are still in force and are part of this concept of operations.

4.3 Status

4.3.1 En-route PBN

En-route implementation of PBN is discussed at ATS/RO meetings, based on gradual improvement of route network versions. The use of route network versions reflects the need for an integrated periodic review to ensure that the best possible airspace structure is always in place, within an integrated development concept. Phase 1 of the route optimisation programme was completed on 20 October 2011 with the implementation of RNAV 5, while RNP10 was maintained in some upper airspace oceanic routes, as in the EUR/SAM Corridor, the Lima-Santiago routes, and the Atlantic Ocean Random Routing Area (AORRA).

At present, taking advantage of PBN-based airspaces, part of version 3 of the ATS route network is being integrated with TMA SIDs and STARs. Likewise, flexible use of airspace has been implemented in some selected airspaces for their optimisation.

Progress made by December 2016 in the implementation of RNAV routes in the upper airspace was 65%, exceeding the 60% goal set in the Declaration of Bogota, as shown in table 1 below:

Table 1

Total ATS routes in SAM upper airspace	Conventional routes	PBN routes	% PBN routes implemented	Indicator Declaration of Bogota: % PBN routes
145	52	93	65%	60%

Source: Final report of the SAM/IG 18 meeting.

4.3.2 PBN in terminal area

Training and follow-up of redesign processes using PBN at the main South American TMAs were conducted through PBN workshops sponsored by Regional Project RLA/06/901. Four training/follow-up workshops were conducted on the planning, design, validation, and implementation phases, respectively.

Likewise, two implementation workshops were conducted for those terminal areas that had action plans for implementation in 2016-2017 and one PANS-OPS workshop to examine with procedure designers the amendments made to ICAO Doc 8168 and circular letter 336 concerning RNAV and RNP approaches.

Regarding the status of PBN implementation in terminal areas, the goal of the Declaration of Bogota has been exceeded as concerns the implementation of PBN SIDs/STARs. However, that is not the case for the implementation of approach procedures, as shown in the following tables:

Table 2

Total number of airports	Total SIDs/STARs	Total PBN SIDs/STARs	ICAO indicator: % PBN SIDs/STARs at international airports	
			April 2016	Goal 2016
99	1680	1209	72%	60%

Source: Final report of the SAM/IG 18 meeting

Table 3

Total international airports	Total IFR thresholds	Total APV or RNP AR or LNAV IAPs	ICAO indicator A37-11 % APV for IFR runways	
			Current regional	Goal 2016
99	175	131	75%	100%

Source: Report of the SAM/IG 18 meeting

For the period 2018-2020, the reference for total international airports will take into account the number of airports listed in the e-ANP and shown in **Appendix A** to this document.

4.3.3 Relationship with the ICAO GANP/ASBU

The International Civil Aviation Organization (ICAO) has developed Doc 9854 “Global ATM Concept”, which describes ICAO’s vision of a global ATM.

Furthermore, it has developed the global “Aviation system block upgrade” (ASBU) framework, which sets forth a set of air traffic management (ATM) solutions or upgrades that build upon existing equipment, establishing an implementation framework for attaining global interoperability within certain timelines.

ASBU consists of a set of modules, organised in flexible and scalable blocks. The block upgrades describe a way of applying the concepts defined in the ICAO Global Air Navigation Plan (Doc 9750) for the implementation of regional performance improvements. It includes the development of technological roadmaps to make sure that standards are mature and to facilitate synchronisation between air and ground systems, and between Regions. The final objective is global interoperability.

The following block upgrades have been defined:

- Block 0: in progress
- Block 1: (starts in 2019)
- Block 2: (starts in 2025)
- Block 3: (starts in 2031)

The CONOPS set forth in this document contemplates, amongst other related applications, the following ASBU block 0 modules:

B0-APTA Optimisation of approach procedures, including vertical guidance
First step towards universal implementation of GNSS-based approaches

B0-FRTO Improved operations through enhanced en-route trajectories
To allow the use of airspace that would otherwise be segregated (*i.e.*, special use airspace) along with flexible routing adjusted for specific traffic patterns. This will allow greater routing possibilities, reducing potential congestion on trunk routes and busy crossing points, resulting in reduced flight length and fuel burn.

B0-CDO Improved flexibility and efficiency in descent profiles (CDO)
Deployment of performance-based airspace and arrival procedures that allow aircraft to fly their optimum aircraft profile, taking account of airspace and traffic complexity with continuous descent operations (CDOs).

B0-CCO Improved flexibility and efficiency in departure profiles – Continuous climb operations (CCO)
Deployment of departure procedures that allow aircraft to fly their optimum aircraft profile, taking account of airspace and traffic complexity with continuous climb operations (CCOs).

5 AIRSPACE CONCEPT (CONOPS)

5.1 ICAO strategic objectives

The PBN Concept of Operations (CONOPS) developed herein is directly related to ICAO strategic objectives for the period 2018 – 2020, pursuant to the 2016 – 2030 Global air navigation plan, fifth edition, as described below:

a) Safety: Enhance global civil aviation safety.

b) Air navigation capacity and efficiency: Increase capacity and improve efficiency of the global civil aviation system.

c) Economic development of air transport: Foster the development of a sound and economically-viable civil aviation system.

d) Environmental protection: Minimise the adverse environmental effects of civil aviation activities.

Additionally, the use of this CONOPS is indirectly related to the objective of enhancing global civil aviation facilitation.

5.2 Statistics and growth

Aircraft and passenger movement forecasts are important for anticipating when and where could airspace or airport congestion take place (excess demand). Accordingly, they are essential for planning capacity improvements. These forecasts play an important role in the implementation of CNS/ATM systems.

For the purpose of this document, consideration has been given to forecasts relevant for the SAM Region within the context of the main traffic flows. These forecasts were developed for the period 2011-2031 at the Ninth Meeting of the CAR/SAM Traffic forecasting working group.

Passenger traffic—only within the South American Region—has been calculated for the period 2016–2021 (see Table 4), where an annual growth rate of 7.7% is expected, since this is the closest period to the triennium considered in this document. It is also expected that aircraft movement for the same period will grow at an annual rate of 6.6% (see Table 5).

The following tables show the estimated growth of passengers and aircraft movements in the CAR/SAM Regions, for the various periods under consideration.

Table 4

PASSENGER MOVEMENTS, IN MILLIONS, 2011-2031

Major Route Groups	2011	2012	2013	2014	2016	2021	2031	Average Annual Growth (%)			
								2011-2016	2016-2021	2021-2031	2011-2031
South Atlantic	8.89	9.39	9.92	10.49	11.76	14.83	23.35	5.7	4.7	4.6	4.9
Mid Atlantic	9.10	9.67	10.28	10.93	12.29	15.71	26.79	6.2	5.0	5.5	5.5
Intra-South America	19.99	21.93	24.06	26.39	31.17	45.11	93.31	9.3	7.7	7.5	8.0

Between South America and Central America/Caribbean	5.45	5.90	6.45	7.05	8.42	12.58	30.17	9.1	8.4	9.1	8.9
Intra-Central America/Caribbean	4.65	5.10	5.59	6.13	7.17	10.24	21.00	9.0	7.4	7.4	7.8
Between North America and South America /Central America/Caribbean	65.38	69.48	73.96	78.96	88.03	108.93	175.26	6.1	4.4	4.9	5.1
TOTAL	113.47	121.48	130.27	139.94	158.85	207.39	369.88	7.0	5.5	6.0	6.1

Source: CAR/SAM Regional Traffic Forecast 2011-2031

Table 5

AIRCRAFT MOVEMENTS, IN MILES, 2011-2031

Major Route Groups	2011	2012	2013	2014	2016	2021	2031	Average Annual Growth (%)			
								2011-2016	2016-2021	2021-2031	2011-2031
South Atlantic	38.49	40.62	42.94	45.39	50.90	62.57	97.85	5.7	4.2	4.6	4.8
Mid Atlantic	60.49	64.29	68.32	72.61	81.70	102.16	173.8	6.2	4.6	5.5	5.4
Intra-South America	147.99	162.33	178.06	195.31	230.74	317.83	614.95	9.3	6.6	6.8	7.4
Between South America and Central America/Caribbean	76.70	83.81	92.43	101.93	123.96	172.22	357.4	10.1	6.8	7.6	8.0
Intra-Central America/Caribbean	266.44	292.26	320.58	351.64	410.72	561.59	1072.1	9.0	6.5	6.7	7.2
Between North America and South America /Central America/Caribbean	595.73	636.07	680.28	729.62	821.20	975.69	1446.8	6.6	3.5	4.0	4.5
TOTAL	1185.84	1279.38	1382.60	1496.50	1719.22	2192.06	3762.9	7.7	5.0	5.6	5.9

Source: CAR/SAM Regional Traffic Forecast 2011-2031

These figures suggest that commercial air traffic will continue growing firmly in the Region. CNS/ATM systems shall continue to provide acceptable solutions for traffic growth that are acceptable from both the safety and business perspective to all users and operators. This requires that States of the Region keep their action plans updated for proper implementation, so that they may actively participate in the benefits derived from this growth and actively contribute to regional and global interoperability.

5.3 Theoretical assumptions of the concept of operations

i. The main navigation element of the CONOPS is Performance-Based Navigation (PBN), mainly supported by GNSS, still using inertial navigation systems (INS/IRU) for IFR operations within controlled airspace. As to DME/DME systems, their use is limited to those airspaces that meet coverage and geometry requirements.

ii. The upper airspace will be controlled, Class A, in all SAM FIRs. For this purpose, the dividing line will be FL 245. Regarding this division, there are some exceptions in the States of the Region, based on the operational requirements of their airspace.

iii. All regional airspace should be managed in a flexible manner.

iv. The CONOPS assumes that voice VHF is the main means of communication in continental airspace. For oceanic/remote airspace, specific applications are foreseen for each case, such as CPDLC or SATVOICE, which will replace HF communications.
v. Ground-based navigation aids will continue to be used in support of navigation reversal and contingency procedures.
vi. It is assumed that ATM capacity will be expanded to absorb IFR traffic growth.
vii. There will still be commercial and general aviation operators that, given the characteristics of their fleet, will not be PBN-approved. Nevertheless, airspace planning will be based on PBN, applying the "Best Equipped, Best Served" concept.
viii. Environmental factors gain more importance.
ix. Collaborative decision-making (CDM) will be adopted in the design of both en-route and TMA airspace.
x. RPAS operations are expected to grow significantly in the coming years, covering different activities and business sectors, and should be considered in airspace planning and procedures.
xi. The States of the Region will continue striving to modernise their air navigation systems in accordance with their operational needs and new developments of the industry.
xii. Air cargo and passenger operators will continue modernising their fleet and on-board equipment in order to add more PBN functionalities. They will expect to recover their investments through more efficient operations using procedures that take advantage of the enhanced functionalities of their fleet.

5.4 PBN implementation enablers

5.4.1 State PBN implementation plans

States have developed PBN implementation plans based on Doc 9613 and Doc 9992, which clearly define PBN implementation strategies. These implementation plans are developed in accordance with implementation objectives agreed at regional level, which are, in turn, defined in accordance with the guidance set forth in the Global Air Navigation Plan and the block upgrades required for evolution to a global ATM system.

5.4.2 Communications

At present, almost all pilot-controller communications are mainly through VHF voice communications in continental areas. However, with the growing number of flights that are expected to fly PBN procedures, it will be necessary to change the way in which pilots and controllers communicate in order to support an enhanced and more robust exchange of information, without affecting the workload of the pilot or the controller.

The concept of operations contemplates data link communications (CPDLC) or SATVOICE in oceanic airspace in support of RNP 2 implementation. Some States of the Region have implemented ADS-C with CPDLC in their oceanic airspace, and it is expected that beyond 2020, a growing number of digital data communication applications and services will be gradually introduced until it becomes the primary means of communication. But there will still be cases in which clearances and instructions will be issued by voice.

In accordance with the global air traffic management (ATM) concept of operations, communication specifications will be established in accordance with the required communication performance (RCP) and the airspace where operations take place.

5.4.3 ATS surveillance

ATS surveillance plays an important role in air traffic. The ability to accurately determine, track, and update the position of aircraft contributes to optimise aircraft separation and improves the efficient use of a given airspace.

ATS surveillance will be implemented taking into account the operational requirements of the airspace under consideration. The States of the Region, especially those with rough terrain, are expected to study the possibility of ATS surveillance using ADS and/or MLAT systems.

Like in RCP, ATS surveillance specifications will be established in accordance with the required surveillance performance (RSP) and the airspace in which operations will take place.

5.4.4 Flexible use of airspace

Aviation includes a broad range of users, from commercial aviation to military and recreational operations, each with its own mission or business objectives.

The CONOPS considers SAM airspace as a unique resource shared by all airspace users, with different and sometimes conflicting interests and requirements, which must be taken into account and accommodated to the extent possible.

The flexible use of airspace is an airspace management concept based on the principle of accommodating all the users of that airspace inasmuch as possible, taking into account effective communications, cooperation, and the coordination required to ensure safety, efficiency and environmental sustainability.

Where conditions allow, standard arrival and departure procedures, as well as conditional routes (CDR) will be implemented for more efficient use of airspace.

5.4.5 Use of information on flight operations for FOQA and/or ICAO “Big Data” project

Once FOQA (*Flight Operations Quality Assurance)* is available, this information will be used for the design of procedures, routes, and mainly for post-implementation assessment of a PBN airspace concept, since it offers actual data on the benefits derived from implementation.

The information provided by the Big Data Project on air traffic movement is a high-value input for airspace planning. This information results from the analysis of the data provided by airborne ADS equipment and transmitted to a network of ground receivers for analysis and for the development of safety or statistical indicators that may be used for airspace measurement and planning. Information can be updated every three hours, thus providing constant, accurate and low-cost information. The following are some of the indicators that have been defined for use in airspace planning within a PBN concept of operations:

a) SID utilisation rate: number of flights conducted for each SID within a given period of time, *e.g.,* one month.
b) STAR utilisation rate: number of operations conducted for each STAR within a given period of time, *e.g.,* one month.
c) APCH utilisation rate: number of operations conducted for each APCH within a given period of time, *e.g.,* one month.
d) Mean top of descent: a figure can be obtained for the mean at which aircraft descent in a STAR is started. It can be classified by airway category, by period of time, etc.
e) Average number of deviations in PBN airspace: information can be provided on the percentage of STAR, SID or APCH deviations.
f) Number of ACAS RAs: a measure of RAs can be obtained and filtered by levels, altitudes or airspace segments.

Likewise, the information captured by “Big Data” can help determine aircraft movement flows, as an input for airspace design, especially useful for noise segregation procedures or other applications.

The aforementioned are just a few indicators that will be at the disposal of the Big Data project users, and will directly support airspace planning tasks.

5.4.6 Air traffic flow management (AMAN/DMAN)

The optimisation of aircraft operations cannot be achieved through PBN implementation alone. Additional tools are needed for supply/demand balancing, as well as for traffic flow enhancement through runway sequencing and proper distribution of control sectors.

The automation of arrival and departure sequencing maximises capacity usage, ensures full utilisation of the most efficient departure and arrival paths, and supplements path design optimisation in terminal areas and PBN-based routes.

5.4.7 PBN certification of aircraft operators

It is expected that the number of users without PBN certification will gradually decrease. The benefits derived from the concept of operations are based on the modern navigation capabilities of most of the commercial fleets operating in the Region.

5.4.8 Human factors

An increasing level of automation will be required as we move towards the Global ATM Concept of Operations. However, humans will always be in control of automation. In simple terms, this means that humans will decide what needs to be done, will delegate the execution of tasks, and will intervene as needed.

5.4.9 Human resources and training

Duly certified individuals with the appropriate skills and competencies will continue to be the pillars of ATM operations. In view of the expected growth in aviation, it is essential to have an adequate number of competent personnel to guarantee a safe and efficient aviation system.

States must take into account human performance when planning and implementing the new systems and technologies. Early participation of operational personnel is also essential.

Regarding the above, it is important to highlight the role that aviation training centres in the States of the Region play in the training of aeronautical personnel and, for purposes of this document, more specifically in PBN training of both the service provider and the regulator.

Procedure and airspace designers play a significant role in the development of flight procedures and routes. The Region has experts with the necessary competencies to perform these tasks, but some States still do not have the staff required to perform PBN implementation tasks.

SAM States will promote the development of PANS-OPS training courses, as well as the conduction of PANS-OPS workshops for reviewing, updating, and standardising the criteria to be applied in the design of PBN procedures and routes.

An aspect to be taken into account in the PBN implementation action plan is that Sates must make sure that all the experts and air controllers concerned receive sufficient information, guidance material and training, including, as applicable, the corresponding practice in the new operational environment through ATC simulators.

Regarding the above, it is expected that experts that receive PBN training will replicate such training in their own State, thus multiplying the specialised knowledge and optimising the economic investment made by administrations in the area of training.

5.5 Other factors to be considered in the implementation

5.5.1 Cost/benefit analysis

The States of the Region should perform a cost/benefit analysis of airspace modifications and of infrastructure and modernisation investments planned.

5.5.2 Pre-operational analysis and accessibility

It should be noted that, within route optimisation, there are factors of interest to the user, such as: aeronautical charges, routes in case of depressurisation (escape routes), distance to alternate aerodromes, weather conditions, etc., which might determine that, in certain cases, the shortest distance between two points is not necessarily the optimum path.

Consideration should also be given to the impact of publishing meteorological minima for the alternate airport that are greater than the minima of the instrument approach procedures published for the same aerodrome in order to ensure accessibility.

5.5.3 Safety assessment

Safety must be guaranteed in any procedure or design modification in an airspace considered for PBN implementation. This includes compliance with ICAO SARPs and the regulations that each State may have on the matter.

After implementing airspace changes, the system should be monitored and operational data collected to make sure that safety is preserved, to determine whether strategic objectives have been achieved, and to identify opportunities for improvement.

6 PBN NAVIGATION SPECIFICATIONS

The navigation specifications listed in ICAO Doc 9613 are summarised below. Likewise, chapters 7 and 8 of this document define the appropriate specifications for the corresponding airspaces, in accordance with the operational scenario identified.

Table 6 below contains a summary of navigation specifications, divided by flight phase and the required navigation aid sensors.

6.1 RNAV 10 (RNP 10)

The RNP 10 specification was defined in support of reduced lateral and longitudinal separation minima, for application in oceanic and remote areas with limited availability of navigation aids, communications and surveillance.

The minimum spacing between routes when using RNP 10 is 50 NM.

RNP 10 operational requirements are defined in Chapter 1, Volume II, Part B of ICAO Doc 9613.

6.2 RNP 4

The RNP 4 specification was developed for operations in oceanic and remote airspace, where ground-based navaid infrastructure is not available. The GNSS is the primary navigation sensor in support of RNP 4, whether as autonomous navigation system or as pat of a multisensory system. It supports procedure-based separation defined in ICAO Doc 4444-PANS ATM with a longitudinal separation minimum of 30 NM. In order to apply this separation standard, RNP 4 must be combined with additional communication capabilities, specifically ADS-C.

The operational requirements of RNP 4 are defined in ICAO Doc 9613, Volume II, Part C, Chapter 1.

6.3 RNP 2

RNP 2 was developed for en-route applications, particularly in geographical areas with limited or no ground navaid infrastructure, with limited or no ATS surveillance. Use of RNP 2 in continental applications requires a continuity requirement less stringent than that used for oceanic and remote applications.

The RNP 2 specification is based on GNSS and will not be used in areas of known interference of GNSS signals. GNSS-based operators must have the means to predict GNSS failure detection availability to support operations along the ATS RNP 2 route.

RNP 2 operational requirements are defined in ICAO Doc 9613, Volume II, Part C, Chapter 2.

6.4 RNAV 5

RNAV 5 operations are based on the use of RNAV equipment that automatically determines the position of the aircraft on the horizontal plane, using information from one of the following types of position sensors or a combination thereof, and the means for establishing and maintaining the desired path:

a) VOR/DME;
b) DME/DME;
c) INS or IRS; and
d) GNSS.

In a large portion of SAM airspace, RNAV 5 operations using only VOR/DME and DME/DME sensors have limitations due to inadequate coverage and geometry of ground radio aids and insufficient number of stations to provide an appropriate support infrastructure.

Direct pilot-controller speech communications are mandatory.

ATS surveillance can be used to mitigate the risk of gross navigation errors, provided the route is under ATS surveillance and the volume of communication services and ATS resources is enough for the task.

6.5 RNAV 1 and RNAV 2

RNAV 1 and RNAV 2 specifications are applicable to all ATS routes, for both en-route and terminal area operations. They also apply to IAPs up to the FAF.

RNAV 1 and RNAV 2 specifications have been developed for RNAV operations within an ATS surveillance context. However, they can be used in a setting without ATS surveillance, if GNSS is required and if the State of implementation guarantees an appropriate level of safety of the system and responds for the lack of on-board performance monitoring and alert.

RNAV 1 and RNAV 2 operations are based on the use of the same aircraft receivers as those required for RNAV 5. Additional functional infrastructure and aircraft navigation aids are required to meet the most stringent RNAV 1 and RNAV 2 performance.

RNAV 1 and RNAV 2 routes contemplate direct pilot-controller speech communications.

6.6 RNP 1

The RNP 1 specification provides a means for developing connecting routes between the en-route structure and the terminal airspace with or without ATS surveillance.

RNP 1 may be associated with the termination of an RF path and baro-VNAV.

The RNP 1 specification is based on GNSS and will not be used in areas of known interference with the navigation signal (GNSS). Although RNAV systems based on DME/DME may have RNP 1 precision capability, supported by a robust DME station infrastructure, this navigation specification is mainly intended for environments where such infrastructure cannot support DME/DME area navigation for the required performance.

6.7 RNP APCH

The RNP APCH specification is based on GNSS to support RNP APCH operations up to LNAV or LNAV/VNAV minima.

RNP APCH does not include specific requirements for ATS communication or surveillance. Adequate obstacle clearance is obtained through aircraft performance and operating procedures.

6.8 A-RNP

For en-route and terminal applications, this navigation specification has requirements that only address the lateral aspects of navigation.

A-RNP is based on GNSS. No ground infrastructure with multiple DME is required, but may be provided based on State requirements, operational requirements and available services.

RF is an additional functional element required for A-RNP. The following functional elements are optional:

a) RNP scalability
b) Greater continuity
c) Fixed radius turns (FRT)
d) Time of arrival control (TOAC)
e) Baro-VNAV

Advanced RNP is the only navigation specification that allows for operations under other associated navigation specifications. The aircraft navigation precision and the functional requirements of other navigation specifications that are met when certified for A-RNP are:

a) RNAV 5
b) RNAV 1
c) RNAV 2
d) RNP 2
e) RNP 1
f) RNP APCH

The A-RNP specification has a very broad operational application: for operations in oceanic/remote airspace, in the continental en-route structure, arrival and departure routes, and approach procedures. Operations would only depend on the integrity of the RNP system with no capability of reversal to conventional means of navigation, since a conventional infrastructure might not be available. Notwithstanding the above, the corresponding contingency procedures must be developed and implemented.

A-RNP is to be implemented in support of the ICAO aviation system block upgrades and the Global air navigation plan.

6.9 RNP AR APCH

The RNP AR APCH is the global ICAO standard for the development of IAPs to airports with obstacles that generate limitations or where significant operational benefits can be derived.

The main risks and complexities of these procedures are mitigated through the application of more stringent RNP criteria, advanced aircraft capabilities, and better training of flight crews.

RNP AR APCH implementations do not require specific considerations regarding ATS communication and surveillance.

Table 6

NAVIGATION SPECIFICATIONS, BY FLIGHT PHASE AND NAVAID SENSORS REQUIRED

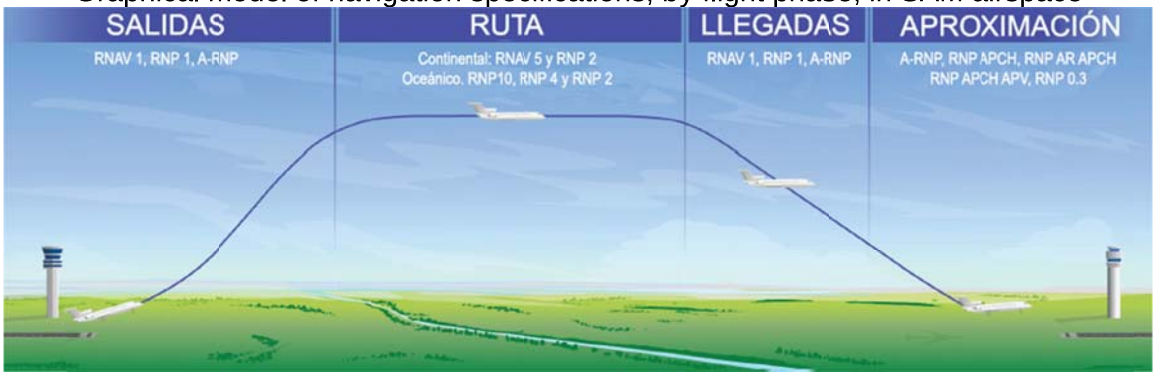
Navigation specification	*Flight phase*								NAVAID sensors				
	Oceanic/ remote en-route	*Continental en-route*	*Arrival*	*Approach*				*Depar-ture*	*GNSS*	IRU	DME/ DME	DME/ DME IRU	VOR/ DME
				Initial	*Intermediate*	*Final*	*Missed*[1]						
RNAV 10	10	N/A		N/A				N/A	O	O	N/A		
RNAV 5[2]	N/A	5	5						O	O	O		O
RNAV 2		2	2					2	O	N/A	O	O	N/A
RNAV 1		1	1	1	1	N/A	1	1	O		O	O	
RNP 4	4	N/A		N/A				N/A	M				
RNP 2	2	2	N/A						M		SR	SR	
RNP 1[3]	N/A		1	1	1	N/A	1	1	M		SR	SR	
Advanced RNP (A-RNP)[4]	2[5]	2 o 1	1	1	1	0,3	1	1	M		SR	SR	
RNP APCH[6]	N/A			1	1	0,3[7]	1	N/A	M		N/A		
RNP AR APCH				1-0,1	1-0,1	0,3-0,1	1-0,1		M				
RNP 0,3[8]	N/A		0.3	0.3	0.3	0.3	0.3	0.3	M				

O: Optional; **M**: Mandatory; **SR**: Subject to ANSP requirements

Notes:
1. Applied only after reaching an obstacle clearance of 50 m (40 m, Cat H) after starting the climb.
2. RNAV 5 is an en-route navigation specification that may be used for the initial part of a STAR beyond the 30 NM and above the MSA.
3. Use of the RNP 1 specification is limited to STARs, SIDs, initial and intermediate IAP segments, and missed approaches after the initial climb phase. Beyond the 30 NM, starting at the ARP, the alert precision value becomes 2 NM.
4. A-RNP also allows for a range of scalable RNP lateral navigation decisions — see Part C, Chapter 4, 4.3.3.7.4. of Doc 9613.
5. Optional — requires higher continuity.

6. There are two sections in Doc 9613 for the RNP APCH specification: Section A is enabled by GNSS and baro-VNAV, Section B is enabled by SBAS.
7. RNP 0.3 applies to RNP APCH Section A. Different angular performance requirements apply only to RNP APCH Section B of Doc 9613.
8. The RNP 0.3 specification is mainly geared to helicopter operations.

Graphical model of navigation specifications, by flight phase, in SAM airspace



7 EN-ROUTE PBN OPERATIONS

7.1 Concept description

The implementation of PBN-based ATS route network versions will continue to be the main characteristic of SAM en-route airspace optimisation in order to take advantage of advanced aircraft navigation capabilities, which, in combination with ATM tools, appropriate ATC sectoring, and air traffic flow management, will allow for ATS routing that, to the extent possible, meets the needs of airspace users, reduces controller and pilot workload, and avoids aircraft concentrations in airspace portions that might generate system congestion.

The review and implementation of SAM route network versions will take place through a collaborative process amongst the States, regardless of national borders, taking into account user requirements, airspace restrictions, and accommodating the main traffic flows, with emphasis on the establishment of trunk routes.

It is expected that, at the end of the period of application foreseen in this CONOPS, the upper continental airspace of the SAM Region, or part of it, will be PBN exclusionary, mainly with RNAV 5 navigation specification and RNP 2 or A-RNP specifications in those airspaces where there is a need to increase airspace capacity by reducing parallel route spacing.

RNAV-5 may be fully replaced by RNP 2 or A-RNP, but for that to happen, the aircraft fleet must be equipped and the operators approved, and the cost/benefit analysis must be favourable.

Aircraft operators increasingly require flexible routes that better accommodate their operational needs (EDTO; weather avoidance, airspace restrictions, etc.). PBN implementation en route and ATM system enhancement would allow for the development of this type of routes. It is expected that future route network versions will contemplate the possibility of implementing random route airspaces, initially in low-density areas, establishing the appropriate COM/SUR requirements.

Flexible route airspaces can be defined using:

- Geographic coordinates that define them laterally;
- Exit/entry points to/from these airspaces; and/or
- Windows between the specified levels.

Additionally, flexible route airspaces may be activated during certain periods of time.

In more complex airspaces, a fixed airspace structure would be maintained using a route network, which, combined with advanced on-board and ground capabilities, will ensure continued system capacity and safety levels. The concept recognises that, in high complex traffic, the required capacity can only be achieved at the expense of some restriction to individual optimum paths (*e.g.,* segregated paths may add to miles flown or impair optimum profiles).

In highly congested areas where climbing and descending traffic flows prevail it will be necessary to increase airspace capacity through the deployment of route structures that provide a higher degree of strategic segregation. The implementation of more advanced navigation specifications, such as RNP 2 or A-RNP will enable a reduction of route spacing.

Likewise, in congested areas, and to the extent possible, overflights should not cross or interfere with incoming and outgoing flows at the main TMAs, and the duration of any possible crossings should be kept to a minimum.

SAM airspace optimisation must also take into account ATC sectors, which should accommodate the main traffic flows and the route network, based on operational requirements. More ATC sectors (including vertical sectoring) will be developed and implemented as needed. ATC sectors must be designed to be adjustable, in shape and size (predefined), to variations in airspace demand and availability. It is foreseen that there will be a need to create cross-border ATC sectors to support operations.

7.2 Specific objectives

It is expected that PBN and airspace optimisation implementation in the South American Region will contribute to the attainment of ICAO strategic objectives.

7.3 Principles

i. Replacement of conventional ATS routes with RNAV routes will continue in the upper airspace, expecting 100% migration by 2020, and considering the possibility for this PBN airspace to be exclusionary by regional agreement.

ii. The optimisation of route network structures will be based on operational requirements, regardless of national borders or FIR boundaries.

iii. The design of route network structures will be a transparent process that takes into account the needs of all users, while addressing safety, capacity, environmental protection aspects, and military and national security requirements.

iv. The airspace structure, in general, will be developed in close coordination between airspace design, airspace management, and air traffic flow management.

v. When required in oceanic routes, RNP 4 / RNP 2 will be implemented with a lateral separation of 23 NM in parallel routes.

vi. In continental airspace where an operational advantage is to be derived, RNP 2 or A-RNP routes will be implemented with a spacing of 15 NM between parallel routes.

vii. In unidirectional routes where levels are assigned in accordance with the semi-circular course table, a separation of 10 NM can be applied with an RNP 2 navigation specification.

viii. For dynamic airspace management, consideration will be given to the implementation of conditional routes, taken into account that no airspace should be restricted on a permanent or fixed basis, or for an extended period of time, to which end effective civil-military coordination is required for flexible use of airspace (FUA).

ix. Safety assessments will be performed during the pre- and post-implementation phases.

x. Ensure the connectivity between the route network and the SIDs and STARs of terminal areas.

7.4 Oceanic airspace

Taking into account low traffic density in oceanic airspaces, no significant changes are expected in the current airspace structure. RNP10 (RNAV10) is applied in certain airspaces, such as the EUR/SAM Corridor, Lima-Santiago routes, and the South Atlantic Random Routing Area. Migration to RNP4 / RNP2 is foreseen, with the application of communication and surveillance performance, in order to reduce separation in accordance with Doc 4444, wherever there is a need to improve safety and/or increase airspace capacity (see **Appendix B**).

Navigation in random routing areas should consider ADS-C/CPDLC, and aircraft flying in these areas should be conveniently equipped with FANS/1A.

7.4.1 Separation

In oceanic airspace, separation between PBN routes will be applied in accordance with the following table:

Table 7

Navigation specification	Separation minimum	Communications	Surveillance
RNAV 10 (RNP 10)	93 km 50 NM		
RNP 4 RNP 2	42,6 km 23 NM	RCP 240	RSP 180
RNP 2	27,8 km 15 NM	Direct pilot-controller VHF	

Reference: Doc 4444, paragraph 5.4.1.2.1.6

7.5 Continental airspace

In the design, major traffic flows will have priority over minor flows, applying the trunk PBN route concept, and will be connected with the main airports through an appropriate SID and STAR structure, thus avoiding the proliferation of low usage routes.

RNAV 5 will be implemented in lower airspace, and RNP 2 or A-RNP will be applied in selected airspaces where there is a need to reduce route spacing, with mandatory use of GNSS, taking into account that the ground infrastructure does not support these navigation specifications. PBN routes in the lower and upper airspace shall be the most direct paths possible and it is advisable that routes in both airspaces use the same reporting points. RNAV-5 may be fully replaced with RNP 2 or A-RNP if the aircraft fleet is equipped and the operators approved, based on a favourable cost/benefit equation.

The CONOPS contemplates that, in the lower airspace, the implementation of PBN routes aligned with routes in the upper airspace will take a little longer, depending on how equipped is the fleet that flies in that airspace.

7.5.1 Separation

In continental airspaces, separation between PBN routes will be applied according to the following table:

Table 8

<table>
<tr><th>Navigation specification</th><th>Separation minimum</th><th>Communications</th><th>Surveillance</th><th>Remarks</th></tr>
<tr><td rowspan="3">RNAV 5*</td><td>55.5 km
30 NM</td><td rowspan="3">Direct pilot-controller VHF</td><td>Without surveillance</td><td>High traffic density</td></tr>
<tr><td>33.3 km
18 NM</td><td rowspan="2">With surveillance</td><td>Traffic in opposite directions</td></tr>
<tr><td>30.6 km
16.5 NM</td><td>Traffic in the same direction</td></tr>
</table>

Navigation specification	Separation minimum	Communications	Surveillance	Remarks
	19 km 10 NM			If the ATC intervention capacity allows
RNP 2 or GNSS equipment**	27.8 km 15 NM	Direct pilot-controller VHF	Without surveillance	Applied while the aircraft is climbing /descending through the level of another aircraft
	13 km 7 NM			
	37 km 20 NM	Other than direct pilot-controller VHF		Applied while the aircraft is climbing /descending through the level of another aircraft

References:
*Doc 9613, Vol. II, Part B, Chapter 2, paragraph 2.2.3
**Doc 4444, paragraph 5.4.1.2.1.6

Likewise, in view of the growing importance of accompanying optimisation with the application of PBN-based navigation specifications to improve lateral separation, it is highly advisable to incorporate into this CONOPS the supplementary optimisation of en-route longitudinal separation.

In this sense, it is suggested that consideration be given to a gradual reduction from 80NM to 20NM longitudinal separation in accordance with the commitments assumed in this regard by States at SAMIG meetings, and to the inclusion of this optimisation in the corresponding metrics and indicators.

8 PBN OPERATIONS IN TERMINAL AREAS

8.1 SID/STAR routes

PBN implementation in the main TMAs of the Region will continue, prioritising implementation based on the traffic volume they support and taking into account proper integration with the route network. It is expected that non-PBN aircraft operations will continue to be allowed; the establishment of exclusionary PBN TMAs will depend on the complexity and density of air traffic.

The CONOPS considers that SID and STAR design will be based mainly on RNAV 1 and RNP 1 navigation specifications, including environments lacking ATS surveillance, with mandatory use of GNSS, taking into account that almost all terminal areas in the SAM Region lack the required ground infrastructure to support these specifications, to allow for these procedures to be used by a larger number of users.

The implementation of these navigation specifications will permit the development of segregated paths between PBN SIDs and STARs, applying the lateral separation mentioned in Doc 4444.

In low-traffic, low-complexity airspaces that have no significant terrain obstacles, an efficiency and safety assessment should be conducted to justify the implementation of PBN STARs, in order to avoid exactly the opposite result to that intended.

In more complex environments that have obstacles or environmental restrictions that call for more advanced specifications, the design of SIDs and STARs will take into account the application of the A-RNP specification in order to take advantage of the functionality of RF segments and/or precision values below 1 NM down to 0.3 NM. It is not expected that design criteria for the implementation of RNP AR in SID design will be available within the period of validity of this CONOPS. Nevertheless, there is already one State that applies RNP AR criteria for SIDs and other States might have the same requirement and could make use of available experiences. (**Appendix C**)

Improved management of climbing or descending flight profiles, together with the use of PBN, provides safer and more profitable operations in terminal areas. PBN procedures facilitate increasing use of CCO/CDO, which improves flight efficiency and reduces fuel burn, CO2 emissions and noise. In SID/STAR design, the States shall take into account the application of CCO/CDO within the possibilities of each scenario under consideration. Work shall be carried out in collaboration with the operators in order to improve the possibilities of success in the validation and implementation of CCO/CDO.

At airports with a more complex operational environment, with a larger number of SID and STAR procedures, consideration should be given to the transition concept in chart identification in order to make it easier for the pilot to access the procedure cleared by the controller, and to prevent the ATCO to have to memorise a significant number of SIDs/STARs.

In terminal areas that are adjacent or very close to each other, SIDs connecting directly to a STAR in the following terminal area and *vice versa* may be implemented, thus channelling two-way traffic flow between two aerodromes, keeping it strategically segregated (see **Appendix D**).

In the terminal area setting and the aerodrome surroundings, navigation precision often leads to concentration of the perceived noise because there are more aircraft following the same approach profile. In some specific cases, mainly in the initial segments of the SIDs, it might be necessary to allow for a greater dispersal of paths, despite the precision of the RNAV system, in order to mitigate the effects of aviation noise.

Consideration should be given to mitigating the environmental impact caused by noise in residential communities affected by procedure design, which over time may suffer cumulative noise pollution, through the application of noise abatement measures based on ICAO methods.

The treatment to be given to VFR flights and the activities conducted by such flights, as well as those airspaces to be used for protecting visual corridors for VFR aircraft operations shall be defined during planning and design.

8.1.1 Navigation specifications

Navigation specifications applicable to terminal areas are RNAV 1, RNP 1 or A-RNP.

8.1.2 Separation

In terminal areas, separation between PBN standard departure and arrival routes will be applied in accordance with the following table:

Table 9

Navigation specification	Separation minimum	Communications	Surveillance	Remarks
RNAV 1	13 km 7 NM	Direct pilot-controller communications	Without surveillance	Between any combination of RNAV 1 with RNAV 1, or RNP 1, RNP APCH or RNP AR APCH tracks
RNP 1	9.3 km 5 NM	Direct pilot-controller communications	Without surveillance	Between any combination of RNP 1, RNP APCH or RNP AR APCH tracks
Between conventional IFPs or between conventional and PBN IFPs		Direct pilot-controller communications	Without surveillance	When the protected areas of tracks designed using obstacle clearance criteria do not overlap and provided operational error is taken into account.

References:

- Doc 4444, paragraph 5.4.1.2.1.4
- ICAO Circular 324

8.2 Instrument approach procedures – IAP

In this CONOPS, it is not foreseen that SBAS or GBAS augmentation systems will be available in the Region for the development of approach procedures during the period considered in this document.

Approach procedures with vertical guidance (APV) will continue to be developed for all IFR thresholds in order to increase safety through stabilised approaches and reducing the possibility of CFIT. Priority will be given to their implementation at international airports and other controlled airports defined by the appropriate authority of each State. The navigation specifications to be applied are RNP APCH and A-RNP, with Baro-VNAV for vertical guidance.

RNP authorisation required approach (RNP AR APCH) procedures will continue to be developed at airports where clear operational benefits can be derived, and not only at those airports with complex terrain. The Region has found a solution to interference between approach procedures in nearby aerodromes through the implementation of RNP AR APCH procedures.

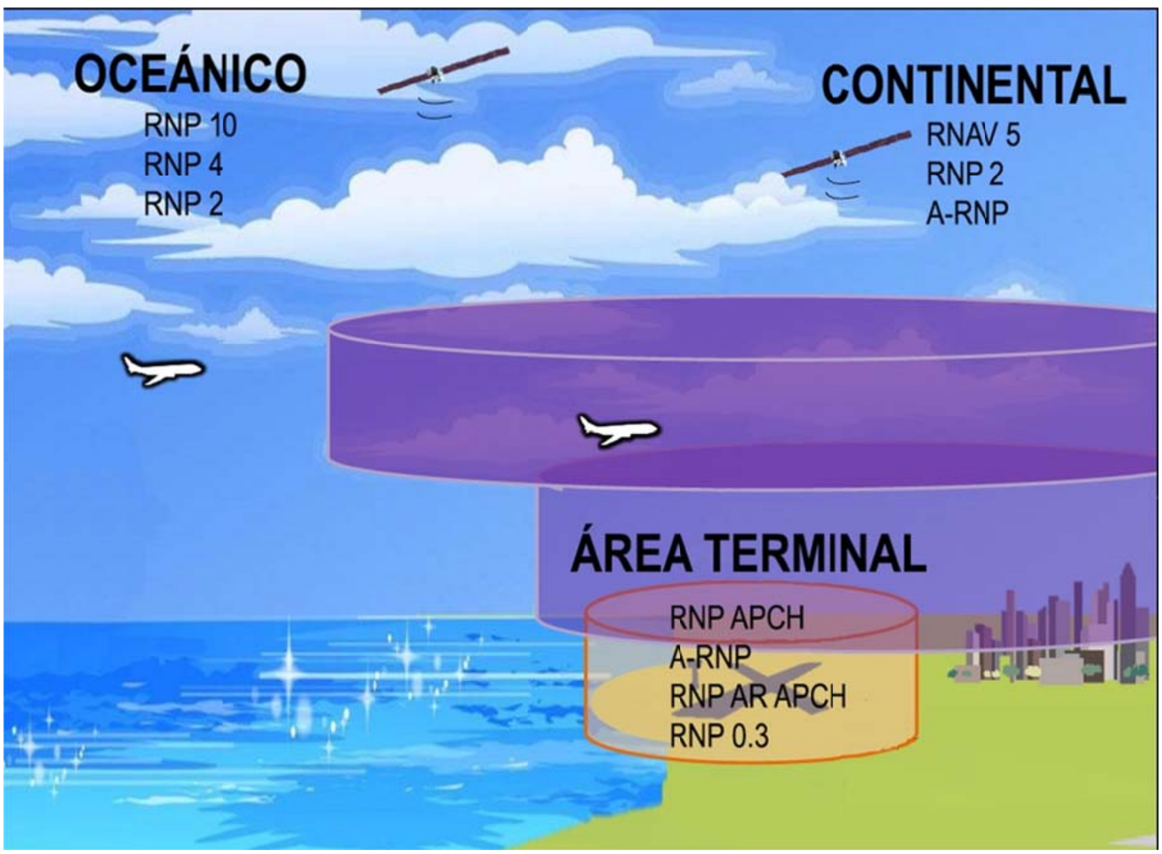
Since RNAV 1 and RNP 1 specifications can be used up to the FAF, these specifications will be applied in the design of the initial and intermediate segments of ILS procedures.

This CONOPS considers as an advisable alternative the implementation of visual RNAV operations for those airports that do not have direct instrument approaches, in order to reduce non-stabilised visual approaches. CDM must be taken into account starting in the design phase. An implementation guide will be developed for this application, to be used by the States of the Region.

8.2.1 Navigation specifications

Navigation specifications applicable in instrument approach procedures are A-RNP, RNP APCH, RNP AR APCH, or RNP 0.3.

Graphical model of navigation specifications, by type of airspace



9 METRICS and INDICATORS

The CONOPS proposes the following table of metrics and performance indicators related to the Declaration of Bogota for the period 2013-2016, and additional metrics to measure the degree of continuity of the tasks proposed for the period 2018-2020.

METRICS FOR THE PERIOD 2018 - 2020				
ELEMENTS	**SCOPE**	**INDICATORS/METRICS**	**GOALS / DATES**	**STATUS AS OF NOV 2016**
1) PBN SIDs SIDs at international airports with scheduled international operations, considered in 2014: 1680	All States	Indicator: % of international airports with scheduled international operations with PNB SIDs. Support metrics: number of international airports with scheduled international operations that have implemented PBN SIDs.	90% by 2018 100% by 2020	72% of the 99 international airports considered in the Declaration of Bogota for scheduled international operations with PBN SIDs already implemented. (Nº of airports)
		Note: The new planning basis for the triennium under consideration, in reference to international airports, appears in Table AOP-1 of the CAR/SAM ANP (see **Appendix A**)		
2) PBN STARs STARs at international airports with scheduled international operations, considered in 2014: 1680	All States	Indicator: % of international airports with scheduled international operations with PBN STARs, where the use of STARs is justified. Support metrics: number of international airports with scheduled international operations that have implemented PBN STARs, where such implementation is justified.	90% by 2018 100% by 2020	72% of the 99 international airports considered in the Declaration of Bogota for scheduled international operations with PBN SIDs already implemented. (Nº of airports)
		Note: The new planning basis for the triennium under consideration, in reference to international airports, appears in Table AOP-1 of the CAR/SAM ANP (see **Appendix A**)		

METRICS FOR THE PERIOD 2018 - 2020				
ELEMENTS	**SCOPE**	**INDICATORS/METRICS**	**GOALS / DATES**	**STATUS AS OF NOV 2016**
3) Application of CCO and CDO techniques for arrivals and departures Considered in 2013: 99 international airports	All States	Indicator: % of international airports with arrivals and departures applying CCO and CDO. Support metrics: Number of international airports with arrivals and departures applying CCO and CDO.	40 % by 2019 60% by 2020	20% of international airports have implemented CCO/CDO (Nº of airports)
		Note:1) Not always can CCO/CDO be implemented at the same time, since they depend on the complexity of the terminal area under consideration. **Note:** 2) CDO is not necessarily related to STAR implementation. The State may create specific procedures to ensure the application of CDO in low traffic airspaces, without applying STARs.		
4) TMA design based on PBN Baseline 2015: 34 selected TMAs	All States	Indicator: % of selected TMAs applying the PBN airspace concept and serving international airports. Support metrics: Number of selected TMAs applying the PBN airspace concept and serving international airports.	70% by 2018 80% by 2019 100% by 2020	18% of selected TMAs with PBN design, according to the baseline under consideration. (Nº of TMAs)
		Note: The baseline under consideration includes 34 terminal areas of the main international airports of the Region.		
5) RNP 2 routes in continental and oceanic areas Routes considered in 2015: 145 routes in the upper airspace	All States	Indicator: % of RNP 2 routes implemented in the upper airspace of the Region Support metrics: Number of RNP 2 routes implemented in the upper airspace of the Region	20% by 2020*	0% RNP 2 routes (Nº of RNP 2 routes in the upper airspace)

METRICS FOR THE PERIOD 2018 - 2020				
ELEMENTS	**SCOPE**	**INDICATORS/METRICS**	**GOALS / DATES**	**STATUS AS OF NOV 2016**
6) Reduction of conventional longitudinal separation from 80 to 40 NM International FIR boundaries under consideration: 52	All States	Indicator: % of international FIR boundaries where a longitudinal separation reduction of 40 NM is applied. Support metrics: Number of international FIR boundaries where the longitudinal separation of 40 NM is applied.	86% by 2016 100% by the first quarter of 2018	86% of international FIR boundaries apply a longitudinal separation of 40 NM.
7) Reduction of conventional longitudinal separation from 40 to 20 NM International FIR boundaries under consideration: 52	All States	Indicator: % of international FIR boundaries where the longitudinal separation reduction of 20 NM is applied Support metrics: Number of international FIR boundaries where the longitudinal separation of 20 NM is applied	20% by 2018 50% by 2019 100% by 2020	10% of international FIR boundaries apply the longitudinal separation of 20 NM in FIR boundaries
		Note: Separation between internal FIRs within the same State is normally less than 40 NM		
8) Approach procedure with vertical guidance (APV) APV at international airports	All States	Indicator: % of international airports that apply approach procedures with vertical guidance Support metrics: number of international airports with scheduled international operations that have implemented APV procedures	90% by 2018 100% by the first semester of 2019	75% of international airports have implemented APV procedures with at least one instrument runway end. (Nº of airports)

METRICS FOR THE PERIOD 2018 - 2020				
ELEMENTS	**SCOPE**	**INDICATORS/METRICS**	**GOALS / DATES**	**STATUS AS OF NOV 2016**
9) Approach procedure with vertical guidance (APV) APV at the main controlled domestic aerodromes	All States	Indicator: % of domestic aerodromes that apply APV procedures Support metrics: number of controlled domestic aerodromes that have implemented APV procedures	15% by 2018 25% by 2019 50% by 2020	% of domestic aerodromes have implemented APV procedures. (Nº of airports)
10) PBN routes (RNAV-5 or RNP 2) in the upper airspace RNAV routes implemented in the upper airspace	All States	Indicator: % routes (RNAV-5 or RNP2) in the upper airspace Support metrics: number of routes of the upper airspace with some PBN navigation specification	75% by 2018 90% by 2019 100% by 2020	65% routes (RNAV-5 or RNP2) of upper airspace (Nº of routes)

Appendix A

Airports listed in the e-ANP

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
ARGENTINA						
SABE	BUENOS AIRES/Aeroparque J. Newbery RS	7	4D	13 31	PA1 NINST	
SAEZ	Ezeiza/Ministro Pistarini RS	9	4E 4E	11 29 17 35	PA3 NPA NINST PA1	
SADF	SAN FERNANDO RNS	4	3C	05 23	NINST NPA	
SARI	CATARATAS DEL IGUAZÚ / My. D. C. E. Krause RNS & AS	6	4E	13 31	NPA PA1	
SAVC Mosconi RS	COMODORO RIVADAVIA/ Gral. E.	6	4D	07 25	NINST PA1	
SACO	CORDOBA/Ing. Aer. A.L.V. Taravella RS	9	4E 4C	18 36 05 23	PA1 NINST NINST NINST	
SASJ	JUJUY/Gobernador Guzmán RS	6	4D	16 34	NINST PA1	
SAZM	MAR DEL PLATA/Astor Piazolla RG & AS	6	4D	13 31	PA1 NINST	
SAME	MENDOZA/El Plumerillo RS	6	4E	18 36	NPA PA1	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
SAZN	NEUQUÉN/Presidente Perón RNS & AS	6	4C	09 27	PA1 NINST	
SARE	RESISTENCIA RNS & AS	7	4C	03 21	NINST PA1	
SAWG	RÍO GALLEGOS/Piloto Civil N. Fernández RS	7	4E	07 25	NPA PA1	
SAAR	ROSARIO/Islas Malvinas RS	8	4E	02 20	NINST PA1	
SASA	SALTA/ General D. Martín Miguel de Güemes RS	6	4D 4C	02 20 06 24	PA1 NINST NINST ……….	
SAZS	SAN CARLOS DE BARILOCHE RNS & AS	7	4E	11 29	NPA PA1	
SAWH	USHUAIA/Malvinas Argentinas RNS & AS	9	4E	07 25	NPA PA1	
BOLIVIA						
SLCB	COCHABAMBA/ Aeropuerto Internacional Jorge Wilstermann AS	8	4D	14 32	NPA PA1	
SLLP	LA PAZ/ Aeropuerto Internacional de El Alto RS	7	4D	10 28	PA1 NINST	
SLVR	SANTA CRUZ/ Aeropuerto Internacional Viru Viru RS	9	4E	16 34	NPA PA1	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación	RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
		RC	Rwy No	Rwy Type	
1	2	3	4	5	6
BRAZIL / BRASIL					
SBBE BELÉM/Val de Cans/Júlio Cezar Ribeiro, RS	9	4D	06 24	PA1 NPA	
SBCF BELO HORIZONTE/ Tancredo Neves, MG RS	9	4E	16 34	PA1 NPA	
SBBV BOA VISTA/ Atlas Brasil Cantanhede, RR RS	6	4D	08 26	PA1 NPA	
SBBR BRASÍLIA/ Pres. Juscelino Kubitschek, DF RS	9	4E 4E	11L 29R 11R 29L	PA1 PA1 PA2 PA1	
SBCB CABO FRIO/Cabo Frío, RJ RS	9	4E	10 28	NPA NPA	
SBKP CAMPINAS/Viracopos, SP RS	10	4E	15 33	PA1 NPA	
SBCG CAMPO GRANDE/Campo Grande, MS RS	7	4E	06 24	PA1 NPA	
SBCR CORUMBÁ/Corumbá, MS RS	5	4C	09 27	NPA NPA	
SBCZ CRUZEIRO DO SUL/Cruzeiro do Sul, AC RS	5	4C	10 28	NPA NPA	
SBCY CUIABÁ/Marechal Rondon, MT l RS	7	4C	17 35	NPA PA1	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
SBCT	CURITIBA/Afonso Pena , PR RS	8	4D	15 33 11 29	PA3 PA2 NPA NPA	
SBFL	FLORIANÓPOLIS/ Hercílio Luz , SC RS	7	4C	14 32 03 21	PA1 NPA NINST NINST	
SBFZ	FORTALEZA/Pinto Martins, CE RS	8	4E	13 31	PA1 NPA	
SBFI	FOZ DO IGUAÇU/ Cataratas, PR RS	7	4D	14 32	PA1 NPAT	
SBMQ	MACAPÁ/ Alberto Alcolumbre, AP RS	6	4C	08 26	NPA NPA	
SBMO	MACEIO/Zumbi dos Palmares, AL RS	7	4C	12 30	PA1 NPA	
SBEG	MANAUS/Eduardo Gomes, AM RS	9	4D	10 28	PA1 NPA	
SBPP	PONTA PORÃ/Ponta Porã, MS RNS	3	4C	04 22	NPA NPA	
SBPL	PETROLINA/Senador Nilo Coelho, PE RS	6	4E	13 31	NPA NPA	
SBPA	PORTO ALEGRE/Salgado Filho, RS	8	4D	11	PA1	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
	RS		4E	29	NPA	
SBRF	RECIFE/Guararapes–Gilberto Freyre, PE RS	9	4E	18 36	PA1 NPA	
SBGL	RIO DE JANEIRO/Galeão-Antônio Carlos Jobim, RJ RS	10	4E 4E	10 28 15 33	PA2 PA1 PA1 NPA	
SBSV	SALVADOR/Deputado Luis Eduardo Magalhães, BA RS	8	4E	10 28 17 35	PA1 PA1 NINST NINST	
SBSN	SANTARÉM/Maestro Wilson Fonseca, PA AS	6	4D	10 28	PA1 NPA	
SBSL	SÃO LUÍS/Marechal Cunha Machado, MA AS	7	4D	06 24 09 27	PA1 NPA NINST NINST	
SBSG	SÃO GONÇALO DO AMARANTE/ São Gonçalo do Amarante RN RS	9	4E	12 30	PA1 NPA	
SBGR	SÃO PAULO/Guarulhos-Governador André Franco Montoro, SP RS	10	4E 4E	09R 27L 09L 27R	PA3 PA1 PA2 PA1	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM							
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
SBTT	TABATINGA/Tabatinga, AM RS	5	4C	12 30	NPA NPA	
SBUG	URUGUAIANA/Rubem Berta, RS RS	3	3C	09 27 04 22	NINST NPA NINST NINST	
CHILE						
SCFA	ANTOFAGASTA/ AP. Cerro Moreno AS	6	4D	19 01	NPA NPA	
SCAR	ARICA/ AP. Chacalluta RS	6	4D	02 20	NPA NINST	
SCIE	CONCEPCIÓN/ AP. Altn. Carriel Sur AS	7	4D	02 20	PA1 NPA	
SCDA	IQUIQUE/ AP. Diego Aracena RS	6	4D	19 01	PA1 NPA	
SCTE	PUERTO MONTT/ AP. El Tepual RS	6	4D	17 35	NPA PA1	
SCCI	PUNTA ARENAS/ AP. Pdte. Carlos Ibañez del Campo AS	6	4D 4D 3B	07 25 12 30 01 19	NPA PA1 NPA NPA NINST NPA	
SCEL	SANTIAGO/ AP. Arturo Merino Benítez RS	9	4E 4E	17R 35L 17L	PA1 NPA PA1	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM					
City/Aerodrome/Designation Ciudad/Aeródromo/Designación	RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
		RC	Rwy No	Rwy Type	
1	2	3	4	5	6
			35R	NPA	
SCIP ISLA DE PASCUA / AP Mataveri RS	8	4D	10 28	PA1 NPA	
COLOMBIA					
SKBQ BARRANQUILLA/Ernesto Cortissoz/Atlantico RS	7	4E	05 23	PA1 NINST	
SKBO Bogotá /Eldorado/Distrito Capital RS	10	4E 4E	13L 31R 13R 31L	PA1 NINST PA2 NINST	
SKBG BUCARAMANGA/Palonegro RS	6	4C	17 35	PA1 NINST	
SKCL CALI/Alfonso Bonilla Aragón/Valle RS	7	4D	01 19	PA1 NINST	
SKCG CARTAGENA/Rafael Nuñez/Bolívar RS	7	4D	01 19	NINST NPA	
SKCC CUCUTA/Camilo Daza/Norte de Santander RNS & AS	7	4C 4C	16 34 02 20	PA1 NINST NINST NINST	
SKLT LETICIA/Alfredo Vásquez Cobo/Amazonas RNS & AS	6	4C	03 21	PA1 NINST	
SKPE PEREIRA/Matecaña RS	7	4C	08 26	NPA NINST	
SKRG RIONEGRO/José María Córdoba/Antioquia	8	4D	18	PA1	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
	RS			36	NINST	
SKSP	SAN ANDRÉS/Gustavo Rojas Pinilla/San Andrés RS	7	4C	06 24	NPA NINST	
SKSM	SANTA MARTA/Simón Bolívar RS	6	3C	01 19	NPA NINST	
ECUADOR						
SEGU	GUAYAQUIL/José Joaquín Olmedo RS	9	4E	03 21	NPA PA1	
SELT	LATACUNGA/Cotopaxi RNS & AS	8	4E	19 01	PA1 NPA	
SEMT	MANTA/Eloy Alfaro RS	8	4E	06 24	NPA PA1	
SEQM	QUITO/Mariscal Sucre RS	9	4E	18 36	NPA PA1	
FRENCH GUIANA / GUYANA FRANCESA (France/Francia)						
SOCA	CAYENNE/Rochambeau RS	9	4E	08 26	PA1 NPA	
GUYANA						
SYCJ	Georgetown /Cheddi Jagan Int’l Airport RS	10	4E	06 24	PA1 NPA	
SYEC	Georgetown/ Eugene F. Correia International Airport RS	5	3C	07 25	NPA NPA	
PANAMÁ						
MPBO	BOCAS DEL TORO/Bocas del Toro	4	3B	08	NPA	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
	RS & AS			26	NPA	
MPDA	DAVID/Enrique Malek RS	7	4D	04 22	NPA NINST	
MPMG	PANAMA/Marcos A. Gelabert RS & AS	6	3C	19 01	NINST NINST	
MPPA	PANAMA/Panamá Pacifico AS	7	4D	18 36	NINST NPA	
MPSM	PANAMA/Cap. Scarlett Martínez AS	7	4D	17 35	NPA PA1	
MPTO	PANAMÁ/Tocumen Intl RS	9	4E 4E	03R 21L 03L 21R	PA1 NPA NPA NPA	
PARAGUAY						
SGAS	LUQUE/Silvio Pettirossi Intl. RS	9	4E	02 20	NPA PA1	
SGES	MINGA GUAZÚ/Guaraní Intl. RS	9	4E	05 23	NPA PA1	
PERÚ						
SPQU	AREQUIPA/INTL Alfredo Rodríquez Ballón AS	7	4D	10 28	PA1 NINST	
SPHI	CHICLAYO/ INTL Capitán FAP José Abelardo Quinoñes Gonzalez; Gran General del Aire del Peru AS	8	4D	01 19	PA1 NINST	
SPZO	Cusco/INTL Teniente FAP Alejandro Velazco	7	4D	10	NINST	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
	Astete RS			28	NPA	
SPQT	IQUITOS/ INTL Coronel FAP Francisco Secada Vignetta RS	8	4D	06 24	PA1 NINST	
SPJC	LIMA-CALLAO/ INTL Jorge Chávez RS	9	4E	15 33	PA3 NPA	
SPSO	PISCO/INTL Pisco AS	9	4E	04 22	NINST PA1	
SPTN	TACNA/ INTL Coronel FAP Carlos Ciriani Santa Rosa RS	7	4C	02 20	PA1 NINST	
SPRU	TRUJILLO/ INTL Capitán FAP Carlos Martínez de Pinillos AS	7	4C	02 20	PA1 NINST	
SURINAME						
SMJP	ZANDERY/Johan Adolf Pengel Intl RS	9	4E	11 29	PA1 NPA	
URUGUAY						
SULS	MALDONADO/Intl. C/C, Carlos A. Curbelo “Laguna del Sauce” RS	7	4C 3C	08 26 01 19	NPA NPA NPA NPA	
SUMU	MONTEVIDEO/ Intl. de Carrasco “Gral. Cesáreo L. Berisso” RS	9	4E 4E	06 24 01 19	NPA PA1 NPA PA1	
VENEZUELA						

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM					
City/Aerodrome/Designation Ciudad/Aeródromo/Designación	RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
		RC	Rwy No	Rwy Type	
1	2	3	4	5	6
SVBC BARCELONA/Gral. José Antonio Anzóategui Intl RS	9	4C	15 33 02 20	PA1 NINST NINST NPA	
SVMI MAIQUETIA/Simón Bolívar Intl, RS	9	4E	10 28 09 27	PA1 NPA NINST	
SVMC MARACAIBO/La Chinita Intl RS	9	4E	03 21	PA1 NPA	
SVMG MARGARITA/Intl Del Caribe Gral. Santiago Marino RS	9	4E	09 27	PA1 NPA	
SVMT MATURIN/General José Tadeo Monagas Intl. RS	7	4C	08 26	NPA NPA	
SVJC PARAGUANA/Josefa Camejo Intl RS	7	4C	09 27	NPA NPA	
SVSA SAN ANTONIO DEL TÁCHIRA/Gral. Juan Vicente Gómez Intl	7	3D	17 35	NPA NINST	
SVVA VALENCIA/Arturo Michelena Intl	8	4D	10 28	NPA NPA	
SVBM BARQUISIMETO/Gral. Jacinto Lara Intl. RS	7	4C	09 27	PA1 NPA	
SVPR PUERTO ORDAZ/Gral. Manual Carlos Piar Intl RS	7	4C	08 26	NPA NPA	

SAM Region- International Aerodromes/ Aeródromos Internacionales-Región SAM						
City/Aerodrome/Designation Ciudad/Aeródromo/Designación		RFF Category Categoría RFF	Physical Characteristics/ Características Físicas			Remarks Comentarios
			RC	Rwy No	Rwy Type	
1		2	3	4	5	6
SVSO	SANTO DOMINGO DEL TACHIRA/May. Buenaventura Vivas Intl. RS	7	4C	12 30	NPA	
SVCS	CARACAS/Oscar Machado Zuloaga Intl. RS	4	3B	10 28	PA1 NPA	

References / Referencias:

RS - International scheduled air transport, regular use /
Transporte aéreo internacional regular, uso regular

RNS - International non-scheduled air transport, regular use /
Transporte aéreo internacional no regular, uso regular

AS - International scheduled air transport, alternate use /
Transporte aéreo internacional regular, de alternativa de destino

ANS - International non-scheduled air transport, alternate use /
Transporte aéreo internacional no regular, de alternativa de destino

NINST - Non-instrument runway /
Pista de vuelo visual

NPA - Non-precision approach runway /
Pista para aproximaciones que no sean de precisión

PA1 - Precision approach runway, Category I /
Pista de aproximaciones de precisión, Categoría I

PA2 - Precision approach runway, Category II /
Pista de aproximaciones de precisión, Categoría II

PA3 - Precision approach runway, Category III /
Pista de aproximaciones de precisión, Categoría III

Appendix B

Example of an operational scenario with PBN routes between States

As an example, Peru and Chile are countries that are actively working in the improvement of their airspaces using PBN, implementing segregated incoming and outgoing flows at their main TMAs, Peru through the PROESA project, and Chile through the PAMPA project.

The flow between the terminal areas of Lima and Santiago was structured in 2006 based on two airways, UL302 and UL780, declared RNP 10 (RNAV10) with a 50-NM spacing, bidirectional, and some sectors have speech VHF communication deficiencies and are lacking ATS surveillance because they are outside the coverage, especially at the FIR boundary (see Figure B1).

Figure B1

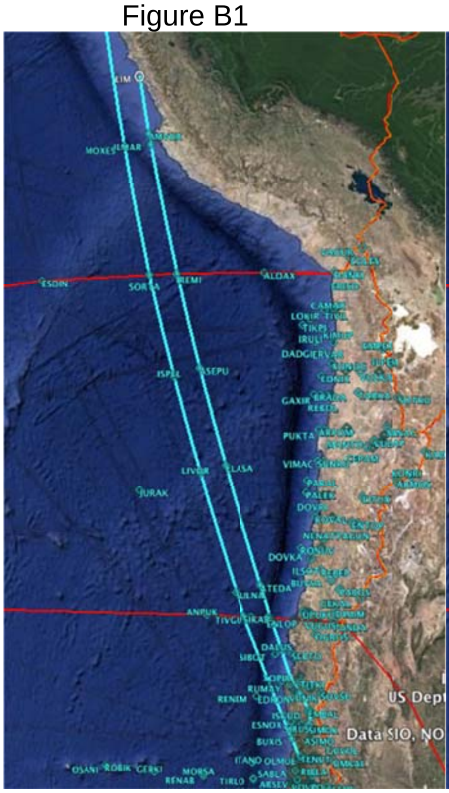
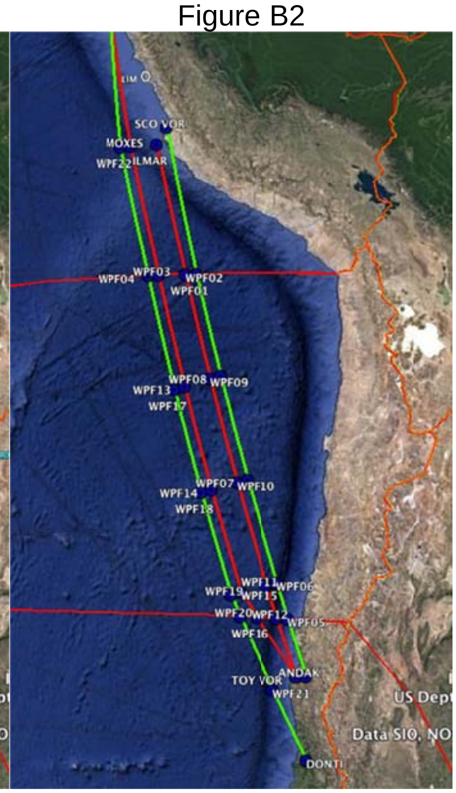


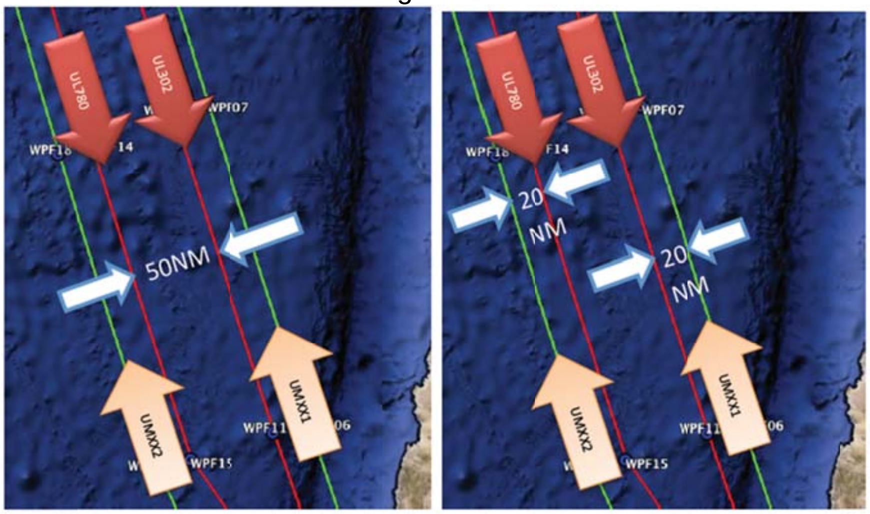
Figure B2



Taking into account the development work carried out in both countries, traffic complexity in the oceanic airspace and the need to increase safety levels at the transfer points between the FIRs involved, it is proposed to implement two new RNP 10 routes (RNAV 10), parallel to the existing ones. In this new context, the routes would be unidirectional. The existing routes UL780 and UL302 would be North-South and the two new routes would be South-North (see Figure B2).

These new routes would have 20 NM spacing with respect to the existing ones, which maintain their 50-NM spacing (see Figure B3).

Figure B3



The spacing between routes allows for separation for "*RNAV operations where RNP is specified on parallel tracks or ATS routes*", described in chapter 5 of Doc 4444. Thus, a 37 km (20 NM) separation minimum between tracks can be applied while an aircraft is climbing/descending through the level of another aircraft when using types of communication other than direct pilot-controller VHF speech, if there is a prescription for RNP 2 navigation performance or **a GNSS equipment**, declared in the FPL with a letter G, taking into account that RNP 10-approved aircraft meet the requirement of GNSS equipment and that the use of the letter G in the FPL means that the GNSS receiver meets the requirements of Annex 10, Volume I.

This airway configuration would mitigate possible operational errors in coordination between ATS units; provide operational efficiencies in the short term, since changes in flight level are not constrained by traffic in the opposite direction, if the aircraft involved are GNSS-equipped; and support the estimated traffic growth in the coming years.

When warranted by the need to increase airspace capacity, and the fleet operating on these airways is prepared, it will be possible to think of the implementation of a more advanced navigation specification, such as RNP 2, on an exclusionary basis, using the same route structure.

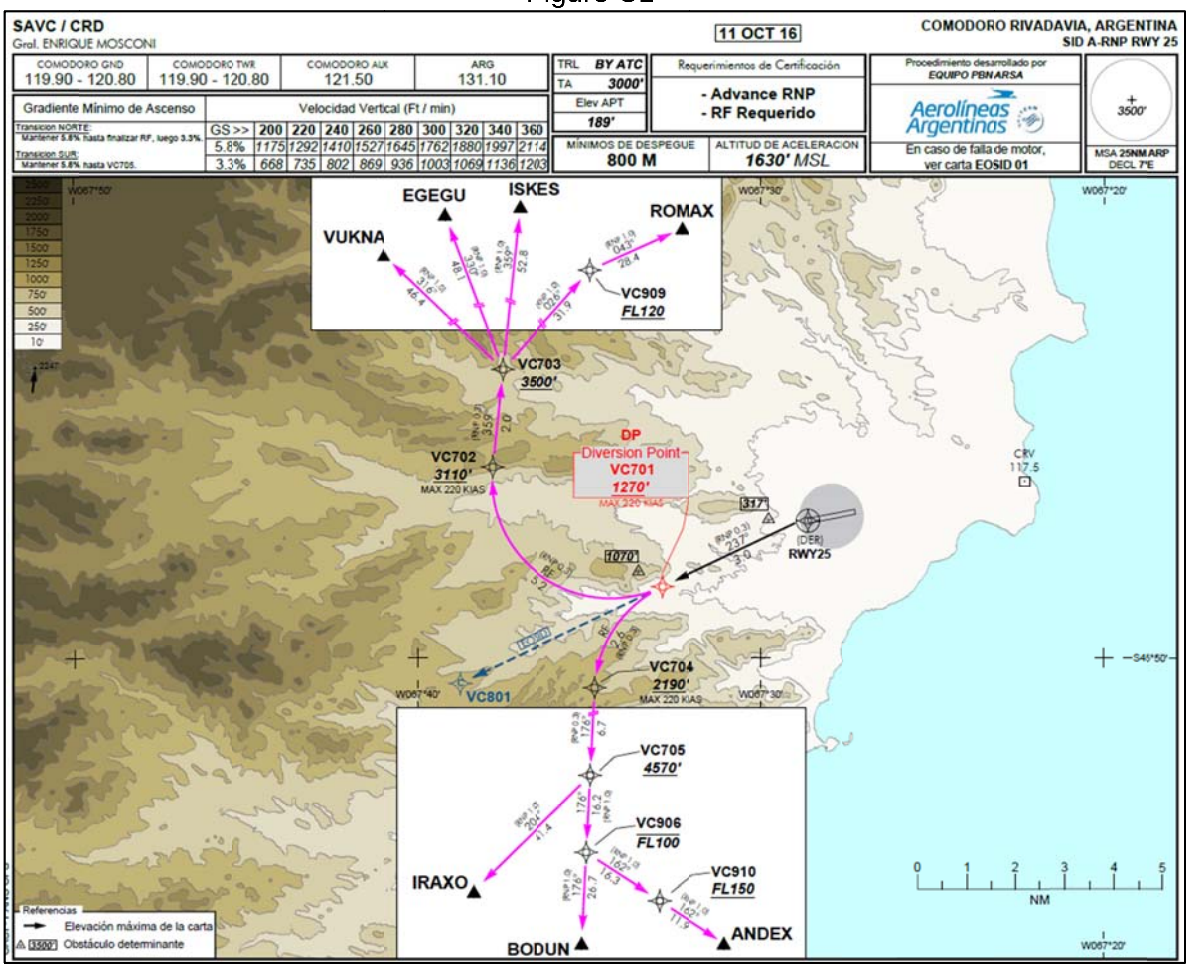
Appendix C

Example of A-RNP SID and RNP AR SID

As an example, SID charts developed applying A-RNP and RNP AR are shown.

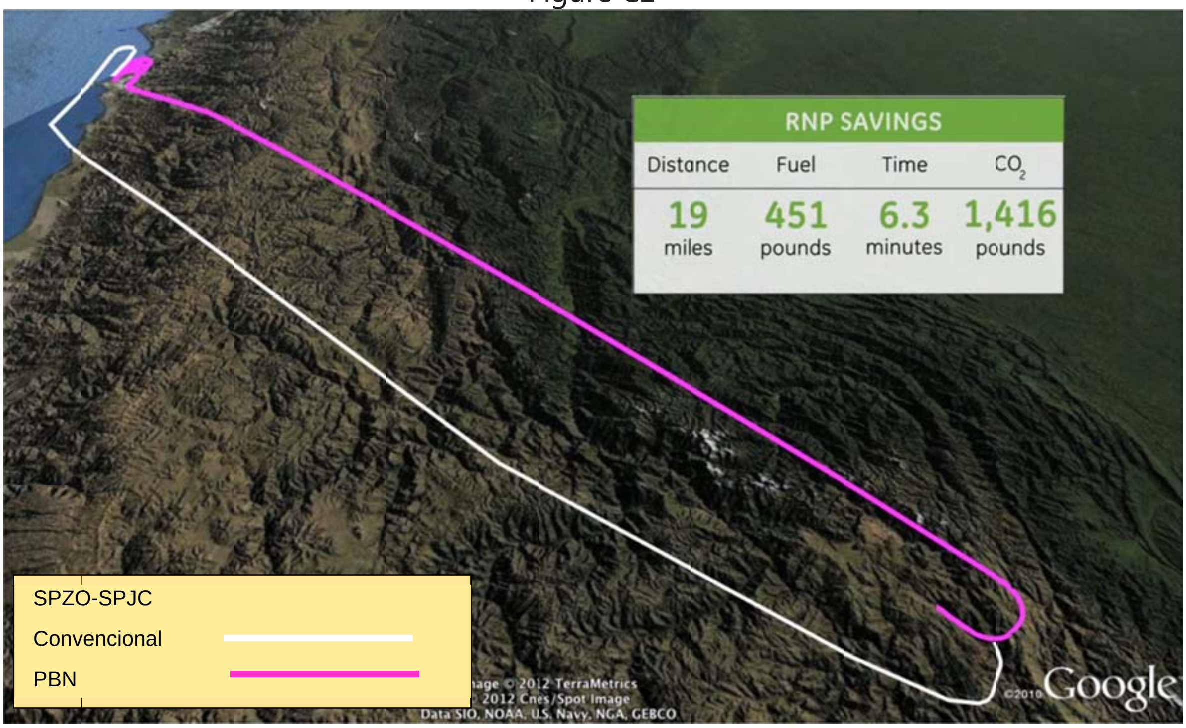
1. In Argentina, *Aerolíneas Argentinas* found the solution for the development of instrument departures at two airports with complicated settings, namely San Martín de los Andes (SAZY) and Comodoro Rivadavia (SAVC), through the application of the A-RNP RF specification. Initially, these SIDs will be for private use by *Aerolíneas* while coordination takes place with the Argentinian authority to make them public.

Figure C1



2. Before the A-RNP specification appeared, Peru needed to develop instrument departures from Cusco to connect with the new RNAV 5 route to Lima. Since no suitable solution was found for the development of instrument departures with the RNP 1 specification, RNP AR SIDs were developed. Thus it was possible to find a fully PBN alternative from departure in Cusco to the arrival in Lima: RNP AR SID - RNAV 5 route- RNP 1 STAR - RNP AR APCH IAP.

Figure C2



Appendix D

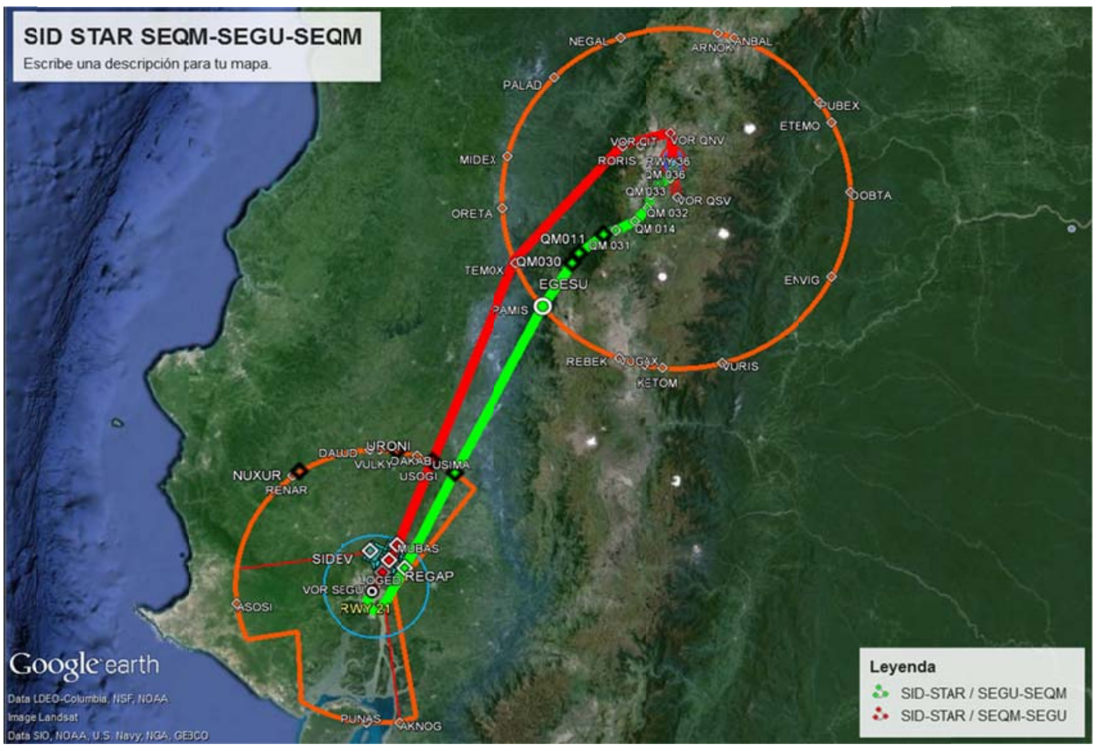
Example of an operational scenario with SIDs and STARs in a State

As an example, a scenario of arrivals and departures between adjacent or very close terminal areas is presented.

Ecuador, within its airspace optimisation process, has implemented PBN in the terminal areas of Quito and Guayaquil. Within this process, it has developed standard departure and arrival routes that are interconnected at a common point. Thus, incoming and outgoing traffic flows between the airports of Quito and Guayaquil (which are 149 NM away) have been strategically segregated.

This SID and STAR configuration reduces points of conflict and facilitates CCO/CDO implementation, reducing pilot and controller workload (see Figure C1).

Figure D1



ATTACHMENT H

REFERENCE DOCUMENTS

- ICAO Document 7192 -AN/857: Training Manual
- ICAO Document 8126 “Aeronautical Information Services Manual”
- ICAO Document 8697 “Aeronautical Chart Manual”
- ICAO Document 8733: CAR/SAM Regional Air Navigation Plan
- ICAO Document 8896: Manual of aeronautical meteorological practice
- ICAO Document 9137. Airport Services Manual.
- ICAO Document 9157. Aerodrome Design Manual
- ICAO Document 9184. Airport Planning Manual.
- ICAO Document 9377: Manual on coordination between air traffic services, aeronautical information services and aeronautical meteorological services
- ICAO Document 9674 “World Geodetic System (WGS-84) Manual”.
- IMO/ICAO Doc 9731 – International Manual of Search and Rescue Aeronautical and Maritime Services
- ICAO Document 9750: Global Air Navigation Plan
- ICAO Document 9774: Aerodrome Certification Manual.
- ICAO Document 9828: Eleventh Air Navigation Conference
- ICAO Document 9830. Surface Movement Guidance and Control Systems (SMGCS) Manual
- ICAO Document 9854: Global ATM Operational Concept
- ICAO Document 9859. Safety Management Manual.
- ICAO Document 9868: Training (PANS)
- ICAO Document 9882: Manual on ATM Requirements
- ICAO Document 9883: Manual on global performance of the air navigation system
- ICAO Document 9931: Manual on Continuous Descent Operations
- ICAO Document 9971: Manual on Collaborative Decision-Making
- ICAO Document 9981: Pans Airdromes
- ICAO Document 9988: Guidance on the Development of States' Action Plans on CO2 Emissions Reduction Activities
- ICAO Document 10003: Manual on the Digital Exchange of Aeronautical Meteorological Information
- ICAO Document 10039: Manual on System Wide Information Management (SWIM) Concept
- ICAO Annex 2 – Rules of the Air
- ICAO Annex 3 - Meteorological service for international air navigation.
- ICAO Annex 4 - “Aeronautical Charts”
- ICAO Annex 10, Volumes I to V
- ICAO Annex 11, Air Traffic Services
- ICAO Annex 12, Search and Rescue Services
- ICAO Annex 14, Standards and Recommended Practices - SARPS
- ICAO Annex 15 – “Aeronautical Information Service”
- ICAO Electronic Bulletin EB2010/40 of 28 September 2010 “ ICAO Civil Aviation Training Policy”
- Circular 311
- Circular 330

- WMO Bulletin No. 258, Supplement No. 1 – Training and qualification requirements for aeronautical meteorological personnel
- CAR/SAM PBN Roadmap, version 1.4 / July 2009;
- GNSS Manual, Doc 9849 AN/457;
- Air Traffic Flow Management Operational Concept for the Caribbean and South American Regions (CAR/SAM ATFM CONOPS)
- Roadmap SAM Roadmap for Air Traffic Flow Management
- Guidelines for the transition to satellite navigation systems in the CAR/SAM Regions (Appendix H to Document 8733)
- Strategies for the introduction and application of non-visual aids in approach, landing and departure in the CAR/SAM Regions (Appendix I to Document 8733)
- Caribbean/South American Air Traffic Flow Management Manual
- Manual on the Collaborative Decision-Making Process for the South American Region
- Guide for the application of a common methodology to estimate airport and ATC sector capacity for the SAM Region
- Programme for optimising the ATS route network in the South American Region
- CAR/SAM Roadmap for Performance-Based Navigation
- PBN implementation Project – En-route operations – Short term – SAM Region
- PBN Implementation Project – TMA and Approach Operations – Short Term – SAM Region.
- GNSS Manual, Doc 9849 AN/457
- GREPECAS /14 final report (April 2007)
- Strategy for the evolution of air navigation systems in the CAR/SAM Regions - First Edition Rev. 2.0 – CNS/ATM/SG/1
- GREPECAS/14 Final Report
- CAR/SAM regional unified surveillance strategy - CNS/ATM/SG/1
- Guidance for improving communication, navigation and surveillance systems to meet short- and medium-term operational requirements for en-route and terminal area operations – Regional Project RLA/06/901- October 2008
- Guideline for the implementation of national IP digital networks in support of current and future aeronautical applications (RLA/06/901 project)
- Guide for the operational interconnection of AMHS systems in the SAM Region (RLA/06/901 project)
- Model Memorandum of Understanding (MoU) for the interconnection of AMHS (RLA/06/901 project)
- Plan for the interconnection of automated ACC in the CAR/SAM Regions (RLA/06/901 project)
- Preliminary system interface control document for the interconnection of ACC centers of the CAR/SAM Regions (RLA/98/003 project)
- Preliminary reference system/subsystem specification for the air traffic control automation system (SSS) (Project RLA/06/901)
- Model Memorandum of Understanding (MoU) for the interconnection of automated systems (RLA/06/901 project)
- 37th Session of the Assembly, Working Paper A37-WP/ 64: Report on outcomes of initiatives regarding Next Generation of Aviation Professionals
- 37th Session of the Assembly A37-19
- 38th Session of the Assembly A38-18
- 39th Session of the Assembly A39-2
- 39th Session of the Assembly A39-3
- FANS 1/1 Operations Manual – FOM
- Global Operational Data Link Document (GOLD).

- *http://www2.icao.int/en/anb/met-aim/met/sadisopsg/Pages/default.aspx*
- *http://www.metoffice.gov.uk/sadis/index.html*
- *http://www2.icao.int/en/anb/met-aim/met/wafsopsg/Pages/default.aspx*
- *http://www2.icao.int/en/anb/met-aim/met/metwsg/Pages/HomePage.aspx*
- *http://www2.icao.int/en/anb/met-aim/met/iavwopsg/Pages/HomePage.aspx*
- *http://www2.icao.int/en/anb/met-aim/met/ivatf*
- "AIS-AIM Transition Roadmap" – ICAO
- Report of the seventh meeting of the AGA/AOP/SG7 Subgroup, Buenos Aires, Argentina, 9 to 13 September 2009.
- SESAR HP in the Single European Sky ATM Research Programme.

Agenda Item 2: Optimization of SAM airspace

a) PBN regional implementation progress
b) Actions to standardise minimum longitudinal separations between en-route aircraft
c) Results and recommendations of PANS-OPS workshops
d) Coordination for SAM route network Version 04

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

a) WP/05 - *Follow-up to PBN implementation as relates to the goals of the Declaration of Bogota and other implementations related to airspace optimisation* (presented by the Secretariat);
b) WP/10 - *Review of the Letter of Operational Agreement between Brazilian ACCs and ACCs of States providing ATS in neighbouring FIRs* (presented by Brazil);
c) WP/11 - *Implementation of the PBN concept at the Curitiba FIR and at the Curitiba, Florianopolis and Porto Alegre TMAs* (presented by Brazil);
d) IP/04 - *Acciones realizadas por EANA-Argentina para lograr la optimización del espacio aéreo de la TMA BAIRES* (presented by Argentina - Spanish only);
e) IP/08 - *Update on the implementation of PBN in Paramaribo airspace* (presented by Suriname); and
f) IP/10 - *Advance in the implementation of PBN procedures in the Panama TMA* (presented by Panama).

PBN Concept of Operations

2.2 The Meeting took note of the PBN Concept of Operations for SAM Airspace (CONOPS), for the period 2018-2020, developed under Project RLA/06/901 to strengthen the Declaration of Bogota and provide a conceptual frame of reference for the SAM Performance-based Air Navigation Implementation Plan (SAM-PBIP).

2.3 It was noted that the preliminary text of the CONOPS had been reviewed at the SAM/IG/19 meeting. At present, the CONOPS was incorporated into ATM matters of the SAM-PBIP (Version 1.5), as Attachment H. This issue is presented in SAM/IG/20-WP/03 and Appendix B to the report on Agenda Item 1.

PBN en route

2.4 The Meeting noted that the implementation of PBN en route was based on route network versions to ensure that the best airspace structure was available. Information was provided on the results of the ATSRO/08 meeting held in September 2017, where 95 initiatives were analysed, based on Version 04 of the route network, of which 30 had been accepted and 3 rejected. The remaining 52 initiatives would be the subject of coordination.

2.5 It was noted that Conclusion ATSRO/8-1 defined a 3-stage timetable for the publication of route modifications on AIRAC dates in June, August and October 2018, taking into account two AIRAC cycles prior to effective implementation.

2.6 The SAM Region had continued optimising the route network, covering 65% of upper airspace routes, exceeding by 5% the 60% goal established in the Declaration of Bogota.

2.7 As a result of the PBN meetings held in the CAR Region in 2016, Brazil, Guyana, Suriname and Venezuela had optimised a set of RNAV routes in their FIRs on 17 August 2017. The list of these routes is shown in SAM/IG/20-WP/05 and the implementation in the Paramaribo FIR is described in SAM/IG/20-IP/08.

2.8 The Secretariat noted that a meeting of SAM States had been scheduled for April 2018 for updating Letters of Agreement and Contingency Plans. This meeting would review data on aircraft transfer and ATS management on optimised routes, and coordinate with the Mexico NACC Office for the development of joint route improvement initiatives based on NAM and CAR flows.

PBN in TMAs

2.9 Regarding recent implementations, the new PBN airspace of the Asunción FIR and TMA became effective in August 2017. Likewise, *Aerocivil* of Colombia implemented the new Bogota TMA with RNAV/RNP standard routes and approach procedures on 12 October 2017.

2.10 In Brazil, through the PBN SUL project that also became effective on 12 October 2017, several main TMAs, such as Curitiba, Florianopolis and Porto Alegre, had been optimised. The progress made in these activities is described in SAM/IG/20-WP/11, presented by Brazil, which also includes AIC A 20/17.

2.11 Regarding progress made by Argentina, PBN procedures had been implemented at the airports of Aeroparque, Córdoba, Salta and Iguazú, amongst others. The activities being carried to optimise the Baires TMA are listed in SAM/IG/20-NI/04 (Spanish only).

2.12 The Meeting took note that Suriname was taking action to implement PBN routes and procedures for the Paramaribo international airport airspace by February 2018. These PBN activities and others related to training and ATM and CNS improvements in Suriname are described in SAM/IG/20-IP/08.

2.13 Panama was currently defining a process for airspace improvement and redesign at the Tocumen TMA. It expected to initiate the project in early 2018 and a roadmap with deadlines would be available by then. They also expected to implement a new National air navigation plan. Information on these activities can be found in SAM/IG/20-IP/10.

2.14 The delegates of Argentina, Brazil and Paraguay highlighted the tripartite PBN implementation in October 2017 of the FOZ TMA (covering operations at the airports of Foz de Iguazú, Cataratas and Guaraní). Argentina and Paraguay informed about bipartite PBN planning for the Posadas TMA (covering the airspace of the Encarnación and Posadas airports), to be implemented in February 2019.

2.15 The Secretariat informed about the progress made in PANS-OPS training of staff in the administrations of Argentina, Bolivia, Ecuador, Guyana, Peru and Uruguay, which showed that the number of designers in the Region was gradually increasing.

2.16 The tentative dates for PBN implementation in TMAs were updated during the Meeting. The status of implementation is shown in the following table:

<table>
<tr><th colspan="4">Redesign of selected TMA airspaces 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.
Optimisation of available resources.
Phase 2.- 2017-2020.
Introduction of the PBN concept.
(See SAM/IG/20-NI/04)</td></tr>
<tr><td rowspan="3">Bolivia</td><td colspan="2">Cochabamba</td><td rowspan="3">Phase 1.- July 2018. PBN design but also considering conventional procedures.
Phase 2.- August 2019. Definitive PBN design, considering airspace 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">Manaus</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>Red de ruta FIR CW</td></tr>
<tr><td colspan="2">Fortaleza, Natal and Maceió</td><td>September 2019</td></tr>
<tr><td colspan="2">Vitória</td><td>October 2018</td></tr>
<tr><td colspan="2">Belém, Campo Grande and Sao Luis</td><td>October 2021</td></tr>
<tr><td colspan="2">Cuiabá, Boa Vista, Porto Velho and Rio Branco</td><td>October 2023</td></tr>
<tr><td colspan="2">Sao Paulo</td><td>TBD</td></tr>
<tr><td rowspan="2">Chile</td><td colspan="2">Santiago (South)</td><td rowspan="2">08 Dec 2016 (implemented)</td></tr>
<tr><td colspan="2">Santiago FIR route network</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">Panamá</td><td>Project start-up in 2018.
(See SAM/IG/20-IP/10)</td></tr>
<tr><td>Paraguay</td><td colspan="2">Asunción</td><td>17 Aug 2017 (implemented)</td></tr>
<tr><td rowspan="4">Peru</td><td colspan="2">Arequipa</td><td>December 2018</td></tr>
<tr><td colspan="2">Cusco</td><td>December 2018</td></tr>
<tr><td colspan="2">Juliaca</td><td>December 2018</td></tr>
<tr><td colspan="2">Puerto Maldonado</td><td>December 2018</td></tr>
</table>

Redesign of selected TMA airspaces based on PBN planning		
State		**Implementation**
Uruguay	Carrasco and Laguna del Sauce	First semester of 2018 * The Carrasco TMA will be optimised in accordance with Phase 2 of the Baires TMA.
Venezuela	Maiquetía	December 2017
	Isla Margarita	Second semester of 2018

Implementation of PBN SIDs, STARs and approach procedures

2.17 Taking into account recent implementations in Argentina, Brazil, Colombia and Paraguay, PBN SIDs/STARs implementation as of 12 October 2017 reached 72.9%, exceeding the 60% goal of the Declaration of Bogota.

2.18 Associated to the design of arrival and departure procedures was the application of CDO and CCO, which had reached 34% and 26% implementation, respectively.

2.19 Regarding compliance with ICAO Resolution A37-11 concerning the implementation of PBN approaches, the States continued making efforts to reach 100%, which was to be achieved in 2016. As of 12 October 2017, implementation had reached 78.6%.

Environmental benefits derived from CO_2 reduction during the period 2013-2017

2.20 It was estimated that, between January 2014 and June 2017, airspace improvements in the SAM Region resulted in CO_2 savings in the order of 93,516 tonnes, according to the following table:

Year	***Tonnes of CO_2***
2014	51,132
2015	23,351
2016	11,000
2017 *	8,033
Total	**93,516**

* *until June 2017*

2.21 As part of the lessons learned, the Meeting identified the need to receive feedback on calculations of fuel and CO_2 savings based on data from aircraft operators, and also to include, as part of the variables to be analysed, the increase in the number of aircraft operations in the flows of the Region.

2.22 The Meeting highlighted the on-going task of States to send to the Secretariat all the information concerning calculated fuel savings in relation to route optimisation or redesign of selected airspaces.

PBN focal points of the regulator and of the air navigation service provider

2.23 The updated list of PBN points of contact of the regulator and of the air navigation service provider (ANSP) for purposes of coordination an teleconferencing is attached as **Appendix A** to this part of the report.

PANS-OPS workshops

2.24 The Meeting took note that the PANS-OPS/2 workshop for State designers and airline experts had been held on the third week of September 2017, and agreed with the analysis performed at said workshop, which stressed the need to prepare a Regional Guide for the design and use of visual RNAV procedures.

2.25 Likewise, it ratified the importance of continued implementation of the recommendations of the PANS-OPS/1 workshop, which were being monitored through the updated table shown in **Appendix B** to this part of the report. Additional references to the PANS-OPS/2 workshop and its results are described in SAM/IG/20-WP/05.

Actions to standardise longitudinal separation of aircraft en route

2.26 As reported at the SAM/IG/19 meeting, there was a set of Letters of Agreement and MoUs containing the commitments assumed at the SAM/IG/17 meeting regarding the reduction of longitudinal separation from 80 to 40 NM. Appendix C to SAM/IG/20-WP/05 shows the agreements reached between adjacent FIRs in the SAM Region and with FIRs with boundaries with the CAR Region.

2.27 Although the Paramaribo and Atlántico FIRs remained mostly with oceanic separation, the implementation process had been positive in the States of the Region, recognising that agreements were still pending with adjacent CAR States.

2.28 Within this context, Brazil informed that after two years of having made the transition from 80 to 40 NM of longitudinal separation, and taking into account the existing VHF communication infrastructure, it deemed feasible to make adjustments to coordination procedures between the Amazónico and Curitiba ACCs and the adjacent ACCs, with a view to applying the 20-NM separation, if necessary, only in transfers entering the Brazilian FIRs. In airspaces with radar surveillance, a longitudinal separation of 10 NM was proposed. This initiative is described in SAM/IG/20-WP/10.

2.29 The Meeting took note that the 40-NM separation had not been fully implemented for the transfer of aircraft to the La Paz FIR. The delegates of Bolivia informed that they were using VHF communication coverage assessments at FIR boundaries to diagnose the situation and see the possibility of applying such separation, in accordance with the established agreements.

2.30 With the support of Project RLA/06/901, a 4-day workshop will be held on 6-10 November 2017 in the SAM Regional Office, where an Action Plan will be proposed to promote the reduction from 40 to 20 NM, and to continue signing Letters of Agreement between States to consolidate the 40-NM separation and to analyse initiatives such as the one set forth by Brazil.

SAM airspace optimisation action plan

2.31 The Meeting reviewed and approved the SAM Airspace Optimisation Action Plan presented in Appendix D to SAM/IG/20-WP/05.

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

2.32 The Eleventh meeting of the Coordination Committee of Project RLA/06/901 (RCC/11) approved the following activities in support of SAM airspace optimisation for 2018:

- *Third PANS-OPS implementation workshop* - To continue with the harmonisation and coordination of PBN instrument procedures in the SAM Region, advanced RNP and CDO/CCO.

- *Seminar on the organisation of flight procedure design (IFPD) services* - To address the implementation of the IFPD service in accordance with ICAO Annex 11 and supplementary documents. Aimed at strengthening regional capacity to sustain PBN implementation over time.

- Preparation of the draft Version 05 of the SAM route network - Deliverable: Document containing Version 05 of the SAM route network.

- *ATSRO/9* - Follow-up to the implementation of Version 04 of the SAM route network (final version).

- *SAM/IG/21* - All air navigation implementation priorities contemplated in the Declaration of Bogota - In order to continue with implementation activities related to the action plans developed by the Project in the AGA, AIM, ATM, CNS and MET areas.

- *SAM/IG/22* - All air navigation implementation priorities contemplated in the Declaration of Bogota - In order to continue with implementation activities related to the action plans developed by the Project in the AGA, AIM, ATM, CNS and MET areas.

- *ATS meeting for 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.

PBN implementation strategy in the SAM Region

2.33 SAM/IG meetings promote a PBN implementation strategy in TMA and en-route airspace, approving various activities. Some of these activities were included in the airspace optimisation work plan. In summary, PBN implementation would be based on the following activities/events to be held in 2018.

a) ATSRO/9 meeting, with activities to follow-up the implementation of Version 04 of the ATS route network and make adjustments thereto.

b) Development of a draft Version 05 of the ATS route network.

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

d) Harmonisation and coordination of PBN instrument procedures in the SAM Region - PANS-OPS workshops.

e) Longitudinal separation optimisation - Multilateral and bilateral meetings.

f) Meetings for updating Contingency Plans and ATS Letters of Agreement, to guarantee safety and consolidate PBN implementation and improvement, in addition to ensuring that benefits are derived.

g) Workshop for drafting an Action Plan for promoting the reduction from 40 to 20 NM, and continuing with the signing and effective implementation of Letters of Agreement between States to consolidate the 40-NM separation.

h) Coordination and harmonisation of the route network and longitudinal separation between CAR/SAM Regions - NAM/CAR/SAM interregional implementation meetings and teleconferences.

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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** Updated SAM/IG/20 / Actualizados en la SAM/IG/20*

APPENDIX B

PANS-OPS/1 WORKSHOP RECOMMENDATIONS

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGI	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
<u>1. IFPP Panel</u> 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.	OG	OG	OG	YES		YES			YES	OG	OG		NO	YES	Argentina: Applies Resolution 457 of year 2016, which included the use of TERPS-FAA Concepts for IFP designs.
<u>2.Changes in the denomination of approach procedures (Circular 336)</u> 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..	YES	OG	NO			OG					NO		YES	NO	Argentina: Yes Rest of States: Pending recommendation is assumed as indicated in ICAO bulletin suspending Circular 336
<u>3. Procedure validation</u> That SAM States consider the adoption of documentation on ground and flight validation of procedures, similar to that applied by Argentina.	YES	YES	NO	OG		OG			YES	NO	YES		OG	YES	Brazil counts with a consolidated ground validation process

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	OG	YES	OG		YES			YES	YES	OG		OG	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	OG	YES	OG		YES			YES	YES	OG		OG	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	OG	OG	NO		NO			OG	OG	OG		NO	YES	
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	OG YES		OG NO			OG	OG	NO		NO NO	YES NO	

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	OG		OG			OG	YES	OG		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.				OG		NO				N/A	OG		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	OG	OG		YES			OG	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	

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGI	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
<u>10. Level segments to intercept the ILS glide slope</u> 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	OG		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.				OG		YES					YES		NO	YES	
<u>11. Elimination of publication of procedures on paper</u> 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	OG	O/G	OG		YES			OG	OG	NO		OG	YES	

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGI	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
<u>12. Retirement of information on ceiling and MDA/MDH from approach charts</u> That SAM States publish the OCA/OCH in instrument approach procedures and **<u>not</u>** 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	OG	OG		OG			YES	YES	YES		YES	YES	
<u>13. Application of CCO/CDO techniques at airports with low traffic volume</u> That SAM States:		OG	YES						OG	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		NO		

Agenda Item 3: Implementation of air traffic flow management (ATFM)
a) Procedures for coordination between FMPs
b) Updating of the ATFM CONOPS

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

a) WP/06 – *Follow-up to ATFM implementation* (presented by the Secretariat);
b) IP/03 - *Acciones realizadas por EANA-Argentina en el desarrollo ATFM* (presented by Argentina) (***Spanish only***); and
c) IP/09 - *Cálculo de capacidad de plataforma como subsistema de navegación aérea* (presented by Argentina) (***Spanish only***).

Follow-up to ATFM implementation

3.2 In order to analyse compliance with ATFM goals, the following indicators have been considered:

- Percentage of States that have performed runway and ATC sector capacity calculations

- Percentage of States that have implemented ATFM at flow management units (FMUs) or flow management positions (FMPs)

3.3 Appendix A to SAM/IG/20-WP/06 contains updated information on ATFM implementation activities in the SAM Region through the GREPECAS project.

3.4 85% of the States of the Region have performed runway capacity calculations as a task prior to implementation. During the meeting, Paraguay reported that it had completed ATC sector calculations, totalling 9 States of the Region--that is 64%--that have performed such calculations.

3.5 The Meeting took note that Bolivia intended to promote ATFM implementation activities at the DGCA, without that meaning that the provider (AASANA) would no longer participate in the provision of the ATFM service at the ACC. The metrics for flow unit implementation in the SAM Region remains at 63%.

3.6 The States updated the list of ATFM focal points included in **Appendix A** to this part of the report. They also updated the survey on the status of ATFM activities, as shown in **Appendix B** to this part of the report.

Issuance of NOTAMs on flow control measures

3.7 The Meeting noted that conclusion SAM/IG/19-01 called for the strengthening of FMP/FMU functions by means of resources and trained personnel with powers to coordinate with ATS services the implementation of ATFM initiatives (TMI) in case of air traffic capacity/demand imbalances caused by scheduled or unforeseen events.

3.8 The Secretariat informed that it had monitored the issuance of NOTAMs on flow control by the ACCs or FMPs/FMUs of the Region, noting a significant reduction since June 2017, which would reflect the efforts made by the States to fully eliminate these NOTAMs.

3.9 The Meeting ratified the importance of implementing the actions specified in conclusion SAM/IG/19-01, urging States that had not yet implemented ATFM to install at least one ATFM management position (FMP) in order to balance the demand of aircraft operations with service capacity in the airspace and international aerodromes.

ATFM meeting/workshop for the harmonisation of coordination procedures

3.10 The Meeting took note that the *Meeting/workshop for the harmonisation of ATFM procedures* had been tentatively scheduled for the first week of March 2018. The purpose of this event was to sign Memoranda of Understanding (MoUs) and to conduct a seminar to discuss the contents of ICAO Doc 9971. The MoU models defined at the SAM/IG/19 meeting are shown in Appendix D to SAM/IG/20-WP/06.

3.11 The aforementioned meeting/workshop was also expected to assess the preliminary text of the updated ATFM CONOPS, as later discussed in this part of the report.

3.12 The possibility was discussed of conducting a joint CAR and SAM ATFM meeting. It was agreed that the implementation had to be first addressed in the SAM Region, and given the importance of ATFM implementation harmonised with the CAR Region, the Secretariat was requested to coordinate with the NACC Office in Mexico to see the possibility of conducting an interregional ATFM meeting in 2018.

Updating of the ATFM CONOPS

3.13 The Meeting reviewed the proposed contents of the ATFM CONOPS presented in Appendix E to SAM/IG/20-WP/06 and the status of implementation of ATFM. It also agreed that the ATFM CONOPS should be geared towards the development of a second implementation phase consisting of the identification and measurement of the expected performance objectives. Accordingly, it should be updated based on the following guidelines:

- It should fall within the framework of the new edition of ICAO Doc 9971.

- To date, different results have been obtained in ATFM implementation. In general, the ATFM has allowed for demand/capacity balancing in runways and ATS airspaces, and a reduction of delays in major airports through the application of domestic air traffic initiatives.

- Progress has been made in runway and ATC sector capacity measurements, in view of the availability of a methodology and the respective training. It is necessary to promote a periodic review and updating of these measurements when the scenarios change.

- Regarding the efficiency of en-route operations and management of overflying aircraft, a better application and understanding of the ATFM concept is perceived upon having reduced the issuance of NOTAMs with unilateral flow control measures. However, the application of initiatives between adjacent FMPs/FMUs must be emphasized.

- Although they are implemented separately, there is a strong linkage and interaction between runway and airspace ATFM and aircraft operations (AOP) to/from parking stands, pushback and start-up area, and taxiways. Accordingly, their linkage to A-CDM processes being implemented at some international airports of the Region is also essential.

- Based on runway and ATC sector capacity measurements, it is extremely important to match the number of aircraft with the operational model foreseen for the AOP to *feed* the ATFM and *vice versa*.

- The ATFM CONOPS should be a harmonised document for the CAR and SAM Regions.

3.14 It was noted that the Secretariat was defining and coordinating the means for developing the ATFM CONOPS proposal, and that it was expecting to obtain the support of an expert and/or the creation of a CAR/SAM task force.

CADENA CDM sessions

3.15 The Meeting took note that the Secretariat had been participating in the CANSO CADENA sessions as an observer since July 2017. The aforementioned teleconferences link up ATFM units, generating a communication and collaboration routine among the participants. These teleconferences are also attended by the airlines, IATA, FAA and other organisations, favouring feedback. The ANSPs of Argentina and Brazil have been participating in the initiative since its inception.

3.16 The Meeting agreed on the importance of conducting ATFM teleconferences in the Region, and promoting a communication routine in support of CDM and TMIs, while facilitating linkage between ACCs or ATFM units at the FIR boundaries of the CAR/SAM Regions.

3.17 The delegates of Chile, Panama, Paraguay, Peru and Venezuela expressed their interest in participating in the weekly sessions of CADENA on a trial basis, and would provide their input at the ATFM workshop/meeting to be held in March 2018 for its corresponding analysis. The Secretariat would coordinate such participation with CANSO.

3.18 Consequently, the Meeting agreed to maintain the validity of conclusion SAM/IG/5-7 "*ATFM teleconferences in the South American Region*", and updated the corresponding remarks in the table on the status of implementation of Conclusions and Tasks shown in Appendix A to the report on Agenda Item 1.

Action taken by EANA-Argentina for ATFM implementation

3.19 The Meeting took note that EANA, the ANSP of Argentina, had produced a manual on a "*Methodology for runway capacity calculations*" based on the Brazilian method, which had been validated by the aeronautical authority. SAM/IG/20-IP/03 and its Appendix A describe the process used.

3.20 During 2016, training was provided to EANA and ANAC personnel on runway capacity calculations. To date, this training has been put into practice for measuring twelve airports in Argentina. It is foreseen that capacity calculations will be carried out in six airports in 2018.

3.21 By October 2017, EANA had measured the ATC sectors of the Ezeiza, Córdoba and Mendoza ACCs and the objective was to measure at least three more units. Likewise, an ATFM CONOPS document and an ATFM Implementation Plan had been developed for Argentina.

3.22 SAM/IG/20-IP/03 provided details of the status of implementation of ATFM and flow control management in Argentina.

Apron capacity calculations in Argentina

3.23 Argentina reported that ANAC was developing and testing an analytical model for calculating the theoretical capacity of the parking apron, based on the number of available parking stands and the average time of stand occupancy according to the aircraft mix requesting the service, taking into account utilisation restrictions for each parking stand.

3.24 The Meeting took note of the information, and agreed that the method could be used as a reference or be tailored to the needs of other airports of the Region, and expressed its interest in presenting the results of the calculations at Ezeiza and/or Aeroparque at the next ATFM meeting/workshop. SAM/IG/20-IP/09 and its appendix show details of the development of the methodology used.

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
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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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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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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		
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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) Mcal. Lopez /22 de setiembre Edif. Ministerio de Defensa Nacional Asunción Paraguay Tel./Fax: +595 21205365 Cel.: +595 981841794 Email: atm_gna@dinac.gov.py	**1. Unidad de Flujo (SGAS) – FMU SGAS (Unidad Operativa)** Current responsible / Responsable actual de dicha Unidad: ATCO. Alejandro Amarilla Tel./Fax: +595 21 758-5110 Tel.: +595 971180665 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 dicha 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
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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	

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
Others / Otros	**INTERNATIONAL ORGANIZATIONS / ORGANIZACIONES INTERNACIONALES**	**ICAO / OACI**
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*Updated SAM/IG/20 / Actualizados en la SAM/IG/20

APPENDIX B

ATFM SURVEY

ATFM SURVEY	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	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.	**NO**	**NO**	**YES**	**YES**	**YES**	**YES**			**YES**	**YES**	**YES**		**YES**	**YES**	Panama: The responsible is the Control Centre Supervisor Argentina plans to implement an FMP for the second half of 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 URUGUAY: ACC MVD
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**	**YES**	**YES**	**YES**	**NO**	**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**	**0**	**0**	**1**		**1**	**0**	**17**		**0**	**0**	**Argentina**: Has defined a method, and is starting to calculate. **Bolivia**: SLLP, SLCB and SLVR **Brazil:** Apron capacity calculations have been performed for one airport (Guarulhos international airport in São Paulo-SP). This information was provided by GRU- (Guarulhos Airport Administration). Rio de Janeiro International Airport (SBGL) has also performed platform capacity calculations, has not yet reported values. **Chile:** We believe that SCEL, SCIE, and Loa de Calama require this calculation. **Colombia**: None. It is required for several airports since airport capacity is not being managed to address growing demand. **Ecuador**: None of the airports in the country has apron capacity calculations. However, it is estimated that the airports of Quito, Guayaquil, require these 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 and SULS. **Venezuela**: None. We still do not have personnel duly trained to conduct these calculations, and do we have airdromes to perform calculation: international airport of Maiquetía, Margarita and Barcelona
6. Number of operations per hour at the airport considered to be the most important one:															**Chile**: SCEL **Peru:** SPIM.

ATFM SURVEY	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
Runway capacity	**SAEZ** **SACO** **See Obs.**	**SLLP 16**	**SBGR 52**	**SCEL 40**	**SKBO 70**	**SEQU 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: 21 average, max 30
Apron capacity	**NO**	**NO**	**SBGR 90**	**NO**	**NO**	**NO**	**NO**	**NO**	**MPTO 49**	**NO**	**SPJC**	**NO**	**NO**	**NO**	**Argentina**: Has started calculations.
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
Runway capacity	**20**	**12**	**18**	**15**	**4**	**1**	**3**		**2**	**3**	**8**		**5**	**5**	
Apron capacity	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**3**	**NO**	**NO**	**NO**	**Brazil**: The methodology and training of personnel for this task are the responsibility of the concessionaire.
ATS sector capacity	**5**	**10**	**20**	**4**	**4**	**1**	**3**		**2**	**3**	**8**		**5**	**6**	**Argentina**: Completed courses in June 2017. 10 people are now trained.

Updated SAM/IG/20

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

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

a) WP/07 **–** Follow-up to the implementation of AMHS interconnections (presented by the Secretariat);
b) IP/05 **–** Implantación del nuevo sistema de mensajería aeronáutica AMHS/AIDA-NG (presented by Venezuela) (*Spanish only*); and
c) IP/07 **–** Impacto estimado en el riesgo de colisión vertical con el uso de la vigilancia ADS-B satelital en la Región NAT (presented by AIREON) (*Spanish only*).

4.2 All the aforementioned papers addressed the following item:

- Activities carried out under Project D2, ATN ground-ground and air-ground applications.

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

4.3 The Meeting took note of the progress made and the actions taken for the implementation of the AMHS interconnection in each State in the SAM Region.

Argentina

4.4 Regarding the Ezeiza-Lima AMHS interconnection, the Lima AMHS system still had problems for processing AMHS messages sent by Argentina that contained optional information in the message header (section 3.3.3 Text, Chapter 3, Part II of ICAO Doc 9880). Argentina reported (teleconference held on 9 October 2017) that this problem had not arisen during AMHS interconnection tests conducted with Chile, Brazil and Uruguay. In this regard, Argentina would conduct the same tests with Venezuela or Colombia, which had installed AMHS systems from the same manufacturer as Peru. Tests with Venezuela were to be conducted in November 2017.

4.5 The Ezeiza-Montevideo AMHS interconnection still had problems with the transmission of AFTN messages from Argentina to Uruguay. Argentina had received information from Brazil regarding the configuration of the Brasilia MTA for the interconnection with Uruguay. Argentina had made arrangements with Skysoft, the manufacturer of the AMHS equipment of Argentina, for the adoption of the required measures to solve the problem.

4.6 Regarding the Ezeiza-Brasilia AMHS interconnection, pre-operational tests were conducted in early September 2017, with positive results. In order to migrate to the operational phase, Skysoft would load the global AMHS address directory in the Ezeiza AMHS system. Argentina, through ICAO, had started arrangements for registering and requesting the global AMHS address directory from the EUROCONTROL ATS Messaging Management Centre (AMC), and for designating an external AMHS operator to the AMC.

4.7 Regarding the Ezeiza-Santiago de Chile AMHS interconnection, operational tests had been conducted and the migration to the operational phase was scheduled for the first week of November 2017.

4.8 Regarding interregional AMHS connections, Argentina informed about the conduction of positive IP interconnectivity tests between the Ezeiza MTA and the Madrid MTA. This circuit was not contemplated in the CAR/SAM Regional Air Navigation Plan (Doc 8733). For these tests, Argentina and Spain had implemented an MPLS circuit through local communication providers. Regarding migration of the circuit with Johannesburg from AFTN to AMHS, it could start in 2018, once the modernisation of the Ezeiza CAFSAT node had been completed. Satisfactory interoperability tests (IOT) had also been conducted between the Ezeiza MTA and the SITA Gateway in Atlanta.

Bolivia

4.9 Regarding the La Paz-Lima AMHS interconnection, positive IP interconnectivity tests were conducted in September. Operational tests were scheduled throughout October 2017.

Brazil

4.10 In early July 2017, the AMHS circuit between Brasilia and Georgetown, Guyana, came on line again.

4.11 Regarding the Brasilia-Montevideo AMHS interconnection, tests were carried out successfully. The only thing pending for operational start-up was for Uruguay to change the AMHS test addresses with operational addresses. Activities for changing the addresses would take place in Uruguay with the support of the provider for the certification of test protocols.

4.12 Regarding the Brasilia-La Paz AMHS interconnection, tests would be carried out after completing the AMHS interconnection between La Paz and Lima, possibly during the first quarter of 2018.

4.13 Regarding the Brasilia-Asunción AMHS interconnection, tests were to be carried out once the manufacturer of the Paraguayan AMHS system had updated the Asunción AMHS.

4.14 Regarding the Brasilia-Suriname AMHS interconnection, tests would be carried out once INTELCAN had updated its AMHS system.

4.15 Regarding interregional AMHS interconnections, Brasilia-Madrid was already implemented and awaiting for Spain to set the commissioning date, which depended on the start up of the operational interconnection between the Brasilia MTA and the SITA Gateway in Atlanta.

4.16 As to the Brasilia-Dakar interconnection through the AFISNET network, no progress had been made in its implementation.

4.17 Regarding the Brasilia-Atlanta AMHS interconnection through the MEVA III/REDDIG II interconnection, a teleconference was held during the Meeting with an FAA representative, to analyse the implementation of an initial circuit configuration, which would also be used for the implementation of the Lima-Atlanta and Caracas-Atlanta AMHS connections. The FAA also informed that it would send, through the Regional Office, a form to allow Peru and Venezuela to start procedures for the AMHS connection with Atlanta. That same day, the FAA sent the form and the Secretariat delivered it to the delegates of Peru and Venezuela. In order to continue analysing the circuit configuration to be implemented, a second teleconference was scheduled for 26 October 2017 with the participation of Brazil and the FAA.

Chile

4.18 The Lima-Santiago de Chile AMHS interconnection was already operational, with no problems. The status of the Santiago de Chile-Ezeiza AMHS interconnection is described in the section on Argentina.

Colombia

4.19 Regarding the Bogota-Panama AMHS interconnection, operational interconnection tests were conducted successfully through the MEVAIII/REDDIGII interconnection. Based on these results, coordination would start with the MEVA III communication provider to implement the Bogota-Panama AMHS circuit. The test circuit was provided by the MEVA III communication provider on a provisional basis.

Ecuador

4.20 No progress was reported in the implementation of the AMHS interconnection between the Quito MTA and the Bogota MTA.

French Guiana

4.21 A new AMHS system (COMSOFT) would start operating in January 2018 but AMHS tests with the corresponding SAM States would be conducted in October or November 2018. Prior to the implementation of AMHS interconnections, France would install security equipment to prevent possible cyber threats.

Guyana

4.22 The AMHS interconnection between the Georgetown MTA and the Brasilia MTA was operational since July 2017.

Panama

4.23 Regarding the status of implementation of the AMHS interconnection between the Panama MTA and the Bogota MTA, see paragraph 4.19.

4.24 Panama reported a change in parameter O (Organization name) of its CAAS addressing, which was updated in the AMC on AIRAC date 12 October 2017.

4.25 Panama also reported that it had signed the technical letter required by the FAA to start the implementation of the AMHS interconnection between the Panama MTA and the Atlanta MTA through the MEVA III regional network, starting with the interconnectivity tests. The letter had been signed on 30 May 2017. The circuit that had been considered for the interconnectivity test is shown in **Appendix** A to this agenda item. The interconnectivity document shown in **Appendix B** would be used for interconnectivity tests.

Paraguay

4.26 No progress was reported in AMHS interconnection tests with Brazil (for more information, see paragraph 4.13).

Peru

4.27 Regarding the Lima-La Paz AMHS interconnection, positive IP connectivity tests had been conducted between the two MTAs. Operational tests would be carried out during October 2017 (for more information, see paragraph 4.9). For information on the status of implementation of the interconnection between the Lima MTA and the Ezeiza MTA, see paragraph 4.4, and for the interconnection between the Lima MTA and the Maiquetía MTA, see paragraph 4.30.

Suriname

4.28 The contract with INTELCAN for updating the AMHS system would be signed before the end of this year. Once this process had been completed, AMHS interconnection tests between the Paramaribo MTA and Brasilia would be resumed.

Uruguay

4.29 Regarding the status of implementation of the AMHS interconnection between the Montevideo MTA and the Brasilia MTA, see paragraph 4.11 and for the interconnection between the Montevideo MTA and the Ezeiza MTA, see paragraph 4.5.

Venezuela

4.30 The new AMHS system started operating on 20 September 2017 and the corresponding aeronautical information circular (C03/A03) was published on 14 September 2017 (see Appendix A to WP/07). AMHS interconnection tests were started with Colombia, to be completed in October 2017. Likewise, AMHS interconnection tests with Trinidad and Tobago were scheduled for October, and in November with the other States with whom Venezuela had AMHS interconnection requirements.

Other AMHS considerations

Declaration of Bogota

4.31 The Declaration of Bogota contemplated the implementation of 26 AMHS interconnections by the end of 2016. To date, 14 AMHS interconnections had been implemented, 10 of which were in the operational phase and the remaining in the pre-operational phase, waiting for the States to migrate to the operational phase. Accordingly, the level of implementation was 58%.

Status of implementation of AMHS interconnections and AMHS focal points

4.32 The status of implementation of all AMHS interconnections in the SAM Region and the estimated dates of their operational implementation appear in **Appendix C**, which shows that all AMHS interconnections listed in Table CNS II-1 of Volume II of the CAR/SAM Regional Air Navigation Plan (Doc 8733) were expected to be completed by June 2019. **Appendix D** contains the updated list of focal points for the implementation of AMHS interconnections.

Actions concerning EUROCONTROL AMC

4.33 The Meeting was reminded of the need for States to communicate any change they made to AMHS addressing to the EUROCONTROL ATS Messaging Management Centre (AMC), in accordance with the procedure established in ICAO State letter AN 7/49.1-09/34 dated 14 April 2009. According to this procedure, the communication to the AMC had to be sent by an external operator designated by the State.

4.34 The Meeting took note of the change made by Panama to parameter O (Organization name) of its CAAS addressing from MPTO to MPZL. Panama had reported the change to the AMC and it was already recorded in the AMC since 12 October. In this regard, it was noted that all the States of the Region should update their AMHS addressing table accordingly.

4.35 The Meeting took note that not all the States of the Region had designated or updated their candidate as external operator to the AMC, and recalled that this process was to be done at the following website http://www.eurocontrol.int/amc. In this sense, the SAM/IG had formulated conclusion SAM/18/02 *Nomination and registration of SAM candidates for EUROCONTROL AMC.* To date, the following SAM States had not registered external operators: Argentina, Chile, Guyana, Panama, Suriname and Uruguay.

Advanced AMHS course

4.36 The Meeting took note that the Eleventh Coordination Meeting of Project RLA/06/901 had approved the delivery of the advanced AMHS course requested at the SAM/IG/19 meeting. The content of the advanced AMHS course is shown in Appendix D to WP/07.

AMHS connection between the Brasilia and Ezeiza MTAs and the SITA Gateway

4.37 The Meeting took note of the progress made in the implementation of the AMHS interconnection between the Brasilia and Ezeiza MTAs and the SITA AMHS Gateway. Once implemented, these interconnections would allow airlines that lacked AFTN/AMHS terminals to access the international AFTN/AMHS network through SITA in order to deliver and receive flight plan information, MET information and other flight data of interest. It was noted that the AMHS connection between the SITA Gateway and the Brasilia MTA would come on line on 7 December 2017. Regarding the AMHS interconnection between the Ezeiza MTA and the SITA Gateway, it was noted that Ezeiza was having problems because its MTA did not accept the XF addressing scheme and ANSPs that used this addressing scheme would not be able to exchange messages with Ezeiza. In this regard, Argentina noted that it was analysing a solution to this problem.

COMMUNICATION NETWORK

4.38 The Meeting took note that the network infrastructure and connections for supporting ATM services were typically designed individually for each service (voice, radar data, AMHS, etc.), which led to higher individual costs and a complex network operation. In order to change to modern IP networks, FREQUENTIS presented solutions for the integration and migration to IP connectivity of existing infrastructures, following international standards. It also explained how intelligent networks, the so-called software-defined networks (SDN), could improve service availability while reducing overhead and bandwidth requirements.

4.39 FREQUENTIS also explained that they could not only provide and install such networks, but also provide technical advice or develop the migration project. These general concepts should also take into account operational requirements and priorities, such as available and/or planned infrastructure. Furthermore, not only the air navigation service provider (ANSP) would need to be involved, but also the provider of the physical connections, typically national telephone companies. FREQUENTIS already had regional SDN experience in Latin America (Brazil and Colombia) and worldwide.

Operational integration of international AIDC connections in the SAM Region

4.40 Regarding this activity, the Meeting took note of the progress made in AIDC interconnections. These activities are discussed in detail under Agenda Item 5.

Ground-air applications

Space-based ADS-B over the REDDIG II

4.41 The Meeting took note that the Eleventh Coordination Meeting of Project RLA/06/901 (RCC/11) had approved the conduction of a study in May 2018 on the convenience and feasibility of the regional Space ADS-B service proposed by AIREON, to be submitted to the SAMIG/21 meeting. AIREON would assist the expert that would conduct such study by providing the required information.

4.42 AIREON presented an update of the global deployment of the space-based ADS-B system, and informed that on 9 October 2017, it had made the third launching, placing ten more satellites into orbit, totalling 30 satellites of the 66 foreseen to be in operation in space.

4.43 AIREON also noted that it would provide, free of charge, any available information on the position of aircraft that might have suffered an accident to search and rescue centres. This required prior registration, which would be available by the begining of 2018 on the Aireon website (www.aireon.com).

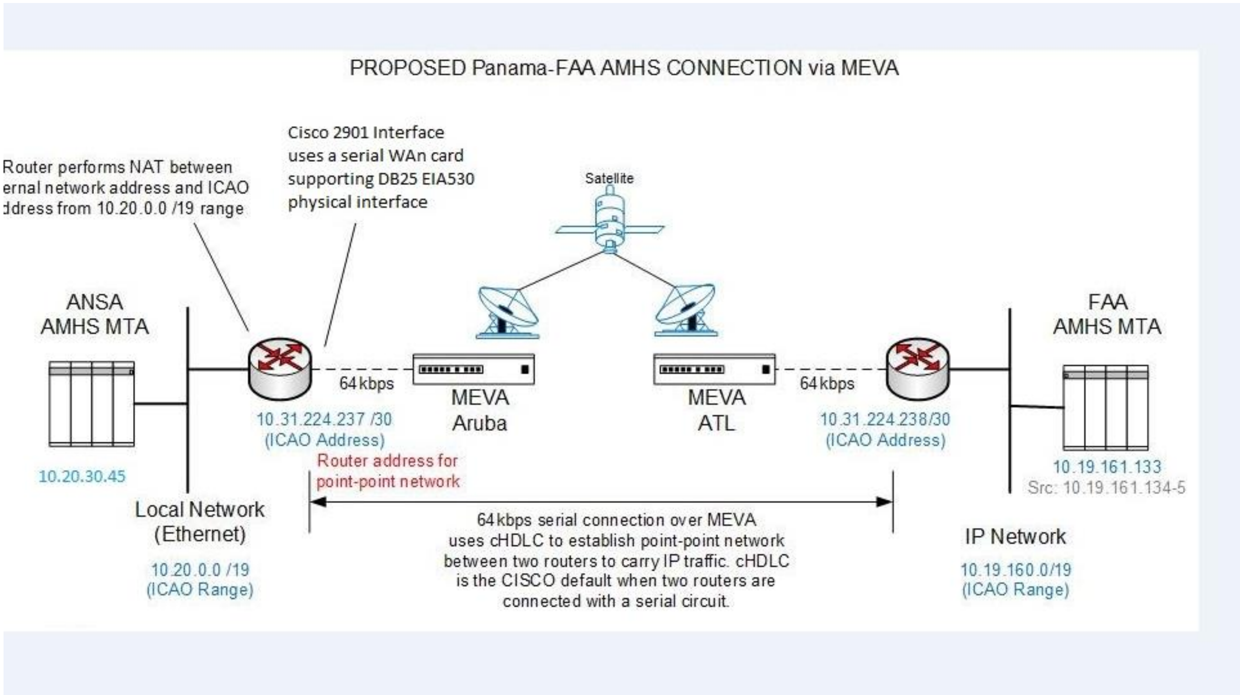
4.44 It also presented a study showing that the vertical data verification and frequent position updates to be provided by space-based ADS-B, when operational, could reduce vertical collision risk, since ATM systems equipped with selected flight level (SFL) processing and display, including cross-checking with the cleared flight level (CFL), would benefit from more accurate and frequent information (every 1.5 seconds) from the space-based ADS-B, providing advanced indication of aircraft intending to fly a path other than the authorised one.

D-ATIS over the REDDIG II

4.45 The Meeting took note that the administrations of Brazil and Paraguay, with the support of SITA, had signed a Technical Cooperation Agreement, by virtue of which the airports of Asunción and Ciudad del Este, which had automated tower services, would be able to use the REDDIGII to send digital ATIS information to the D-ATIS processor of Brazil’s DECEA in Rio, for subsequent delivery to the SITA ACARS processor for processing and distribution within the SITA data link network.

APPENDIX A

Proposed Panama-Atlanta AMHS connection via MEVA



APPENDIX B

Interoperability Test Plan of AMHS Service Between the United States and Panama

Interoperability Test Plan of AMHS Service Between the United States and Panama

Version 1.0

5 September 2017

DOCUMENT CONTROL LOG

Version	Page	Reason for Change	Date	Name	Note
1.0		Generated initial document.	September 5, 2017	FAA	

1 Test Objectives

1.1 This document describes the procedures for the AMHS interoperability test between the United States and Panama. The objectives of the test are as follows:

- Test that both systems successfully connect, in accordance with the stated Interoperability Test
- To highlight any potential issues in the connected systems and identify any mitigation required

2 Test Environment

2.1 This Interoperability testing will be carried out on the environment detailed in xxxxxx. [Further written information can be provided here, if needed.]

3 Test Schedule

3.1 The test will comprise the following steps.

Step 1.	Establish VPN connection between test systems.
Step 2.	Run the tests described in section 5.
Step 3.	Confer between states regarding test results.

The specific dates and times of test schedules will be agreed to via email exchange between the states involved.

4 Considerations for Document Update

<u>NOTES to PANAMA</u>: While reviewing this document, please note the following:

1. **The following addresses have been used for PANAMA:**

   AFTN: MPPCFTNA

   AMHS: MPPCYFYX

   These addresses are used throughout the document and are also specified in Appendix B. If different addresses are to be used, please make the appropriate changes in the test scripts and in Appendix B (all addresses to be used should be shown in Appendix B).

2. **Not all tests will apply in all cases. For instance, if one party does not have an AFTN system included in their configuration, then those tests that require the generation of a message from an AFTN position should be marked as Not Applicable (N/A) at the start of Section 5 where indicated. Also, certain tests are designed to utilize an adjacent partner MTA to originate or receive a message; these may need to be marked as N/A if there is no adjacent partner. Note that in some cases, the FAA has modified the body of these tests to create valid tests in order to exercise a variety of addresses to be sent and received. Questions regarding these tests can be directed to the FAA**.

3. **Numerous tests in the latter portion of the document call for testing using adjacent addresses. The FAA has attempted to insert suitable addresses where needed. These have been highlighted in yellow and should be verified/modified by Panama.**

5 Test Scripts

NOTE: The following tests are considered Not Applicable to this Interoperability Test and therefore will not be executed:

[5.38]

5.1 Submit, Transfer and Deliver an IPM (US-PANAMA)

Test Script Title: Submit, transfer and deliver an IPM (US-PANAMA); IT101 and IT801.		
Test Criteria: This test is successful if the US MTA transfers the submitted messages (IPM) correctly with different ATS-message-priorities to the PANAMA MTA which delivers the ATS messages (IPM) to the PANAMA AMHS. From the UA of US, send a sequence of five ATS messages (IPMs) to the PANAMA AMHS.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From the US AMHS (UA) send Message 1, priority KK to address MPPCYFYX (PANAMA AMHS)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI: non-urgent -the ATS-message-filing-time and -the ATS-message-text	
b) From the US AMHS (UA) send Message 2, priority GG to address MPPCYFYX (PANAMA AMHS)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI: non-urgent -the ATS-message-filing-time and -the ATS-message-text	
c) From the US AMHS (UA) send Message 3, priority FF to address MPPCYFYX (PANAMA AMHS)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI:normal -the ATS-message-filing-time and -the ATS-message-text	
d) From the US AMHS (UA) send Message 4, priority DD to address MPPCYFYX (PANAMA AMHS)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI:normal -the ATS-message-filing-time and -the ATS-message-text	
e) From the US AMHS (UA) send Message 5, priority SS to address MPPCYFYX (PANAMA AMHS)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI:urgent -the ATS-message-filing-time and -the ATS-message-text	

	Check Receipt Notification sent back to US AMHS	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.2 Submit, Transfer and Deliver an IPM (PANAMA-US)

Test Procedure	Expected Results	P/F
Test Script Title: Submit, transfer and deliver an IPM (PANAMA-US);IT102.		
Test Criteria: This test is successful if the PANAMA MTA transfers the submitted messages (IPM) correctly with different ATS-message-priorities to the US MTA which delivers the ATS messages (IPM) to the US AMHS. From the UA of PANAMA, send a sequence of five ATS messages (IPMs) to the US AMHS.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From the PANAMA AMHS (UA) send Message 1, priority KK to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI: non-urgent -the ATS-message-filing-time and -the ATS-message-text	
b) From the PANAMA AMHS (UA) send Message 2, priority GG to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI: non-urgent -the ATS-message-filing-time and -the ATS-message-text	
c) From the PANAMA AMHS (UA) send Message 3, priority FF to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI:normal -the ATS-message-filing-time and -the ATS-message-text	
d) From the PANAMA AMHS (UA) send Message 4, priority DD to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI:normal -the ATS-message-filing-time and -the ATS-message-text	
e) From the PANAMA AMHS (UA) send Message 5, priority SS to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI:urgent -the ATS-message-filing-time and -the ATS-message-text	

	Check Receipt Notification sent back to PANAMA AMHS	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.3 Convert an AFTN Message to AMHS Format (US to PANAMA)

Test Script Title: Convert an AFTN message to AMHS format (US to PANAMA); IT202.		
Test Criteria: Conversion of messages with different AFTN priorities, sent from the AFTN terminal of US, converted to AMHS and received at PANAMA.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From the US AFTN terminal, create and send an AFTN Message with priority KK to address MPPCYFYX (PANAMA UA)	Check the correct reception of the message on the PANAMA AMHS system. Check and confirm -the ATS-message-priority: PRI: non-urgent -the ATS-message-filing-time and -the ATS-message-text	
b) From the US AFTN terminal, create and send an AFTN Message with priority GG to address MPPCYFYX (PANAMA UA)	Check the correct reception of the message on the PANAMA AMHS system. Check and confirm -the ATS-message-priority: PRI: non-urgent -the ATS-message-filing-time and -the ATS-message-text	
c) From the US AFTN terminal, create and send an AFTN Message with priority FF to address MPPCYFYX (PANAMA UA)	Check the correct reception of the message on the PANAMA AMHS system. Check and confirm -the ATS-message-priority: PRI: normal -the ATS-message-filing-time and -the ATS-message-text	
d) From the US AFTN terminal, create and send an AFTN Message with priority DD to address MPPCYFYX (PANAMA UA)	Check the correct reception of the message on the PANAMA AMHS system. Check and confirm -the ATS-message-priority: PRI: normal -the ATS-message-filing-time and -the ATS-message-text	
e) From the US AFTN terminal, create and send an AFTN Message with priority SS to address MPPCYFYX (PANAMA UA)	Check the correct reception of the message on the PANAMA AMHS system. Check and confirm -the ATS-message-priority: PRI: urgent -the ATS-message-filing-time and -the ATS-message-text Check Receipt Notification sent back to FAA AMHS and	

	AFTN ACK message received at FAA AFTN Originator.		
Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.4 Convert an AFTN Message to AMHS Format (PANAMA to US)

Test Script Title: Convert an AFTN message to AMHS format (PANAMA to US); IT201.		
Test Criteria: Conversion of messages with different AFTN priorities, sent from the AFTN terminal of PANAMA, converted to AMHS and received at the US.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From the PANAMA AFTN terminal, create and send an AFTN Message with priority KK to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI: non-urgent -the ATS-message-filing-time and -the ATS-message-text	
b) From the PANAMA AFTN terminal, create and send an AFTN Message with priority GG to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI: non-urgent -the ATS-message-filing-time and -the ATS-message-text	
c) From the PANAMA AFTN terminal, create and send an AFTN Message with priority FF to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI:normal -the ATS-message-filing-time and -the ATS-message-text	
d) From the PANAMA AFTN terminal, create and send an AFTN Message with priority DD to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI:normal -the ATS-message-filing-time and -the ATS-message-text	
e) From the PANAMA AFTN terminal, create and send an AFTN Message with priority SS to address KATLATNA (US AMHS)	Check the correct reception of the message on the US system. Check and confirm -the ATS-message-priority: PRI:urgent -the ATS-message-filing-time and -the ATS-message-text Check Receipt Notification sent back to PANAMA AMHS and AFTN ACK message received at PANAMA AFTN Originator.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.5 Convert an IPM to AFTN Format (US-PANAMA)

Test Script Title: Convert an IPM to AFTN format (US-PANAMA); IT301.		
Test Criteria: This test is successful if the receiving (PANAMA) AMHS converts IPMs correctly into AFTN format. Tested functionality is the conversion of messages with different ATS-message-priorities; for example, a KK priority message, will be submitted from the UA of US, converted to AFTN by the PANAMA AMHS and received at the AFTN terminal of PANAMA.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From the US AMHS (UA) send Message 1, priority KK to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI: KK -the ATS-message-filing-time and -the ATS-message-text	
b) From the US AMHS (UA) send Message 2, priority GG to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI: GG -the ATS-message-filing-time and -the ATS-message-text	
c) From the US AMHS (UA) send Message 3, priority FF to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI: FF -the ATS-message-filing-time and -the ATS-message-text	
d) From the US AMHS (UA) send Message 4, priority DD to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI: DD -the ATS-message-filing-time and -the ATS-message-text	
e) From the US AMHS (UA) send Message 5, priority SS to address MHTGFPLX (PANAMA AFTN)	Check the correct reception of the message on the PANAMA system. Check and confirm -the ATS-message-priority: PRI: SS	

	-the ATS-message-filing-time and -the ATS-message-text Check Receipt Notification sent back to US AMHS	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.6 Convert an IPM to AFTN Format (PANAMA-US)

<table>
<tr><td colspan="3">Test Script Title: Convert an IPM to AFTN format (PANAMA-US); IT301.</td></tr>
<tr><td colspan="3">Test Criteria: This test is successful if the receiving (US) AMHS converts IPMs correctly into AFTN format. Tested functionality is the conversion of messages with different ATS-message-priorities; for example, a KK priority message, will be submitted from the UA of PANAMA, converted to AFTN by the US AMHS and received at the AFTN terminal of US.</td></tr>
<tr><td colspan="3">AMHS Technical Specification reference:</td></tr>
<tr><td>Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td>a) From the PANAMA AMHS (UA) send Message 1, priority KK to address KATLEDIT (US AFTN)</td><td>Check the correct reception of the message on the US system.
Check and confirm
-the ATS-message-priority: PRI: KK
-the ATS-message-filing-time and
-the ATS-message-text</td><td></td></tr>
<tr><td>b) From the PANAMA AMHS (UA) send Message 2, priority GG to address KATLEDIT (US AFTN)</td><td>Check the correct reception of the message on the US system.
Check and confirm
-the ATS-message-priority: PRI: GG
-the ATS-message-filing-time and
-the ATS-message-text</td><td></td></tr>
<tr><td>c) From the PANAMA AMHS (UA) send Message 3, priority FF to address KATLEDIT (US AFTN)</td><td>Check the correct reception of the message on the PANAMA system.
Check and confirm
-the ATS-message-priority: PRI: FF
-the ATS-message-filing-time and
-the ATS-message-text</td><td></td></tr>
<tr><td>d) From the PANAMA AMHS (UA) send Message 4, priority DD to address KATLEDIT (US AFTN)</td><td>Check the correct reception of the message on the PANAMA system.
Check and confirm
-the ATS-message-priority: PRI: DD
-the ATS-message-filing-time and
-the ATS-message-text</td><td></td></tr>
<tr><td>e) From the PANAMA AMHS (UA) send Message 5, priority SS to address KATLEDIT (US AFTN)</td><td>Check the correct reception of the message on the PANAMA system.
Check and confirm
-the ATS-message-priority: PRI: SS
-the ATS-message-filing-time and
-the ATS-message-text</td><td></td></tr>
</table>

		Check Receipt Notification sent back to PANAMA AMHS	

Test Result:	PASS	FAIL	INCONCLUSIVE

5.7 Convert an AFTN Message to AMHS and Back to AFTN Format (PANAMA to US)

Test Script Title: Convert an AFTN message to AMHS and back to AFTN format (PANAMA to US); IT401.		
Test Criteria: This test is successful if PANAMA AMHS converts AFTN user messages correctly to AMHS messages (IPM) and the IPMs are converted back to AFTN in the US. Conversion of messages with different AFTN priorities will be sent from the AFTN terminal of PANAMA to the AFTN terminal of US via the AMHS connection.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From the PANAMA AFTN terminal, create and send an AFTN Message with priority KK to address KATLEDIT (FAA AFTN)	Check the correct reception of the message on the US AFTN system. Check and confirm -the ATS-message-priority: PRI: KK -the ATS-message-filing-time and -the ATS-message-text	
b) From the PANAMA AFTN terminal, create and send an AFTN Message with priority GG to address KATLEDIT (FAA AFTN)	Check the correct reception of the message on the US AFTN system. Check and confirm -the ATS-message-priority: PRI: GG -the ATS-message-filing-time and -the ATS-message-text	
c) From the PANAMA AFTN terminal, create and send an AFTN Message with priority FF to address KATLEDIT (FAA AFTN)	Check the correct reception of the message on the US AFTN system. Check and confirm -the ATS-message-priority: PRI: FF -the ATS-message-filing-time and -the ATS-message-text	
d) From the PANAMA AFTN terminal, create and send an AFTN Message with priority DD to address KATLEDIT (FAA AFTN)	Check the correct reception of the message on the US AFTN system. Check and confirm -the ATS-message-priority: PRI: DD -the ATS-message-filing-time and -the ATS-message-text	
e) From the PANAMA AFTN terminal, create and send an AFTN Message with priority SS to address KATLEDIT (FAA AFTN)	Check the correct reception of the message on the US AFTN system. Check and confirm -the ATS-message-priority: PRI: SS	

From KATLEDIT, send an AFTN ACK message to the originator of the SS message.	-the ATS-message-filing-time and -the ATS-message-text Check Receipt Notification sent back to PANAMA AMHS and AFTN ACK message received at PANAMA AFTN Originator	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.8 Convert an AFTN Message to AMHS and Back to AFTN Format (US to PANAMA)

Test Script Title: Convert an AFTN message to AMHS and back to AFTN format (US to PANAMA); IT402.		
Test Criteria: This test is successful if US AMHS converts AFTN user messages correctly to AMHS messages (IPM) and the IPMs are converted back to AFTN in the PANAMA. Conversion of messages with different AFTN priorities will be sent from the AFTN terminal of US to the AFTN terminal of PANAMA via the AMHS connection.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From the US AFTN terminal, create and send an AFTN Message with priority KK to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA AFTN system. Check and confirm -the ATS-message-priority: PRI: KK -the ATS-message-filing-time and -the ATS-message-text	
b) From the US AFTN terminal, create and send an AFTN Message with priority GG to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA AFTN system. Check and confirm -the ATS-message-priority: PRI: GG -the ATS-message-filing-time and -the ATS-message-text	
c) From the US AFTN terminal, create and send an AFTN Message with priority FF to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA AFTN system. Check and confirm -the ATS-message-priority: PRI: FF -the ATS-message-filing-time and -the ATS-message-text	
d) From the US AFTN terminal, create and send an AFTN Message with priority DD to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA AFTN system. Check and confirm -the ATS-message-priority: PRI: DD -the ATS-message-filing-time and -the ATS-message-text	
e) From the US AFTN terminal, create and send an AFTN Message with priority SS to address MPPCFTNA (PANAMA AFTN)	Check the correct reception of the message on the PANAMA AFTN system. Check and confirm -the ATS-message-priority: PRI: SS -the ATS-message-filing-time and -the ATS-message-text Check Receipt Notification sent back to FAA AMHS and AFTN ACK message received at FAA AFTN Originator	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.9 Distribute an IPM to AFTN and AMHS Users (PANAMA to US)

Test Script Title: Distribute an IPM to AFTN and AMHS users (PANAMA to US); IT501.		
Test Criteria: This test is successful if the PANAMA AMHS distributes an IPM addressing both an AFTN and an AMHS user correctly. A message will be sent from the PANAMA AFTN terminal to US with Primary Recipients addressing both AFTN and AMHS.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From the PANAMA AFTN terminal, create and send an AFTN message with priority FF to addresses KATLEDIT (FAA AFTN) and KATLATNA (FAA AMHS)	Check the correct reception of the messages on the FAA system. Check and confirm -the ATS-message-priority: PRI: FF (on AFTN) -the ATS-message-priority: PRI: normal (on AMHS) -the ATS-message-filing-time and -the ATS-message-text	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.10 Distribute an IPM to AFTN and AMHS Users (US to PANAMA)

<table>
<tr><td colspan="4">Test Script Title: Distribute an IPM to AFTN and AMHS users (US to PANAMA); IT501.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the US AMHS distributes an IPM addressing both an AFTN and an AMHS user correctly. A message will be sent from the US AFTN terminal to PANAMA with Primary Recipients addressing both AFTN and AMHS.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From the US AFTN terminal, create and send an AFTN message with priority FF to addresses MPPCFTNA (PANAMA AFTN) and MPPCYFYX(PANAMA AMHS)</td><td>Check the correct reception of the messages on the PANAMA system.
Check and confirm.
-the ATS-message-priority: PRI: FF (on AFTN)
-the ATS-message-priority: PRI: normal (on AMHS)
-the ATS-message-filing-time and
-the ATS-message-text</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.11 Distribute an IPM to AMHS and AFTN Users (PANAMA to US) including Primary, Copy and Blind Copy Recipients

<table>
<tr><td colspan="4">Test Script Title: Distribute an IPM to AMHS and AFTN users (PANAMA to US) including Primary, Copy and Blind Copy recipients; IT501.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the US AMHS distributes an IPM addressing both an AMHS and an AFTN user correctly. A message will be sent from the PANAMA UA to the US with Primary Recipients, Copy Recipients and Blind Copy Recipients, addressing both AFTN and AMHS.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td>Test Procedure</td><td colspan="2">Expected Results</td><td>P/F</td></tr>
<tr><td>a) From the create AMHS message Box of the PANAMA UA, send a Message, priority FF to:
b) addresses KATLEDIT and KATLATNA as Primary Recipients
c) addresses KATLYTBB and KATLATNB as Copy Recipient
d) addresses KATLYTCC and KATLATNC as Blind Copy Recipients</td><td colspan="2">Check the correct reception of the messages on the US system.
Check and confirm
-the ATS-message-priority: PRI: FF (on AFTN)
-the ATS-message-priority: PRI: normal (on AMHS)
-the ATS-message-filing-time and
-the ATS-message-text
-Check that Primary and Copy Recipients cannot see Blind Copy Recipients</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.12 Expand a DL Addressing Both AMHS and AFTN Users (US-PANAMA).

<table>
<tr><td colspan="4">Test Script Title: Expand a Distribution List addressing both AMHS and AFTN users (US-PANAMA); IT502 TC01 TC04.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the receiving (PANAMA) AMHS distributes an IPM, addressing AMHS and AFTN users in a distribution list correctly. From US AFTN send a message to PANAMA AMHS. The recipient contained in the MTE addresses a distribution list MPPCLIST. The distribution list shall have the addresses of one AMHS user and two AFTN users on PANAMA AMHS as members. The message shall have the dl-expansion-prohibited attribute set to “false”. Check the messages received in each AFTN user address verifying that each one contains its corresponding address.
• This test should be deleted if the distribution list is not used in PANAMA.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) Create a message on US AFTN. Send the message, priority normal, to DL address MPPCLIST.
DL MPPCLIST contains the following addresses:
MPPCYFYX
MPPCFTNA
MPPCYTAB</td><td>Check the correct reception of the messages on PANAMA AMHS system.
Check and confirm
-the ATS-message-priority: PRI: FF (on AFTN)
-the ATS-message-priority: PRI: normal (on AMHS)
-the ATS-message-filing-time and
-the ATS-message-text.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.13 Expand a DL Addressing Both AMHS and AFTN Users (PANAMA-US).

<table>
<tr><td colspan="4">Test Script Title: Expand a Distribution List addressing both AMHS and AFTN users (PANAMA-US); IT502 TC01.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the sending (PANAMA) AMHS expands and distributes an IPM, addressing AMHS and AFTN users in a distribution list correctly. From PANAMA AMHS send a message using a local distribution list that contains AFTN and AMHS addresses in the US. The distribution list shall have the addresses of one AMHS user and two AFTN users in the US as members. The message shall have the dl-expansion-prohibited attribute set to “false”.
• This test should be deleted if the distribution list is not used in PANAMA.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">b) Create a message on PANAMA AMHS. Send the message, priority normal, to DL address MPPCFAAA.
DL MPPCFAAA contains the following addresses:
KATLYTAA
KATLYTAB
KATLATNA</td><td>Check the correct reception of the messages on the US AMHS system.
Check and confirm
-the ATS-message-priority: PRI: FF (on AFTN)
-the ATS-message-priority: PRI: normal (on AMHS)
-the ATS-message-filing-time and
-the ATS-message-text.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.14 Send an IPM to an AFTN User With an ATS-message-text Containing More Than 1800 Characters (PANAMA to US)

<table>
<tr><td colspan="4">Test Script Title: Send an IPM to an AFTN user with an ATS-message-text containing more than 1800 characters (PANAMA to US).</td></tr>
<tr><td colspan="4">Test Criteria: From PANAMA AMHS send an ATS message (IPM) containing ATS-message-text of 2900 characters to a US AFTN recipient.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) Create an AMHS message on PANAMA AMHS with message text of length 2900 and send to address KATLEDIT.</td><td>Check the correct reception of the messages on US system.
Check and confirm
-the ATS-message-priority: PRI: FF (on AFTN)
-the ATS-message-priority: PRI: normal (on AMHS)
-the ATS-message-filing-time and
-the ATS-message-text</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.15 Reject an IPM Sent to a AFTN User if the ATS-message-text Contains More Than 3400 Characters (PANAMA to US)

<table>
<tr><td colspan="4">Test Script Title: Reject an IPM sent to an AFTN user if the ATS-message-text contains more than 3400 characters (PANAMA to US).</td></tr>
<tr><td colspan="4">Test Criteria: From PANAMA AMHS send an ATS message (IPM) containing ATS-message-text of 5000 characters to a US AFTN recipient. Verify that US AMHS does not convert the IPM into AFTN format, but returns an NDR. Check the NDR content received at PANAMA AMHS. Verify that the NDR contains the following elements:
• “unable-to-transfer” for the non-delivery-reason-code;
• “content-too-long” for the non-delivery-diagnostic-code; and
• “unable to convert to AFTN due to message text length” for the supplementary-information.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td>Test Procedure</td><td colspan="2">Expected Results</td><td>P/F</td></tr>
<tr><td>a) Create an AMHS message on PANAMA AMHS with message text of length 5000 and send to address KATLEDIT.</td><td colspan="2">Verify that the US AMHS does not convert the IPM into AFTN format, but returns an NDR. Check the NDR content on the outgoing system for the following elements:
• “unable-to-transfer” for the non-delivery-reason-code;
• “content-too-long” for the non-delivery-diagnostic-code;
• “unable to convert to AFTN due to message text length” for the supplementary-information.</td><td></td></tr>
<tr><td>b) On PANAMA AMHS, confirm that NDR has been received.</td><td colspan="2">Check the NDR content on the incoming for the following elements: -
• “unable-to-transfer” for the non-delivery-reason-code;
• “content-too-long” for the non-delivery-diagnostic-code;
• “unable to convert to AFTN due to message text length” for the supplementary-information.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.16 Split an Incoming IPM Addressing More Than 21 AFTN Users (US to PANAMA)

<table>
<tr><td colspan="5">Test Script Title: Split an incoming IPM addressing more than 21 AFTN users (US to PANAMA); IT504.</td></tr>
<tr><td colspan="5">Test Criteria: This test is successful if the PANAMA AMHS receives an ATS message (IPM) addressing more than 21 AFTN users and splits the received IPM into several messages each addressing 21 or less AFTN users.</td></tr>
<tr><td colspan="5">AMHS Technical Specification reference: 4.5.2.1.8</td></tr>
<tr><td colspan="2">Test Procedure</td><td colspan="2">Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From the US send an ATS message (IPM) to the PANAMA AMHS. The message shall address 50 AFTN users as primary recipients (use MPPCPBAA to MPPCPBBX, as shown in Appendix B)</td><td colspan="2">Verify that the PANAMA AMHS converts the IPM into AFTN format and sends three AFTN messages to its AFTN component. Check the addressee indicators contained in the AFTN messages. Verify that no AFTN recipient is lost and the total number of AFTN addressee indicators contained in all three messages is 50. For example:
• the first AFTN message contains addressee indicators for the first 21 recipients, and
• the second AFTN message contains addressee indicators for the next 21 recipients, and
• the third AFTN message contains addressee indicators for the remaining 8 recipients.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td colspan="2">INCONCLUSIVE</td></tr>
</table>

5.17 Split an Incoming IPM Addressing More Than 21 AFTN Users (PANAMA to US)

Test Script Title: Split an incoming IPM addressing more than 21 AFTN users (PANAMA to US); IT504.		
Test Criteria: This test is successful if the US AMHS receives an ATS message (IPM) addressing more than 21 AFTN users and splits the received IPM into several messages each addressing 21 or less AFTN users.		
AMHS Technical Specification reference: 4.5.2.1.8		
Test Procedure	**Expected Results**	**P/F**
a) From PANAMA send an ATS message (IPM) to the US AMHS. The message shall address 50 AFTN users as primary recipients (use KATLYTAA to KATLYTBX, as shown in Appendix B)	Verify that the US AMHS converts the IPM into AFTN format and sends three AFTN messages to its AFTN component. Check the addressee indicators contained in the AFTN messages. Verify that no AFTN recipient is lost and the total number of AFTN addressee indicators contained in all three messages is 50. For example: • the first AFTN message contains addressee indicators for the first 21 recipients, and • the second AFTN message contains addressee indicators for the next 21 recipients, and • the third AFTN message contains addressee indicators for the remaining 8 recipients.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.18 Probe Conveyance Test (US to PANAMA)

<table>
<tr><td colspan="4">Test Script Title: Probe Conveyance Test (US to PANAMA); IT505 TC01.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the PANAMA system generates a report (Delivery Report or Non-Delivery Report) as indicated, upon receipt of probes.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference: 4.5.5 (reception of AMHS probe), 4.5.6.2.27</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From the US, send AMHS probes to the PANAMA addressing two AFTN recipients (MPTOXXXX and MPPCFTNA) and one AMHS recipient (MPPCYFYX)</td><td>Verify that the PANAMA AMHS returns one Delivery Report with 2 AFTN recipients from the MTCU and one Delivery Report with one recipient from the MTA.

Verify in all cases that the Delivery Reports regarding the AFTN addresses which could be translated contain the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</td><td></td></tr>
<tr><td colspan="2">b) From the US, send AMHS probes to the PANAMA addressing two AFTN recipients, one of which can be mapped (MPPCFTNA) and one of which cannot be mapped onto a valid AFTN address (fill in what you want so the PANAMA AMHS gateway will return a non-delivery for the address in the probe).</td><td>Verify that the PANAMA AMHS returns one Delivery Report and one Non-Delivery Report in response to the probes received.

Verify that the Delivery Report regarding the AFTN address which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.19 Probe Conveyance Test (PANAMA to US)

<table>
<tr><th colspan="4">Test Script Title: Probe Conveyance Test (PANAMA to US); IT505 and TC01.</th></tr>
<tr><th colspan="4">Test Criteria: This test is successful if the US system generates a report (Delivery Report or Non-Delivery Report) as indicated, upon receipt of probes.</th></tr>
<tr><th colspan="4">AMHS Technical Specification reference: 4.5.5 (reception of AMHS probe), 4.5.6.2.27</th></tr>
<tr><th colspan="2">Test Procedure</th><th>Expected Results</th><th>P/F</th></tr>
<tr><td colspan="2">a) From PANAMA, send AMHS probes to the US addressing two AFTN recipients (KATLEDIT and KATLXXXX) and one AMHS recipient (KATLATNA)</td><td>Verify that the US AMHS returns one Delivery Report with 2 AFTN recipients from the MTCU and one Delivery Report with one recipient from the MTA.

Verify in all cases that the Delivery Reports regarding the AFTN addresses which could be translated contain the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</td><td></td></tr>
<tr><td colspan="2">b) From the PANAMA, send AMHS probes to the US addressing two AFTN recipients, one of which can be mapped (KATLEDIT and one of which cannot be mapped onto a valid AFTN address (“PRMD=MA,O=AFTN,OU=MAXXXXXX” – unknown nationality)</td><td>Verify that the US AMHS returns one Delivery Report and one Non-Delivery Report in response to the probes received.

Verify that the Delivery Report regarding the AFTN address which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</td><td></td></tr>
<tr><th>Test Result:</th><th>PASS</th><th>FAIL</th><th>INCONCLUSIVE</th></tr>
</table>

5.20 Stress Load on AMHS Link

Test Script Title: Stress load on AMHS link; IT601, IT903 and IT904.		
Test Criteria: This test is successful if both AMHS systems perform AMHS traffic interchange correctly for a number of messages queued in advance. The load will be built up to 1500 messages with length between 1000 and 2000 characters in the payload.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) On US AMHS, close connection to PANAMA AMHS	Connection is closed, may still indicate connected.	
b) On PANAMA AMHS, create an AMHS message and send it to US AFTN address KATLEDIT with priority normal	A bind error alarm will be generated on PANAMA AMHS and data will be queued on the outgoing channel.	
c) Create another 9 messages and send them to KATLEDIT	All ten messages will be queued on PANAMA AMHS.	
d) On US AMHS, create 10 messages and send to PANAMA AFTN address MPPCFTNA with priority normal	All ten messages will be queued on US AMHS.	
e) Open US connection to PANAMA AMHS	Check the correct reception of the messages on US AFTN system. Check and confirm -the ATS-message-priority: PRI: FF (on AFTN) -the ATS-message-priority: PRI: normal (on AMHS) -the ATS-message-filing-time and -the ATS-message-text Check the correct reception of the messages on PANAMA AFTN system. Check and confirm -the ATS-message-priority: PRI: FF (on AFTN) -the ATS-message-priority: PRI: normal (on AMHS) -the ATS-message-filing-time and -the ATS-message-text	
f) On US AMHS close connection to PANAMA AMHS	Connection is closed, may still indicate connected.	
g) On PANAMA AMHS start message generator to build a queue of 1500 messages of normal priority destined for KATLEDIT. Note that all	All 1500 messages will be queued on PANAMA AMHS.	

messages generated should have a sequence number embedded in the message. Note first number of sequence. Messages should be about 1500 characters in length.		
h) On US AMHS start message generator to build a queue of 1500 messages of normal priority destined for MPPCFTNA. Note that all messages generated should have a sequence number embedded in the message. Note first number of sequence. Messages should be about 1500 characters in length.	All 1500 messages will be queued on US AMHS.	
i) Open connection to PANAMA AMHS	In PANAMA, queue starts to go down after connection established. Verify messages are received at US.	
	In US, queue starts to go down after connection established. Verify messages are received at PANAMA.	
j) When Queue drops to around 750 messages close connection in US	Message flow stops. Note the identifier of last message sent in either direction.	
k) Enable the connection and allow message flow again	At both sites, queue starts to go down after connection established. Verify messages are being received at US and PANAMA. Verify message identifiers and check for message repeats after the re-establishment of the connection.	
l) Confirm that the correct number of messages have been received at each system and that, with relation to the circuit bandwidth confirm that delay was within expected tolerances	Confirm 1510 messages received at US and 1510 messages received at PANAMA.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.21 Submission / Transfer / Delivery Between the Partner MTAs of Recipients Using a Combination of Addressing Schemes (US Sending)

<table>
<tr><td colspan="4">Test Script Title: Submission / Transfer / Delivery between the partner MTAs of recipients using a combination of addressing schemes (US sending); IT701.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the messages from the US are received by PANAMA AMHS and the system elsewhere in another region in PANAMA.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From the US as EDDFYMYX send a message, priority FF (normal) to address MPPCYFYX (CAAS Address)

and to another CAAS address

MPMGABCD(remote user elsewhere in Panama).</td><td>Check the correct reception of the message on the PANAMA system and on the adjacent test system.

-the ATS-message-priority: PRI: normal

-the ATS-message-filing-time and

-the ATS-message-text</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.22 Submission / Transfer / Delivery Between the Partner MTAs of Recipients using a Combination of Addressing Schemes (PANAMA Sending)

<table>
<tr><td colspan="3">Test Script Title: Submission / Transfer / Delivery between the partner MTAs of recipients using a combination of addressing schemes (PANAMA sending); IT702.</td></tr>
<tr><td colspan="3">Test Criteria: This test is successful if the messages from PANAMA are received by the US and its adjacent partner system used in this test.
* This will be a test system mimicking the adjacent partner for this testing.</td></tr>
<tr><td colspan="3">AMHS Technical Specification reference:</td></tr>
<tr><td>Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td>a) From PANAMA send a message, priority FF (normal) to address KATLEDIT (US AFTN)

and to addresses

LEMDZTZX (CAAS: Spain)

and

TJSJYFYX (XF: Puerto Rico).</td><td>Check the correct reception of the message on the US AFTN system and on the adjacent test systems (Spain and Puerto Rico).

-the ATS-message-priority: PRI: normal

-the ATS-message-filing-time and

-the ATS-message-text</td><td></td></tr>
</table>

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.23 Relay of Message Through US MTA Using XF Originator and Destination Addressing Scheme

<table>
<tr><td colspan="4">Test Script Title: Relay of message through US MTA using XF Originator and Destination Addressing Scheme; IT703.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the messages specified are correctly relayed by the US MTA.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From US as RKSIYPYX (Korea) send a message, priority FF (normal) to address MPPCYFYX (PANAMA AMHS).</td><td>Check the correct reception of the message on the PANAMA AMHS.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that MHAAAMHS was correctly relayed through the US MTA.</td><td></td></tr>
<tr><td colspan="2">b) From PANAMA AMHS send a message, priority FF (normal) to address VVCAXXXX (Vietnam).</td><td>Check the correct reception of the message on the US system.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that VABBAICO was correctly relayed through the US MTA.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.24 Relay of Message Through US MTA Using CAAS Originator and XF Destination Addressing Scheme

Test Script Title: Relay of message through US MTA using CAAS Originator and XF Destination Addressing Scheme; IT704 (note that all XF addresses may not be possible).		
Test Criteria: This test is successful if the messages specified are correctly relayed by the US MTA.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From US as OERKKNEO (Saudi Arabia) send a message, priority FF (normal) to address MPLBABCD. Check the correct reception of the message on the PANAMA AMHS system.	Check the correct reception of the message on the PANAMA AMHS system. -the ATS-message-priority: PRI: normal -the ATS-message-filing-time and -the ATS-message-text Check that MPPCYFYX was correctly relayed through the US MTA.	
b) From PANAMA AMHS send a message, priority FF (normal) to address CZYZZQZQ (Canada).	Check the correct reception of the message on the US system. -the ATS-message-priority: PRI: normal -the ATS-message-filing-time and -the ATS-message-text Check that CZYZZQZQ was correctly relayed through the US MTA.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.25 Relay of Message Through US MTA Using XF Originator and CAAS Destination Addressing Scheme

<table>
<tr><td colspan="4">Test Script Title: Relay of message through US MTA using XF Originator and CAAS Destination Addressing Scheme; IT703 (note that all addresses may not be possible).</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the messages specified are correctly relayed by the US MTA.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From US as EGGGYXYF (UK) send a message, priority FF (normal) to address MPDAABCD.</td><td>Check the correct reception of the message on the PANAMA AMHS.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that TNCAXXXX was correctly relayed through the US MTA.</td><td></td></tr>
<tr><td colspan="2">b) From PANAMA [as MPHOABCD] send a message, priority FF (normal) to address VABBAICO (India).</td><td>Check the correct reception of the message on the US system.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that VABBAICO was correctly relayed through the US MTA.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.26 Relay of Message Through US MTA Using CAAS Originator and CAAS Destination Addressing Scheme

Test Script Title: Relay of message through US MTA using CAAS Originator and CAAS Destination Addressing Scheme; IT703.		
Test Criteria: This test is successful if the messages specified are correctly relayed by the US MTA. * An XF address has been substituted.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From US [as RKSIYPYX (Korea)] send a message, priority FF (normal) to address SKBOABCD (Colombia)	Check the correct reception of the message on the PANAMA AMHS. -the ATS-message-priority: PRI: normal -the ATS-message-filing-time and -the ATS-message-text Check that SKBOABCD was correctly relayed through the US MTA.	
b) From PANAMA [as MPLBABCD], send a message, priority FF (normal) to address NFFNZQZX (Fiji).	Check the correct reception of the message on the US system. -the ATS-message-priority: PRI: normal -the ATS-message-filing-time and -the ATS-message-text Check that NFFNZQZX was correctly relayed through the US MTA.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.27 Relay of Message Through PANAMA AMHS to/from K Region Using XF Originator and Destination Addressing Scheme

<table>
<tr><td colspan="4">Test Script Title: Relay of message through PANAMA AMHS to/from K Region using XF Originator and Destination Addressing Scheme; IT705.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the messages to/from ????????* are correctly relayed by PANAMA AMHS.
* This will be a simulated system mimicking the adjacent partner for this testing (if there is one).</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td>Test Procedure</td><td colspan="2">Expected Results</td><td>P/F</td></tr>
<tr><td>a) From MPMGYFYX send a message, priority FF (normal) to address KATLEDIT.</td><td colspan="2">Check the correct reception of the message on the PANAMA AMHS system.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that KATLEDIT was correctly relayed through the PANAMA AMHS.
Check that the message was received at KATLEDIT.</td><td></td></tr>
<tr><td>b) From KATLEDIT send a Message, priority FF (normal) to address MPMGABCD.</td><td colspan="2">Check the correct reception of the message on the PANAMA system.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that MPMGABCD was correctly relayed through the PANAMA AMHS.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.28 Relay of Message through PANAMA AMHS to/from K Region Using CAAS Originator and XF Destination Addressing Scheme

<table>
<tr><td colspan="4">Test Script Title: Relay of message through PANAMA AMHS to/from K Region using CAAS Originator and XF Destination Addressing Scheme; IT706.</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the messages to/from MZBZXXXX* are correctly relayed by PANAMA AMHS.
* This will be a simulated system mimicking the adjacent partner for this testing (if there is one).</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From SVBBYTAA (Venezuela), (or any CAAS originator), send a message, priority FF (normal) to address KATLEDIT.

(((if Panama is able to change their originator)))

Check the correct reception of the message on US AFTN.</td><td>Check the correct reception of the message on US AFTN.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that KATLEDIT was correctly relayed through the PANAMA AMHS.
Check that the message was received at KATLEDIT.</td><td></td></tr>
<tr><td colspan="2">b) From EUCBZMFP (Eurocontrol), (or any CAAS originator), send a Message, priority FF (normal) to address MPPCYFYX.</td><td>Check the correct reception of the message on the PANAMA system.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that MPPCYFYX was correctly relayed through the PANAMA AMHS.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

** There is no CAAS address through PANAMA, so an XF address was substituted.

5.29 Relay of Message through PANAMA AMHS to/from K Region Using XF Originator and CAAS Destination Addressing Scheme

<table>
<tr><td colspan="4">Test Script Title: Relay of message through PANAMA AMHS to/from K Region using XF Originator and CAAS Destination Addressing Scheme; IT704 (note that all XF addresses may not be possible).</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the messages to/from partners are correctly relayed by PANAMA AMHS.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td>Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From PANAMA as TTPPYTAA (XF originator), send a message, priority FF (normal) to address LCCCYNYX (CAAS destination).

(((if Panama is able to change their originator)))</td><td>Check the correct reception of the message on US AFTN.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that LCCCYNYX was correctly relayed through the PANAMA AMHS.</td><td></td></tr>
<tr><td colspan="2">b) From the US as LTACYXYX (XF originator), send a Message, priority FF (normal) to MPPCYFYX and MPLBABCD.</td><td>Check the correct reception of the message on the PANAMA system.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that MPPCYFYX and MPLBABCD were correctly relayed through the PANAMA AMHS.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td>INCONCLUSIVE</td></tr>
</table>

5.30 Relay of Message through PANAMA AMHS to/from K Region Using CAAS Originator and CAAS Destination Addressing Scheme

Test Script Title: Relay of message through PANAMA AMHS to/from K Region using CAAS Originator and CAAS Destination Addressing Scheme; IT704.		
Test Criteria: This test is successful if the messages to/from partners are correctly relayed by PANAMA AMHS.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From PANAMA as MPLBABCD send a message, priority FF (normal) to address LOAAYFYX (CAAS destination).	Check the correct reception of the message on US AMHS. -the ATS-message-priority: PRI: normal -the ATS-message-filing-time and -the ATS-message-text Check that LOAAYFYX was correctly relayed through the PANAMA AMHS.	
b) From the US as ZBBNYXYX (CAAS originator), send a message, priority FF (normal) to address MPHOABCD.	Check the correct reception of the message on the PANAMA AMHS system. -the ATS-message-priority: PRI: normal -the ATS-message-filing-time and -the ATS-message-text Check that MPHOABCD was correctly relayed through the PANAMA AMHS.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.31 Acknowledgement and Service Messaging Tests (US Sending)

Test Script Title: Acknowledgement and service messaging tests (US sending).		
Test Criteria: This test is successful if the correct DN or NDR is sent to the sending station.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From US AFTN send a message, priority SS, to address MPPCFTNA (PANAMA AFTN).	Check the correct reception of the message on the PANAMA AMHS system. Check and confirm -the ATS-message-priority: PRI: urgent -the ATS-message-filing-time and -the ATS-message-text	
b) On PANAMA AMHS, Acknowledge the SS message.	Check Receipt Notification sent back to US.	
c) From US AFTN send a message, priority FF (normal), to MPPCFTNA and MPPCUNKN. The MPPCUNKN address is an AFTN address unknown at PANAMA AMHS but default routed to MTCU.	Trace Message received and forwarded to X400_MTCU. IPM converted to AFTN address, trace forward on message and check SVC ADS message generated. Trace forward and find SVC ADS converted to AMHS NDR. IPM sent back to US with Subject of AFTN Service info Message to MPPCFTNA delivered as expected.	
d) Check at US that IPM with an UNKNOWN SVC message has been received.	UNKNOWN IPM received at US.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.32 Acknowledgement and Service Messaging Tests (PANAMA Sending)

<table>
<tr><td colspan="4">Test Script 22: Acknowledgement and service messaging tests (PANAMA sending).</td></tr>
<tr><td colspan="4">Test Criteria: This test is successful if the correct DN or NDR is sent to the sending station.</td></tr>
<tr><td colspan="4">AMHS Technical Specification reference:</td></tr>
<tr><td>Test Procedure</td><td colspan="2">Expected Results</td><td>P/F</td></tr>
<tr><td>a) From PANAMA AMHS send a message, priority SS, to address KATLEDIT (US AFTN).</td><td colspan="2">Check the correct reception of the message on the US AFTN system.
Check and confirm
-the ATS-message-priority: PRI: urgent
-the ATS-message-filing-time and
-the ATS-message-text</td><td></td></tr>
<tr><td>b) On US AFTN Acknowledge the SS message.</td><td colspan="2">Check Receipt Notification sent back to PANAMA.</td><td></td></tr>
<tr><td>c) From PANAMA AMHS send a message, priority FF (normal), to KATLEDIT and KATLUNKN.
The KATLUNKN address is an AFTN address unknown at US AMHS but default routed to MTCU.</td><td colspan="2">Trace Message received and forwarded to X400_MTCU.
IPM converted to AFTN address, trace forward on message and check SVC ADS message generated.
Trace forward and find SVC ADS converted to AMHS NDR.
IPM sent back to PANAMA with Subject of AFTN service info
Message to KATLEDIT delivered as expected.</td><td></td></tr>
<tr><td>d) Check at PANAMA that IPM with an UNKNOWN SVC message has been received.</td><td colspan="2">UNKNOWN IPM received at PANAMA.</td><td></td></tr>
<tr><td>Test Result: PASS</td><td>FAIL</td><td colspan="2">INCONCLUSIVE</td></tr>
</table>

5.33 Switch-Over Test on PANAMA AMHS

Test Script Title: Switch-Over Test on PANAMA AMHS		
Test Criteria: The test is successful if the call re-establishes on the standby PANAMA AMHS with no message loss. • *If feature is appropriate for PANAMA system. If not, test script should declared N/A.*		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) On PANAMA AFTN start a message stream towards KATLEDIT at a rate of 20 messages per minute.	Messages flowing to KATLEDIT via AMHS connection. Confirm traffic received at US AFTN.	
b) On US AFTN start a similar message stream towards MPPCFTNA.	Messages flowing to MPPCFTNA via AMHS connection. Confirm traffic received at PANAMA AFTN.	
c) On PANAMA AMHS initiate a system switch-over.	Traffic will be interrupted for a brief period while the standby system establishes and then message traffic will be re-established. Check that there is no message loss or repetition on the AMHS link.	
d) Stop the message generation on both systems.		

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.34 Test of Bind Error Events Raised by Distant End Activity as Seen on PANAMA AMHS

Test Script Title: Test of bind error events raised by distant end activity as seen on PANAMA AMHS.		
Test Criteria: Confirm to operator at PANAMA AMHS what bind error event descriptions are raised if the distant end (US) cannot accept X.400 message traffic.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) Ensure both systems are reporting the AMHS/X.400 connection is enabled and reachable. Sent a Probe in both directions to confirm this.	A potentially reachable report is received on both US and PANAMA AMHS systems.	
b) Disconnect the US AMHS application from the network by shutting down the MTA listener service.*	Application is disconnected.	
c) Send an AMHS message from PANAMA AMHS to KATLEDIT (US AFTN).	Bind error reported at PANAMA stating….	
d) Reconnect application at US AMHS, message sent and received.	Bind confirmed and message sent. Confirm message received at US AFTN.	
e) Disconnect the US AMHS application from the network by disabling the input from the MTA channel to the PANAMA.*	Application is disconnected.	
f) Send an AMHS message from the PANAMA AMHS to KATLEDIT (US AFTN).	Bind error reported at PANAMA stating….	
g) Reconnect application at US AMHS, message sent and received.	Bind confirmed and message set. Confirm message received at US AFTN.	
h) On PANAMA AMHS set association limit to 5 (2 default for ATL MTA).##	Application is still connected.	
i) On PANAMA AMHS start a message generator with 100 messages per minute addressed to KATLEDIT (US AFTN).	Two associations binds to US AMHS and sends messages. Bind error reported as PANAMA AMHS tries to establish more than two connection.	
j) Stop message generator	Bind confirmed and message sent. Confirm message	

on PANAMA AMHS and change association limit back to 2. Send a single test message to KATLEDIT.	received at US AFTN.	
k) On US test platform change TSAP listen address from P1 to P2 and leave IP addresses and MTA passwords the same.	Confirm with PANAMA settings change.	
l) Send an AMHS message from PANAMA AMHS to KATLEDIT (US AFTN).	Bind error reported at PANAMA stating….	
m) Change TSAP listen address back to P1.	Message received at US AFTN.	
n) Note password on US test system, then change MTA password on US test system to 'password'.	Change confirmed.	
o) Send an AMHS message from PANAMA AMHS to KATLEDIT (US AFTN).	Bind error reported at PANAMA stating….	
p) Change password back on US test system.	Message received at US AFTN.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

* To replicate a loss of upper layers of connection but with network connectivity still in place.

+ To replicate a network switchover to the Salt Lake City Centre if Atlanta goes offline, assumption that TSAP's are different at each MTA but passwords are the same and that IP address presented to PANAMA as network address is the same.

If the results are not as expected, temporarily set the association in katlmta to 1 and repeat the test.

5.35 Test of Bind Error Events Raised by Distant End Activity as Seen on US AMHS

Test Script Title: Test of Bind Error Events raised by distant end activity as seen on US AMHS.		
Test Criteria: Confirm to operator at US AMHS what Bind Error event descriptions are raised if the distant end (PANAMA) cannot accept X.400 message traffic.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) Ensure both systems are reporting the AMHS/X.400 connection is enabled and reachable. Sent a Probe in both directions to confirm this.	A potentially reachable report is received on both US and PANAMA AMHS systems.	
b) Disconnect the AMHS application at PANAMA AMHS from the network*	Application is disconnected.	
c) Send an AMHS message from US AMHS to MPPCFTNA and MPPCYFYX.	Bind error reported to US Control Position. Check MTA logs and sniffer at FAA.	
d) Reconnect application at PANAMA AMHS, message sent and received.	Bind confirmed and message set. Confirm messages received at PANAMA.	
e) On PANAMA test platform change TSAP from TCP (0x5031) to P2 (0x5032) and leave IP addresses and MTA passwords the same.	Confirm PANAMA settings change.	
f) Send an AMHS message from US AMHS to MPPCFTNA and MPPCYFYX.	Bind error reported to US Control Position. Check MTA logs and sniffer at FAA.	
g) Change TSAP back to TCP (0x5031).	Messages received at PANAMA.	
h) Note password on PANAMA test system then change MTA password on PANAMA test system to 'password'.	Confirm PANAMA password change.	
i) Send an AMHS message from US AMHS to MPPCFTNA and MPPCYFYX.	Bind error reported to US Control Position. Check MTA logs and sniffer at FAA.	
j) Change password back on PANAMA test system.	Messages received at PANAMA.	

Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

*To replicate a loss of upper layers of connection but with network connectivity still in place.

5.36 Test of Validly Formatted Address with Incorrect O Value

Test Script Title: Test of validly formatted address with a valid but incorrect O value.			
Test Criteria: Confirmation of transmission/reception of AFTN messages with a validly formatted CAAS address with a valid, but incorrect 'O' value. (SEE APPENDIX A)			
AMHS Technical Specification reference:			
Test Procedure	**Expected Results**	**Actual Results**	**Obs. Ref.**
a) Change the O value in the PANAMA CAAS addressing table for Germany from EDWW to EDDD.	Changes are accepted on PANAMA AMHS.		
b) Send an AMHS message from MPPCFTNA to EDDMZTZX.	Message sent via US.		
c) Message routed onward to Germany at US AMHS.	Message routed and event logged.		
d) Change the O value in the US CAAS addressing table for Panama from MPZL to HQ	Changes are accepted on US AMHS.		
e) Send an AMHS message from KATLEDIT to MPHOABCD.	Message sent via PANAMA.		
f) Message relayed onward to MPHOABCD at PANAMA AMHS.	Message relayed and event logged.		
Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.37 Test of PRMD Value Not Known to the Receiving AMHS

Test Script Title: Test of PRMD value that is not known to the receiving AMHS.			
Test Criteria: This test is designed to simulate the case where a state changes its PRMD value. An AFTN message will be sent with a validly formatted CAAS address, with a PRMD value that is not known to the receiving AMHS. If the change is not introduced in both sites, an error will occur. (See Appendix A for additional Information regarding this test).			
AMHS Technical Specification reference:			
Test Procedure	**Expected Results**	**Actual Results**	**Obs. Ref.**
a) Add CAAS route SPAINX to PANAMA addressing table and route via US AMHS.	Changes are accepted on PANAMA AMHS.		
b) Send an AMHS message from MPPCFTNA to LEMDZTZX.	Message sent via US.		
c) Message NDR sent from US to MPPCFTNA.	NDR received at PANAMA AMHS.		
d) Add CAAS route PANAMAX to US addressing table and route via PANAMA AMHS. Note: If the system under test has no relays-this may result in the message returned to FAA and a loop detected by FAA MTA.	Changes are accepted on US AMHS.		
e) Send an AMHS message from KATLEDIT to MPLBABCD.	Message sent via PANAMA.		
f) Message NDR sent from PANAMA AMHS to KATLEDIT. Note: If the system under test has no relays-this may result in the message returned to FAA and a loop detected by FAA MTA.	NDR received at US. Note: If the system under test has no relays-this may result in the message returned to FAA and a loop detected by FAA MTA.		
Test Result:	**PASS**	**FAIL**	**INCONCLUSIVE**

5.38 Test of Address Exceptions N/A – There are no exception addresses

Test Script Title: Test of Address Exceptions.			
Test Criteria: Confirmation of transmission/reception of AFTN messages which require Address Exceptions to be configured in both AMHS systems. This occurs when an address begins with Nationality letters that would not normally route to a particular AMHS Management Domain.			
AMHS Technical Specification reference:			
Test Procedure	**Expected Results**	**Actual Results**	**Obs. Ref.**
(a) From PANAMA, send a message from MHTGFPLX to address MHSCYXYX (US AFTN).	Check the correct reception of the message on US AMHS. Check that MHSCYXYX was correctly relayed through the PANAMA AMHS.		
(a) From US AFTN send, send a message from MHSCYXYX to address MHTGFPLX (PANAMA AFTN).	Check the correct reception of the message on PANAMA AMHS. Check that MHTGFPLX was correctly relayed through the PANAMA AMHS.		

Test Result:-	**PASS**	**FAIL**	**INCONCLUSIVE**

5.39 General Text Body Part (US Sending)

Test Script Title: General Text Body Part (US Sending).			
Test Criteria: Confirmation of reception of AMHS message which contains General Text Body Part. This is part of extended services and requires the ability of the sending system to be able to generate such a message.			
AMHS Technical Specification reference:			
Test Procedure	**Expected Results**	**Actual Results**	**Obs. Ref.**
(a) From US UA, send a message with "general text body part" (1,6) to address MPPCFTNA (PANAMA AFTN) and MPPCYFYX (PANAMA AMHS). The content of the text will be ASCII characters only.	Check the correct reception of the message on PANAMA AFTN and AMHS. Check and confirm the use of the IPM heading fields and recipient extensions, in support of the extended ATSMHS. - authorization-time (not present in this test) - originators-reference - precedence-policy-identifier - precedence. Original encoded information types will take the value: OID {id-cs-eit-authority 1},OID {id-cs-eit-authority 6}. A single body part in the IPM body, with the standard extended body part type "general-text-body-part", using General Text character sets 1,6.		
	If the local policy of the AMHS management domain of PANAMA is not to support the use the above attributes, generation of a non-delivery with the following elements :		

	- "unable-to-transfer" for the non-delivery-reason-code - "content-syntax-error" for the non-delivery-diagnostic-code		
b)From the US UA, send a message in ASCII text with "general text body part" (1,6,100) to address MPPCFTNA (PANAMA AFTN) and MPPCYFYX (PANAMA AMHS).	Check the correct reception of the message on PANAMA AFTN and AMHS. Check and confirm the use of the IPM heading fields and recipient extensions, in support of the extended ATSMHS. - authorization-time (not present in this test) - originators-reference - precedence-policy-identifier - precedence. Original encoded information types will take the value: OID {id-cs-eit-authority 1},OID {id-cs-eit-authority 6},and OID {id-cs-eit-authority 100} A single body part in the IPM body, with the standard extended body part type "general-text-body-part", using General Text character sets 1,6,100. If the local policy of the AMHS management domain of PANAMA is not to support the use the above attributes, generation of a non-delivery with the following elements : - "unable-to-transfer" for the non-delivery-reason-		

	code - "content-syntax-error" for the non-delivery-diagnostic-code		
c) From the US UA, send a message with ASCII text and iso-8859-1 characters to address MPPCFTNA (PANAMA AFTN) and MPPCYFYX (PANAMA AMHS).	Check the correct reception of the message on PANAMA AFTN and AMHS. Check and confirm the use of the IPM heading fields and recipient extensions, in support of the extended ATSMHS. - authorization-time (not present in this test) - originators-reference - precedence-policy-identifier - precedence. Original encoded information types will take the value: OID {id-cs-eit-authority 1},OID {id-cs-eit-authority 6}, and OID {id-cs-eit-authority 100} A single body part in the IPM body, with the standard extended body part type "general-text-body-part", using General Text character sets 1, 6, 100. If the local policy of the AMHS management domain of PANAMA is not to support the use the above attributes, generation of a non-delivery with the following elements : - "unable-to-transfer" for		

	the non-delivery-reason-code - "content-syntax-error" for the non-delivery-diagnostic-code		

Test Result:-	PASS	FAIL	INCONCLUSIVE

5.40 General Text Body Part (PANAMA Sending)

Test Script Title: General Text Body Part (PANAMA Sending).			
Test Criteria: Confirmation of reception of AMHS message which contains General Text Body Part. This is part of extended services and requires the ability of the sending system to be able to generate such a message.			
AMHS Technical Specification reference:			
Test Procedure	**Expected Results**	**Actual Results**	**Obs. Ref.**
(a) From PANAMA UA, send a message with "general text body part" to address KATLEDIT (US AFTN) and KATLATNA (US AMHS).	Check the correct reception of the message on US AFTN and AMHS.		
Test Result:-	**PASS**	**FAIL**	**INCONCLUSIVE**

5.41 Alternate Path Test for US AMHS

Test Script Title: Alternate Path Test for US AMHS		
Test Criteria: The test is successful if the call re-establishes on the US Alternate path with no message loss.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) On the US AMHS initiate a change to the alternate path.	US AMHS connected via Alternate path.	
b) From the US AFTN send a message addressed to PANAMA AFTN MPPCFTNA	Check the correct reception of the messages on the PANAMA AFTN system. Check and confirm -the ATS-message-priority: PRI: FF (on AFTN) -the ATS-message-priority: PRI: normal (on AMHS) -the ATS-message-filing-time and -the ATS-message-text.	
c) From PANAMA AFTN send a message addressed to US AFTN KATLEDIT	Check the correct reception of the messages on the US AFTN system. Check and confirm -the ATS-message-priority: PRI: FF (on AFTN) -the ATS-message-priority: PRI: normal (on AMHS) -the ATS-message-filing-time and -the ATS-message-text.	
a) On the US AMHS initiate a change to the normal path.	US AMHS connected via Normal path.	
b) On PANAMA AFTN start a message stream towards KATLEDIT at a rate of 20 messages per minute.	Messages flowing to KATLEDIT via AMHS connection. Confirm traffic received at US AFTN.	
c) On US AFTN start a similar message stream towards PANAMA.	Messages flowing to PANAMA via AMHS connection. Confirm traffic received at PANAMA AFTN.	
d) On US AMHS initiate a change to the alternate path.	Traffic will be interrupted for a brief period while the standby system establishes and then message traffic will be re-established. Check that there is no message loss or repetition on the AMHS link.	
e) Stop the message generation on both		

systems.		

Test Result:	PASS	FAIL	INCONCLUSIVE

5.42 Line Break on 69 Characters

Test Script Title: Line Break on 69 Characters		
Test Criteria: The test will determine if a line break is added after 69 characters.		
AMHS Technical Specification reference:		
Test Procedure	**Expected Results**	**P/F**
a) From PANAMA AFTN (if it is possible to send a message without a line break) or AMHS User agent send a message containing 90 characters in a line of the text message to US AFTN (KATLEDIT).	Messages flowing to US from PANAMA AFTN (if possible) and AMHS Confirm traffic received at KATLEDIT. Verify that there has been no break introduced in the text. The US AMHS does not add a break in the text after 69 characters when sending to our AFTN system because other automated flight processing systems cannot handle the break.	
b) From US AFTN send a message addressed to PANAMA AFTN containing 90 characters in a line of the text of the message.	Messages flowing from US via AMHS connection. Determine if a line break has been added to the message text in the message processing between the PANAMA AMHS and its AFTN system.	

Test Result:	**Line Break Added?**	**INCONCLUSIVE**

5.43 Relay of Message through PANAMA AMHS to/from K Region SITA addressing scheme.

<table>
<tr><td colspan="5">Test Script Title: Relay of message through PANAMA AMHS to/from K Region using SITA Scheme.</td></tr>
<tr><td colspan="5">Test Criteria: This test is successful if the messages to/from partners are correctly relayed by PANAMA AMHS.</td></tr>
<tr><td colspan="5">AMHS Technical Specification reference:</td></tr>
<tr><td colspan="2">Test Procedure</td><td colspan="2">Expected Results</td><td>P/F</td></tr>
<tr><td colspan="2">a) From US as EGGGYXYF (UK) send a message, priority FF (normal) to address LFBCZPZX (SITA), MPFSABCD, LFBOAIBY(SITA),and MPPCFTNA</td><td colspan="2">Check the correct reception of the message on US AFTN.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that LFBCZPZX and LFBOAIBY were correctly relayed through the PANAMA AMHS.</td><td></td></tr>
<tr><td colspan="2">b) From PANAMA enter a message for KATLEDIT, MPFSTEST, LFBDBAWL (SITA) and MUHAZWZX (Cuba).</td><td colspan="2">Check the correct reception of the message on the Trinidad AMHS system.
-the ATS-message-priority: PRI: normal
-the ATS-message-filing-time and
-the ATS-message-text
Check that MUHAZWZX, KATLEDIT and LFBDBAWL were correctly relayed through the PANAMA AMHS.</td><td></td></tr>
<tr><td>Test Result:</td><td>PASS</td><td>FAIL</td><td colspan="2">INCONCLUSIVE</td></tr>
</table>

5.44 Send and Receive when Panama connects to US AMHS in KSLC

1. **Test Script Title: Test Usage of Alternate US AMHS at KSLC center**		
2. **Test Criteria: The test is successful if messages are sent using the US AMHS in KSLC.**		
3. **AMHS Technical Specification reference:**		
4. **Test Procedure**	5. **Expected Results**	6. **P/F**
a) US makes all necessary configuration changes to route all AMHS messages to and from KSLC AMHS.	US AMHS connected via KSLC AMHS.	
b) From PANAMA AFTN send a message addressed to KALTEDIT and RJJJABCD (Japan)	Check the correct reception of the messages on the US AFTN and AMHS system. Check and confirm -the ATS-message-priority: PRI: FF (on AFTN) -the ATS-message-priority: PRI: normal (on AMHS) -the ATS-message-filing-time and -the ATS-message-text. -the message entered into the US at the KSLC AMHS	
c) From US as RJJJYXYX (Japan) send a message addressed to Panama AMHS MPPCYFYX	Check the correct reception of the message on the Panama AMHS system. Check and confirm -the ATS-message-priority: PRI: normal (on AMHS) -the ATS-message-filing-time and -the ATS-message-text. -the message entered into the US at the KSLC AMHS	
d)From the US AFTN send a message from KATLEDIT to Panama MPPCFTNA	Check the correct reception of the message on the Panama AFTN system. Check and confirm -the ATS-message-priority: PRI: FF (on AFTN) -the ATS-message-priority: PRI: normal (on AMHS) -the ATS-message-filing-time and -the ATS-message-text. -the message entered into the US at the KSLC AMHS	

6 Test Recording

6.1 The testing defined in this document was carried out as follows:-

Date(s) of Test	

	Name	Signature
Tester		
Tester		
Tester		
Witness		
Witness		
Witness		

7 Summary of Test

7.1 Include brief summary of observations and any other pertinent information.

Appendix A Additional Information

This section provides additional information for tests 5.36 and 5.37. The purpose of these tests is to introduce potential errors or inconsistencies between the AMHS CAAS or AMHS Management Domain tables at US and PANAMA. The result will be to ensure operational awareness of what might be encountered in these instances. These inconsistencies will usually be handled in the following manner:

1) logging of the inconsistency and transferring the message to its recipient, or

2) generation of a Non Delivery Report for the recipient.

These tests may require temporary change to the CAAS or Management Domain table at US or PANAMA. Data should be captured for analysis.

Detailed message data and addressing information are provided below for these 2 tests.

<u>Test 5-36:</u> Test of validly formatted address with a valid but incorrect O value.

Changes should be made to the tables as shown in RED.

The CAAS addresses to be used for this test are shown in the table below.

	Value (PANAMA)	Value (US)
Common Name	EDDMZTZX	MPHOABCD
C	XX	XX
ADMD	ICAO	ICAO
PRMD	GERMANY	PANAMA
O	EDWW (EDDD)	MPZL (HQ)
OU1	EDDM	MPHO

a) PANAMA to US – Change the PANAMA CAAS table to reflect the values shown in RED in the PANAMA column.

The recipient address that the US AMHS would receive would be:

/C=XX/ADMD=ICAO/PRMD=GERMANY/O=EDDD/OU1=EDDM/CN=EDDMZTZX

GG EDDMZTZX
ddhhmm MPPCFTNA
TEST 5-36 FOR CAAS ADDRESSING WITH INCONSISTENT ORGANIZATION VALUE - TO US FROM PANAMA

We would expect that the inconsistency would be logged and the message would be delivered to the remote MTA or the remote user.

b) US to PANAMA - Change the US CAAS table to reflect the values shown in RED in the US column.

The recipient address that the PANAMA AMHS would receive would be:

/C=XX/ADMD=ICAO/PRMD=PANAMA/O=HQ/OU1=MPHO/CN=MPHOABCD

GG MPHOABCD

ddhhmm KATLEDIT

TEST 5.36 FOR ADDRESSING WITH INCONSISTENT ORGANIZATIONAL VALUE – TO PANAMA FROM US

At the completion of the test, the changes made for this test should be removed. The CAAS addressing for PANAMA and US should reflect the values shown in BLACK in the table above. These are the operational values.

<u>Test 5-37</u> Test of PRMD value that is not known to the receiving AMHS.

Changes should be made to the tables as shown in RED.

The addresses to be used for this test are shown in the table below.

	Value (PANAMA)	Value (US)
Common Name	LEMDZTZX	MPLBABCD
C	XX	XX
ADMD	ICAO	ICAO
PRMD	SPAIN (SPAINX)	PANAMA (PANAMAX)
O	LEEE	MPZL
OU1	LEMD	MPLB

a) PANAMA to US – PRMD with a value of SPAINX is not known to ICAO, FAA, or PANAMA. PANAMA will add the route for PRMD = SPAINX and an entry in the Management Domain table to match the entry in the above table, including what is marked in RED under the PANAMA column.

The recipient address that the US AMHS would receive would be:

/C=XX/ADMD=ICAO/PRMD=SPAINX/O=LEEE/OU1=LEMD/CN=LEMDZTZX

GG LEMDZTZX
ddhhmm MPPCFTNA
TEST 5-37 FOR CAAS ADDRESSING WITH AN UNKNOWN PRMD VALUE - TO US FROM PANAMA

We would expect that the inconsistency would produce a Non Delivery from the US AMHS as that PRMD value is not known to the US AMHS.

b) US to PANAMA - Change the US Management Domain table to reflect the values shown in RED in the US column.

PRMD with a value of PANAMAX is not known to ICAO, US, or PANAMA. US will add the route for PRMD = PANAMAX and an entry in the Management Domain to match the entry in the above table, including what is marked in RED under the PANAMA column.

The recipient address that the PANAMA AMHS would receive would be:

/C=XX/ADMD=ICAO/PRMD=PANAMAX/O=MPZL/OU1=MPLB/CN=MPLBABCD

GG MPLBABCD

ddhhmm KATLEDIT
TEST 5.37 FOR ADDRESSING WITH AN UNKNOWN PRMD VALUE – TO PANAMA FROM US

We would expect that the inconsistency would produce a Non Delivery from the PANAMA AMHS as that PRMD value is not known to the Panama AMHS.

Note: If the system under test has no relays-this may result in the message returned to FAA and a loop detected by FAA MTA.

At the completion of the test, the addressing added for this test should be removed.

Appendix B Address Tables

The following non-operational addresses must be added for test purposes, as detailed in the test scripts in Section 4 above.

Addressing Scheme	**AFTN Address**	**AMHS Address**
USA AMHS ADDRESSING		
XF	KATLATNA	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLATNA
XF	KATLATNB	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLATNB
XF	KATLATNC	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLATNC
XF	KATLEDIT	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLEDIT
XF	KATLYTAA	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAA
XF	KATLYTAB	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAB
XF	KATLYTAC	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAC
XF	KATLYTAD	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAD
XF	KATLYTAE	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAE
XF	KATLYTAF	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAF
XF	KATLYTAG	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAG
XF	KATLYTAH	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAH
XF	KATLYTAI	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAI
XF	KATLYTAJ	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAJ
XF	KATLYTAK	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAK
XF	KATLYTAL	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAL
XF	KATLYTAM	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAM
XF	KATLYTAN	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAN

XF	KATLYTAO	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAO
XF	KATLYTAP	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAP
XF	KATLYTAQ	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAQ
XF	KATLYTAR	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAR
XF	KATLYTAS	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAS
XF	KATLYTAT	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAT
XF	KATLYTAU	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTAU
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XF	KATLYTBX	C=XX/A=ICAO/P=K/O=AFTN/OU1=KATLYTBX
PANAMA AMHS ADDRESSING		
CAAS	MPPCYFYX	C=XX/A=ICAO/P=PANAMA/O=MPZL/OU1=MPPC/CN=MPPCYFYX
CAAS	MPPCFTNA	C=XX/A=ICAO/P=PANAMA/O=MPZL/OU1=MPPC/CN=MPPCFTNA
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CAAS	MPPCPBAB	C=XX/A=ICAO/P=PANAMA/O=MPZL/OU1=MPPC/CN=MPPCPBAB
CAAS	TNCAPBAC	C=XX/A=ICAO/P=PANAMA/O=MPZL/OU1=MPPC/CN=MPPCPBAC
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DL ADDRESSES	
MPPCFAAA	MPPCYFYX MPPCFTNA MPPCYTAB
MPPCLIST	MPPCFPLX MPPCABCD MPPCYFYX

APPENDIX C

AMHS INTERCONNECTION REQUIREMENT AND DATE OF IMPLEMENTATION

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
Argentina	Bolivia	Dec 2018	Pending initial coordination
	Brazil	Nov 2017	Final operational tests for AMHS interconnection between Brasilia and Ezeiza were successfully completed on 18 May 2016. Pending decision from authorities of Argentina and Brazil for operational implementation.
	Chile	Nov 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	Nov 2017	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	Dec 2017	Connectivity in Protocol P1 level between MTA Ezeiza – Montevideo. Operational test foreseen November 2017.
	Venezuela	Dec 2017	Implemented and operational (out of service- failure in AMHS Venezuela) since Dec 2016. Operational since 20 September 2017. Tests foreseen for November 2017.
	SITA (Atlanta)	Dec 2017	Positive connectivity tests carried out. Operation foreseen December 2017.
Bolivia	Argentina	Dec 2018	Pending initial coordination
	Brazil	Jun 2018	Pending initial coordination
	Peru	Mar 2018	IP connectivity between La Paz and Lima MTAs achieved.
Brazil	Argentina	Nov 2017	Final operational tests for AMHS interconnection between Brasilia and Ezeiza were successfully completed on 18 May 2016. Pending decision from authorities of Argentina and Brazil for operational implementation.
	Bolivia	Jun 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, Brazil is expecting confirmation from Spain to migrate to operational phase.
	United States	Jun 2018	Coordination began between Brazil and United States. Circuit implementation will be made through MEVAIII/REDDIGII.
	Guyana	Sep 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	Dec 2017	Positive P1 connectivity tests were carried out. Pending operational tests by October 2017.
	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)	Dec 2017	Successful operational and IP interoperability tests carried out in August 2017. Operation foreseen by last quarter of 2017.
	Suriname	Mar 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	Sep 2017	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 September 2017.
	Venezuela	Dec 2017	Positive connectivity in Protocol P1 level between Brasilia and Caracas (Oct 2016). Operational since 20 September 2017. Tests foreseen November 2017.
Chile	Argentina	Nov 2017	Positive operational tests carried out in mid-December 2016. Pending decision from authorities of Argentina and Chile

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
			for operational implementation.
	Peru	Dec 2016	Began operations on mid-December 2016.
Colombia	Brazil	May 2017	Operational May 2017.
	Ecuador	Dec 2017	Successful IP connectivity tests Pending resume of operational tests
	Panama	Mar 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 contract the AMHS circuit with MEVA III communication provider in 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	Dec 2017	IP connectivity tests successfully made. Pending resume of operational tests.
	Peru	Jul 2012	Implemented and operational
	Venezuela	Dec 2017	Operational since 20 September 2017 with new AMHS System. Tests foreseen November 2017.
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
	Venezuela	Dec 2017	Operational since 20 September 2017 with new AMHS System. Tests foreseen November 2017.
Panama	Colombia	Mar 2018	Circuital interconnection has been configured through MEVA III/REDDIG II (mid-February 2017). Positive operational tests made on August

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
			2017. Operational implementation will take place once Colombia and Panama contract AMHS circuit to the MEVA III communications provider in MEVAIII/REDDIGII interconnection.
Paraguay	Argentina	Mar 2012	Implemented and operational
	Brazil	Dec 2017	IP interconnectivity tests began mid July 2016. Pending of operational tests on October 2017.
Peru	Argentina	Nov 2017	Positive operational tests carried out at the end of 2016. Pending decision from authorities of Argentina and Chile for operational implementation.
	Bolivia	Mar 2018	Successful IP connectivity between La Paz MTA and Lima MTA.
	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.
Suriname	Brazil	Mar 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	Implemented and operational
	Venezuela	Mar 2018	Pending operational tests to be made when Venezuela has implemented its new AMHS system (September 2017) and Suriname has updated its AHMS system (date TBD). New AMHS system operative in Venezuela since 20 September 2017.
Uruguay	Argentina	Dec 2017	Positive P1 connectivity between Ezeiza and Montevideo achieved. Operational tests foreseen November 2017.
	Brazil	Sep 2017	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. Commissioning September 2017.

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
Venezuela	Argentina	Dec 2017	Implemented and operational (out of service- failure in AMHS Venezuela) New AMHS system started operations in Venezuela on 20 September 2017. Tests foreseen November 2017.
	Brazil	Dec 2017	New AMHS system started operations in Venezuela on 20 September 2017. Tests foreseen November 2017.
	Colombia	Dec 2017	New AMHS system started operations in Venezuela on 20 September 2017. Tests foreseen November 2017.
	Spain	Dec 2018	Pending initial coordination. Interconnection will be made through a communication circuit rented to a local provider.
	United States	Dec 2018	Pending initial coordination. AMHS circuit will be implemented through MEVAIII/REDDIGII interconnection.
	Ecuador	Dec 2017	New AMHS system started operations in Venezuela on 20 September 2017. Tests foreseen November 2017.
	Guyana	Dec 2017	New AMHS system started operations in Venezuela on 20 September 2017. Tests foreseen November 2017.
	French Guiana	Dec 2018	French Guiana has scheduled for January 2018 the commissioning of an AMHS (CONSOFT) system. AMHS interconnection foreseen to begin on October 2018.
	Peru	Dec 2017	New AMHS system started operations in Venezuela on 20 September 2017. Tests foreseen November 2017.
	Suriname	May 2018	Pending operational tests to be made when Venezuela has implemented its new AMHS system (September 2017) and Suriname has updated its AHMS system (date TBD).
	Trinidad & Tobago	Dec 2018	New AMHS system started operations in Venezuela on 20 September 2017. Tests foreseen November 2017.

Green highlighted: AMHS interconnection operative
Light green: almost operational

APPÉNDIX D

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	Hernan 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
		Moira Callegare	Jefe departamento CNS (ANAC)	(54 11) 594-13097	mcallegare@anac.gob.ar
BOLIVIA	AASANA	Remigio Blanco	Responsable de Telecomunicaciones AASANA	(591 2) 237-0340	rblanco@aasana.bo
BRAZIL/ BRASIL	DECEA	Eduardo Alberto do Nascimento Fontes	Coordinación técnica SDTE/DECEA	552121016620	eduardoeanf@decea.gov.br
		Murilo Loureiro	Asesor aistemas automatizados	(55 21) 2101-6658	loureiromal@decea.gov.br
COLOMBIA	UAEAC	Gabriel Guzmán	Especialista de Comunicaciones	(571) 296-2940 (57) 317-656 7202	gabriel.guzman@aerocivil.gov.co
		Robinson Quintero	Especialista de Comunicaciones	(57) 1 296 2241	robinson.quintero@aerocivil.gov.co
CHILE	DGAC	Christian Vergara	Especialista comunicaciones	(56 2) 836-4005 (56 2) 644-8345	cvergara@dgac.gob.cl
ECUADOR	DAC	Raul Avellan	Especialista CNS coordinador sistema AMHS	(593 4) 269-2829 (593 9) 9530-2735	raul.avellan@aviacioncivil.gob.ec
GUYANA	Guyana Civil Aviation	Mortimer Salisbury	Supervisor - AN & T	(592) 261-2569	mbsalisbury2000@yahoo.com
GUYANA FR./FRENCH	Dirección de los servicios de	Michel Areno	Jefe del centro de control del aeropuerto de Cayena	594 594 359395	michel.areno@aviation-civile.gouv.fr

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
GUIANA	navegación aérea (Francia)				
PANAMA	Autoridad Aeronáutica Civil (AAC)	Daniel de Avila	Supervisor Dep. de COM	507 315 9877	deavila@aeronautica.gob.pa
		Abdiel Vásquez	Jefe Depart. CNS	507) 315-9877/78/44	abvasquez@aeronautica.gob.pa
PARAGUAY	DINAC	Víctor Morán Maldonado	Jefe Departamento de Comunicaciones	(595 21) 758 5208	moranchu@gmail.com
		Aldo Pereira	Jefe departamento técnico AMHS	595217585257 / +595217585255	aldopereira26@gmail.com
PERÚ	CORPAC	Jorge Garcia	Jefe de Comunicaciones	5112301000 Ext 3131	jgarcia@corpac.gob.pe
		Raul Anastasio Granda	Supervisor Comunicaciones AMHS-AFTN Área de Comunicaciones Fijas Aeronáuticas	(511) 230-1018	ranastacio@corpac.gob.pe
SURINAM/ SURINAME	Ministry of Transport, Communication and Tourism, Civil Aviation Department	Mitchell Themen	CNS Technical Division	(597) 325-123 (597) 325-172 (597) 497-143	mickiano@live.com
URUGUAY	DINACIA	Daniel Pelayo	Jefe de Comunicaciones		wiledda@hotmail.com
VENEZUELA	INAC	Richard Canales	Jefe del Área de Trabajo AFTN/AMHS	0416-812.83.19 0212-355.18.64	r.canales@inac.gob.ve
		Maricel Berroteran	Responsable CCAM		maricelberroteranq@gmail.com

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 examined:

a) WP/08 **-** *Follow-up to the interconnection of automated systems between adjacent ACCS* (presented by the Secretariat); and
b) WP/14 - FPL – Regional harmonization and best practices (presented by IATA).

Follow-up to the interconnection of automated systems between adjacent ACCs

5.2 Information is presented below on the progress made in the implementation of AIDC connections, the availability of flight plans, and follow-up to the implementation of activities contemplated in the MoUs for the interconnection of automated systems since the SAM/IG/19 meeting.

AIDC interconnection

Argentina

5.3 The meeting was informed that the AIDC between the Cordoba ACC and the Ezeiza ACC was still in the pre-operational phase. The letter of operational agreement had been amended and signed between the Ezeiza and Cordoba ACCs, considering the AIDC as the primary means of communication for flight reporting, coordination and transfer operations. Tests were to be conducted with communication protocols P7 to P3 in the AMHS connection between the MTA and the automated system of INDRA to see if this could solve the problems identified in message generation and processing times.

5.4 It was also noted that an AIDC training plan for controllers of the Comodoro Rivadavia, Mendoza and Resistencia ACCs had been launched and would conclude in October 2017. Upon completion of these courses, the AIDC pre-operational phase would start in these centres. There was still some resistance to change from operational personnel, an issue that needed to be addressed through appropriate strategies to allow controllers to accept and understand the operational benefits to be derived from the use of AIDC.

5.5 Another factor that had contributed to delays in AIDC implementation was the need to improve the content of the databases of automated systems involved in the respective interconnections, to allow for a proper flow of messages without rejects.

5.6 The AIDC between national ACCs was expected to become operational by the end of the second semester of 2017, while the AIDC with adjacent regional ACCs was expected to be operational in 2018-2019.

Bolivia

5.7 It was noted that the automation of the main ATS units of Bolivia was expected to be operational in 2019. The automated systems to be installed were Thales model Topsky. Once the automation of ATS units had been completed, Bolivia would start coordinating with the ACCs of adjacent States for the conduction of AIDC tests.

Brazil

5.8 It was noted that, since mid-2016, the AIDC was in the operational phase between the adjacent ACCs of Brazil, with the exception of the Atlantico ACC, which was recently upgraded to the ATECH Sagitario system. AIDC connections between the Atlántico ACC and ACCs at national level were expected to be operational on the second semester of 2017.

5.9 AIDC tests were conducted with the Asunción ACC but with unsatisfactory results. Coordination would take place between Brazil and Venezuela to exchange flight plan and automated transfer data using the messages contained in Doc 4444.

5.10 Brazil was currently in the process of updating the Sagitario system to allow for processing of the FPL2012 form. This had been assigned the highest priority in order to solve FPL message processing issues. This version should come on line initially at the Amazonico and Curitiba ACCs by the end of 2017. Accordingly, AIDC interconnection tests between the Curitiba ACC and the Resistencia ACC, as well as between the Amazónico ACC and the Lima ACC could be resumed starting on the first semester of 2018, and between the Curitiba ACC and Asunción on the second semester of 2018.

5.11 The internal message addressing issue was still pending solution, to determine what AIDC address would be used for the interconnection between the Amazónico ACC and the Lima ACC in order to start the pre-operational phase. This issue was to be solved by the first semester of 2018.

Chile

5.12 It was noted that the TopSKy of the Santiago ACC would be updated by the first semester of 2018, although investment in this project was still pending approval by the Chilean authority. In this sense, once this update had been completed, AIDC tests would continue between the Santiago ACC and the Mendoza ACC and between the Santiago Oceánico ACC and the Lima ACC.

5.13 At national level, the AIDC operational connections between the Punta Arenas ACC and the Puerto Montt ACC and between the Iquique ACC and the Antofagasta APP had been implemented.

5.14 The drafting of the letter of operational agreement between the Lima and Iquique ACCs was still pending before proceeding to the formal implementation of the AIDC operational phase between these ACCs.

Colombia

5.15 The AIDC interconnections implemented at national and intraregional level were still in the pre-operational phase.

Ecuador

5.16 No progress was reported in AIDC operation with Peru and Colombia, which was still in the pre-operational phase.

French Guiana

5.17 The implementation of AIDC between the Cayenne ACC and the ACCs of adjacent States was foreseen for the period 2018-2019. French Guiana had AIDC at the Cayenne ACC.

Guyana

5.18 The implementation of AIDC with the ACCs of adjacent States was foreseen for 2017-2019. At present, Guyana did not have AIDC at its ACC.

Panama

5.19 It was noted that the updating of the TopSky automated system at the Panama ACC had been completed in mid-July 2017. Since early September 2017, the AIDC between the Panama ACC and CENAMER was in the pre-operational phase, and the AIDC between the Panama ACC and the Barranquilla and Bogota ACCs was in the pre-operational phase since mid-September 2017. Likewise, satisfactory AIDC interconnection tests had been conducted in July 2017 with the Kingston ACC, and the pre-operational phase was scheduled to start on the first semester of 2018 between the Panama and Kingston ACCs.

5.20 The operational phase with the Barranquilla ACC and the Bogota ACC was scheduled to start on the first semester of 2018, and with the Cali APP an the Rio Negro APP on the second semester of 2018.

5.21 The focal point of Panama highlighted the importance of updating the designator in the CAAS AMHS tables for the ACC systems with which messages were exchanged, replacing the old designator MPTO with the new one, MPZL.

Paraguay

5.22 The updating of the automated system of the Asunción ACC (INDRA AIRCON 2100) could not be completed. Accordingly, the implementation of the AIDC interconnection with adjacent ACCs would be postponed until 2018.

Peru

5.23 The updated ATM automation system at the Lima ACC was scheduled to come on line on the week of 16 October 2019. However, there had been a delay, due to the need for the operational personnel to become familiar with the system, which would take two more weeks. Accordingly, it was expected to come on line on the week of 30 October. It was expected that, starting in November 2017, the AIDC between the Lima ACC and the Guayaquil ACC would become operational again, and that migration of the AIDC to the operational phase between the Lima ACC and the Bogota ACC and between the Lima ACC and the Iquique ACC could be coordinated.

5.24 The drafting of the Letter of Operational Agreement between the Lima and Iquique ACC was still pending prior to formal implementation of the operational phase of the AIDC between these ACCs.

Suriname

5.25 The implementation of AIDC with the ACCs of adjacent States was foreseen for the period 2017-2019. Suriname did not have AIDC.

Uruguay

5.26 The implementation of AIDC with the ACCs of the adjacent States was foreseen for the period 2017-2019.

Venezuela

5.27 There were plans to acquire an automated system, which would become operational in 2018-2019. Accordingly, AIDC implementation with the ACCs of adjacent States was foreseen starting in 2019.

Table of AIDC interconnection requirements

5.28 Based on the aforementioned information on AIDC implementation developments, **Appendix A** contains a table with AIDC interconnection requirements in the SAM Region, its status of implementation, and status foreseen for the period 2017-2019.

List of AIDC focal points

5.29 The Meeting reviewed the AIDC focal points, as shown in **Appendix B** to this agenda item.

Analysis of flight plan availability in the SAM Region

5.30 The Meeting did a follow-up to Conclusion SAM/IG/19-2 *Implementation of procedures to mitigate the duplication/multiplicity of scheduled commercial flight plans*, in which States were urged to establish AFTN address XXXXZPZX as the only address for receiving the flight plans corresponding to ARO/AIS Offices, and to prepare an AIC indicating the flight plan filing procedure.

5.31 In this regard, the Meeting took note of the following:

Argentina

5.32 Argentina was waiting for the aeronautical authority of Argentina (ANAC) to approve the amendment to the national regulation on flight plan filing, to allow commercial airlines to submit their flight plan in electronic format directly to the ARO/AIS Offices or to the FDPs of ACCs. This was expected to occur in late October 2017.

Brazil

5.33 It was noted that the goal of Brazil was to implement a centralised flight plan processing system as part of the project for the implementation of the SIGMA system (*Sistema Integrado de Gestão de Movimentos Aéreos*) being used by CGNA (*Centro de Gerenciamento da Navegação Aérea*). The SIGMA project was to be completed by 2020.

Ecuador

5.34 An improved procedure had been developed to reduce errors in flight plans sent to the Guayaquil ACC. This procedure had been published in the AIP amendment dated 14 September 2017. Regarding the establishment of a single address, it was noted that, at national level, international flights had two AFTN addresses: one for the ARO/AIS Office in Guayaquil and another for the ARO/AIS Office in Quito.

Peru

5.35 It was noted that, on 24 July 2017, Peru had published AIC/05/2017 that superseded AIC/04/2017 "Filing of the flight plan via AMHS or AFTN for companies operating scheduled flights" pursuant to Conclusion SAM/IG/19-2. Thus, Peru had adopted the single address SPIMZPZX. The AIC/05/2017 is shown in **Appendix C** to this agenda item. An informational workshop had been held and tests had been conducted with 17 commercial airlines, 16 of which had obtained satisfactory results. In this regard, letters of agreement would be established with the airlines for the use of the procedure so that airlines would be able to submit their flight plans directly to SPIM ZPZX. Letter of agreement would also be signed with the two airlines with whom tests had not been successful.

Venezuela

5.36 Venezuela noted that it had implemented and was operating an automated flight plan handling system to help reduce filing errors. This system was located at the ARO Office in Maiquetía.

5.37 The remaining States of the Region showed no progress in the implementation of Conclusion SAM IG /19-2.

Follow-up to the implementation of activities contemplated in the MoOs for the interconnection of automated systems

5.38 The Meeting took note that Argentina and Chile had resumed coordination for the exchange of surveillance data (secondary radar). This coordination had been interrupted because Chile had to purchase and install software for filtering surveillance data used by the military in order to exclude it from the exchange. The technical-operational activities for the implementation of radar and flight plan data exchange (AIDC) between Argentina and Chile were contemplated in the MoU signed between the authorities of Argentina and Chile on 18 October 2010. A teleconference had been held between the Secretariat (ICAO), Argentina and Chile on 11 October 2017 to define a new action plan for the implementation of surveillance and flight plan data interconnection. At this teleconference, it was agreed to begin coordination on 23 October 2017 for radar exchange between Mendoza (Argentina) and the secondary radar of Santiago (Chile).

5.39 The Meeting recalled that MoUs had also been established and signed during the period 2010 and 2012 between Argentina and Brazil, Argentina and Uruguay, Brazil and Uruguay, Brazil and Venezuela, and Brazil and Peru for the exchange of surveillance and fight plan data with a view to better guaranteeing air traffic control in transfer areas between adjacent ACCs. Of the activities contemplated in these MoUs, work was underway on AIDC implementation; the exchange of surveillance data had been suspended because it was not possible to use certain communication protocols (Asterix 62/63).

5.40 The Meeting took note that Argentina and Peru were already capable of processing surveillance information with protocol ASTERIX 62 and 63 and transmit these protocols at the automated systems of the Resistencia and Mendoza ACCs and at the Lima ACC. In this regard, and based on this important development that had delayed the exchange of surveillance radar data between Brazil and the adjacent States, the Meeting considered that this activity should be resumed, starting with the holding of a teleconference on 30 October 2017 between the focal points of Argentina, Brazil and Peru to review the established MoUs and define an initial programme of activities.

5.40 Regarding the exchange of radar data between Argentina and Uruguay, it was noted that Argentina was in the process of modernising the Parana radar and, upon its completion, would coordinate with Uruguay to go ahead with the exchange. The Meeting took note that the only radar data exchange at present was between Argentina and Uruguay. The secondary radar of Durazno in Uruguay was being used at the ACC of Ezeiza and Resistencia, and the radar of Ezeiza was being used by the Montevideo ACC.

Regional harmonisation of flight plans and best practices

5-41 The Meeting recalled the actions agreed in conclusion SAM/IG/14-18 concerning the exception to mandatory completion of the alternate aerodrome field in the flight plans. In this regard, only Brazil was reported to have implemented it, and the Meeting urged the States to comply with the aforementioned conclusion.

5.42 Upon reviewing WP/14 presented by IATA on the need to harmonise the flight plan filing process, the Meeting considered that conclusion SAM/IG/19-2 addressed this issue, establishing a single AFTN/AMHS address at national level for receiving international flight plans, and the need to inform users through an AIC explaining the procedure.

5.43 The Meeting felt the need to prepare a guide for the States for the harmonisation and optimisation of flight plan management in the SAM Region. This guide would be prepared with the assistance of IATA, based on the material developed by the SAM/IG, taking into account any other relevant aspects.

5.44 Regarding the requirement to transmit the contents of Box 19 of the flight plan, the Meeting agreed that it should remain as stipulated in Document 4444, as supplementary information, which would be made available upon request. IATA noted that it would take measures to ensure that airlines provide this information through the fastest means when so required by the ANSPs.

APPENDIX A

(AIDC) GROUND-GROUND DATA INTERCONNECTION LEVEL REQUIREMENTS IN THE SAM REGION

ARGENTINA						
ACC	ACC ADJ	Flight plan Interconnection levels *				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
CORDOBA (AUT. INDRA AIRCON2100) (2007)	IQUIQUE	XI			X	Positive AIDC tests - March 2016 As a result of the tests, the transmission speed has to be incremented from 2400 to 9600 bit/seg AIDC foreseen to be operational at the end of the second semester of 2018.
	LA PAZ	XI			X	AIDC foreseen for period - 2019
	EZEIZA	XI			XI	AIDC in pre-operational phase since December 2015. Operational phase foreseen by the first semester of 2017
	MENDOZA	XI			X	AIDC pre-operational phase by the second semester of 2017
	RESISTENCIA	XI			X	AIDC pre-operational phase by the second semester of 2017
RESISTENCIA (AUT. INDRA AIRCON2100) (May 2016)	ASUNCION	XI			X	Positive AIDC tests were conducted in 2015 between Ezeiza and Asuncion. Tests between Resistencia and Asuncion were conducted in the end of 2016. AIDC foreseen to be operational by the first semester of 2018.
	CORDOBA	XI			X	AIDC pre-operational by the second semester of 2017
	CURITIBA	XI			X	AIDC foreseen by the first semester of 2018
	EZEIZA	XI			X	AIDC pre-operational by the second semester of 2017
	MONTEVIDEO	XI			X	AIDC foreseen by the first semester of 2018

EZEIZA (AUT. INDRA AIRCON2100) (2007)	COMODORO RIVADAVIA	XI			X	AIDC pre-operational by the second semester of 2017
	MENDOZA	XI			X	AIDC pre-operational by the second semester of 2017
	PUERTO MONTT	XI			X	AIDC by the first semester of 2018
	CORDOBA	XI			XI	AIDC in pre-operational phase since December 2015. Operational phase foreseen by the second semester of 2017
	RESISTENCIA	XI			X	AIDC pre-operational by the second semester of 2017
	JOHANNESBURG	XI			X	AIDC tests foreseen by the second semester of 2017
	MONTEVIDEO	XI			X	AIDC foreseen by the first semester of 2018
MENDOZA (AUT INDRA AIRCON2100) (May 2016)	EZEIZA	XI			X	AIDC pre-operational by the first semester of 2017
	SANTIAGO	XI			X	AIDC foreseen for period 2018-2019
	CORDOBA	XI			X	AIDC pre-operational by the second semester of 2017
COMODORO RIVADAVIA (AUT INDRA AIRCON2100) (June 2016)	EZEIZA	XI			X	AIDC pre-operational by the first semester of 2017
	PUNTA ARENAS	XI			X	AIDC by the end of the second semester of 2017
	PUERTO MONTT	XI			X	AIDC by the end of the second semester of 2017

BRAZIL						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
AMAZÓNICO (MANAUS) AUTO. SAGITARIO ATECH	BRASILIA	XI			XI	AIDC implemented June 2016
	BOGOTÁ	XI			X	AIDC operational foreseen by first semester 2018
	CAYENNE	XI			X	AIDC foreseen for period 2018-2019
	CURITIBA	XI			XI	AIDC implemented July 2016
	GEORGETOWN	XI			X	AIDC foreseen for period 2018-2019
	LA PAZ	XI			X	AIDC foreseen for period 2019

	LIMA	XI			X	AIDC foreseen first semester 2018
	MAIQUETIA	XI	X		X	AIDC foreseen for period 2018-2019
	PARAMARIBO	XI			X	AIDC foreseen for period 2018-2019
	RECIFE	XI			X	AIDC implemented since 2 May 2016
	ATLÂNTICO	XI			X	Second semester 2017
BRASILIA AUTO. SAGITARIO ATECH	AMAZÔNICO	XI			XI	AIDC implemented June 2016
	CURITIBA	XI			XI	AIDC implemented July 2016
	RECIFE	XI			XI	AIDC implemented June 2016
CURITIBA AUTO. SAGITARIO ATECH	AMAZONICO	XI			XI	AIDC implemented July 2016
	ASUNCION	XI			X	AIDC foreseen second semester 2018
	BRASÍLIA	XI			Xi	AIDC implemented July 2016
	LA PAZ	XI			X	AIDC foreseen for period 2018-2019
	MONTEVIDEO	XI			X	AIDC foreseen for the first semester of 2018
	RECIFE	XI			XI	AIDC implemented July 2016
	RESISTÊNCIA	XI			X	AIDC foreseen by the first semester of 2018
	ATLÂNTICO	XI			X	Second Semester 2017
RECIFE AUTO. SAGITARIO ATECH	AMAZÔNICO	XI			XI	AIDC Implemented on 2 May 2016
	BRASÍLIA	XI			XI	AIDC implemented June 2016
	CURITIBA	XI			XI	AIDC implemented July 2016
	ATLÂNTICO	XI			X	Second Semester 2017
ATLÁNTICO AUTO. SAGITARIO ATECH	AMAZÔNICO	XI			X	Second Semester 2017
	CURITIBA	XI			X	Second Semester 2017
	DAKAR	XI			X	AIDC TBD
	JOHANNESBURG	XI			X	AIDC TBD
	LUANDA	XI			X	AIDC TBD
	MONTEVIDEO	XI			X	AIDC foreseen for period 2018-2019
	RECIFE	XI			X	Second Semester 2017
	CAYENNE	XI			X	AIDC foreseen for period 2018-2019

BOLIVIA						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
LA PAZ (MANUAL)	AMAZÔNICO	XI			X	AIDC foreseen for period 2019
	ASUNCION	XI			X	AIDC foreseen for period 2019
	CURITIBA	XI			X	AIDC foreseen for period 2019
	CORDOBA	XI			X	AIDC foreseen for period 2019
	LIMA	XI			X	AIDC foreseen for period 2019
	IQUIQUE	XI			X	AIDC foreseen for period 2019

CHILE						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
SANTIAGO (AUTO THALES TOPSKY)	IQUIQUE	XI			X	AIDC foreseen for period 2018-2019
	LIMA	XI			X	AIDC foreseen for period 2018-2019
	MENDOZA	XI			X	AIDC foreseen for period 2018-2019
	PUERTO MONTT	XI			X	AIDC foreseen for period 2018-2019
IQUIQUE (AUTO INDRA AIRCON 2100)	CORDOBA	XI			X	Positive AIDC tests - March 2016. Tests results indicate the requirement of increase transmission speed from 2400 to 9600 bit/sec. AIDC operational foreseen by the first semester of 2018
	LA PAZ	XI			X	AIDC foreseen for period 2018-2019
	LIMA	XI			X	Positive AIDC tests conducted in February 2016. AIDC foreseen to be operational by the second semester of 2017
PUERTO MONTT (INDRA AUTOMATED)	SANTIAGO	XI			X	AIDC foreseen for period 2018-2019
	PUNTA ARENAS	XI			X	AIDC pre operational since November 2016.
	EZEIZA	XI			X	AIDC by the first semester of 2018

	COMODORO RIVADAVIA	XI			X	AIDC by the first semester of 2018
PUNTA ARENAS (INDRA AUTOMATED)	PUERTO MONTT	XI			X	AIDC pre operational since November 2016
	COMODORO RIVADAVIA	XI			X	AIDC by the first semester of 2018

COLOMBIA						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
BOGOTÁ (AUTO INDRA AIRCON 2100)	AMAZÔNICO	XI			X	AIDC operational foreseen first semester 2018
	CENAMER	XI			X	AIDC foreseen for period 2018-2019
	GUAYAQUIL	XI			XI	Positive AIDC tests conducted AIDC in pre-operational phase (August 2015). Implementation foreseen December 2017.
	LIMA	XI			XI	Positive AIDC tests conducted. AIDC pre-operational (August 2015) Operational letter of agreement incorportating AIDC was signed on November 2016 Operational phase foreseen last quarter 2017
	MAIQUETIA	XI			X	AIDC foreseen for period 2018-2019
	PANAMA	XI			X	Positive AIDC tests conducted. AIDC foreseen to be operational by first semester 2018.
	BARRANQUILLA	XI			XI	AIDC pre-operational (March 2016)
BARRANQUILLA (AUTO INDRA AIRCON 2100)	MAIQUETIA	XI			X	AIDC foreseen for period 2018-2019
	PANAMA	XI			X	Positive AIDC tests conducted. AIDC foreseen to be operational by first semester 2018.
	BOGOTA	XI			XI	AIDC pre-operational (March 2016)
	KINGSTON	XI			X	AIDC TBD
	CURAÇAO	XI			X	AIDC TBD
APP Rio Negro (AIRCON 2100)	PANAMA	XI			X	Tests on first semester 2018
APP Cali (AIRCON 2100)	PANAMA	XI			X	Tests on first semester 2018

ECUADOR						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
GUAYAQUIL AUTO INDRA AIRCON 2100	BOGOTA	XI			XI	Positive AIDC tests conducted. AIDC pre-operational (August 2015) implementation foreseen December 2017
	LIMA				XI	AIDC operational implementation (31 March 2016) Migrated to pre-operational phase since Nov 2016. Resume to operational phase foreseen for last quarter 2017.
	CENAMER	XI			X	Positive AIDC tests conducted. AIDC foreseen for period 2018-2019

FRENCH GUIANA						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
CAYENNE AUTO ADACEL AIDC not installed	AMAZÔNICO	XI			X	AIDC foreseen for period 2018-2019
	PARAMARIBO	XI			X	AIDC foreseen for period 2017-2019
	PIARCO	XI			X	AIDC foreseen for period 2018-2019
	DAKAR	XI			X	AIDC foreseen for period 2018-2019
	ATLANTICO	XI			X	AIDC foreseen for period 2018-2019

GUYANA						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
GEORGETOWN AUTO INTELCAN AIDC not installed	AMAZONICO	XI			X	AIDC foreseen for period 2018-2019
	PIARCO	XI			X	AIDC foreseen for period 2018-2019
	MAIQUETIA	XI			X	AIDC foreseen for period 2018-2019
	PARAMARIBO	XI			X	AIDC foreseen for period 2018-2019

PANAMA						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
PANAMA (AUTO THALES)	BOGOTA	XI			X	Positive AIDC tests conducted. AIDC foreseen to be operational by first semester 2018.
	BARRANQUILLA	XI			X	Positive AIDC tests conducted. AIDC foreseen to be operational by first semester 2018.
	CENAMER	XI			X	Positive AIDC tests conducted. Pre operational phase. AIDC foreseen to be operational by first semester 2018.
	APP CALI	XI			X	Tests on first semester 2018.
	APP RIO NEGRO	XI			X	Tests on first semester 2018.
	KINGSTON	XI			X	Pre-operational phase by first semester 2018

PARAGUAY						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
ASUNCION AUTO AIRCON 2100 INDRA	CURITIBA	XI			X	AIDC foreseen for second semester 2018
	LA PAZ	XI			X	AIDC foreseen for period 2018-2019
	RESISTENCIA	XI			X	Positive AIDC tests conducted in 2015 between Ezeiza and Asuncion. Tests between Resistencia and Asuncion were held by the end of 2016. AIDC foreseen to be operational by the first semester 2018.

PERU						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
LIMA AUTO AIRCON 2100 INDRA	AMAZONICO	XI			X	AIDC foreseen to be operational by first semester 2018
	BOGOTA	XI			XI	Positive AIDC tests conducted. AIDC pre-operational phase (August 2015). Amendment to the operational agreement including the AIDC signed in November 2016. Operational phase foreseen last quarter 2017
	SANTIAGO	XI			X	AIDC foreseen for period 2018-2019
	IQUIQUE	XI			X	Positive AIDC tests conducted in February 2016. AIDC foreseen to be operational by the second semester of 2017.

	GUAYAQUIL	XI			XI	AIDC operational (31 March 2016) migrated to pre-operational phase on November 2016. Expected to resume operational phase the las quarter 2017.
	LA PAZ	XI			X	AIDC foreseen for period 2019

SURINAME						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
PARAMARIBO (AUTO INTELCAN) AIDC not installed	AMAZÓNICO	XI			X	AIDC foreseen for period 2018-2019
	GEORGETOWN	XI			X	AIDC foreseen for period 2018-2019
	PIARCO	XI			X	AIDC foreseen for period 2018-2019
	CAYENNE	XI			X	AIDC foreseen for period 2018-2019

URUGUAY						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
MONTEVIDEO (AUTO INDRA AIRCON2100)	CURITIBA	XI			X	AIDC foreseen by first semester 2018
	EZEIZA	XI			X	AIDC foreseen by the first semester 2018
	RESISTENCIA	XI			X	AIDC foreseen by first semester 2018
	ATLANTICO	XI			X	AIDC foreseen for period 2018-2019
	JOHANNESBURG	X			X	AIDC TBD

VENEZUELA						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
MAIQUETIA (AUTO ATECH X4000) AIDC not installed	AMAZONICO	XI	XI		X	AIDC foreseen for period 2018-2019
	BOGOTA	XI			X	AIDC foreseen for period 2018-2019
	BARRANQUILLA	XI			X	AIDC foreseen for period 2018-2019
	PIARCO	XI			X	AIDC TBD
	CAYENNE	XI			X	AIDC foreseen for period 2018-2019
	CURAZAO	XI			X	AIDC TBD
	SAN JUAN	XI			X	AIDC TBD

*** X PLANNED**
***XI IMPLEMENTED AND IN PRE-OPERATIONAL OR OPERATIONAL PHASE**

APPENDIX B / APÉNDICE B

NATIONAL FOCAL POINTS/PUNTOS FOCALES NACIONALES
IMPLEMENTATION OF INTERCONNECTION OF AUTOMATED SYSTEMS/IMPLANTACIÓN INTERCONEXIÓN SISTEMAS AUTOMATIZADOS

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
ARGENTINA	EANA	Javier Schenk	Gerente CNS EANA	(549 11) 5848 6936	Jschenk@eana.com.ar
		Osvaldo Oscar Godoy	Jefe ANS Subregional Ezeiza	Cel (54911) 28836444 5411 44802309	ogodoy@eana.com.ar
		Daniel Coria	Coordinador nacional sistema automatizados	T.E:+5491135942686	dcoria@eana.com.ar
		Mario Correa	Jefe sistemas automatizados ATS	(5411) 4320 3955 Cel (54911) 5460 9199	mccorrea@eana.com.ar
	ANAC	Diego Agüero	Técnico automatización	(54911) 2258-7836 (5411) 5941-3000 Ext.69-128	daguero@anac.gob.ar
BOLIVIA	DGAC	Jaime Yuri Álvarez Miranda	Jefe Unidad CNS	Tel: +5912 2444450 int. 2651	jalvarez@dgac.gob.bo
BRAZIL/ BRASIL	DECEA	Luiz Antonio dos Santos	Asesor ATM	5521 2101 6088	luizantoniolas@decea.gov.br
		Murilo Loureiro	Asesor sistemas automatizados	(55 21) 2101-6658	loureiromal@decea.gov.br
COLOMBIA	UAEAC	Harlen Mejía	Jefe de Aeronavegación		harlen.mejia@aerocivil.gov.co
		Mauricio Ferrer	Especialista ATM sistemas automatizados		mauricio.ferrer@aerocivil.gov.co
		Pedro Alejandro Velasco	Jefe Grupo de Vigilancia Aeronáutica	(57) 317656-7203	pedro.velasco@aerocivil.gov.co

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
CHILE	DGAC	Pedro Pastrian	Especialista radar y sistemas automatizados	(56 2) 836-4005 (56 2) 644-8345	ppastrian@dgac.gob.cl
		Christian Vergara	Especialista comunicaciones	(56 2) 836-4005 (56 2) 644-8345	cvergara@dgac.gob.cl
		Gustavo Cáceres Moraga	Controlador Tránsito Aéreo Ofc. Operaciones ACCS	(56 2) 91581853 (56 2) 28364018	gcaceres@dgac.gob.cl
ECUADOR	DAC	Raul Avellan	Especialista CNS coordinador sistema AMHS	(593 4) 269-2829 (593 9) 9530-2735	raul.avellan@aviacioncivil.gob.ec
		Jorge Zúñiga	Programación FDP y coordinaciones	(593 2) 2604477	jorzu40@hotmail.com
		Eugenio Espinoza	Controlador ACC Guayaquil Radar	(593) 981269823	eugenio.espinoza@aviacioncivil.gob.ec
GUYANA					
GUYANA FR./ FRENCH GUIANA	Service de la Navigation Aérienne aux Antilles-Guyane (SNA-AG)	Michel Areno	Head French Guiana ACC	(594) 694455617	michel.areno@aviation-civile.gouv.fr
PANAMA	Autoridad Aeronáutica Civil (AAC)	Mario Antonio Facey Howard	Especialista radar y sistemas automatizados	(507) 315-9852/65	mfacey@aeronautica.gob.pa
PARAGUAY	DINAC	Digno Nelson Cardozo González	Técnico Especialista en Radar y Sistemas Automatizados	(595) 217585016 Cel: (595) 961779106	nechicar@gmail.com
		Diego Ramón Aldana Fernández	Supervisor ACC/APP	(595) 752719 (59) 5961692104	diegoaldana@gmail.com
PERÚ	CORPAC	Johnny Ávila	Jefe equipos centro de control	(511) 230-1000 Anexo:1267	javila@corpac.gob.pe

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
		Jorge Eduardo Merino Rodríguez	Especialista ATM Controlador de Tránsito Aéreo	(51 1) 230-1000 Ext 1158 (511) 5750886 (Centro de Control Lima) (511) 5750995 Cel: 51 99737407	jmerino@corpac.gob.pe jemr69@yahoo.com
		Jaime Arturo Contreras Benito	Coordinador General del Centro de Control	(511) 630 1154 Celular: (51) 948 463 081	jcontreras@corpac.gob.pe
		Raul Anastacio Granda	Supervisor Comunicaciones AMHS-AFTN Área de Comunicaciones Fijas Aeronáuticas	(511) 230-1018	ranastacio@corpac.gob.pe
		Sara Siles La Rosa	Jefe del Área de Servicios de Información Aeronáutica CORPAC S.A.	(511) 230 1168 / (511) 230 1169 Cel: (51) 978 598 481	ssiles@corpac.gob.pe
	DGAC	Sady Beaumont Valdez	Inspector de Navegación Aérea	Tel: +511 6157880	sbeaumont@mtc.gob.pe
SURINAM/ SURINAME					
URUGUAY	DINACIA	Antonio Lupacchino	Especialista CNS sistemas automatizados	(598) 2604-0408 Ext.4520	alupacch@yahoo.com.ar
		Gustavo Turcatti	Jefe Departamento Operativo de Tránsito Aéreo	(598) 2604-0408 Ext.5111	blantur@gmail.com
VENEZUELA	INAC	Jean Carlos Lozano Garcia	Controlador tránsito aéreo ACC Maiquetía	(58 416) 7226428	jclozgar@hotmail.com

APPENDIX C

FLIGHT PLAN PRESENTATION VIA AMHS OR AFTN FOR AIRLINES OPERATING REGULAR FLIGHTS

TELÉFONO (511)2301170 / 4141170
TELEFAX (511)4141452 / 2301169
DIRECCIÓN TELEGRÁFICA
AFTN : SPJCYGYJ
COM: CORPAC S.A.
e-mail: aisperu@corpac.gob.pe

PERÚ

Corporación Peruana de Aeropuertos y Aviación Comercial S.A.
ÁREA DE INFORMACIÓN AERONÁUTICA
Apartado 680 LIMA 100 – PERÚ

AIC

05/17

JUL 24th, 2017

FIR LIMA (SPIM)

Nota.- La presente circular entrará en vigencia el día 24 julio 2017, dejando sin efecto a la circular 04/17
***Note**.- The following Circular enter into force on July 24, 2017, leaving no effect to the Circular 04/17*

05/17 PRESENTACIÓN DEL PLAN DE VUELO VÍA AMHS O AFTN PARA LAS COMPAÑIAS QUE OPEREN VUELOS REGULARES

1. INTRODUCCIÓN

1.1 La presente Circular de Información Aeronáutica AIC, describe el procedimiento de presentación del plan de vuelo vía AMHS o AFTN.

1.2 Las disposiciones presentadas en esta AIC se aplican a todas las compañías aéreas que operan vuelos regulares, que posean una terminal de mensajería AMHS o AFTN o hayan contratado un servicio de transmisión de planes de vuelo vía AMHS o AFTN.

1.3 En caso la compañía aérea no transmita directamente el FPL vía AMHS o AFTN, procederá a presentar el formato de FPL en el Equipo AIS/ARO correspondientes.

1.4 El usuario será responsable por cualquier demora que pueda ocasionar el rechazo y reenvío de Planes de Vuelo remitido con errores o por falla en su sistema.

2. GENERALIDADES.

Este nuevo procedimiento deberá cumplir con:

2.1 Lo especificado en el documento 4444 PANS/ATM de la OACI, Capítulo 11, el Apéndice 2 y los formatos correspondientes explicados en el Apéndice 3;

2.2 Condiciones adicionales, especificadas en la AIP del Perú parte ENR.1.10 Planificación de vuelos y;

2.3 Regulación Aeronáutica del Perú- RAP 91.

3. DEFINICIONES

Gestión del tránsito aéreo (ATM). Administración dinámica e integrada-segura, económica y eficiente del tránsito aéreo y del espacio aéreo, que incluye los servicios de tránsito aéreo, la gestión del espacio aéreo y la gestión de la afluencia del tránsito aéreo, mediante el suministro de instalaciones y servicios sin discontinuidades en colaboración con todos los interesados y funciones de a bordo y basadas en tierra.

05/17 FLIGHT PLAN PRESENTATION VIA AMHS OR AFTN FOR AIRLINES OPERATING REGULAR FLIGHTS

1. INTRODUCTION

***1.1** This Aeronautical Information Circular - AIC, describes the flight plan submitting procedure via AMHS or AFTN.*

***1.2** The provisions in this AIC apply to all airlines operating regular flights, that have an AMHS or AFTN messaging terminal or that have hired a flight plan transmission service via AMHS or AFTN.*

***1.3** If the airline does not directly transmit the FPL via AMHS or AFTN, then it shall accordingly submit the FPL to the AIS / ARO concerned.*

***1.4** The user shall be responsible for any delays that may be caused due to rejection and forwarding of Flight Plans that have been submitted with errors or due to their own system failure.*

2. GENERAL INFORMATION

This new procedure must comply with the following:

***2.1** As has been specified in ICAO Document 4444 PANS / ATM, Chapter 11, Appendix 2 and the corresponding formats explained in Appendix 3;*

***2.2** Additional conditions, specified in the Peruvian AIP part ENR.1.10 Flight Plans and;*

***2.3** Peruvian Aviation Regulation - RAP 91.*

3. DEFINITIONS

***Air Traffic Management (ATM):** The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.*

Hora prevista de fuera calzos (EOBT). Hora estimada en la cual la aeronave iniciará el desplazamiento asociado con la salida.

Estimated off-block time (EOBT): *The estimated time at which the aircraft will commence movement associated with departure.*

Mensajes de demora (DLA). Se transmitirá un mensaje DLA cuando la salida de la aeronave para la cual se hayan enviado datos básicos de plan de vuelo (FPL o RPL) se demora más de 30 minutos después de la hora prevista de fuera calzos indicada en los datos básicos de plan de vuelo.

Delay messages (DLA): *A DLA message shall be transmitted when the departure of an aircraft, for which basic flight plan data (FPL or RPL) has been sent, is delayed by more than 30 minutes after the estimated off-block time contained in the basic flight plan data.*

Mensajes de Modificación (CHG). Cuando haya de efectuarse un cambio de los datos básicos de plan de vuelo de los FPL o RPL transmitidos anteriormente, se transmitirá un mensaje CHG. El mensaje CHG se enviará a todos los destinatarios de datos básicos de plan de vuelo que estén afectados por el cambio.

Change Message (CHG): *A CHG message shall be transmitted when any change is to be made to basic flight plan data contained in previously transmitted FPL or RPL data. The CHG message*

Mensajes de cancelación de Plan de Vuelo (CNL). Se enviará un mensaje de cancelación de plan de vuelo (CNL) cuando se haya cancelado un vuelo con respecto al cual se hayan distribuido anteriormente datos básicos de plan de vuelo. La dependencia ATS que sirve al aeródromo de salida transmitirá el mensaje CNL a las dependencias ATS que hayan recibido los datos básicos de plan de vuelo.

Flight Plan Cancellation Message (CNL): *A flight plan cancellation (CNL) message shall be transmitted when a flight, for which basic flight plan data has been previously distributed, has been cancelled. The ATS unit serving the departure aerodrome shall transmit the CNL message to ATS units which have received basic flight plan data.*

Oficina de Notificación de los Servicios de Tránsito Aéreo (ARO). Oficina creada con objeto de recibir los informes referentes a los servicios de tránsito aéreo y los planes de vuelo que se presentan antes de la salida.

Air traffic services reporting office (ARO): *A unit established for the purpose of receiving reports concerning air traffic services and flight plans submitted before departure.*

Plan de vuelo (FPL). Información especificada que, respecto a un vuelo proyectado o a parte de un vuelo de una aeronave, se somete a las dependencias de los servicios de tránsito aéreo.
Nota. Las especificaciones relativas a los planes de vuelo aparecen en el anexo 2. El Apéndice 2 del documento 4444 Gestión de tránsito Aéreo PANS/ATM de la OACI, contiene un modelo de plan de vuelo.

Flight plan (FPL). *Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.*
Note.— Specifications for flight plans are contained in Annex 2. A model flight plan form is contained in Appendix 2 of Document 4444 Air Traffic Management PANS / ATM, ICAO.

Publicación de información aeronáutica (AIP). Publicación expedida por cualquier Estado, o con su autorización, que contiene información aeronáutica, de carácter duradero, indispensable para la navegación aérea.

Aeronautical Information Publication (AIP): *A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.*

Red de telecomunicaciones fijas aeronáuticas (AFTN). Sistema completo y mundial de circuitos Fijos aeronáuticos, dispuestos como parte de Servicio Fijo Aeronáutico, para el intercambio de mensajes o de datos numéricos entre estaciones fijas, que posean características de comunicaciones idénticas o compatibles.

Aeronautical Fixed Telecommunication Network (AFTN): *Complete and Global System Fixed Aeronautical Circuits provided, as part of a Fixed Aeronautical Service, to exchange messages or digital data between fixed stations that have the same or compatible communications features.*

Región de información de vuelo (FIR). Espacio aéreo de dimensiones definidas, dentro del cual se facilitan los servicios de información de vuelo y de alerta.

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

Servicio de Tránsito Aéreo (ATS). Expresión genérica que se aplica, según el caso, a los servicios de información de vuelo, alerta, asesoramiento de tránsito aéreo, control de tránsito aéreo (servicios de control de área, control de aproximación o control de aeródromo).

Air Traffic Service (ATS): *A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).*

Sistema de tratamiento o manejo de mensajes aeronáuticos (AMHS) Conjunto de diversos componentes de software o hardware integrados, con el propósito de gestionar un sistema de enrutamiento de mensajería aeronáutica general, que maximiza las ventajas de las técnicas modernas en gestión de redes.

Aeronautical message handling system (AMHS): *Set of various software components, or integrated hardware, used to manage an aircraft message routing system, that maximizes the advantages of modern techniques in network management.*

Usuario. Para fines de esta AIC, el término usuario se refiere a la línea aérea que presenta su Plan de vuelo cumpliendo con los requisitos exigidos en esta AIC.

User: *For purposes of this AIC, the term «user» refers to an airline that present its flight plan that complies with the requirements described in this AIC.*

4. Directrices.

4.1 Los usuarios que harán uso del procedimiento de presentación de plan de vuelo vía AMHS o AFTN, deberán contar con una terminal de mensajería propia o contratada.
Sus direcciones de transmisión, deberán ser notificadas previamente a CORPAC, en calidad de administrador de la red de mensajería AMHS o AFTN, a las siguientes direcciones:
ccam@corpac.gob.pe
ccamo@corpac.gob.pe
ranastacio@corpac.gob.pe

4.2 Se recepcionará el plan de vuelo vía AMHS o AFTN de todas las compañías Aéreas que cuenten con vuelos regulares aprobados por la DGAC PERÚ.

4.3 Las compañías aéreas que cumplan con los requisitos especificados en los numerales 4.1 y 4.2 de esta AIC, continuarán el proceso con el siguiente período de validación.

4.4 Periodo de validación.
4.4.1 Se requiere que la compañía aérea comunique a las direcciones de correo de CORPAC, mostradas en el numeral 4.1 de esta AIC, la siguiente información:

a) Nombre de su punto focal, que debe ser su representante operativo o quien lo reemplace,
b) Teléfono y dirección AMHS o AFTN y email del CCO o centro de despacho que opere H24 o en las operaciones del vuelo, para contactar en caso de alguna observación en el FPL.

4. Guidelines.

4.1 Users who make use of the flight plan presentation procedure via AMHS or AFTN, must have its own, or hired, messaging terminal.
Transmission directions must be previously notified to CORPAC, as a network administrator of the AMHS or AFTN network, to the following addresses:
ccam@corpac.gob.pe
ccamo@corpac.gob.pe
ranastacio@corpac.gob.pe

4.2 Flight plans via AMHS or AFTN shall be received from all airlines which have regular flights that have been approved by the DGAC PERU.

4.3 The airlines that meet the requirements specified in paragraphs 4.1 and 4.2 of this AIC shall continue the process with the following validation period.

4.4 Validation Period.
4.4.1 The airline is required to provide to the CORPAC e-mail addresses, shown in Section 4.1 of this AIC, the following information:

a) Name of the focal point, which should be its operating representative or his/her replacement,
b)Telephone and AFTN or AMHS address and CCO (Operations Control Center) e-mail or dispatch center that operates 24 hours a day or in flight operations so that they may be contacted in case of any observation in the FPL.

4.4.2 Por un periodo de 7 días las compañías aéreas deberán presentar simultáneamente el FPL en las respectivas oficinas ARO de la FIR Lima y el FPL directamente por el sistema AMHS o AFTN, para el control y verificación simultánea de información por CORPAC S.A. Transcurrido este periodo de manera satisfactoria, el Equipo AIS/ARO del Área de Información Aeronáutica de CORPAC se contactará con el punto focal designado, para confirmar que la aceptación de los FPL´s se efectuarán a partir de la fecha únicamente vía AMHS o AFTN.

5. Procedimiento.

5.1 El usuario presentará el plan de vuelo vía AMHS o AFTN a la dirección SPIMZPZX (ACCLIMA) y a las direcciones del aeródromo de destino (ZTZX y YOYX), alternos (ZTZX) y a los ACC correspondientes.

5.2 En caso que la aeronave no despegue del aeródromo de Lima (SPJC), se consignarán en las direcciones del aeródromo de salida ZTZX y YOYX. En el caso de un vuelo desde/hacia el Cuzco se deberá agregar SPZOZAZX.

5.3 Los usuarios serán responsables de enviar sus programaciones diarias de manera física o vía email a la siguiente dirección: aislima@corpac.gob.pe; debiendo esperar la confirmación de recepción del Equipo AIS/ARO para asegurar el monitoreo y control de los Planes de Vuelo. Solo se aceptarán correos corporativos.

5.4 Los mensajes ATS aplicables a esta AIC son: ***FPL, CNL, CHG y DLA***.

5.5 El mensaje FPL, permite enviar un plan de vuelo a las dependencias ATS. En ningún caso se debe reenviar un FPL a una dependencia a la cual ya haya sido transmitido a menos que sea expresamente solicitada. De ser así, este FPL se debe enviar únicamente a la dirección que lo requiera. El tiempo mínimo para la transmisión de un FPL será de 1 hora previa al EOBT.

5.6 El usuario transmitirá mensajes normalizados ATS de ***CNL, CHG o DLA*** antes de los 30 minutos de su EOBT. Al cancelar un plan de vuelo se retornará al punto anterior (5.5)

5.7 El plan de vuelo que exceda 1 hora después de su EOBT será cancelado en forma automática por el sistema.

4.4.2 For a period of seven days the airlines must simultaneously submit the FPL in the respective ARO offices of the FIR Lima and the FPL directly via the AMHS or AFTN system, for the control and simultaneous verification of information by CORPAC S.A. After this period has passed successfully, the CORPAC's Flight Planning Area will contact the designated focal point, to confirm that FPL acceptance will be carried out as of that date only via AMHS or AFTN.

5. Procedure.

5.1 The user shall submit the flight plan via AMHS or AFTN to the address SPIMZPZX (ACCLIMA) and to the addresses of destination aerodrome (ZTZX y YOYX), alternate (ZTZX) and corresponding ACC.

5.2 In case that the aircraft does not take off from Lima aerodrome (SPJC) it shall be entered in the aerodrome of departure ZTZX and YOYX addresses. SPZOZAZX should be added in the case of a flight from/to Cuzco.

5.3 Users shall be responsible for sending their daily schedules in either a physical format or by email to the following address: aislima@corpac.gob.pe having to wait for recepcion confirmation from the aro/ais office to ensure the monitoring and control of the flight plans. Corporate emails shall be accepted only.

5.4 The applicable ATS messages to this AIC are: ***FPL, CNL, CHG and DLA.***

5.5 The FPL message allows to send a flight plan to the ATS units. In no case should an FPL be forwarded to the unit which has already been transmitted unless expressly requested; If this were to happen, then FPL should be sent only to the address required. The minimum transmission time of a FPL will be 1 hour prior to EOBT.

5.6 The ATS messages CNL, CHG or DLA will be transmitted by the user at least 30 minutes before the EOBT. When cancelling a flight plan, the user shall return to the previous point (5.5).

5.7 The flight plan exceeding 1 hour after its EOBT will be canceled by the system automatically.

5.8 Las compañías aéreas serán responsables del correcto envío de los mensajes e itinerarios remitidos vía AMHS o AFTN, los cuales deben estar autorizados por la DGAC.

5.8 The airlines shall be responsible for the proper delivery of messages as well as itineraries sent via AMHS or AFTN, according to the approved Flights Permit granted by the DGAC.

5.9 En caso la aeronave no pueda salir a tiempo por problemas técnicos, operacionales o de otra índole, el plan de vuelo se considerará cancelado y no podrá presentar plan de vuelo hasta cumplir con el procedimiento establecido por la DGAC según oficio N° 0673 – 2007 MTC/ 12.

5.9 If the aircraft can not depart on time due to technical, operational or other reasons, the flight plan will be considered to be canceled and shall not be able to present a flight plan until they comply with the procedures established by the DGAC according to Document No. 0673-2007 MTC/12.

5.10 Los medios de comunicación, disponibles en el Equipo AIS/ARO de Lima, para el suministro, intercambio y coordinaciones entre las dependencias y usuarios serán los siguientes:
a) Dirección AFTN : SPJCYOYX
b) Números telefónicos: (511) 2301172,
(511) 2301173,
(511) 978471875
c) Email: aislima@corpac.gob.pe

5.10 The available communication means at the AIS /ARO Office in Lima, for the provision, exchange and coordination among agencies and users, shall be the following:
a) AFTN Address: SPJCYOYX
b) Telephone Numbers: (511) 2301172,
(511) 2301173,
(511) 978471875
c) Email: aislima@corpac.gob.pe

Agenda Item 6: Other business

6.1 Under this agenda item the Meeting analysed the following papers:

a) WP/09 - *Information in the AIP on the use in ATS route segments of flight levels not appearing in the table of cruising levels* (presented by the Secretariat);
b) WP/13 - Considerations for addressing the duplication of ICARD 5LNC code by SAM States (presented by Venezuela); and
c) IP/06 - Sistema automatizado de diseño de procedimientos instrumentales (presented by Venezuela - Spanish only).

Information in the AIP on the use in ATS route segments of flight levels not appearing in the table of cruising levels

6.2 The Meeting took note that the ATSRO/08 meeting had analysed the information provided by IATA on the use of flight levels that were not contained in the table of cruising levels as regards heading, as indicated in Appendix 3 to ICAO Annex 2, which were tactically applied by control centres (ACCs) in some route segments to prevent aircraft from climbing or descending in very short segments, or to avoid the convergence of traffic that would hinder aircraft separation.

6.3 The Meeting agreed that the Region showed some weakness in the information contained in the AIP, section ENR 3 regarding the use of flight levels that did not appear in the Table of Annex 2 for some route segments, which could result in safety incidents in case of communication failure.

6.4 In this sense, it urged the States to take measures at their ATM and AIM units to provide, for these route segments, appropriate information in section ENR 3, column 6 "*Remarks*" of the AIP route tables, and to issue an AIC is so required.

Considerations for addressing the duplication of ICARD 5LNC codes by SAM States

6.5 Venezuela noted that ICAO had issued State letter 2017/101 - *International codes and route designators (ICARD*) database. This letter contained the rules for addressing 5LNC duplication and urged States to comply with the provisions of ICAO Annex 11 and Annex 15 concerning the code system.

6.6 The Venezuelan Administration was conducting activities to resolve code duplication issues and highlighted that the list of focal points had to be updated in order to contact the adjacent FIR to consolidate the coordinates of common points. Venezuela has common points with Trinidad and Tobago, but the focal point of that State was not identified on the ICARD page.

6.7 The Secretariat noted that, in accordance with letters sent to the States, the Regional Office was responsible for the phasing out of duplicated codes, based on replacement criteria aimed, for example, at minimising costs generated by changes in publications and aeronautical charts. In this regard, it reasserted its readiness to provide any support or information required by SAM States for these tasks.

Automated instrument procedure design system

6.8 The Meeting took note that Venezuela had decided to purchase a flight procedure design system for the production of the aeronautical information publication from a centralised database with data exchange capabilities that allowed users to use digital terrain data for the design. Project details are provided in information paper SAM/IG/20-IP/06.

Consultation on airline requirements for routes between Asunción and Montevideo

6.9 As part of coordination efforts for proposal 4-33 of the ATSRO/08 meeting, Paraguay and Uruguay requested information on airline requirements for route UM402 between Asunción and Montevideo, taking advantage of the presence of IATA and Avianca at the Meeting. It was established that Amazonas and Tampa Cargo conducted operations between the city pair, and that they were using conventional route UA556.

6.10 The Secretariat noted that these routes had been analysed at ATSRO/08 and that the meeting (including Argentina) had agreed to replace conventional route UA556 with an RNAV route, with publication deadline of April 2018. The Secretariat would continue coordinating with the States (including Brazil) and IATA in order to decide whether to maintain or remove UM402, which was not being used by the operators.

Consultation on the technical feasibility of services in the NON-FIR area

6.11 The SAM/IG/19 meeting held in May 2017 recognised the need to define the responsibility for services in the "*NON-FIR*" area in order to improve the quality of such airspace and allow for coordination of Random Routes. Accordingly, it was suggested that the representatives of Ecuador and Peru should make consultations within their States to see the possibility of assuming responsibility for the aforementioned area.

6.12 In this regard, the Secretariat reported that a response has been received from Peru, awaiting the answer from Ecuador, which could not attend this Meeting. The Secretariat will maintain orientation to States in this subject and coordination with ICAO Air Navigation Bureau (ANB).