SAM/IG/18

INTERNATIONAL CIVIL AVIATION ORGANIZATION
South American Office

Regional Project RLA/06/901

EIGHTEENTH WORKSHOP/MEETING OF THE SAM IMPLEMENTATION GROUP

(SAM/IG/18)

FINAL REPORT

Lima, Peru, 17 to 21 October 2016

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HISTORY OF THE MEETING

ii-1 PLACE AND DURATION OF THE MEETING

The Eighteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/18) was held at the premises of the ICAO South American Regional Office in Lima, Peru, from 17 to 21 October 2016, under the auspices of Regional Project RLA/06/901.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Onofrio Smarrelli, RO/CNS SAM 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.

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. Francisco Almeida, delegate from Brazil and Mr. Fernando Hermoza, delegate from Peru, were elected as Chairmans of the Meeting.

Mr. Onofrio Smarrelli acted as Secretary assisted by Messrs. Roberto Arca, ATM/SAR Adviser and Roberto Sosa RO/ANS/SFTY.

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

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 to the new Electronic Air Navigation Plan (eANP)

Agenda Item 2: Optimization of the SAM airspace
a) PBN en-route
b) PBN in Terminal Areas
c) PBN proceedings

Agenda Item 3: Implementation of Air Traffic Flow Management (ATFM)

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 62 participants from 11 States of the SAM Region (Argentina, Bolivia, Brazil, Chile, Ecuador, Panama, Paraguay, Peru, Suriname, Uruguay and Venezuela), and as Observers 1 State from CAR Region (United States), 2 International Organization (IATA and IFALPA) and 7 Observers from the aeronautical industry (AIREON, ARINC, ATECH, SAAB, SAIPHER ATC, SITA and THALES). The list of participants is shown in page iii-1.

ii.7 **LIST OF CONCLUSIONS**

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SAM/IG/18-2	NOMINATION AND REGISTRATION OF SAM CANDIDATES FOR EUROCONTROL AMC	4-6
SAM/IG/18-3	DESIGNATION OF ADS B FOCAL POINTS	5-6

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

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

a) WP/02 - *Follow-up to valid conclusions formulated by SAM/IG meetings* (presented by the Secretariat); and
b) WP/03 - *Progress in the development of the new electronic Air Navigation Plan (eANP)* (presented by the Secretariat).

Conclusions and decisions adopted by SAM/IG meetings

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

a) tasks to be carried out and/or the corresponding conclusion in the areas being analysed;
b) specific tasks leading to the fulfilment of the main task;
c) outcome expected from each task;
d) completion dates;
e) the parties responsible for their execution;
f) members supporting the task; and
g) the status of implementation of the task and, when required for better understanding, comments are included to explain the status of implementation.

1.3 Likewise, the Meeting completed the table contained in **Appendix B** to this agenda item which shows, for monitoring purposes, the tasks under the responsibility of the States.

Progress in the development of the new electronic Air Navigation Plan (eANP) for the CAR/SAM Regions

1.4 The Meeting took note of the progress of the new Regional electronic air navigation plan (eANP) for the CAR/SAM Regions where was informed that the Volume II of the eANP was submitted for comments to the ICAO Air Navigation Bureau (ANB), and it has undergone several changes when circulated to the States. Therefore, it is expected that it will be circulated again, with the proposed changes, prior to its final approval.

1.5 It was also informed that the fourth meeting of the GREPECAS Programmes and Projects Review Committee (PPRC/4) took note of the delays in the CAR and SAM Regions with respect to the dates proposed for the approval of eANP Volumes II and III. Likewise, regarding eANP Volume III, the PPRC/4 meeting decided to postpone its circulation until GANP updating was completed, which is foreseen for 2019.

1.6 The Meeting took note that States must continue using the Regional performance-based implementation plans (SAM-PBIP and RPBANIP) for drafting their national air navigation plans. Furthermore the work done by the Regional Offices concerning Volume III will require the standardisation of criteria, the use of standard formats, and their alignment with the changes to be introduced in the GANP 2019.

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							
3-26	**Conclusion SAM/IG/12-2 PBN approach instrument procedures** That SAM States: a) publish the navigation specification corresponding to such SIDs and STARs RNAV not having such indication at present; b) complete the implementation of APV procedures for all instrument flight runway ends, whether as primary approach or as support to precision approach, with a view to completing 70% of PBN approaches by 2014 and 100% by 2016; and c) advise the Regional office of any changes in the status of implementation of instrument approach procedures, whether conventional or PBN, in each SAM/IG meeting, in order to update regional efficiency indicators.	Implement APV procedures for all instrument flight runway ends.	70% of APV approaches 100% of APV approaches Information papers in SAM/IG meetings	2014 2016 2016	States	RO/ATM	**VALID** Paragraph b) superseded by Bogota Declaration. Paragraph c) superseded by Conclusion SAM/IG/14-4.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
3-29	**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.	Complete details of PBN implementation at each international airport contained in the Air Navigation Plan Calculate fuel and CO2 savings achieved with the optimization of the air spaces	Submission of data to Regional office	SAM/IG/19	STATES	RO/ATM	**VALID** Note: Literal a) completed. Literal b) for the estimation of fuel savings and C O_2 emissions, another tools approved by the Stares can be used
3-30	**Conclusion SAM/IG/14-5 National PBN implementation plans** That SAM States submit their updated national PBN implementation plans to the SAM/IG/15 meeting, using the model National PBN implementation plan shown in Appendix I to this part of the Report	Updating of PBN National Implementation Plans	PBN Plan updated	SAM/IG/18	STATES	RO/ATM	**VALID** States that has presented for the SAM/IG/18 PBN national plans are: ARG, BOL, BRA, CHI, COL, ECU, FGY, GUY, PAR, PER, URU and VEN

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
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** States that has presented during SAM/IG/18 their actions plans for redesign selected air spaces with base on PBN are: ARG, BOL, BRA, CHI, ECU, GUY, PAN, PAR, PER, URU and VEN

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
4. Standards and procedures for performance based navigation operations approval							
4-11	**Para 4.9 SAM/IG/6 report-** Establish standard criteria for the Regional System on ground and flight Validation of flight procedures through satellite-based PBN instruments.	Prepare standardised criteria.	Uniform application of Validation criteria on ground and flight procedures through satellite-based PBN instruments.	SAM/IG/18	RLA/99/901	RO/FLS	**CONCLUDED** The draft AC 91-012 – Flight validation (FV) of satellite-supported instrument flight procedures (IFP) of performance based navigation (PBN) was presented during the SAM/IG/6. On this respect, the Meeting requested the Secretariat to send a survey of flight inspection experts for comments and further approval. The Secretariat will consult with SAM RO/FLS on the status of this Conclusion. AC was timely presented. On this respect the industry agreed not to publish it because does not match with ICAO documents. Advisory Circulars developed by SRVSOP cover completely and exhaustively all performance based navigation specifications available to date and no additional activities have been planned by the SRVSOP related to the elaboration of additional material on PBN.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
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 is being transferred to another server, so it is active. Simultaneously airworthiness area of the SRVSOP has been requested to analyze how to introduce proceedings into the Authorities in order to keep database updated. Letter will be circulated once the actions are completed. Link: http://srvsop.icao.int/CapacidadAeronaves/login
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** REDDIG II had included and operating a telephone IP sub-network addressed to ATFN. It has capacity for 16 users. With the implementation of the new Brasilia node, the capacity is expanded to 17 users. States are exchanging significant information on the operational status of their air spaces and airports by e-mail on daily basis.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
5-16	**Conclusion SAM/IG/6-8 ATFM AIP SUPP/AIC Model** That the States of the ICAO South American Region, when preparing their national AIC, use as a reference the ATFM AIP SUPP/AIC model shown in Appendix E to this part of the report.	Prepare AIC	Harmonised publications in the SAM Region	October 2016	States	RO/ATM	**VALID**
5-24	**Conclusion SAM/IG/14-10 ATFM preparatory activities** That SAM States do their utmost to: a) increase the number of ATFM-trained personnel to the extent required to fulfil ATFM functions; and b) provide ATFM training to their personnel through national courses conducted by instructors trained in courses provided within the framework of Project RLA/06/901, with a view to multiplying training.	Establish the minimum staff to provide the ATFM system Deliver at national level the ATFM training courses	Sufficient human resources Trained national staff	SAM/IG/18	STATES	RO/ATM	**VALID paragraph (b)** Task described in paragraph (a) is finalized
5-26	**Conclusion SAM/IG/15-4: Reduction of the longitudinal separation between aircraft in the SAM airspace** That, taking into account the operational benefits to be gained from reducing the						**VALID** See implementation progress on Appendix D of Agenda Item 2 of SAM/IG/18 Report.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	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	
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							
6-23	**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 to maintain the required security in REDDIG II and submit the results of this analysis at the Twentieth meeting of the	Actions oriented to keep security in REDDIG II	Actions oriented to keep security in REDDIG II implemented	Mach 2017	REDDIG II member States REDDIG II Administration	REDDIG II Administration	**VALID** The Fifth Technical/Operational Meeting (RTO/5) carried out via teleconference on 27 and 28 July 2016, reviewed the results of the REDDIG II security evaluation performed on 26 April 2016. The RTO/5 supported the considerations regarding threat or risk for the REDDIG II classified in two groups, internal and

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
	Coordination Committee of Project RLA/03/01 (RCC/20 March 2017) for approval.						external to the REDDIG II.
6-24	**Conclusion SAM/IG/17/02: Analysis of the REDDIG II connection configuration for the transport of 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.	Asses the configuration of REDDIG II connection for the transport of SITA data link services	Configuration of REDDIG II connection for the transport of SITA data link services	October 2016	REDDIG II member States	REDDIG II Administration	**VALID** A teleconference was carried out to on 21 June 2016 to make a follow-up to this activity as well as the RTO/5 (via WEB). It is expected to complete the analysis during the SAM/IG/18. A teleconference will be held on Friday December 2, 2016 to allow a final review by the REDDIG group.
7. Operational implementation of new ATM automated systems and integration of the existing systems							
7-13	**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.	Updating of the FASID Table CNS 4	FASID Table CNS 4 updated	15 Dec 2014	SAM Region States	ICAO SAM Office	**VALID** FASID table CNS 4 has been replaced with the CNS CAR/SAM 5 in the new eANP. Argentina, Chile; Panama, Paraguay, Peru and Venezuela have provided updated information.

No.	Task to be developed	Specific tasks	Deliverables	Finalization date	Responsible	Supporting members to the task	Status of implementation
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, the AIDC between ACC Lima and ACC Guayaquil started testing operations. Operational phase began on 31 March 2016. Pending operational test phase between Lima ACC-Bogota ACC and Guayaquil ACC – Bogota ACC.
7-15	**Conclusion SAM/IG/15-08 Provision of facilities for the staff in charge of the operational implementation of the AIDC by the aeronautical authorities of the States** That the Aeronautical Authorities of the SAM Region States involved in the implementation of the AIDC systems interconnection, in order to comply with the requirements of the Bogota Declaration in this regard, provide the necessary facilities for the staff designated for the implementation of this	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
	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.						
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 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.	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, 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
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 Guyana, 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.	YES	O/G	YES	YES	YES	O/G	YES	NO	O/G	O/G	O/G	NO	O/G	YES	

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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**	**YES**		**YES**	**YES**	Pending information from Bolivia, Guyana, Panama and Suriname
Conclusion SAM/IG/13-8 – **Actions on air traffic flow control measures** That in view of air traffic flow operational restrictions, SAM States adopt following measures: a) consider the text on flow control measures used in the ATS 06/14 Multilateral Meeting, or similar, for inclusion in the Letters of Operational Agreement between ATS dependencies;	**YES**	**YES**	**YES**			**YES**				**YES**			**YES**		**Argentina:** Used text shown under paragraph a) in their national Letters of Agreement, as well as with Bolivia, Chile and Paraguay, Uruguay and Brazil. **Bolivia**: Used text shown under paragraph a) in their LOAs with Argentina and Paraguay. **Ecuador:** Used the text shown under paragraph a) in their LOA between Guayaquil and Bogota.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
b) consider of utmost priority to take necessary and urgent actions to avoid the adoption of unilateral flow restrictions that could severely affect air traffic flow; c) implement air traffic flow control measures, if necessary, based on well-founded studies of ATS sector capacities, and coordinate same previously with ATC dependencies responsible for ATS supply in adjacent FIRs. d) consider the application of gradual control measures using as far as possible separations based on distance, by taking advantage of existing ATS surveillance tools; e) use in messages established for communicating flow control measures, terminology and format as detailed in Manual on Air Traffic Flow Management for CAR/SAM Regions, Version 1.1, October 2010, Chapters 12 and 13.															**Paraguay**: Used the text shown under paragraph a) in their LOAs with Bolivia and Argentina. **Argentina and Chile set agreements for the establishment of ATFM measures.**
Conclusion SAM/IG/13-9 IATA safety events indicators for SAM States Encourage States to	O/G		**YES**	**YES**			**YES**								Argentina is preparing a convention for the use of data safety events and indicators registered by airlines through IATA.

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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.															
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**	There is a new templated proposed by Peru
Conclusion SAM/IG/14-5 National PBN implementation plans That SAM States submit their updated national PBN implementation plans to the SAM/IG/15 meeting, using the model National PBN implementation plan shown in Appendix I to this part of the Report	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**NO**	**YES**	**YES**	**NO**	**YES**	**YES**	Panama foreseen to complete its PBN national plan by Dec 2016

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**		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: 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.	**YES** **YES**	**YES** **YES**	**YES** **YES**	**YES** **YES**	**YES**	**YES**			**YES**	**YES** **YES**	**YES** **YES**	**YES** **NO**	**YES** **YES**	**YES** **YES**	Paragraph (a) concluded
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**	**O/G**	**O/G**	**O/G**	**N/A**	**O/G**	**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**	**NO**	**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**	**O/G**	**CONCLUDED** States took note on the actions considered.
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**	**N/A**	**VALID** Pending migration AIDC operational phase between: ACC Lima ACC Bogota ACC Guayaquil ACC Bogota

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**				**CONCLUDED** The model amendment to the letter of operational agreement on AIDC at moment is being used by Colombia, Ecuador, Panama and Peru

Conclusión/Tarea Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	OBSERVACIONES REMARKS
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 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.	**O/G**	**NO**	**O/G**	**O/G**	**NO**	**O/G**	**O/G**	**O/G**	**N/A**	**O/G**	**O/G**	**O/G**	**O/G**	**O/G**	The Fifth REDDIG II Technical/Operational Meeting (RTO/5) carried out via teleconference (26-27 July 2016) analyzed the implementation of all actions. All REDDIG II Member States BUT Bolivia and Colombia. The SAM/IG/18 meeting analyzed actions and submit the results to 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**	The teleconference hold on 21 June 216 and the RTO/5 carried out via teleconference (26-27 July 2016) evaluated the configuration of the REDDIG II connection for the SITA database services. The SAM/IG/18 meeting reviewed the configuration and agreed to hold a teleconference on December 2 with REDDIG members, REDDIG administration and SITA for approval.

Agenda Item 2: SAM airspace optimisation
a) PBN en route
b) PBN in terminal area
c) PBN procedures

2.1 Under this agenda item the following papers were discussed:

a) WP/04 – *Follow-up to PBN implementation in relation to the goals of the Declaration of Bogota and other implementations related to airspace optimisation* (presented by the Secretariat);
b) WP/09 – *Amendment to bilingual ATC phraseology in Document 4444* (presented by the Secretariat);
c) WP/14 – *Checklist for analysing PBN concept implementation* (presented by the Secretariat);
d) WP/17 – *Template to follow up on PBN goals established in the Declaration of Bogota* (presented by Peru);
e) IP/03 – *PBN implementation planning in the Southern Region of Brazil– PBN SUL* (presented by Brazil – Spanish only);
f) IP/04 – *Reduction of CO_2 emissions into the atmosphere, as a result of the PBN Project in the Southern Region of Brazil – PBN SUL* (presented by Brazil – Spanish only);
g) IP/07 – *Implementation of the PBN airspace concept in the Foz de Iguaçú TMA - Brazil* (presented by Brazil – Spanish only);
*h) IP/14 – Advanced course on obstacle limitation surfaces and aeronautical studies for the SAM Region in Argentina (*presented by Argentina – Spanish only*);*
i) IP/15 – *Addition of a new RNP indicator in the flight plan format* (presented by Argentina – Spanish only); and
j) IP*/16 – PBN operation manual and action plan in Paraguay* (presented by Paraguay – Spanish only).

Follow-up to PBN implementation in relation to the goals of the Declaration of Bogota and other implementations related to airspace optimisation

2.2 The Meeting took note of the progress made in PBN implementation, and of the difficulties that had affected implementation, such as the lack of designers in some States, failure by PBN project management to meet the agreed goals, and interruptions to address other projects being executed in parallel.

Updating of national PBN plans and action plans

2.3 Regarding the updating of PBN national plans, based on Headquarters metrics, 93% compliance had been reached. **Table 1** below shows the updated information:

2016	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**FGY**	**ECU**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**
93%	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES

Table 1 – States that have submitted their updated national PBN plans

2.4 As a supplement to PBN plans, some SAM States have updated the dates for PBN redesign of selected airspaces in their action plans. IATA pointed out that the efforts made by the States to develop their national plans had been very significant, but emphasised the importance of executing them through their action plans. The status of update of actions plans is shown in **Table 2**.

2016 79%	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**FGY**	**ECU**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**
	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	NO	YES	YES

Table 2 – States that have an Action plan for the redesign of selected airspaces based on PBN

PBN en route

2.5 The Meeting took note of the efforts made by the Region to coordinate the route package agreed by CAR and SAM States. The Secretariat would communicate the results of the modifications to Headquarters for the corresponding amendment.

2.6 Sixty-five per cent (65%) progress had been achieved in the implementation of RNAV routes in upper airspace, exceeding the 60% goal established in the Declaration of Bogota. In order to get a more clear idea, **Table 3** below shows the number of regional conventional and PBN routes in upper airspace, as well as the percentage of PBN routes achieved.

Total ATS routes in upper airspace	Conventional routes	PBN routes	% PBN routes implemented	Declaration of Bogota indicator: % PBN routes
145	52	93	**65%**	60%

Table 3 - ATS routes (conventional and PBN) in upper airspace

Routes proposal made by COPA

2.7 With reference to Conclusion SAM/IG/15-1 regarding the assessment of proposals made by COPA, the Secretariat noted that SAM States concerned informed it would not be feasible to implement such proposal. In this sense, it was requested to consider said Conclusion as concluded.

PBN in TMA

2.8 The Meeting took note of the results of the two PBN implementation workshops that had been conducted with the participation of IATA and leading operators, who helped in the collaborative decision-making process and improved the results of the planning, design, and validation phases.

2.9 Likewise, the States had the opportunity to analyse the results of the First PANS-OPS workshop conducted in the SAM Region to analyse, together with the procedure designers, the amendments made to ICAO Doc 8168 and Circular 336, with respect to RNAV and RNP approaches. The report of these activities appears in **Appendix A** to this part of the report. **Appendix B** contains a table with the recommendations of the PANS-OPS workshop to the States for harmonising PANS-OPS procedures in the SAM Region.

2.10 Taking into account the importance of implementing the recommendations of the First PANS-OPS workshop proposed by the PANS-OPS panel for harmonising instrument procedures and the associated processes to enhance safety, the Meeting agreed on the following Conclusion:

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 harmonising instrument procedures and the associated processes, and enhance safety.

Implementation of SIDs, STARs, and PBN approach procedures

2.11 The Meeting analysed the status of implementation of SIDs, STARs, and PBN procedures. It also took note of the latest information on international aerodromes in the Region, shown in **Appendix C** to this part of the report, which will be included in the procedure implementation control template. Accordingly, the new international aerodromes will be part of the template as of 1 January 2017.

2.12 Regarding the list of international aerodromes presented at the Meeting, the DAC of Suriname sent an e-mail stating that the aerodrome SMZO in Paramaribo was not considered by that authority as being international and, therefore, should not appear in Table AOP of VOL II of the eANP. The Secretariat deleted said aerodrome from the list so that it would not be considered in the PBN procedure control template either.

2.13 This update did not show any significant progress towards meeting the commitment assumed at the ICAO Assembly pursuant to Resolution A37-11, before the end of 2016, since only 75% regional implementation was achieved. Accordingly, the States shall double their efforts in order to achieve this goal. The following table shows the status of implementation:

Total # of international aerodromes	Total thresholds	Total APV or RNP AR or LNAV IAPs	ICAO indicator A37-11 % APV on IFR routes	
			Actual regional	GOAL 2016
99	175	131	75%	100%

2.14 Regarding CCO, 20% implementation has been achieved, and 22% for CDO. The Meeting agreed that the States of the Region would apply the processes described in the CDO and CCO Manuals to the SIDs and STARs already implemented for their validation.

2.15 In this sense, the Meeting also took note that a perfect combined CCO and CDO design is not always possible in complex airspaces and that, in that case, each State should prioritise SIDs inasmuch as possible by applying CCO operational techniques, provided the obstacles or the operational complexity do not jeopardise safety.

2.16 The Meeting also noted that, at some airports, the strict application of a STAR might not prove efficient. In this regard, the Meeting agreed that each State, after due analysis, could make a note stating this fact in the PBN procedure implementation control template.

2.17 The Meeting took note of the convenience of optimising controller and pilot workload by establishing SIDs with different transitions instead of countless SIDs for departing from the same runway.

2.18 The status of implementation of PBN SIDs/STARs in the Region is shown in the following table. It may be noted that the goal of the Declaration of Bogota has been exceeded, and progress continues to be made in this implementation.

Total # of airports	Total # of SIDs/ STARs	Total # of PBN SIDs/STARs	ICAO indicator: % of PBN SIDs/STARs at international airports	ICAO indicator: % of PBN SIDs/STARs at international airports
			April 2016	GOAL 2016
99	1680	1209	72 %	60%

SAM PBN implementation control template

2.19 The Meeting analysed an interesting proposal of Peru regarding a set of improvements to the SAM PBN implementation control template, aimed at better quantifying the progress made in PBN implementation at international airports of the Region.

2.20 Peru informed the opportunity for improvement was identified at the last review of the follow-up template of Peru, when the values obtained in the *SID PBN AIRPORT* column were analysed. It was noted that only 12.5% progress had been achieved, and that the line corresponding to runway 28 of the Cusco international airport had a value of 2 (not implemented) for PBN standard instrument departures, showing a deficiency in that runway.

2.21 Accordingly, it was felt that the "*not implemented*" status was not the most appropriate for runway 28 of Cusco, since it was not possible to implement a SID route for that threshold due to the existence of very high natural obstacles west of the station. In this sense, consideration was given to the possibility of deducting, in the formula of the template, those runways where implementation of the PBN procedure or standard route was completely unfeasible, thus avoiding an incorrect indication of a deficiency that distorts the real percentage of progress in PBN goals.

2.22 Accordingly, it was felt that the Excel spreadsheet should include another option, in addition to status "1 = *implemented*" or "2 = *not implemented*". To this end, a modification to the formula was tested, deducting those boxes that contained the option "N/A" (*not applicable*), as follows:

- Current formula, showing the results of column D in the template of Peru:
  =FREQUENCY (D6:D14; D16)/COUNT (D6:D14)

- Improved formula (grey-shaded), where boxes with N/A values are deducted, thus increasing the percentage:

  =(FREQUENCY(D6:D14;D16)-
  FREQUENCY(D6:D14;D17))/COUNT(D6:D14)

  In the example of Peru, for purposes of comparing the frequency, boxes D16 and D17 contain the values “1” and “N/A”, respectively.

2.23 It was noted that the inclusion of the third “*not applicable*” option in the appropriate cases could better reflect the status of PBN implementation at each airport. This clearly shows the progress made in the State with respect to its commitments with the Declaration of Bogota.

2.24 The States participating in the Meeting and IATA acknowledged the initiative and requested the Secretariat to insert the proposed changes and circulate the template again so that the States might fill in the data based on the proposed formula, which better reflects the details of the implementation.

Reduction of CO_2 emissions as a result of PBN implementation in TMAs

2.25 Several States presented their annual CO_2 savings calculations based on upcoming PBN design implementations. In this sense, Brazil foresees conservative savings of 10,000 tonnes, Chile anticipates saving 2,000 tonnes, and Uruguay foresees saving 7,000 tonnes with the implementation of their designs in 2017.

Activities and resources approved for 2017 with the support of Project RLA/06/901

2.26 The Meeting took note that the Tenth meeting of the coordination committee of Project RLA/06/901 (RCC/10) had approved the following activities to support SAM airspace optimisation in 2017:

- **Second workshop on PANS-OPS implementation,** to continue with the harmonisation and coordination of PBN instrument procedures in the SAM Region, advanced RNP, and CDO/CCO, foreseen to be held in Lima, Peru for one week in July 2017.

- **Longitudinal separation optimisation workshop,** to develop an implementation plan for reducing longitudinal separation in SAM airspace from 40 to 20 NM, and sign the letters of operational agreement, foreseen to be held in Lima, Peru, for one week in October 2017.

- **Version 04 of the SAM route network, based on the PBN operational concept,** to develop the operational concept on the PBN route structure (ATS routes, SIDs, and STARs) for the period 2017-2019, including the implementation strategy, the navigation specification to be applied en route and in TMAs, as well as metrics and indicators, to be conducted by two experts of the Region in Lima, Peru, during three weeks in August 2017.

- **ATS/RO/8 workshop/meeting,** to conduct the preliminary review of Version 04 of the route network optimisation, and to approve the final version to be implemented, foreseen to be held in Lima, Peru, for one week in September 2017.

- **SAM/IG/19** and **SAM/IG/20 meetings,** to continue with the activities for the implementation of the AGA, AIM, ATM, CNS, and MET action plans developed under the Project. These meetings will be held in May and October 2017, respectively.

- **Workshop on ASBU implementation and PBIP revision,** to review the PBIP and the national air navigation plans aligned with ASBU, foreseen to be held during one week in September 2017.

Monitoring the implementation of reduced longitudinal separation in the Region and signing of letters of operational agreement

2.27 Many States took advantage of the Meeting to update their Letters of Agreement or to sign a Memorandum of Understanding, with a view to sealing the commitments assumed at the SAM/IG/17 meeting regarding the reduction of longitudinal separation. This reduction applies to GNSS-equipped aircraft. In case one or the two aircraft participating in a longitudinal separation lacked GNSS capacity, the separation to be applied to this traffic is 80 NM. **Appendix D** to this part of the report shows the agreements reached between adjacent FIRs.

2.28 Ecuador informed that it was already applying 40 NM of longitudinal separation with Bogota since 13 October 2016 and would continue to do so until signing the Letter of Agreement. With the Lima FIR, at the request of Peru, this separation will be effective as of 10 November.

2.29 With CENAMER, Ecuador applies an oceanic separation, considering besides that there are speech communication issues at the boundaries. Furthermore, Ecuador informed that, next week, in Ecuador, the Letter of Agreement Guayaquil-CENAMER would be reviewed and updated with CENAMER, in which AIDC coordination would be also included.

2.30 Although some FIRs, like French Guiana and Atlántico had oceanic separation in most of their FIR, the implementation process had been very positive in the States of the Region, although more coordination was still required with adjacent States in the CAR Region. The reported status of implementation with the ACCs of adjacent States is as follows:

2016 86% %	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**FGY**	**ECU**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**
	YES	YES	YES	NO*[2]	YES	NO*[1]	YES	YES	YES	YES	YES	YES	YES	YES

*[1] French Guiana applies oceanic separations with neighbouring States.
*[2] Chile has not yet completed the external processes for reducing longitudinal separation with adjacent ACCs of other States.

PBN focal points of the regulator and air navigation service provider

2.31 The States of the Region updated the list of PBN focal points of the regulator and the air navigation service provider (ANSP) for coordination and teleconferencing purposes. The list updated by the Meeting appears in **Appendix E** to this part of the report.

Checklist for analysing PBN concept implementation

2.32 The Meeting analysed the proposal presented by the Secretariat on the checklist for analysing the implementation of PBN airspace concepts, as a follow-up to a working paper presented by Uruguay at the SAM/IG/17 meeting.

2.33 The States have developed PBN implementation plans pursuant to Doc 9613 and Doc 9992, which clearly establish the steps and requirements that must be met to ensure that the new airspace concept will preserve or improve the levels of safety, in accordance with Annex 11, paragraph 2.27, which states that "*any significant change of the ATS system related to safety, including the implementation of reduced separation minima or a new procedure, will only become effective after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted. When applicable, the responsible authority will make sure that the appropriate measures are taken for post-implementation oversight to ensure that the defined level of safety is met*".

2.34 In order to ensure compliance with the requirements, the State regulatory authority must exercise safety oversight to ensure strict compliance with the safety standards and recommended practices (SARPs). Similarly, ATS service providers must perform the necessary tasks to make sure that all the requirements and recommended practices issued by ICAO and the appropriate authority of each State are fully met.

2.35 The Meeting took note that for any of the two aforementioned activities, the one to be carried out by the appropriate authority or by the ATS service provider, it is highly advisable to have a guide available that describes the requirements to be met and the evidence to be collected to show compliance with such requirements, making assessment more efficient.

2.36 The Meeting concluded that the States could use **Appendix F** to this part of the report to assess the PBN airspace concepts.

Actions for PBN implementation in the Southern region of Brazil

2.37 In order to meet national needs and to ensure a harmonious and integrated PBN implementation and to ensure a homogeneous restructuring of the route network among the States, Brazil was planning to implement PBN at the Curitiba, Florianopolis, and Porto Alegre terminals.

2.38 After quantifying the tasks required for implementation at the southern aerodromes, it was concluded that it was necessary to produce 506 IFR procedure charts, introducing changes in routes, 5LNC designators, and the AIP, requiring 47 weeks to produce such charts. Accordingly, implementation should be postponed until 12 October 2017.

2.39 The planning of macro activities is shown below:

Route optimisation in the Southern region of Brazil

Implementation of routes at the Curitiba FIR and PBN operational implementation at the TMAs of Curitiba, Florianopolis, and Porto Alegre	**12/10/17**
Airspace concept	30/07/16
Performance measurement	26/08/16
Collaborative decision-making (CDM)	28/11/16

Approval of aircraft and operators	28/04/17
Standards and procedures	23/06/17
Safety assessment	30/06/17
ATC automated systems	30/06/17
Training	31/07/17
Publication of air navigation procedures	17/08/17
Post-implementation monitoring	12/10/18

Reduction of CO_2 emissions into the atmosphere as a result of the PBN project in the Southern region of Brazil – PBN SUR

2.40 The Meeting took note that, in order to calculate the reduction of CO_2 emissions as a result of airspace optimisation in the Southern region, Brazil had conducted an accelerated-time simulation using the TAAM (*Total Airspace and Airport Modeller*) tool. Likewise, for measuring workload and other parameters, a real-time simulation had been conducted.

2.41 The calculated reduction of CO_2 emissions into the atmosphere, using all the updated procedures and a conservative measure, was close to 11,000 tonnes of CO_2 per year.

Implementation of the PBN airspace concept at the Foz de Iguaçu TMA - Brazil

2.42 In order to meet the operational needs of users at the airports located within the Foz de Iguaçu TMA and to ensure a harmonious and integrated new airspace concept, the Brazilian proposal was jointly studied by experts of Argentina and Paraguay, who, after analysing the proposal shown in **Appendix G** to this part of the report, agreed to hold a meeting on the first bimester of 2017 in Foz de Iguaçu to sort out the last operational and design details of that TMA.

Addition of a new RNP indicator in the flight plan format

2.43 Argentina informed that Aerolineas Argentinas, together with the aeronautical authority, had developed a tailored RNP-AR approach procedure for the airport at San Martin de los Andes (SAZY). The procedure included a SID designed according to A-RNP concepts.

2.44 The Meeting took note that the A-RNP navigation specification defined in Document 9613, Chapter 4 "*IMPLEMENTATION OF ADVANCED RNP (A-RNP)*" is a guide for States and aircraft operators as to the minimum requirements to be considered for that purpose. This document was used as a guide for designing the aforementioned standard departure (SID), allowing for obstacle clearance, which would otherwise penalise the operation, and the result had been an efficient operation at the San Martin de los Andes airport.

2.45 The Meeting also analysed Doc 4444, *Procedures for air navigation services "Air traffic management*", in its Appendix 2, *Flight Plan,* Item 18 *"Other information"* and noted the following:

- ✓ *PBN/Indication of RNAV and/or RNP capabilities. Include as many of the descriptors therein described, up to a maximum of 8 entries, i.e. a total of not more than 16 characters, but in the descriptors there is no code designated for A-RNP.*

- ✓ *The presentation of the flight plan includes only T1 RNP AR APCH with RF (special authorisation required), which permits acceptance by the FPL ATS automated systems.*

2.46 The Meeting recalled that the next Amendment to Doc 4444 concerning the flight plan, which will consider the new applications, was expected for 2018. In the meantime, a solution was required for users in presenting their flight plans, bearing in mind that it must not affect the automated systems.

2.47 Based on the above, the Meeting felt that the States of the Region facing the same problem could use the coding applied in Australia, where the following information was inserted in Item 18: **NAV/ARNP**, which means that the operator has an approved advanced RNP navigation specification and that it would not affect the FPL ATS automated systems.

2.48 The Secretariat noted that it would be advisable to describe in an AIC the application of this coding for the benefit of the aeronautical community and also so as not to increase the burden of air controllers with this application. In turn, IATA noted that it would be convenient to indicate in the AIP of each State, in the part that describes how to complete the flight plan, if this coding applies.

PBN operations manual and action plan in Paraguay

2.49 The Meeting acknowledged Paraguay for the presentation of its Performance-based navigation (PBN) operations manual. The manual appears in **Appendix H** to this part of the report, describing PBN procedures, contingency procedures, and phraseology, among other topics of interest, and is to be used by air traffic service personnel. It would be of great assistance to the States for training purposes and to introduce the procedures in the respective ATS operating manuals.

2.50 The Meeting took note that the action plan of Paraguay had been updated, as shown in **Appendix I** to this part of the report.

Amendment to bilingual ATC phraseology in Document 4444

2.51 The Meeting took note that, on 1 March 2016, the ICAO Air Navigation Commission had approved Amendment 7 to Doc 4444, which includes Amendments 7-A and 7-B to the 15th Edition of the PANS-ATM. This amendment, effective on 10 November 2016, includes, *inter alia*, the following elements:

a) Performance-based longitudinal and lateral separation minima and the climb and descent procedure (CDP) with automatic dependent surveillance-contract (ADS-C);

b) Separation between departing and arriving aircraft that follow an area navigation (RNAV) or required navigation performance (RNP) route;

c) Emergency descent procedures;

d) The autonomous runway incursion warning system (ARIWS);

e) Modification of the bilingual ATC phraseology;

2.52 Regarding bilingual ATC phraseology, Amendment 7 to Doc 4444 incorporates significant changes that will have a significant impact on aircraft operations, and thus should be known to air traffic controllers and flight crews. Use of a standard bilingual phraseology is one of the elements that States must ensure in all operations in the airspace under their responsibility. Non-standard phraseology is a latent element that could have a negative impact on safety.

2.53 The Meeting took note of the importance of using standard ATC phraseology and, given the changes introduced by the Amendment to Doc 4444, civil aviation authorities of the Region must take the appropriate measures to inform users of the airspace under their responsibility about the changes made. Among these measures, mention was made of the publication of an AIC with the new phraseology, specifying the date in which it will become effective, the issuance of a NOTAM, and the proper induction process for pilots and controllers.

2.54 The States may disseminate Amendment 7 to Doc 4444, Appendices A and B to the working paper presented (SAM/IG/18-WP/09), which refer to the brochures that help to understand the changes in ATC bilingual phraseology. Amendments 7-A and 7-B to the 15th edition of Doc 4444 can be found in the following link:

http://www2010.icao.int/SAM/Pages/ES/MeetingsDocumentation_ES.aspx?m=2016-SAMIG18

APPENDIX A

RESULTS OF THE

SECOND WORKSHOP ON PBN IMPLEMENTATION IN TMA

AND OF THE

FIRST PANS-OPS WORKSHOP

(PBN/IMP/2-PANS-OPS)

Lima, Peru, 12 to 16 September 2016

APPENDIX A1

REPORT

SECOND WORKSHOP ON PBN IMPLEMENTATION IN TMAs (PBN/IMP/2)

(Lima, Peru, 12 September 2016)

The Second workshop on PBN implementation in TMAs (PBN/IMP/2) analysed the following scenarios, which were scheduled for implementation during the period 2016-2017. The scenarios under consideration were the PBN SUR Project (Brazil), covering the Curitiba FIR in Brazil, scheduled for implementation on 14 September 2017, as well as the Pampa SUR Project (Chile), covering the southern part of the Santiago TMA in Chile, and taking into account the areas of Temuco, Concepción, and Punta Arenas. This implementation is scheduled for 8 December 2016. An analysis was also made of the Asunción TMA in the Project of Paraguay, scheduled for implementation in June 2017. Information was also provided on the designs being developed for the Carrasco TMA (Uruguay) and the persisting difficulties related to the lack of instrument procedure designers.

Brazil

Regarding the PBN SUR project in Brazil, the following was noted:

a) The Curitiba FIR had been sectorised, and several arrival scenarios into Sao Paulo had been analysed.

b) The scenarios had been analysed taking into account controller workload and severity, as part of the safety analysis.

c) Following validation, scenario number 5 had been selected.

d) A real-time simulation had been conducted, with 1:30-hr exercises, which demonstrated the feasibility of the scenario.

e) The PBN Sur project comprises 347 charts (506, including draft simulation charts).

f) (GEAI – Flight inspection) **-** (PEA – Quality check).

g) It is an integrated airspace process (route, approach).

h) The concept is effective 14 September 2017. Users have already tested it in the simulator.

IATA commented on the advantages of real-time simulation compared to accelerated simulation if States were not familiar with the accelerated simulation tool, which is a complex tool that requires much training.

The Secretariat requests that an action plan adjusted to September 2017, as well as savings estimates, be submitted in an information paper to the SAM/IG/18 meeting. It also requested that an information paper be submitted to the SAM/IG/19 meeting containing the results of the real-time simulation.

Chile

Regarding the Pampa SUR project, the experts of this State pointed out that the following had been taken into account:

a) Conventional routes were maintained, and a design had been developed to reduce points of conflict. The design considers CCO and CDO techniques; and

b) GNSS-based navigation was assigned priority in the design.

<u>Santiago terminal area</u>

a) For the Santiago TMA, two projects had been combined: the Santiago terminal area and the Pampa SUR project, enhanced in 2016 with the introduction of arrival-only and departure-only points.

Regarding traffic on Runway 17, arrival and departure flows were segregated, so vertical windows have also been included in the design. Priority has been assigned to meeting optimum flight profiles, and the design includes an open STAR so that the ATC may assign vectors as necessary.

Regarding traffic on Runway 35, flows were analysed in order to segregate arrivals from departures.

The Pampa SUR project gives priority to GNSS-capable aircraft. Arrival and departure flows at the Concepción and Temuco TMAs have been segregated. Regarding the Punta Arenas TMA, all arrivals are executed through a single point, and STARs are the same, although approach procedures change.

It was noted that there were non-measurable safety benefits to be derived from the implementation of segregated routes.
Savings are obtained in the order of 2,047 tonnes of CO_2, equivalent to 647 tonnes of fuel.

An analysis of weather conditions at the Merino Benitez airport had also been conducted, showing that visibility is more than 5,000 m 84.6% of the time. This analysis was considered of great value and, in this sense, it is recommended that all States conduct an analysis of weather conditions applying the methodology used by Chile and, based on such analysis, calculate VMC and IMC capability.

Chile was asked to submit an information paper on the methodology used for this analysis at the next SAM/IG/18 meeting.

Paraguay

The workshop took note of the progress made in the Asunción TMA project:

a) The design and basic validation had been completed.

b) In parallel, progress was being made to update the AIRCOM 2100 radar control automated system.

c) Seminars for the technical personnel had been conducted.

d) Implementation tasks had been established.

e) Implementation was scheduled for 22 June 2017.

f) A PBN Manual had been completed, containing operational and contingency procedures for ATCOs.

g) An SMS analysis had been conducted as part of the validation.

h) Regarding the publication, waypoints were still expressed in alphanumeric terms and would be changed to permanent.

The Secretariat requested Paraguay to submit an information paper to the SAM/IG/18 meeting containing the PBN Manual, as well as the updated implementation plan, and thanked Paraguay for the information on the training courses, which also included a PANS-OPS course.

Uruguay

Regarding the Carrasco TMA, it was noted that it was in a very preliminary phase:

a) Although it did not have a full designer team, it was working with the available resources to implement its Action Plan by March 2017, following the recommendations of Doc 9613.

b) It had conducted risk analyses, 3 iterations, radar simulator tests, consultations with ATCOs, airlines and other users, and B737 and A330 simulator tests. It had also used the IFSET tool to calculate fuel and CO_2 savings, which total 6,900 tonnes per year.

c) It is promoting the drafting of national regulations that contemplate the "ICAO balanced approach" towards the environment and aeronautical noise, especially with respect to constructions in airport surroundings, in order to achieve a sustainable development of civil aviation.

d) The creation of a team of PANS-OPS experts is required to complete the re-design (other runways, TMA volume/layout, and Baro-VNAV procedures), if possible by 2017.

e) Instrument procedures have been published in accordance with Circular 336.

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APPENDIX A2

REPORT

FIRST PANS-OPS WORKSHOP

(Lima, Peru, 13 to 16 September 2016)

Information provided by the IFPP Panel member

An explanation was provided on the activities, composition, and operation of the Instrument Flight Procedures Panel (IFPP), as well as of the processes followed for the development of new IFP criteria, timelines, and the distribution of tasks among its members.

An explanation was also given of the existence of several Task Forces engaged in the development of procedure monitoring requirements, the analysis of limiting surfaces, quality assurance, chart symbology, as well as operations dealing with the interpretation of procedures by pilots.

Information was provided on the issues to be covered by the upcoming amendments in 2018, such as:

- RNP AR departures;
- Updating of the RNP AR Procedure design manual (Doc 9905);
- VSS – Clarification and application.

The analysis of an issue by the IFPP may take up to 7 years until a new amendment to Doc 8168 and the corresponding documents is introduced, which may result in failure to properly meet the needs of the industry. Accordingly, the States normally seek provisional solutions, based on the experience gained by States with a recognised global air navigation capability, such as the United States (FAA) and European Community member countries (EUROCONTROL and EASA).

Recommendation
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.

Database coding

The importance of publishing the Coding Table was discussed and it was recognised that the descriptive text of a procedure does not contain information that is sufficiently clear and objective to be inserted in the database of the aircraft navigation system. All the States participating in the workshop applied the Coding Table to the procedure.

The recommendation is to publish an AIC with detailed information about the Table, on how to access the Table, on the responsibility of the provider to produce such coding, and on any parameter that is different from, or more complex than, the standard and is not contained in the Coding Table.

It would be interesting if a regional harmonised coding table were to be submitted at the next workshop. In this regard, Brazil could send the AIC and its Coding Table to the Group to be used as a basis for discussion in order to define a harmonised regional coding table.

A matter for discussion is the change that would be required in the procedure development software that already has a harmonised coding table. The Secretariat suggested that an agenda item be included for the next workshop on coding tables.

Action by Panel members		
Suggested action	**Responsible party**	**Date**
Send the AIC and the Coding Table to the Panel members (e-mail)	Brazil	Upon completion of the final version of the AIC/Coding Table
Comments on the AIC and the Coding Table sent by Brazil	All	PANS-OPS /2 workshop

Changes in the denomination of approach procedures (Circular 336)

The Secretariat presented the changes effective on 1 December 2022 and the tasks to be taken into account for the transition with regard to changes, the designation of procedures in the charts, and the notes on requirements to be included in the charts. The States also took note of the processes for the development of a transition plan and the assessment of the impact of the proposed changes on all stakeholders.

Recommendation
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.

Procedure validation processes

The training modules of Aerolineas Argentinas for ground- and flight-validation pilots were shown in this presentation. This was considered important because it showed a professional course with detailed standard procedures for validating instrument procedures.

These validations are done in simulator and in real flight. The meeting felt that the validation process used by the airline was very useful, and recommended it use by all the airlines in the Region. Note was taken of the importance of data assessment and encoding, and of training requirements and contents of the ground validation IFP Package.

After data documentation, the simulator flight is prepared. The importance of having highly reliable data on the runway and other infrastructure was analysed. It was noted that the flight must be validated "*on course*" / "*on path*" and that the coded path must be compared with the actual stable flight path, without fix and segment "*bypassing*". The issue of segments was also addressed. These must be long enough to allow for slowing down and changing altitude as needed. Lateral and vertical transition must also be stable to avoid autopilot disconnect.

The participants took note of the importance of assessing each segment, the banking angle, the descent rate, the flyability of the segment, and finally the position of the aircraft with respect to the runway, and others, such as the "*TAWS Caution*" or "*Warnings*", interception courses and angles.

It was deemed advisable to assess the procedures with vertical guidance up to the DA, verifying the *full stop landing* and the *missed approach*. The question was raised as to whether the *missed approach* with one engine inoperative was assessed since, in this case, operators need to create their escape routes, etc.

Human factors were also analysed in terms of the complexity and information contained in the chart, as well as the workload involved in each segment.

The last stage consists in documenting if the procedure is ready for the implementation stage. This documentation is harmonised with that applied by Argentina and may be used as an example for the other SAM States.

Recommendation
That SAM States consider the adoption of documentation on ground and flight validation of procedures, similar to that applied by Argentina.

Flight validation

The workshop analysed the importance of flight validation, although it recognised that in case flight validation was not possible, the flight simulator could be used to check the "*flyability*" of the procedure. One of the core issues in this type of validation is the quality and level of detail of the scenario used in the simulator.

In accordance with Doc 9906, flight validation is required in the following circumstances:

a) the "*flyability*" of a procedure cannot be determined by other means;
b) the procedure requires mitigation for deviations from design criteria;
c) the precision and integrity of terrain and/or obstacle data cannot be determined through other means;
d) the new procedures differ significantly from the existing procedures; and
e) for PinS procedures for helicopters.

If the procedure requires mitigation for deviations from the design criteria, or the integrity and precision of terrain and obstacle data cannot be determined through other means, or the new procedures differ significantly from the existing ones, it is advisable to conduct a flight validation check.

Mention was made of the advisability for the aircraft and the crew to be certified for checking the "*flyability*" of the procedure, which is not always the case.

In any case, the workshop felt that these issues should continue to be analysed in order to define a harmonised process for the Region.

Ground validation

It was felt that ground validation process should always be carried out, as indicated in Doc 9906. The implementation of quality assurance processes is considered essential for the procedure design process.

Regarding simulator validation of an RNP AR procedure, there are differing opinions. This is a matter that should continue to be studied by the Group.

Action by the Panel members		
Suggested action	**Responsible party**	**Date**
Determine in which cases should validation and simulator flights be carried out, based on Doc 9906 and the best international practices.	All	PANS-OPS 2 workshop

Visual RNAV procedure

The workshop took note of existing regulations, their application, as well as the publication and coding of these procedures, through examples. The examples showed the difference between conventional visual approaches and RNAV visual approaches, which permit the use of waypoints instead of geographical locations, altitude and speed indications, which are useful for the ATC and the crew, and vertical guidance in some cases.

This helps to reduce unstable visual approaches. Taking into account that most accidents occur in the approach phase, this type of procedure can help reduce the rate. For this type of implementation, CDM between the authority and the operators must be applied starting in the design phase.

Pilots emphasised the ideal point at which visual conditions should be known in order to perform the RNAV visual procedure. The workshop considered this matter to be very important and that warranted further discussion. One possibility would be to establish an MSA or a point at a given altitude in a STAR at which the VMC condition should be assured.

The operators understand that the use of RVFP is basically to ensure a stabilised approach. In this sense, it is advisable to make this decision at a position close to the airport. However, it was felt that the RNAV visual approach was the most appropriate on runways that lacked instrument approach at an airport, in order to ensure the safety of the operation at that airport.

It was also noted that the ATC must be trained in the use of RVFP and can also permit interception of the RVFP at a point other than the starting point, but must not provide vectoring to the aircraft at the beginning of an RF segment.

The pilots and IFALPA delegates attending the meeting noted that the work mix (instrument references in the cockpit and visual references from outside the cockpit) increases pilot workload if compared with a manual visual flight. However, it is recognised that there are more destabilised approaches in fully manual approaches. Consideration should be given to the possibility of having this application available provided specific training is given for this type of approach.

Regarding lateral and vertical guidance, it enhances safety, but consideration should be given to whether the increased workload in the cockpit is manageable and acceptable for the crew and the operator in some cases.

In this regard, a small working group should be established to consider mitigating measures that could be part of a guide for the implementation of visual RNAV, taking into account IFALPA's *Briefing 15ATSB Lima03*.

The Secretariat proposed to work on this matter through TELECONs and prepare a draft discussion paper for the SAM/IG/19 meeting, which could be discussed by a TF within the PBN Group, with a view to developing an acceptable guide on the use of visual RNAV approaches.

The workshop also analysed the benefits of this type of approach in terms of safety and improved TMA capacity and flow management, tactical airspace management, and separation of airport flows with converging paths. Logically, the avionics capacity of the aircraft is critical for taking advantage of these procedures. In VFR thresholds, these procedures help to avoid CFIT, and to reduce runway excursions.

The workshop deemed it important to harmonise publications, since not all charts clearly establish the requirements for their use. Likewise, it should be possible to encode the data in the NavDB and States must ensure the flyability of these procedures.

Action by the Panel members		
Suggested action	**Responsible party**	**Date**
Develop a guide for the implementation of the RNAV visual procedure, taking into account the mitigation measures required to avoid the issues mentioned in IFALPA's *Briefing 15ATSB Lima03*	All	SAM/IG/19

Interpretation of some navigation requirements

RNAV1/RNP/1 in SIDs/STARs

The workshop discussed the surveillance and alerting requirements to be met for the use of these navigation specifications. It also reviewed the tables contained in Doc 8168 Vol. II for RNAV procedures with GNSS.

It was clear that the separation between any combination of tracks with RNAV-1 or RNP- 1, or RNP APCH, or RNP AR APCH, could be reduced down to 7 NM, and down to 5 NM with RNP-1 or RNP APCH or RNP AR APCH. All RNAV-1 and RNP-1 specifications can be used up to the FAF/FAP, as established in Docs 8168 and 9613.

The majority of South American TMAs do not have the coverage or the geometry for using DME/DME to support RNAV-1 and, therefore, the use of this navigation specification is based on GNSS alone. Consequently, the workshop concluded that there was no need to consider RNP-1 alone in a setting without ATS monitoring. This conclusion is based on the fact that Doc 9613 establishes that monitoring and alerting requirements could be met through an on board navigation system capable of NSE monitoring and alerting (for example, RAIM or FDE algorithm), plus a lateral navigation display (for example, CDI indicator) enabling the flight crew to monitor the FTE. When PDE is assumed to be insignificant, the requirement is met because NSE and FTE are monitored, which leads to TSE monitoring.

The adoption of RNAV-1 or RNP-1 at the PBN STARs and SIDs allows procedures to be used by more users, taking into account that there are still airlines that do not have RNP-1 in their operational specifications.

Recommendation
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.

RNAV-1 and RNP-1 in RNAV/ILS approaches

The workshop took note that some States used the RNP APCH specification in RNAV/ILS procedures. Taking into account the need for a larger number of users to be in a position to use RNAV/ILS procedures, and considering that RNAV-1 and RNP-1 navigation specifications can be applied up to the intermediate segment, the workshop concluded that RNAV-1 and RNP-1 should be used as navigation specifications in RNAV/ILS procedures.

Recommendation
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.

Advanced RNP (A-RNP)

This specification permits the application of RF and precision values between 1 and 0.3 NM. The use of this application could be considered at airports that have problems with DEP minima due to issues related to obstacles, noise, or others, which can be resolved with an RF Leg/or the application of values lower than 1 NM and down to 0.3 NM.

There is no ICAO SARP yet dealing with the application of the RNP AR specification for DEP, although some States have already applied these criteria for take-offs. SARPs for take-off could be ready by 2018. Peru has experience in the application of this specification for take-offs.

Recommendation
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.

ATC gradient

The ATC gradient concept was developed in order to:

a) Allow for steeper climb gradients, facilitating the use of CCO;
b) Reduce the number of published charts through the use, in the same chart, of a minimum climb gradient allowing for obstacle clearance, as well as an ATC gradient that provides a continuous climb, flying "above the STAR"; and
c) Give more flexibility to operations, where the ATC would be responsible for maintain the separation between aircraft that applied the minimum climb gradient and aircraft conducting arrival procedures.

Regarding this application, the workshop concluded that the operations section of airlines could have difficulties to analyse the use of both gradients, taking into account that the trend is to assess the steeper gradient. This may result in the need for a lower take-off weight and thus a reduction in aircraft payload. This factor gets worse when the published gradient does not correspond to the FL restriction shown in the chart, taking into account that the aircraft will always comply with the FL restriction, regardless of the published gradient.

The workshop felt that, in order to include an ATC gradient in the chart, it would be advisable to previously conduct CDM between users and the ATC, and should be limited to domestic airports, taking into account that a smaller number of users might facilitate the dissemination of specific procedures for the use of such gradient. Although this publication of the gradient was aimed at reducing the number of charts, consideration should be given to whether it would be convenient to use two charts with different restrictions for the same departure, with a view to enhancing situational awareness of controllers and pilots.

In case the climb requirement is too stringent, consideration should be given to the possibility of aircraft flying below the recommended altitude in certain cases. In this case, it would be advisable to have two SID charts. It is clear that it will be the airspace concept that will define this possibility, together with the feasibility study for this type of concept.

Recommendation
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 enhance situational awareness of controllers and pilots;

Identification of SIDs/STARs

The workshop discussed the issue concerning the designation of SIDs and STARs, taking into account that, in some cases, the methodology set forth in Annex 11 could increase controller and pilot workload and become a threat to safety. The application of the first "*waypoint*" of the STAR and the last waypoint of the SID to designate them in accordance with Annex 11 is a practice that enhances situational awareness of pilots, in the case of airports with a reduced number of SIDs and/or STARs. However, at airports with a more complex operational environment, with a large number of SIDs and STARs, the application of the transition concept makes it easier for the pilot to apply the procedure authorised by the controller, and the ATCO does not need to memorise a significant number of SIDs/STARs. Accordingly, the workshop concluded that the airspace planner must assess the best way of designating SIDs/STARs through a CDM process with all stakeholders.

Another matter under consideration was the designation of SIDs that used the same designation for different thresholds in parallel runways. The suggestion was to use a different name for each threshold of parallel runways in order to avoid any confusion to the pilot.

Another issue discussed at the workshop was the chart for RNP AR approach with transitions, with many intermediate fixes (IF). Pilots feel comfortable with that display. The situational awareness of pilots and controllers is enhanced. Besides, it is possible to reduce the number of published charts. However, the graphic representation of the charts must be assessed, taking into account that the use of many transitions could render the information unclear. FAA examples were used.

An important point is the fact that the ATC database in automated systems could result in a very complex display if the ATC decides to display approaches on a screen.

Recommendation
• The airspace planner should assess the best way of designating SIDs/STARs (with or without transition) through CDM with all stakeholders; • 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.

Public/tailored RNP procedures

When addressing this issue, an explanation was given of two RNP AR drafting criteria:

a) Public criteria of Doc 9905;

b) Criteria tailored to the characteristics of the operational environment and user needs/capabilities.

Regarding aircraft/operator approval criteria, these may be:

a) *Generic*: applied to procedures in which the public drafting criteria of Doc 9905 are applied. In such cases, approval is sufficient to use any RNP AR procedure published under the public criteria of Doc 9905;

b) *Specific*: applied to procedures in which drafting criteria have been adapted to the operational environment and/or user needs/capabilities. Specific approval for an airport or threshold (*tailored*). In this case, coordination between PANS-OPS experts and aircraft and operator approval inspectors is needed, as well as the publication of drafting and approval criteria.

Regarding the publication of public and tailored RNP AR procedures in the AIP, the workshop recalled that the SAM/IG/17 meeting established, as a general rule, that procedures, whether public or tailored, should be published so that all users that have equipped aircraft and approved operations may use these procedures, which have proven more efficient and safe, and to enhance situational awareness of air traffic controllers and pilots. Nevertheless, the workshop expressed its concern in those cases in which a pilot/aircraft that is not approved for a tailored procedure uses such procedure, becoming a clear threat to safety. Peru, for example, has published tailored procedures for the Cuzco airport, without the Coding Table, to prevent non-approved users from using such procedures without the corresponding approval. In this regard, the workshop concluded that a more in-depth analysis of this matter would be required.

The workshop also received information about special procedures that differ from standard procedures, in accordance with *FAA Order 8260.60*. These are procedures that contain criteria or parameters that are different from the standard, and the user must meet the established requirements, which are developed by the State or an authorised third party. This is not published.

Action by the Panel members		
Suggested action	**Responsible party**	**Date**
Develop a harmonised regional system for publication of tailored RNP AR procedures.	All	PANS-OPS/ 2 workshop

Minimum altitudes of SIDs

The workshop took note that the minimum climb gradient is the one that ensures obstacle clearance, and that the minimum climb gradient of the aircraft is calculated before take-off of the aircraft based on many factors, such as: aircraft type, engine type, runway length, temperature, etc., taking into account that aircraft do not have a "gradient meter". In this sense, the crew has no way of ensuring that the aircraft will meet the minimum gradient in case of interruption of the climb by the ATCO, severe turbulence, etc. Accordingly, the workshop considered that, as an additional safety mechanism, minimum altitudes should be inserted in the SIDs, in critical segments on account of obstacles, so that the pilot may monitor such altitude with the FMS.

The recommendation is to keep the climb in the SID until exceeding the obstacle clearance level before ending the SID en route or in the airway.

Recommendation
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; b) Establish the proper connection between the SIDs and the ATS route network to ensure obstacle clearance.

Level segments to intercept the ILS glide slope

Whenever possible, it is advisable to 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". If a level segment is not possible, then a reduced slope in the intermediate segment is needed, at least, to allow the aircraft to lose power. Likewise, interception of the glide slope "below the path" shall be ensured.

Recommendation
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"; 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.

Publication of RNAV SIDs/STARs and conventional SIDs with similar paths on the same chart

There may be some confusion with the symbology or designation, and there is also the issue of the design, which is different for each. Therefore, it seems best to publish the conventional data separately from PBN.

Elimination of publication of procedures on paper

The workshop cited the following advantages to be derived from the release by the State of aeronautical publications only by electronic means:

a) Monthly updates of aeronautical publications.
b) Savings in the publication of procedures and in aeronautical publication updates, since a significant expenditure in printing and paper is avoided.
c) Expeditious publication of procedures and updating of aeronautical publications, taking into account that the AIRAC publication date could be complied with by inserting the procedure in the web, considering that the information is already known to users and is available to database providers.

However, in accordance with Annex 15, it was felt that there should be a copy of the AIP available at least at ARO/AIS offices. Likewise, in case of contingency, it is advisable for the ATS to have a hard copy of the AIP. Users wishing to keep charts in hard copy should print them or hire a specific company, like Jeppesen, Lido, etc.

Recommendation
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.

Creation of a working group to assess the publication in OCA or OCH charts

According to Annex 6, paragraph 4.2.8.1, the State of the Operator shall require that the operator establish aerodrome operating minima for each aerodrome. Paragraph 4.2.8.2 of Annex 6 contains the parameters to be taken into account in establishing such minima, including OCH/OCA. Accordingly, it is the operator and not the State that must establish the MDA/MDH.

Likewise, Doc 9365, in item 2.1.1, states the following: "*A ceiling or vertical visibility limitation for the decision to continue the approach to land is normally not applied since a safe flight path to DA/H or MDA/H is assured by procedure design*".

Furthermore, the definition of Aerodrome operating minima in Doc 9365 does not establish "ceiling" as one of the parameters to be considered.

> ***Aerodrome operating minima:*** *The limits of usability of an aerodrome for:*
>
> *a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;*
> *b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation;*
> *c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and*
> *d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.*

Some States have expressed that they continued to publish ceilings for instrument approach in their approach charts. In this sense, the workshop concluded that the OCA/OCH should be published and that the MDA/MDH and ceiling should not be published, with a view to harmonising this publication throughout the Region.

Recommendation
That SAM States publish the OCA/OCH in instrument approach procedures and **not** publish MDA/MDH and ceiling, in accordance with ICAO documentation (Annex 6, Doc 8168, and Doc 9365), to ensure harmonisation in the SAM Region.

Application of CCO/CDO techniques at airports with low traffic volume

It was noted that, although a "natural" climb with no restrictions may exist at airports with a low traffic volume, it is convenient to develop optimised procedures to account for possible crossings between arrivals and departures (more direct procedures with altitude restrictions or longer procedures with no restrictions).

As to arrivals, depending on the operational scenario, it is more convenient 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. This direct approach to the IAF would allow the pilot to calculate the ideal point of descent, taking the IAF as a reference, and request it from the ATCO. However, the ideal solution is to develop the corresponding STARs and SIDs, trying to apply CCO/CDO techniques within the possibilities of the scenario under consideration.

Recommendation
That SAM States: 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. b) Develop the corresponding STARs and SIDs, trying to apply CCO/CDO techniques within the possibilities of each scenario under consideration.

Temperature equation with respect to ISA

The workshop analysed a presentation on the incidence of temperature on the altitude indicated in the procedure design. It analysed a difference in the way this equation was expressed in Vol. I compared to Vol. II, as identified by a group of designers of Aerolíneas Argentinas.

The presentation showed the difference, which could affect the result of the equation. The error lied in the formulation of the equation in Vol. I of Doc 8168, PANS-OPS. In this regard, it suggested using the same formula as in Vol. II, which had a well-formulated mathematical expression.

Likewise, some examples were given of the incidence of temperature on the RNP AR design, giving designers the possibility of clarifying any doubts.

Support material for understanding changes in phraseology – Amendment 7 to Doc 4444

The Secretariat informed of a link to Headquarters containing support material for better understanding the changes in phraseology introduced by Amendment 7 to Doc 4444 concerning SIDs and STARs . The website address is:

http://www.icao.int/airnavigation/sidstar/Pages/CHANGES-TO-SID_STAR-PHRA-SEOLOGIES.aspx

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APPENDIX B

PANS-OPS/1 WORKSHOP RECOMMENDATIONS

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
IFPP To the extent possible, harmonise at a regional level (SAM) the use of documentation of States with recognised global air navigation capacity, such as the United States (FAA) and European Community member countries (EUROCONTROL and EASA), while awaiting ICAO documentation.															
Changes in approach procedure designation (Circular 336) That, when implementing the changes set forth in Circular 336, States consider the processes for the development of the transition plan and the impact assessment, and publish an AIC on this matter, in coordination with all stakeholders.															
Validation of procedures That SAM States consider the adoption of ground and flight procedure validation documentation, similar to that used in Argentina.															

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
RNAV1/RNP/1 in SIDs/STARs That SAM States use RNAV-1 and RNP-1 in PBN SIDs/STARs, including non-radar environments, since RNAV-1 is used exclusively with GNSS.															
<u>RNAV-1 and RNP-1 in RNAV/ILS approach</u> 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.															
<u>Advanced RNP (A-RNP)</u> That SAM States consider the use of A-RNP at airports facing DEP minima problems due to obstacle or aeronautical noise issues that can be resolved with an RF Leg and/or the use of values below 1 NM down to 0.3 NM.															
<u>ATC gradient</u> That SAM States, when applying the ATC gradient, take into account the following: a) use at domestic airports only; b) prior CDM process among stakeholders; c) assess the convenience of publishing different charts in order to facilitate situational awareness of controllers and pilots;															

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
<u>Identification of SIDs/STARs</u> • That the airspace planner assess the best possible way of designating SIDs/STARs (with or without transitions) through CDM with all stakeholders; • That SAM States apply the transition concept in RNP AR procedures by inserting multiple intermediate fixes (IF), assessing their impact on the graphical representation on the chart, as well as any possible problem in ATC automated systems.															
<u>Minimum altitudes in SIDs</u> That SAM States: a) Publish, as an additional safety mechanism, minimum altitudes in SIDs, in obstacle-critical segments, in order to allow the pilot to monitor that altitude through the FMS; b) Establish the proper connection between SIDs and the ATS route network in order to ensure obstacle clearance.															

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
<u>Level segments for ILS glide slope interception</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 glide slope interception "below the path"; **b)** If it were not possible to establish a level segment, use a reduced slope in the intermediate segment to that the aircraft may lose power, also ensuring glide slope interception "below the path".															
<u>Elimination of publication of procedures in hard copy</u> That SAM States assess the possibility of eliminating or substantially reducing paper publications, especially of the AIP, including air navigation procedures (routes, STARs, SIDs, IAC, etc.), so as to enable monthly updates, printing/paper savings, and faster publication and updating of said publications.															

Conclusion/Task	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
<u>Withdrawal of ceiling and MDA/MDH information in 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), in order to ensure harmonisation in the SAM Region.															
<u>Use of CCO/CDO techniques at low-density airports</u> That SAM States: a) Publish an AIC and/or instruct air traffic controllers to authorise approach direct to the IAF, from a distance of approximately 200 NM from the airport, especially if there is no terrain and obstacle involvement, in order to allow the pilot to calculate the ideal point of descent, taking the IAF as a reference, and request it to the ATCO. **b)** Develop the corresponding STARs and SIDs, trying to apply CCO/CDO techniques, within the possibilities of each scenario under consideration.															

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 RG	4	3C	05 23	NINST NPA	
SARI Krause	CATARATAS DEL IGUAZÚ / My. D. C. E. 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	
SAZN	NEUQUÉN/Presidente Perón RNS & AS	6	4C	09 27	PA1 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
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	
BRAZIL / BRASIL						
SBBE	BELÉM/Val de Cans/Júlio Cezar Ribeiro, RS	9	4D	06 24	PA1 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
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 I RS	7	4C	17 35	NPA PA1	
SBCT	CURITIBA/Afonso Pena , PR RS	8	4D	15 33 11 29	PA3 PA2 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
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 RS	8	4D 4E	11 29	PA1 NPA	
SBRF	RECIFE/Guararapes–Gilberto Freyre, PE RS	9	4E	18 36	PA1 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
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	
SBTT	TABATINGA/Tabatinga, AM RS	5	4C	12 30	NPA NPA	
SBUG	URUGUAIANA/Rubem Berta, RS RS	3	3C	09 27	NINST 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
				04 22	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 35R	PA1 NPA PA1 NPA	
SCIP	ISLA DE PASCUA / AP Mataveri RS	8	4D	10 28	PA1 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
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 RS	8	4D	18 36	PA1 NINST	
SKSP	SAN ANDRÉS/Gustavo Rojas Pinilla/San Andrés RS	7	4C	06 24	NPA 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
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 RG & AS	4	3B	08 26	NPA NPA	
MPDA	DAVID/Enrique Malek RS	7	4D	04 22	NPA 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
MPMG	PANAMA/Marcos A. Gelabert RG & 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 Astete RS	7	4D	10 28	NINST NPA	
SPQT	IQUITOS/ INTL Coronel FAP Francisco Secada Vignetta RS	8	4D	06 24	PA1 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
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 Cesáreo	MONTEVIDEO/ Intl. de Carrasco "Gral. L. Berisso" RS	9	4E 4E	06 24 01 19	NPA PA1 NPA PA1	
VENEZUELA						
SVBC	BARCELONA/Gral. José Antonio Anzóategui Intl RS	9	4C	15 33 02 20	PA1 NINST NINST 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
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 RG	7	3D	17 35	NPA NINST	
SVVA	VALENCIA/Arturo Michelena Intl RS	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	
SVSO	SANTO DOMINGO DEL TACHIRA/May. Buenaventura Vivas Intl. RG	7	4C	12 30	NPA	
SVCS	CARACAS/Oscar Machado Zuloaga Intl. RG	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 D

LONGITUDINAL SEPARATION LEVEL OF IMPLEMENTATION IN THE SAM REGION

ARGENTINA						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of implementation	20 NM GNSS/ DME	Date of implementation	
CORDOBA	IQUIQUE	OG				
	LA PAZ	YES	01/01/17			
	EZEIZA			YES	13/10/2016	
	MENDOZA			YES	13/10/2016	
	RESISTENCIA			YES	13/10/2016	Some problems with VHF Com.
RESISTENCIA	ASUNCION	YES	01/01/17			
	LA PAZ	YES	01/01/17			
	CORDOBA			YES	13/10/2016	
	CURITIBA	YES	01/01/17			
	EZEIZA			YES	13/10/2016	
	MONTEVIDEO	YES	01/01/17			
EZEIZA	COMODORO RIVADAVIA			YES	13/10/2016	
	MENDOZA			YES	13/10/2016	
	PUERTO MONTT	OG				
	CORDOBA			YES	13/10/2016	
	RESISTENCIA			YES	13/10/2016	
	MONTEVIDEO	YES	01/01/17	YES	2010	PAPIX, KUKEN and DORBO 20NM
MENDOZA	EZEIZA			YES	13/10/2016	
	SANTIAGO	OG				
	CORDOBA			YES	13/10/2016	
COMODORO RIVADAVIA	EZEIZA			YES	13/10/2016	
	PUNTA ARENAS	OG				
	PUERTO MONTT	OG				

BOLIVIA						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementation	
LA PAZ	AMAZÓNICO	YES	01/01/17			
	ASUNCION	YES	01/01/17			
	CURITIBA	YES	01/01/17			
	CORDOBA	YES	01/01/17			
	LIMA	OG				
	IQUIQUE	OG				
	RESISTENCIA	YES	01/01/17			

BRAZIL						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementatio n	20 NM GNSS/ DME	Date of implementation	
AMAZÓNICO	BRASILIA	---	---	---	---	10NM
	BOGOTÁ	YES	13/10/16			
	CAYENNE	---	---	---	---	10 Minutes
	CURITIBA	---	---	---	---	10NM
	GEORGETOWN	YES	07/01/16			
	LA PAZ	YES	01/01/17			
	LIMA	YES	31/03/16			COM/SUR required, does not apply, overflights from/to La Paz FIR
	MAIQUETIA	YES	23/10/16			
	PARAMARIBO	YES	13/10/16			
	RECIFE	---	---	---	---	10NM
	ATLANTICO	---	---	---	---	10 Minutes
BRASILIA	AMAZÔNICO	---	---	---	---	10NM
	CURITIBA	---	---	---	---	5NM
	RECIFE	---	---	---	---	5NM
CURITIBA	ASUNCION	YES	Mar/2016			
	AMAZONICO	---	---	---	---	10NM
	BRASILIA	---	---	---	---	5NM
	LA PAZ	YES	01/01/17			
	MONTEVIDEO	YES	01/01/17			
	RECIFE	---	---	---	---	5NM
	RESISTÊNCIA	YES	01/01/17			
	ATLÂNTICO	---	---	---	---	10 Minutes
RECIFE	AMAZÔNICO	---	---	---	---	10NM
	BRASÍLIA	---	---	---	---	5NM
	CURITIBA	---	---	---	---	5NM
	ATLÂNTICO	---	---	---	---	10 Minutes
ATLÁNTICO	AMAZÔNICO	---	---	---	---	10 Minutes VHS Com. problems
	CURITIBA	---	---	---	---	
	RECIFE	---	---	---	---	
	CAYENNE	---	---	---	---	

CHILE						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementation	
SANTIAGO	IQUIQUE					5NM
	LIMA	OG				
	MENDOZA	OG				
	PUERTO MONTT					5NM
IQUIQUE	CORDOBA	OG				
	LA PAZ	OG				
	LIMA	OG				
PUERTO MONTT	SANTIAGO					5NM
	PUNTA ARENAS					5NM
	EZEIZA	OG				
	COMODORO RIVADAVIA	OG				
PUNTA ARENAS	PUERTO MONTT					5NM
	COMODORO RIVADAVIA	OG				

COLOMBIA						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementation	
BOGOTÁ	AMAZÔNICO	YES	13/10/16			
	CENAMER					No available information
	GUAYAQUIL	YES	13/10/16			Reduced separation of 40 NM is applied. Memorandum of Understanding among ATC service providers signed.
	LIMA	YES	31/03/16			COM SUR required, does not apply overflights
	MAIQUETIA	OG				
	PANAMÁ	YES	Oct/16			
	BARRANQUILLA					No available information
BARRANQUILLA	MAIQUETIA	OG				
	PANAMÁ	YES	Oct/16			
	BOGOTÁ					No available information
	KINGSTON					No available information
	CURAÇAO					No available information

ECUADOR						
ACC	ACC ADJ	Longitudina separationl				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementatio n	
GUAYAQUIL	BOGOTÁ	YES	13/10/16			Reduced separation of 40 NM is applied. Memorandum of Understanding among ATC service providers signed.
	LIMA	YES	31/03/16			COM/SUR required, does not apply overflights. Updated with signing of LoA during SAM/IG/18, limitations on overflights is eliminated since 10/11/16.
	CENAMER	NO	---	N/A	---	Oceanic Separation

FRENCH GUIANA						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementation	
CAYENNE	AMAZÔNICO	---	---	---	---	10 Minutes
	PARAMARIBO	---	---	---	---	10 Minutes
	PIARCO					No available information

GUYANA						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementation	
GEORGETOWN	AMAZONICO	YES				
	PIARCO					No available information
	MAIQUETIA	OG				
	PARAMARIBO	YES				

PANAMÁ						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementation	
PANAMÁ	BOGOTÁ	YES	Oct/16			
	BARRANQUILLA	YES	Oct/16			
	CENAMER	OG	Oct/16			

PARAGUAY						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementation	
ASUNCION	CURITIBA	YES	Mar/16			
	LA PAZ	YES	01/01/17			
	RESISTÊNCIA	YES	01/01/17			

PERU						
ACC	ACC ADJ	Longitudinal separation				Comments
		40 NM GNSS/ DME	Date of Implementation	20 NM GNSS/ DME	Date of implementation	
LIMA	AMAZONICO	YES	31/03/16			COM/SUR required, does not apply overflights to/ from La Paz FIR
	BOGOTÁ	YES	31/03/16			COM/SUR required, does not apply overflights
	SANTIAGO	OG				
	IQUIQUE	OG				
	GUAYAQUIL	YES	31/03/16			COM/SUR required, does not apply overflights. With updated LoA signed during SAM/ IG/18, overflights limitation is eliminated since 10/11/16.
	LA PAZ	OG				

<table>
<tr><th colspan="7">SURINAME</th></tr>
<tr><th rowspan="2">ACC</th><th rowspan="2">ACC ADJ</th><th colspan="4">Longitudinal separation</th><th rowspan="2">Comments</th></tr>
<tr><th>40 NM GNSS/ DME</th><th>Date of Implementation</th><th>20 NM GNSS/ DME</th><th>Date of implementation</th></tr>
<tr><td rowspan="4">PARAMARIBO</td><td>AMAZÓNICO</td><td>YES</td><td>13/10/16</td><td></td><td></td><td>OG</td></tr>
<tr><td>GEORGETOWN</td><td>YES</td><td>29/03/16</td><td></td><td></td><td>Signed</td></tr>
<tr><td>PIARCO</td><td>N/A</td><td></td><td></td><td></td><td>Oceanic Separation</td></tr>
<tr><td>CAYENNE</td><td>N/A</td><td>---</td><td>---</td><td>---</td><td>Oceanic Separation</td></tr>
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<tr><th>40 NM GNSS/ DME</th><th>Date of Implementation</th><th>20 NM GNSS/ DME</th><th>Date of implementation</th></tr>
<tr><td rowspan="3">MONTEVIDEO</td><td>CURITIBA</td><td>YES</td><td>01/01/17</td><td></td><td></td><td></td></tr>
<tr><td>EZEIZA</td><td>YES</td><td>01/01/17</td><td>YES</td><td>2010</td><td>PAPIX
KUKEN
DORBO
20NM</td></tr>
<tr><td>RESISTENCIA</td><td>YES</td><td>01/01/17</td><td></td><td></td><td></td></tr>
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<tr><th rowspan="2">ACC</th><th rowspan="2">ACC ADJ</th><th colspan="4">Longitudinal separation</th><th rowspan="2">Comments</th></tr>
<tr><th>40 NM GNSS/ DME</th><th>Date of Implementation</th><th>20 NM GNSS/ DME</th><th>Date of implementation</th></tr>
<tr><td rowspan="6">MAIQUETIA</td><td>AMAZONICO</td><td>YES</td><td>23/10/15</td><td></td><td></td><td></td></tr>
<tr><td>BOGOTA</td><td>OG</td><td></td><td></td><td></td><td></td></tr>
<tr><td>BARRANQUILLA</td><td>OG</td><td></td><td></td><td></td><td></td></tr>
<tr><td>PIARCO</td><td></td><td></td><td></td><td></td><td>Negotiating</td></tr>
<tr><td>CURAZAO</td><td>NO</td><td></td><td></td><td></td><td>Curazao does not accept.</td></tr>
<tr><td>SAN JUAN</td><td></td><td></td><td></td><td></td><td>Negotiating</td></tr>
<tr><td></td><td>GEORGETOWN</td><td>OG</td><td></td><td></td><td></td><td></td></tr>
</table>

APPENDIX E / APÉNDICE E

LIST OF CONTACTS FOR OPERATIONAL PBN FOCAL POINTS

LISTA DE CONTACTOS PARA PUNTOS FOCALES PBN

State/ Estado	PBN FOCAL POINTS PUNTOS FOCALES PBN
ARGENTINA*	Carlos Omar Torres Administración Nacional de Aeronáutica Civil (ANAC) Jefe Departamento Programación Técnica Tel: +54 11 5941 3000, Ext. 69193 E-mail: ctorres@anac.gov.ar Nicolas Borovich Jefe de Departamento Planificación (EANA) Tel: +54 11 4320 3947 Cel: +54911 3119 9377 E-mail: Nborovich@eana.com.ar Guillermo Ricardo Cocchi Director de Servicios de Navegación Aérea (DSNA) Tel: +54 11 5789 8453 E-mail: dsna@faa.mil.ar
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State/ Estado	PBN FOCAL POINTS PUNTOS FOCALES PBN
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State/ Estado	**PBN FOCAL POINTS PUNTOS FOCALES PBN**
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** Updated SAM/IG/18 / Actualizados en la SAM/IG/18*

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 - Part B Chapter 2.2 2.2.1	Was the airspace concept defined in sufficient detail to be identifiable and to be capable of supporting navigation functions?	Show inputs to Process 1, such as: • strategic objectives; • operational needs derived from airspace users; • environmental mitigation guidelines.	Yes No Not applicable	
Doc 9992 - 2.1.1	Was a phased implementation plan prepared that includes the development and implementation of an airspace concept?	• Verify the implementation plan; • Verify that it contains, at least, the planning, design, validation, and implementation phases; • Check if plan implementation dates have been met and, if not, if there are revised versions of the plan.	Yes No Not applicable	
Doc 9992 - 2.2.2.1 Doc 9613 - 2.3.1	Has a multidisciplinary team been established for the implementation of the airspace concept?	• Check if the establishment of the team has been documented; • Specify who was team leader; • Specify team composition; • Check if there are any records of work team meetings.	Yes No Not applicable	
Doc 9992 - 2.3.2 Doc 9613 - 2.2.3	Were the PBN airspace concept objectives clearly defined, taking into account existing infrastructure and other inputs?	• Check if there are any records of the defined objectives; • Verify that the CNS structure was taken into account for the development of the concept.	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 - 2.3.5.2.2	What reference scenario was used as the basis for the project?	• Show study on air traffic growth; • Show data collected on existing traffic; • Traffic flows and composition; • Assessment of surveillance, communication, and navigation infrastructure available in the airspace.	Yes No Not applicable	
Doc 9613 - 2.3.5.5	Has an assessment been done of ATS surveillance infrastructure, communication infrastructure and ATM system?	• Verify if the CNS/ATM infrastructure assessment has been documented; • Verify if the assessment was taken into account when defining the navigation specification.	Yes No Not applicable	
Doc 9613 - 2.3.5	Has a study of the fleet been conducted to determine and identify the navigation specification for the Region?	• Show fleet analysis; • Evidence of identification of approach types required according to the fleet	Yes No Not applicable	
Doc 9613 - 2.3.5.5	Considering that an air traffic system is the summation of available CNS/ATM capabilities, has an availability assessment been conducted?	• Show evidence of assessment of availability of communications between the aircraft and the air traffic service provider; • Show evidence of assessment of ATS surveillance infrastructure available to support the operation.	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 - 2.3.6	Was the PBN airspace concept developed following a logical order?	• Verify that the airspace concept was developed according to the following order: a) First, SID/STAR routes were developed; b) Next, the initial procedure of the proposed flows was designed; c) The overall airspace volume was designed next to protect IFR flight paths.	Yes No Not applicable	
Doc 9613 - 3.2	Is a Safety plan in place, together with a safety policy of the authority, as a requirement for starting the validation phase?	• Verify that a safety plan has been documented, which describes in detail the way in which the safety assessment is to be performed for the implementation of RNAV or RNP.	Yes No Not applicable	
Doc 9613 - 3.2	Was the airspace concept validated?	• Verify that the airspace concept validation was documented.	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 - 3.3.1	Were the airspace concept validation objectives met?	• Verify if the following validation objectives were met: a) It has shown that airspace design has allowed efficient ATM operations to be conducted satisfactorily; b) It concluded that project objectives can be achieved with the implementation of airspace design and the airspace concept in general; c) Possible weak points of the concept were identified and mitigation measures developed; d) Proof that the design is safe was provided to support the safety assessment.	Yes No Not applicable	
Doc 9613 - 3.3.1.4	Was an appropriate airspace concept validation method selected?	• Check evidence of: a) ATC participation (if any); • Review assessment documentation; • Review validation forms; • Review the validation report.	Yes No Not applicable	
Doc 9613 - 3.3.2	What decision factors were taken into account to proceed with the validation process?	• Verify that the decision factors for the implementation of the airspace concept have been described in detail.	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 3.3.4	Was the PBN airspace concept final validation conducted?	• Verify if ground and flight validation was conducted; • Check evidence of the analysis of procedure design stages and calculations; • Check evidence of ground validation; • Check evidence of flight validation.	Yes No Not applicable	
Doc 9613 3.3.6	Did the new airspace concept require changes in interfaces and/or ATC system displays so that ATCs could have the required information available?	• Verify that the following modifications were made (if applicable): a) Flight data processor; b) Radar data processor; c) Flight progress strips; d) Video maps.	Yes No Not applicable	
Doc 9613 3.3.7	Was the required training provided, including raising awareness of the airspace concept?	• Verify the existence of: a) Training records; b) Material used for training and raising awareness.	Yes No Not applicable	

Ref. doc	Question	Process 1: Specification identification	Answer	Remarks
Doc 9613 3.3.8	Was the airspace concept properly implemented?	• Verify that at least the following action was taken: a) Meetings held prior to concept implementation b) Follow-up at least within seven days following implementation c) The required measures were taken to support the facility supervisor before and after the implementation d) The appropriate information was provided to pilots and controllers	Yes No Not applicable	
Doc 9613 - 3.3.9	Has a post-implementation assessment process been established?	• Verify if the necessary measures have been taken for system monitoring, safety assurance, and to ensure that strategic objectives have been met.	Yes No Not applicable	

APPENDIX G

Implementación del concepto de espacio aéreo PBN en la TMA Foz de Iguaçu - Brasil

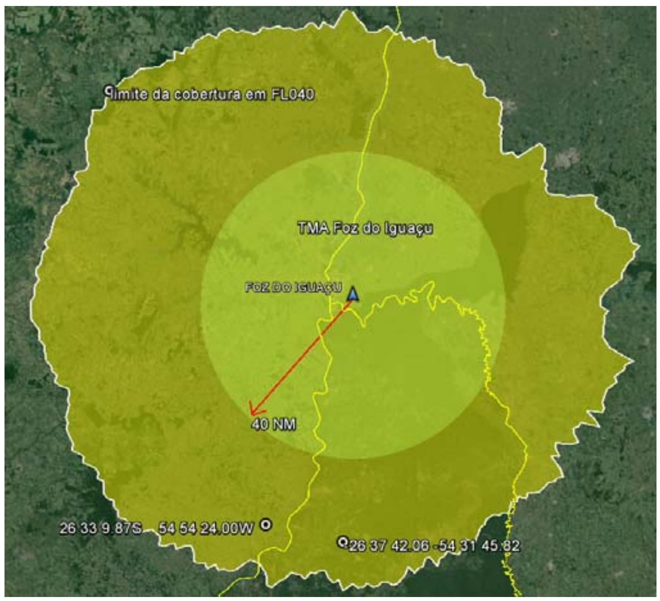
(Spanish only)

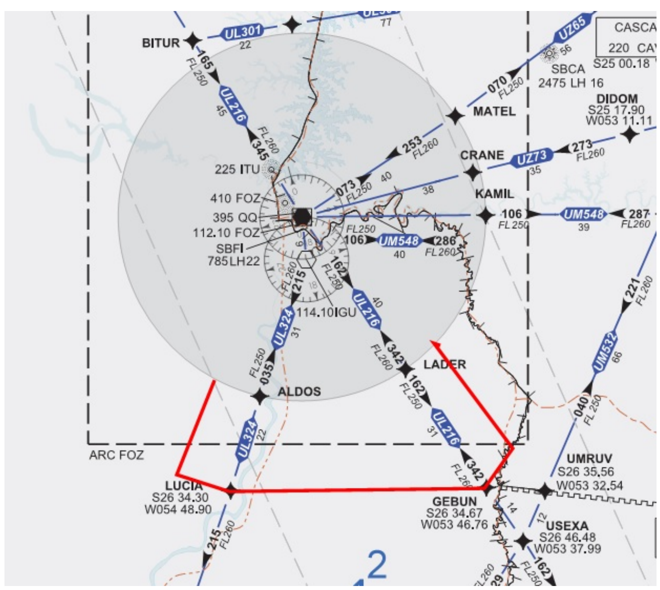
ANÁLISIS TMA-FI HA AUMENTADO Y PROCEDIMIENTOS RNAV SARI

1) TMA-FI AUMENTADO

APP-FI y ATM CINDACTA 2 decidieron no aumentar la TMA, pero la actualización acordó para que se pueda proporcionar el ATS al tránsito desde / hasta la posición LUCIA.

Sin embargo, se debería evaluar la conveniencia del aumento de TMA, con miras de abarcar LUCIA y GEBUN. Para eso, es necesario una evaluación de la cobertura VHF y RADAR. Esa evaluación fue solicitada a la División Técnica del CINDACTA II, pero todavía no se han recibido los resultados. Además, es necesario establecer nuevos acuerdos entre Brasil, Argentina y Paraguay.



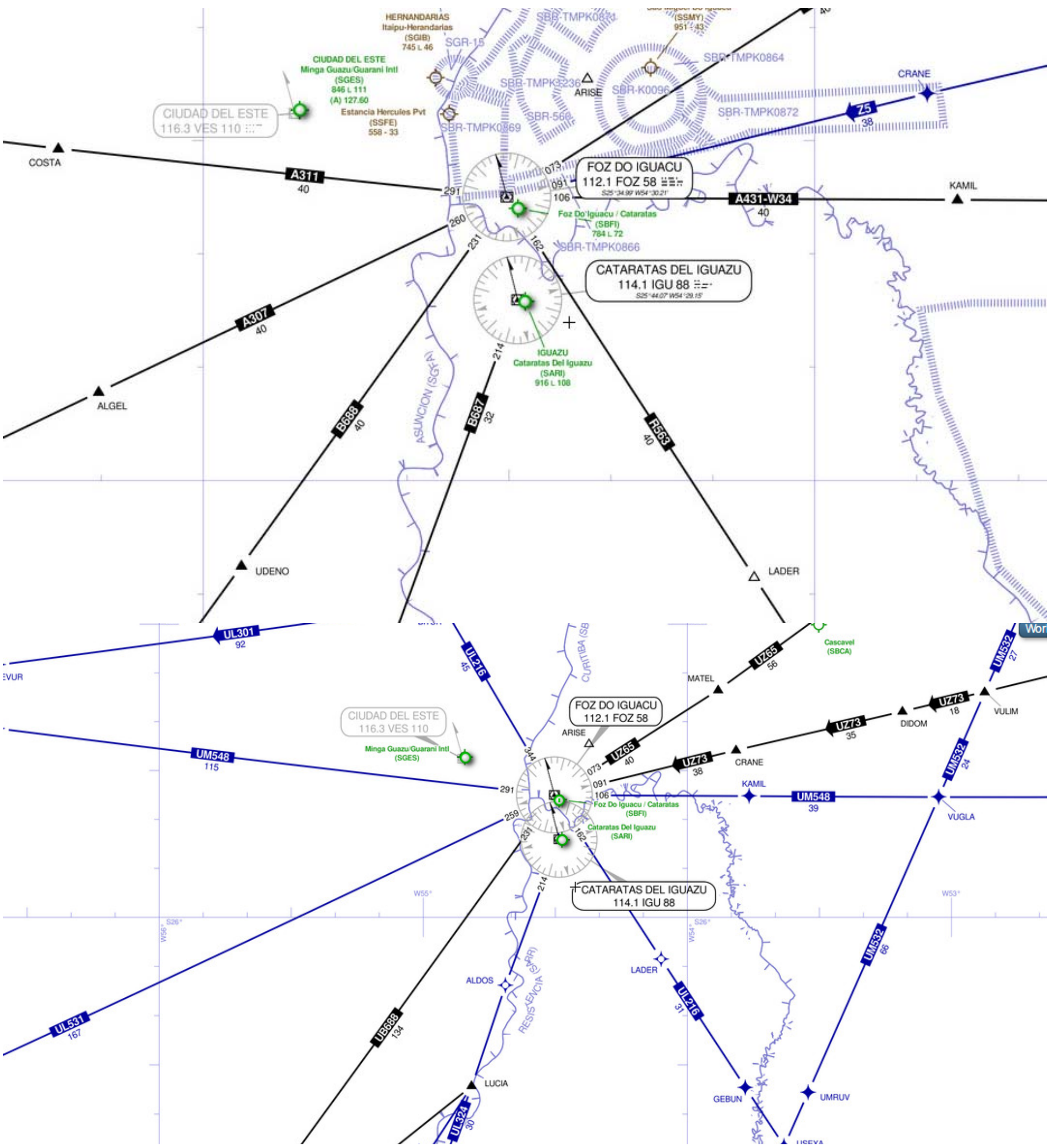


2) PROCEDIMIENTOS Y CARTAS DE AERONÁUTICA DE SBFI

a) Eliminación de la STAR CONV a RWY14 de SBFI con la inserción en los segmentos STAR RNAV de DIDOM y KAMIL.

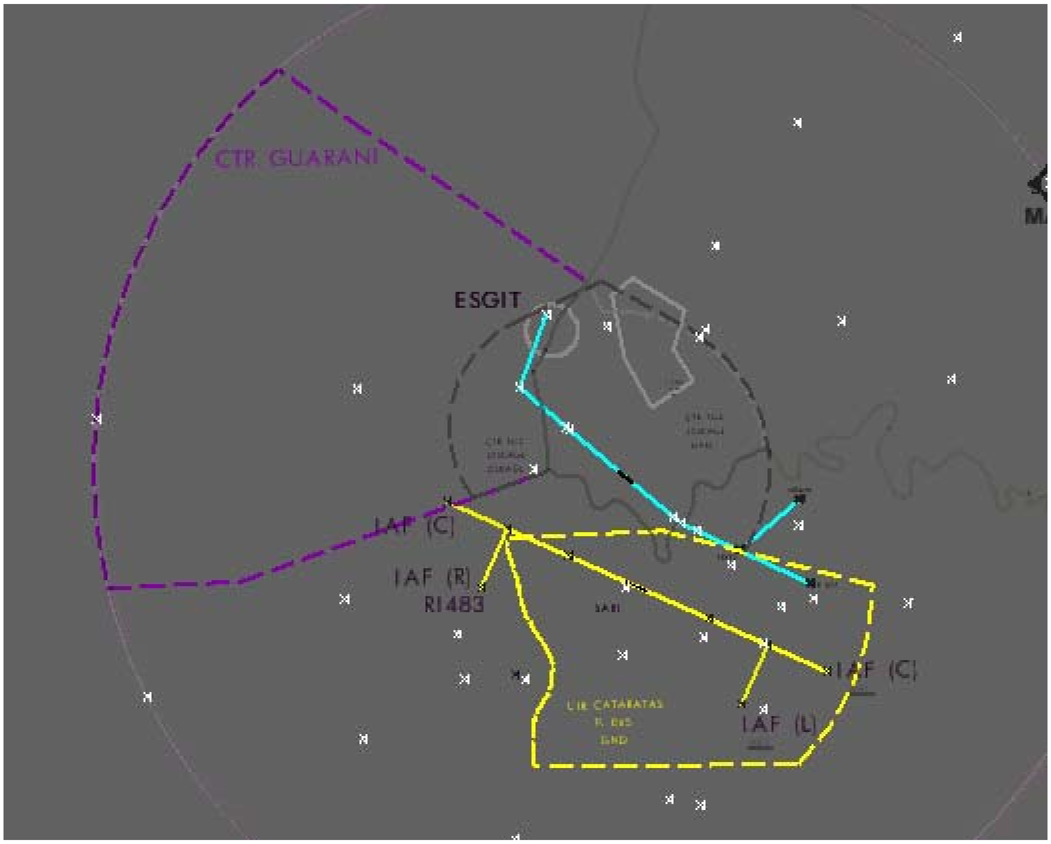
b) Evaluar que el tramo de FOZ –CTB- FOZ de la UM548 sea también utilizado por las aeronaves que llegan de SBCT.

c) Incluir los puntos del sector oeste de la TMA FOZ (COSTA, ALGEL y UDENO). (Ver Anexo A).



d) Revaluar las CTR de los 3 aeródromos, teniendo en cuenta que la configuración actual no atendería al concepto de espacio aéreo PBN. Por ejemplo, las trayectorias de IAC de SBFI están fuera del CTR-

FOZ y las trayectorias de la IAC de SARI están ingresando a la CTR GUARANI..(Ver Anexo K - CTR x IAC SARI-SBIF).

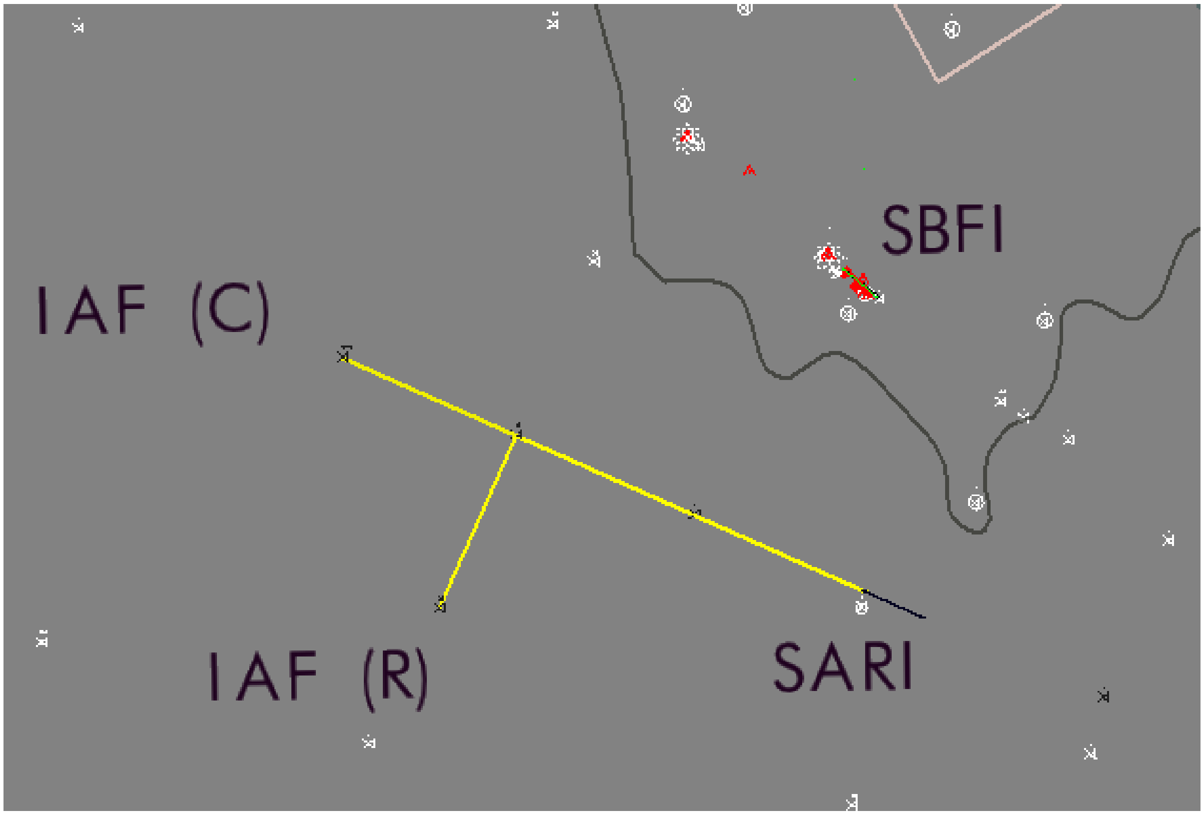


CTR de GUARANI – FOZ – CATARATAS x IAC SBFI - SARI

3) SARI RWY 13

a) la RWY 13 es el más utilizado para las salidas en SARI.

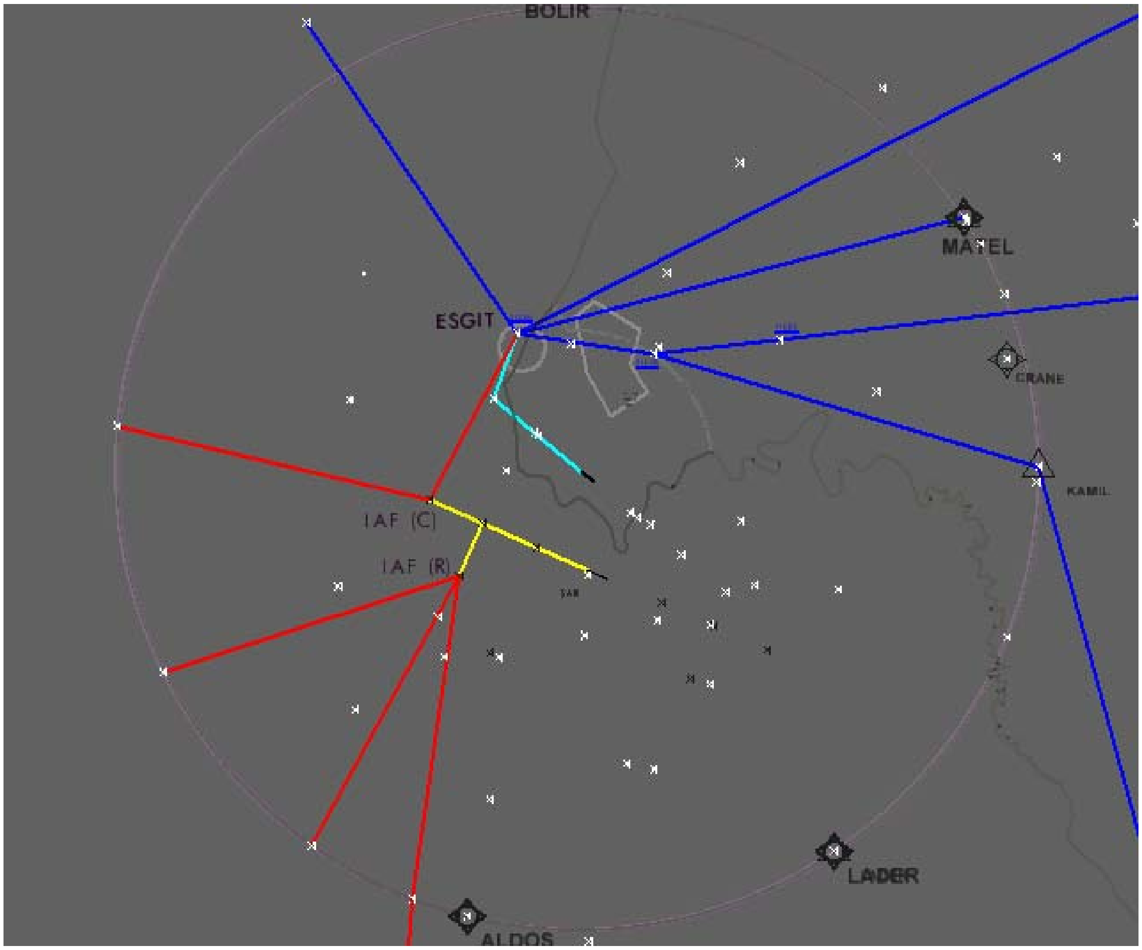
b) IAC RNAV la RWY 13 (Ver Anexo B - SARI_IAC_RWY13 propuesta con correcciones)
- Creación de la IAF CENTRAL a 5 NM de la IF;
- IAF mantenimiento del lado DIR (90 °) en T.



IAC SARI propuesta fija

c) STAR RNAV RWY 13 (Anexo C - STAR_SARI_RWY13 x STAR_SBFI_RWY14)

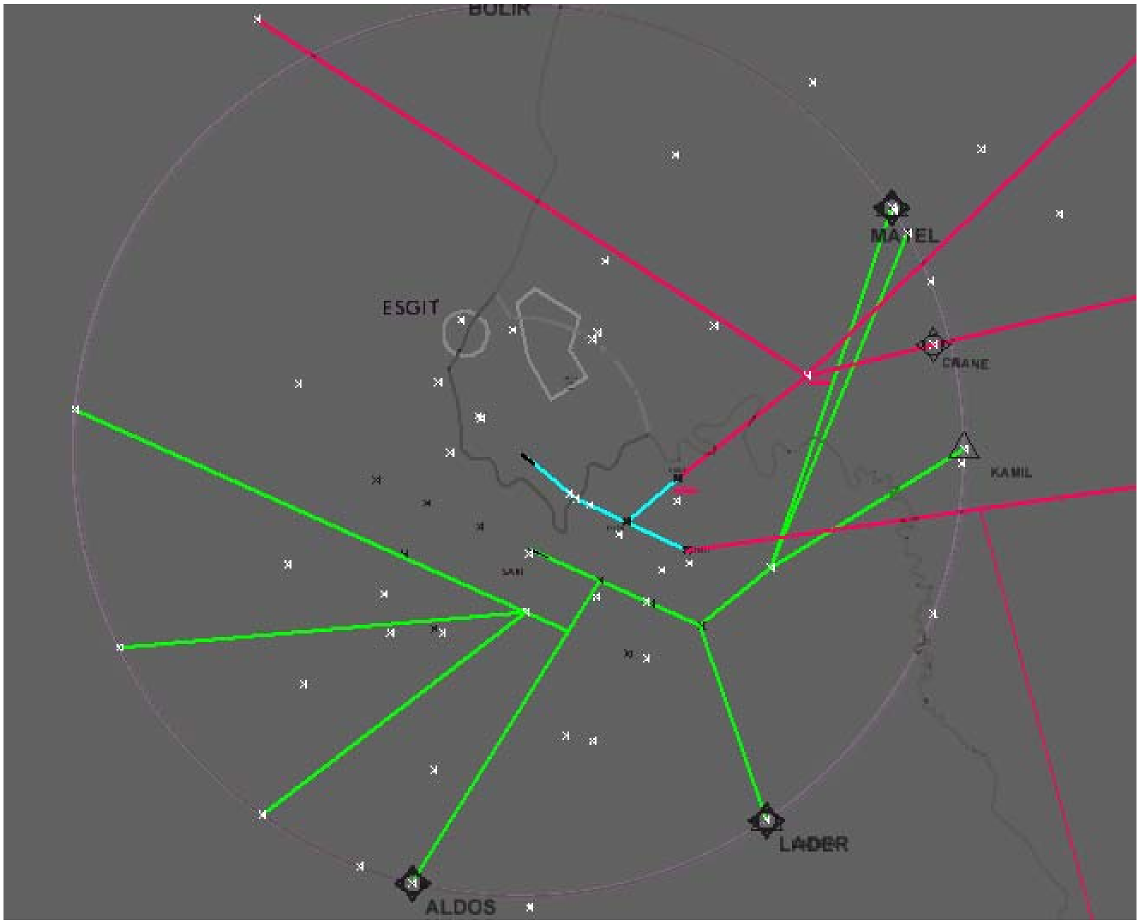
- STAR OBMIX – no tiene punto de conexión con la IAC (¿);
- Sugerencia: el sector N y NE en Brasil igual a de STAR SBFI y desde ESGIT se llegaría al IAF CENTRAL IAC SARI RWY 13.
- Evaluar que a partir del punto LUCIA, la STAR tendría una desviación a la izquierda a un punto a 5 NM laterales de ALDOS, a fin de no interferir con la SID en el punto ALDOS. Así, no habría el cruce dentro de la TMA-FI.



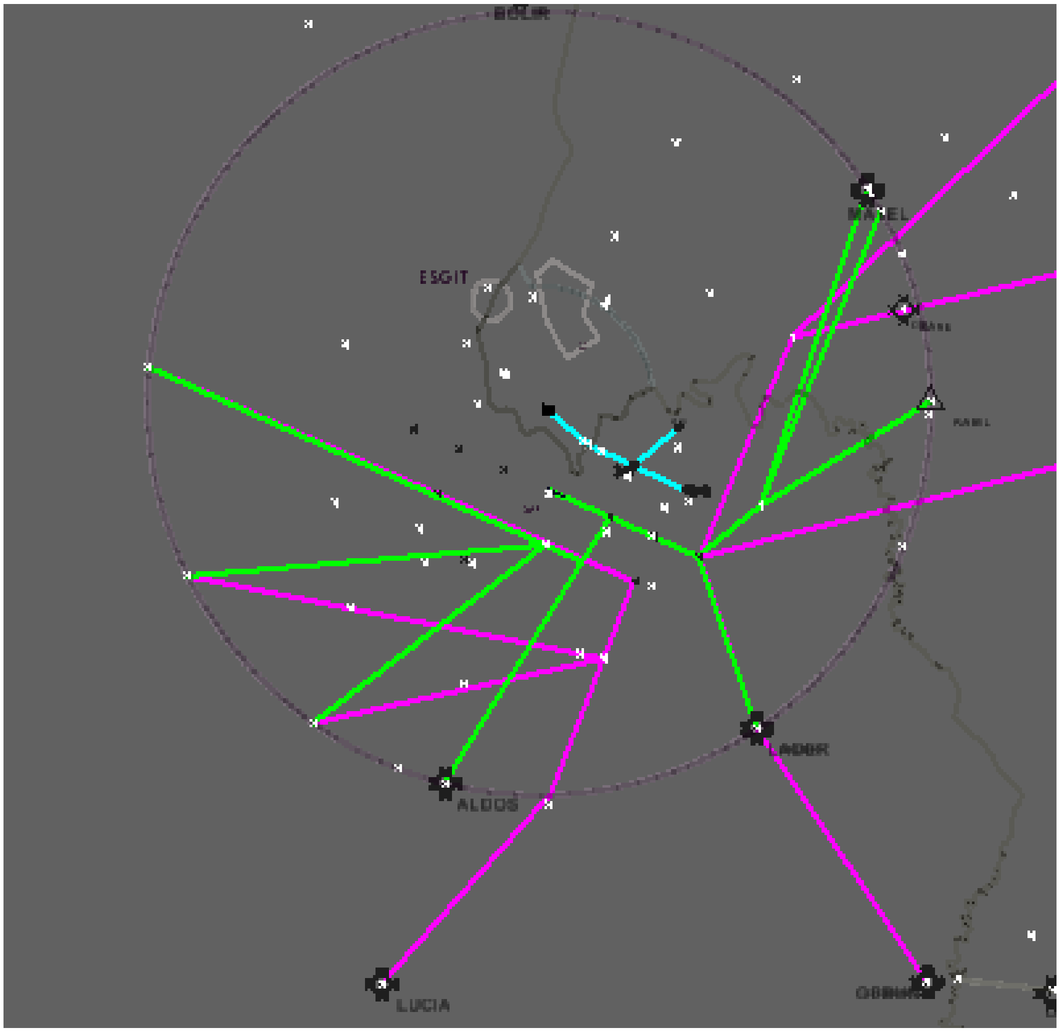
STAR_SARI_RWY13 x STAR_SBFI_RWY14

d) SID RNAV RWY 13 (Anexo F - SID SARI RWY 13 x STAR-IAC SBFI RWY 32)

- Las operaciones de la RWY 13 en SARI y de la RWY 32 en SBFI son independientes, desde que en el despegue de la RWY 13 se mantenga el eje de la pista hasta 15 NM después de ANBUK y TRNS, caso la aeronave tenga como destino un aeropuerto brasileiro. De esa manera, sería posible evitar las aproximaciones para la RWY 32 SBFI;
- Sugerencia: el primer tramo de la SID insertar un WPT con el fin de permitir que se utilice el Path Terminator TF (Track to fix), seguido de CF ;
- El SID RWY13 fue diseñado para ir a ALDOS y no entrar en conflicto con las STAR de RWY13 o RWY31 de SARI.
- Las operaciones de salida de la RWY13 de SARI se acercan de la RWY32 y. De esa manera, la STAR de la RWY32 SUR (LUCIA) no entra en conflicto con la SIDWY13. Ver Anexo I - SARI_STAR_RWY32 x SARI_SID_RWY13.

- 

SID SARI RWY 13 x STAR-IAC SBFI RWY 32

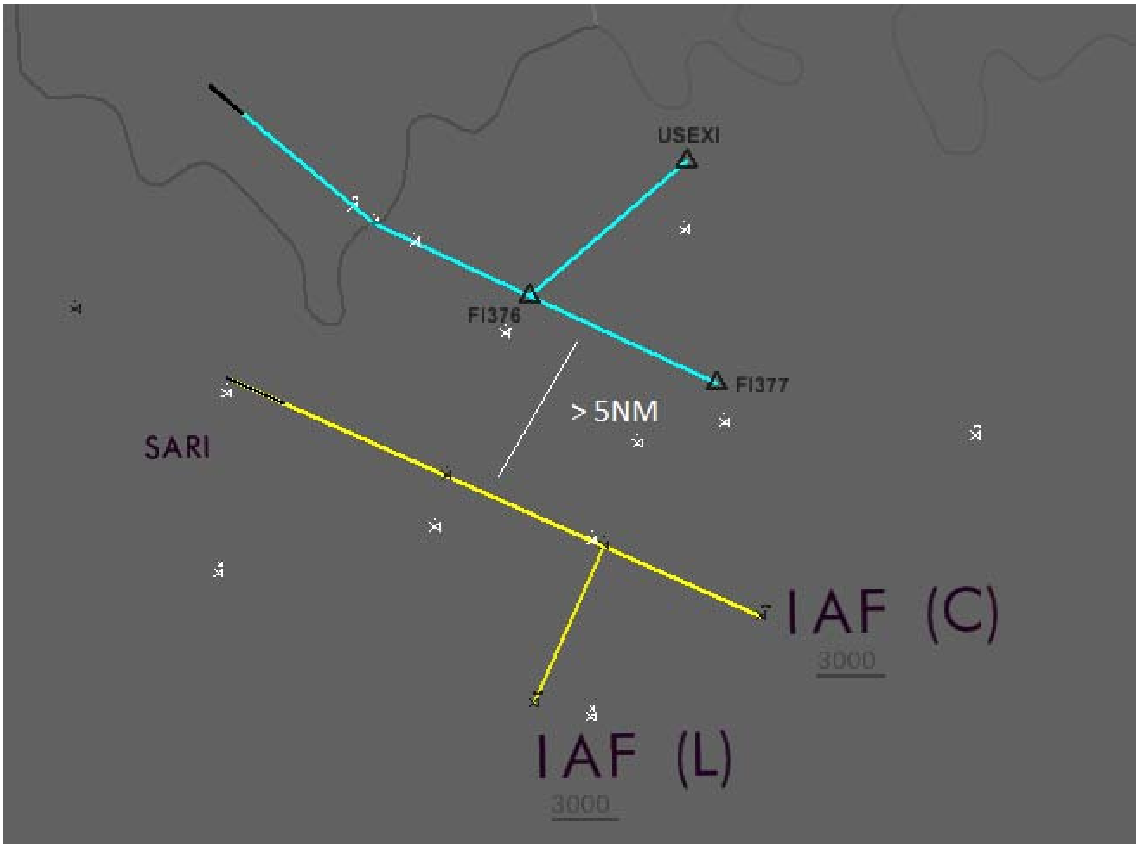


SARI_STAR_RWY32 x SARI_SID_RWY13

4) SARI RWY 31

a) la RWY 31 es la pista más utilizada para aterrizar en SARI y es donde está ubicado el ILS.
b) IAC RNAV la RWY 31 (Ver Anexo J - SARI_IAC_RWY31 propuesta con correcciones);

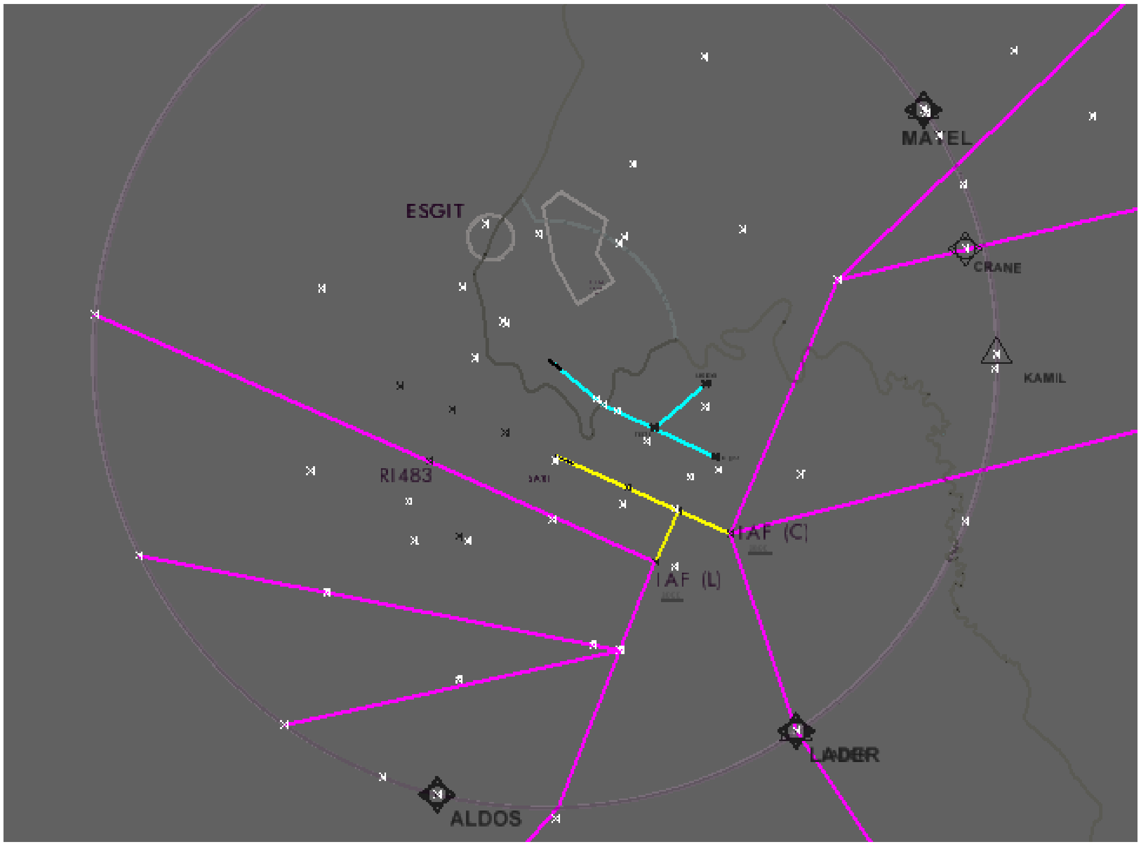
- IAF lateral derecho interfiere con la aproximación la RWY 32 SBFI. • Creación de la IAF central;
- Mantenimiento de la IAF IZQUIERDO pero a 90 ° en T.



SARI_IAC_RWY31 x SBFI_IAC_RWY32

c) STAR RNAV RWY 31 (Ver anexo D - SARI_SID_STAR_RWY 31)

- A STAR desde el punto COSTA en el sector sur de SARI, a través de RI483 DCT IAF LATERAL ESQ (90°) en T.



SARI_STAR_RWY31

d) SID RNAV RWY 31 (Ver anexo G - SID SARI RWY 31 x STAR SBFI RWY 14)

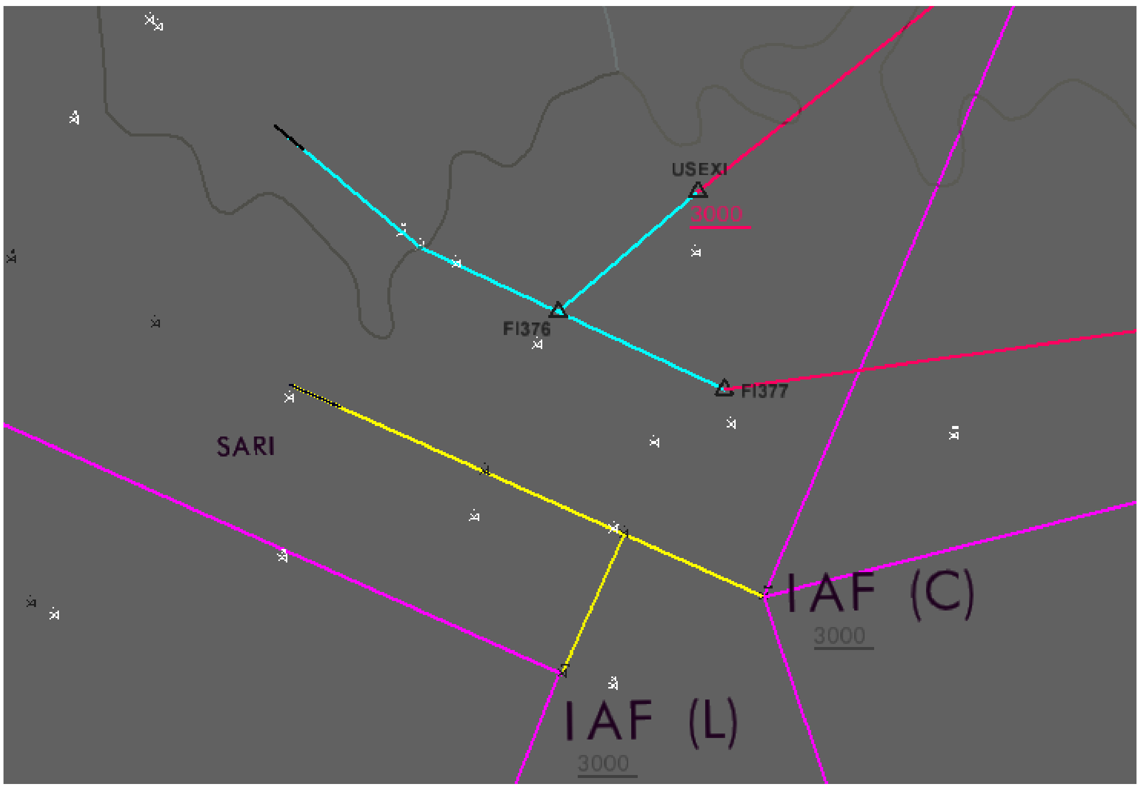
- La operación de la RWY 31 en SARI y de la RWY 14 en SBFI son independientes. desde que se cruce el VOR FOZ por encima de FL050 para evitar las aproximaciones de la RWY 32 SBFI.
- Sugerencia:
- el primer tramo de la SID insertar un WPT con el fin de permitir que se utilice el Path Terminator TF (Track to fix), seguido de CF ;
-

SARI_SID_RWY31 x SBFI_IAC_RWY14

5) SBFI RWY 32

a) IAC RNAV RWY 32 (Ver Anexo H – SARI_STAR_RWY 31 x SBFI_STAR_RWY 32)

- No hay separación lateral para aproximaciones simultáneas en la RWY 32 de SBFI y la RWY 31 con SARI, en la configuración actual de los procedimientos RNAV;
- Sugerencia: realizar un desplazamiento de 15° en el tramo intermedio del procedimiento RNAV de la RWY 32 SBFI, con miras a que el tramo intermedio sea paralelo al de la RWY 31 SARI, con una separación lateral mayor de 5 NM;
- Eliminar la IAF LADO ESQ (FI373) que interfiere con la aproximación final la RWY 31 SARI y entra en la Argentina CTR.



SBFI_STAR-IAC_RWY32 x SARI_STAR-IAC_RWY31

b) STAR RWY 14

- Se sugiere armonizar las 2 STAR de la RWY 14 para el STAR DIDOM – KAMIL, de PAPAS para TF FI381 (o ESGIT), con miras a tener el mismo perfil lateral. Eliminar de STAR CONV y cambiar la trayectoria DIDOM - KAMIL para la trayectoria de la STAR RNAV RWY14.

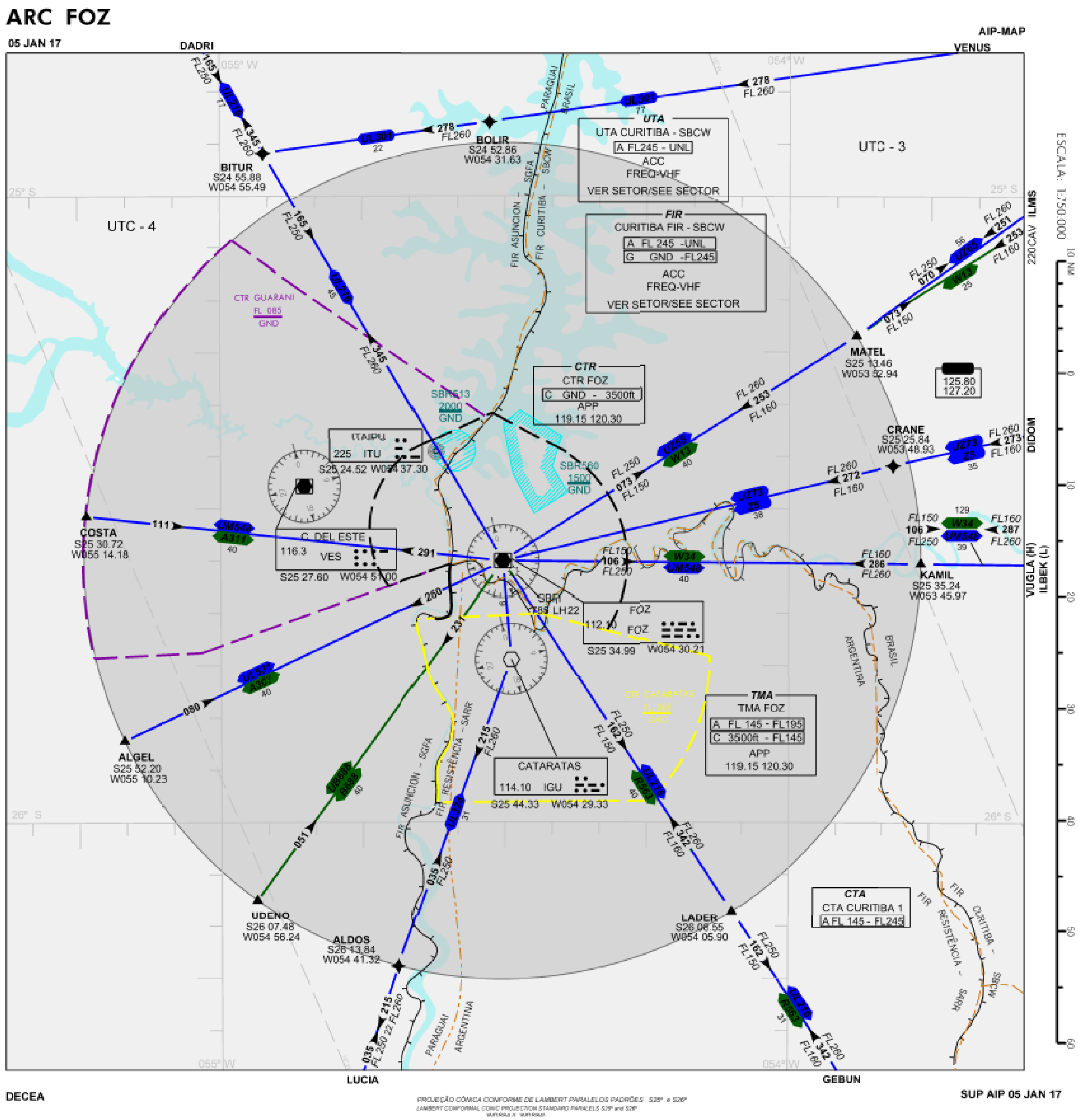
6) PROCEDIMENTOS RNAV SBFI

- Los procedimientos de aproximación RNAV de SBFI ya están desarrollados para la absorción del nuevo concepto de espacio aéreo de SARI;
- El SID y STAR deben ajustarse en función de la red de rutas PBN-SUL;
- Adjuntos P, Q, R, S.

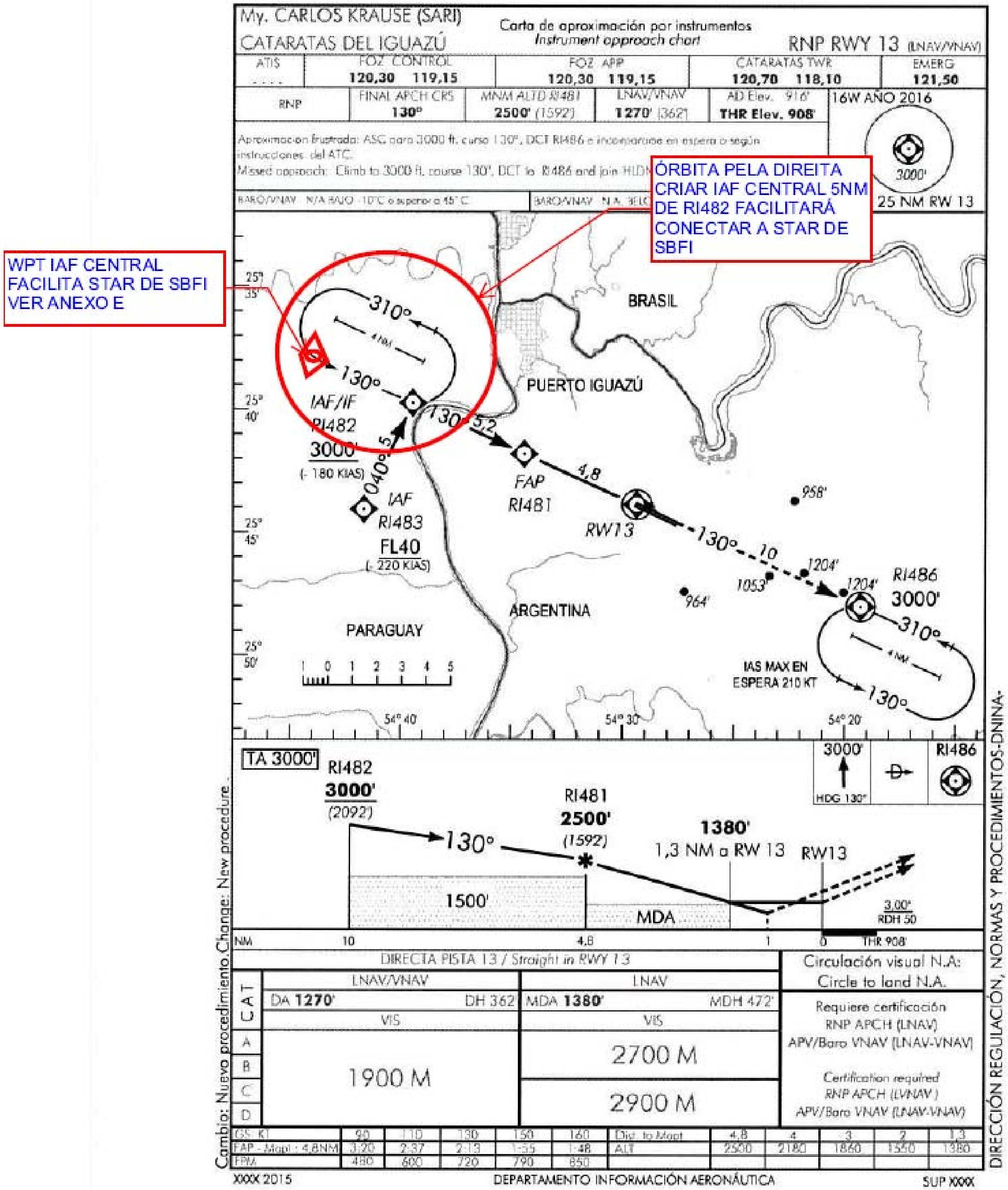
7) PROCEDIMENTOS RNAV SARI

- El IAC SARI se debe ajustarse a los anexos B y E;
- El SID y STAR deben ajustarse a la planificación de la red de rutas del proyecto PBN-SUR de Brasil, de acuerdo a los Anexos L, M, N, O;

ANEXO A

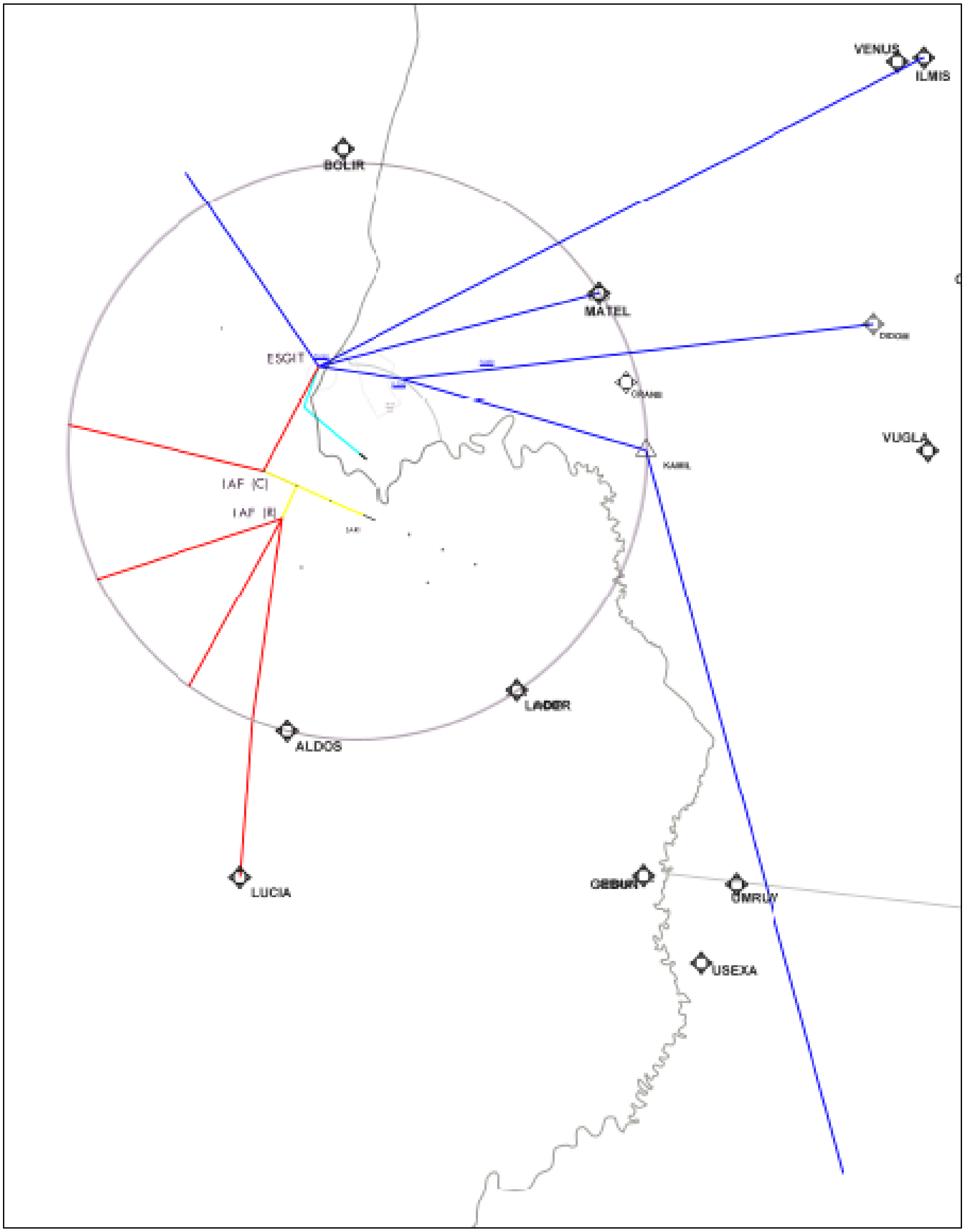

ARC FOZ
05 JAN 17
AIP-MAP
DADRI
VENUS
BOLIR
S24 52.86
W054 31.63
BITUR
S24 55.88
W054 55.49
UTA
UTA CURITIBA - SBCW
A FL245 - UNL
ACC
FREQ-VHF
VER SETOR/SEE SECTOR
UTC - 3
UTC - 4
FIR
CURITIBA FIR - SBCW
A FL 245 - UNL
G GND - FL245
ACC
FREQ-VHF
VER SETOR/SEE SECTOR
CTR GUARANI
FL 085
GND
MATEL
S25 13.46
W053 52.94
CTR
CTR FOZ
C GND - 3500ft
APP
119.15 120.30
125.80
127.20
ITAIPU
225 ITU
S25 24.52 W054 37.30
CRANE
S25 25.84
W053 48.93
COSTA
S25 30.72
W055 14.18
C. DEL ESTE
116.3 VES
S25 27.60 W054 51.00
KAMIL
S25 35.24
W053 45.97
FOZ
112.10 FOZ
S25 34.99 W054 30.21
ALGEL
S25 52.20
W055 10.23
TMA
TMA FOZ
A FL 145 - FL195
C 3500ft - FL145
APP
119.15 120.30
CATARATAS
114.10 IGU
S25 44.33 W054 29.33
CTA
CTA CURITIBA 1
A FL 145 - FL245
UDENO
S26 07.48
W054 56.24
ALDOS
S26 13.84
W054 41.32
LADER
S26 06.55
W054 05.90
LUCIA
GEBUN
PARAGUAI
BRASIL
ARGENTINA
ESCALA: 1:750.000
DECEA
SUP AIP 05 JAN 17

ANEXO B



My. CARLOS KRAUSE (SARI)
CATARATAS DEL IGUAZÚ
Carta de aproximación por instrumentos
Instrument approach chart
RNP RWY 13 (LNAV/VNAV)
ATIS
FOZ CONTROL 120,30 119,15
FOZ APP 120,30 119,15
CATARATAS TWR 120,70 118,10
EMERG 121,50
RNP
FINAL APCH CRS 130°
MNM ALTD RI481 2500' (1592')
LNAV/VNAV 1270' (362')
AD Elev. 916'
THR Elev. 908'
16W AÑO 2016
3000'
25 NM RW 13
ÓRBITA PELA DIREITA
CRIAR IAF CENTRAL 5NM
DE RI482 FACILITARÁ
CONECTAR A STAR DE
SBFI
WPT IAF CENTRAL
FACILITA STAR DE SBFI
VER ANEXO E
BRASIL
PUERTO IGUAZÚ
ARGENTINA
PARAGUAY
IAF/IF
RI482
3000'
(- 180 KIAS)
IAF
RI483
FL40
(- 220 KIAS)
FAP
RI481
RW13
RI486
3000'
IAS MAX EN
ESPERA 210 KT
TA 3000'
RI482
3000'
(2092')
RI481
2500'
(1592')
1380'
1,3 NM a RW 13
RW13
1500'
MDA
HDG 130°
DIRECTA PISTA 13 / Straight in RWY 13
LNAV/VNAV
LNAV
DA 1270'
DH 362'
MDA 1380'
MDH 472'
1900 M
2700 M
2900 M
Circulación visual N.A:
Circle to land N.A.
Requiere certificación
RNP APCH (LNAV)
APV/Baro VNAV (LNAV-VNAV)
Certification required
RNP APCH (LNAV)
APV/Baro VNAV (LNAV-VNAV)
Cambio: Nuevo procedimiento.Change: New procedure.
DIRECCIÓN REGULACIÓN, NORMAS Y PROCEDIMIENTOS-DNINA-
XXXX 2015
DEPARTAMENTO INFORMACIÓN AERONÁUTICA
SUP XXXX

ANEXO C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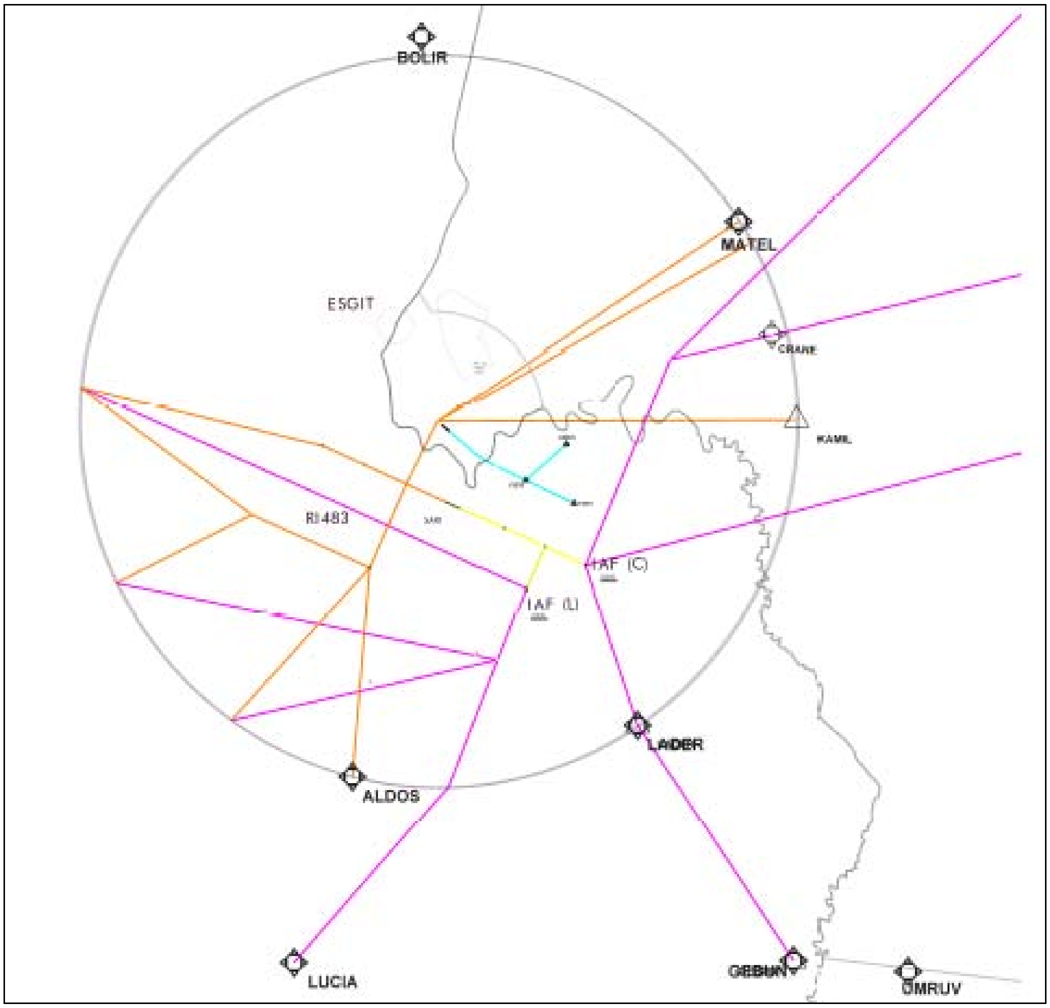
ANEXO D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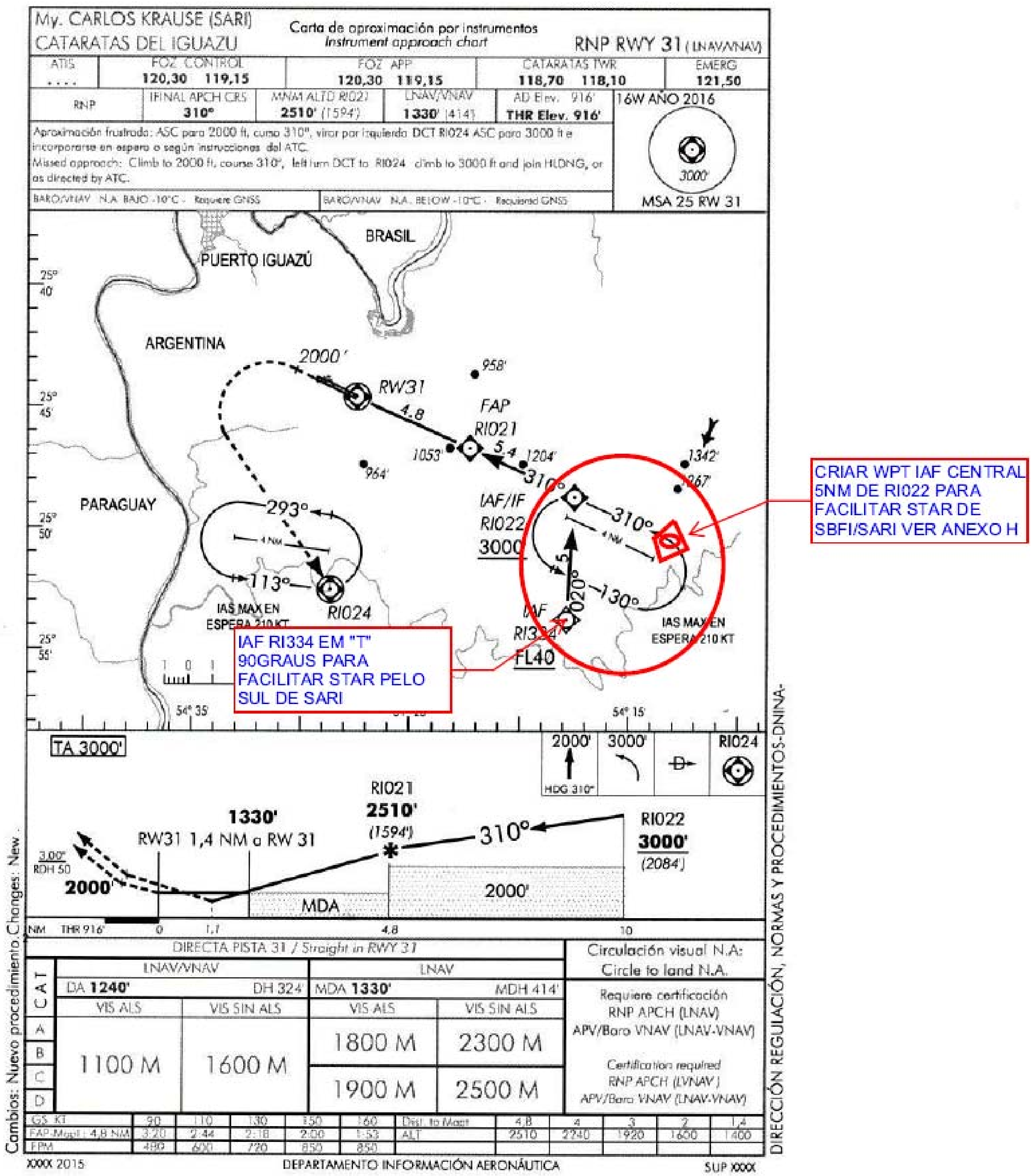
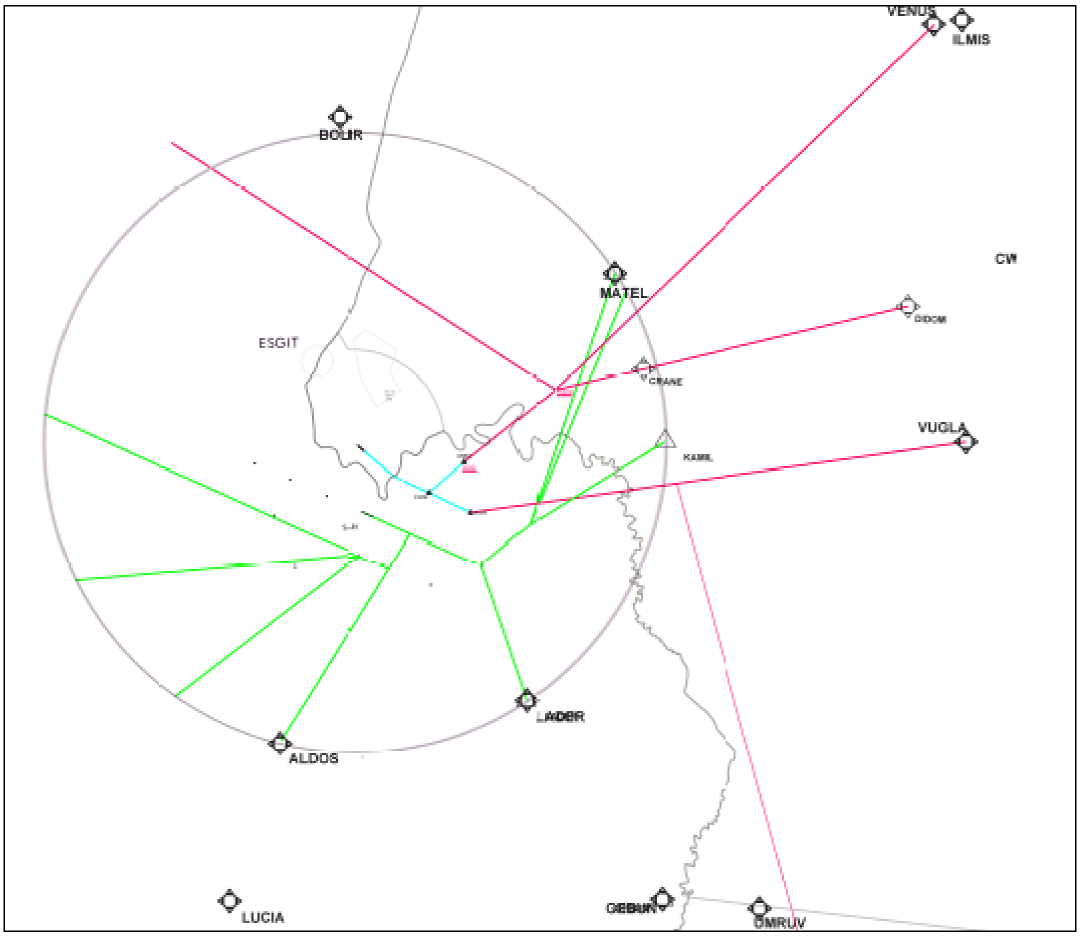
ANEXO E


My. CARLOS KRAUSE (SARI)
CATARATAS DEL IGUAZU
Carta de aproximación por instrumentos
Instrument approach chart
RNP RWY 31 (LNAV/VNAV)
ATIS
FOZ CONTROL 120,30 119,15
FOZ APP 120,30 119,15
CATARATAS TWR 118,70 118,10
EMERG 121,50
RNP
FINAL APCH CRS 310°
MNM ALTD RI021 2510' (1594')
LNAV/VNAV 1330' (414')
AD Elev. 916'
THR Elev. 916'
16W AÑO 2016
Aproximación frustrada: ASC para 2000 ft, curso 310°, virar por izquierda DCT RI024 ASC para 3000 ft e incorporarse en espera o según instrucciones del ATC.
Missed approach: Climb to 2000 ft, course 310°, left turn DCT to RI024 climb to 3000 ft and join HLDNG, or as directed by ATC.
BARO/VNAV N.A. BAJO -10°C - Requiere GNSS
BARO/VNAV N.A. BELOW -10°C - Required GNSS
3000'
MSA 25 RW 31
BRASIL
PUERTO IGUAZÚ
ARGENTINA
PARAGUAY
2000'
RW31
4.8
FAP
RI021
5.4
958'
1053'
1204'
964'
1342'
310°
293°
113°
RI024
IAS MAX EN ESPERA 210 KT
IAF/IF
RI022
3000
310°
130°
020°
IAF
RI334
FL40
IAS MAX EN ESPERA 210 KT
54° 35'
54° 15'
CRIAR WPT IAF CENTRAL 5NM DE RI022 PARA FACILITAR STAR DE SBFI/SARI VER ANEXO H
IAF RI334 EM "T" 90GRAUS PARA FACILITAR STAR PELO SUL DE SARI
TA 3000'
2000'
HDG 310°
3000'
RI024
RI021
2510'
(1594')
1330'
RW31 1,4 NM a RW 31
310°
RI022
3000'
(2084')
3.00°
RDH 50
2000'
MDA
2000'
NM THR 916' 0 1,4 4,8 10
DIRECTA PISTA 31 / Straight in RWY 31
LNAV/VNAV
LNAV
DA 1240' DH 324'
MDA 1330' MDH 414'
VIS ALS
VIS SIN ALS
1100 M
1600 M
1800 M
2300 M
1900 M
2500 M
Circulación visual N.A.
Circle to land N.A.
Requiere certificación RNP APCH (LNAV) APV/Baro VNAV (LNAV-VNAV)
Certification required RNP APCH (LNAV) APV/Baro VNAV (LNAV-VNAV)
CAT A B C D
GS KT 90 110 130 150 160
FAP-Mapt: 4,8 NM 3:20 2:44 2:18 2:00 1:53
FPM 480 600 720 850 850
Dist. to Mapt 4.8 4 3 2 1.4
ALT 2510 2240 1920 1600 1400
XXXX 2015
DEPARTAMENTO INFORMACIÓN AERONÁUTICA
SUP XXXX
Cambios: Nuevo procedimiento. Changes: New.
DIRECCIÓN REGULACIÓN, NORMAS Y PROCEDIMIENTOS-DNINA-

ANEXO F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LUCIA
GEBUN
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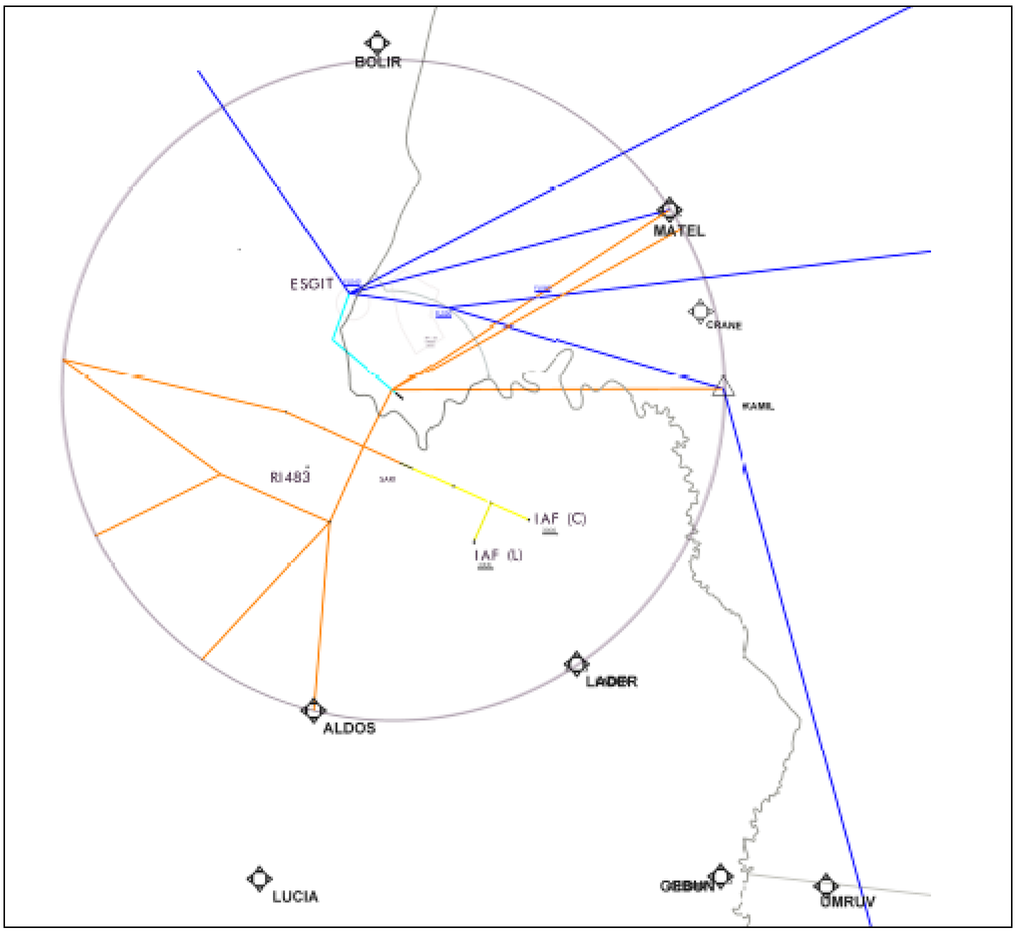
ANEXO G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IAF (L)
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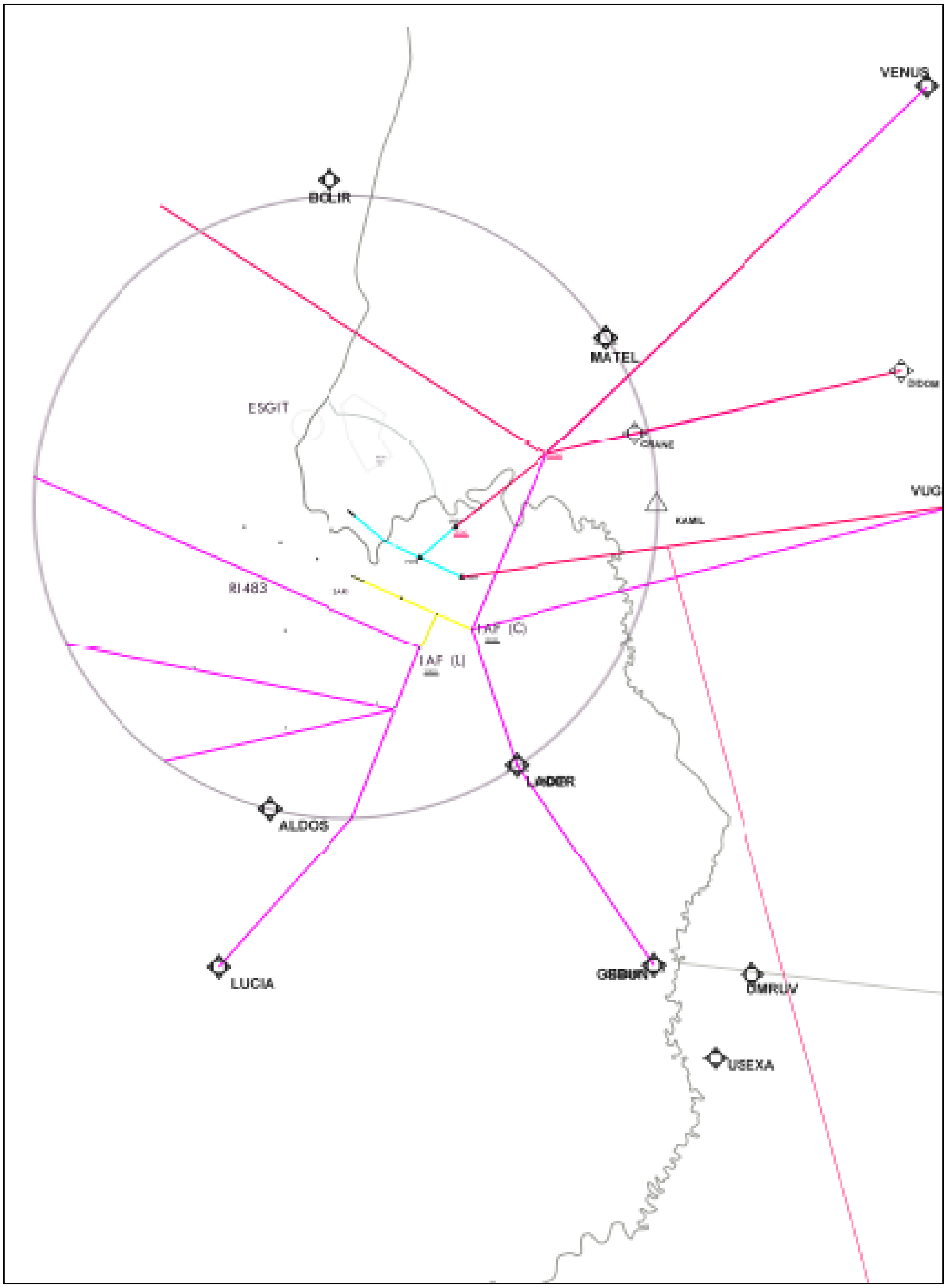
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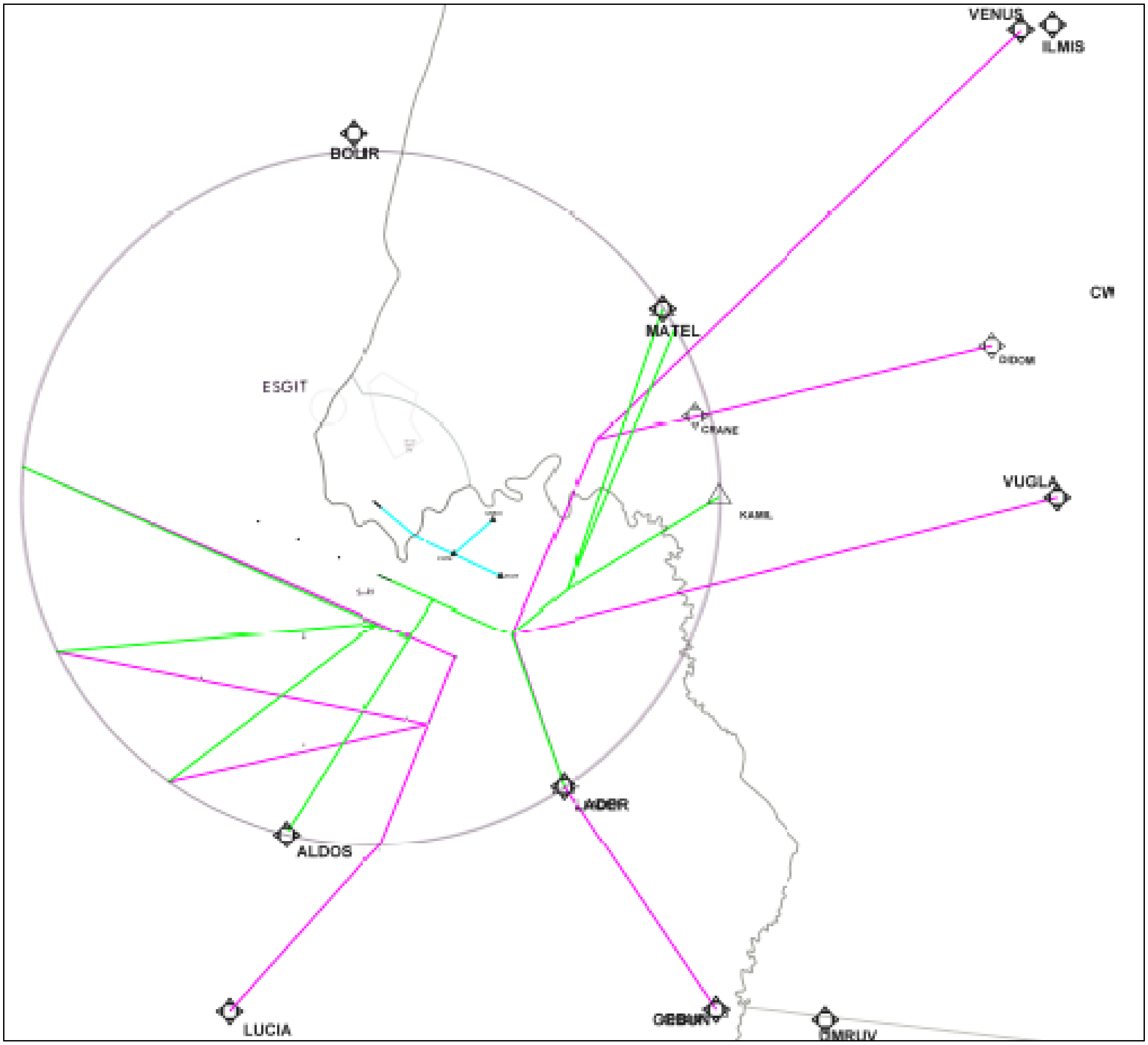
DMRUV
USEXA

ANEXO I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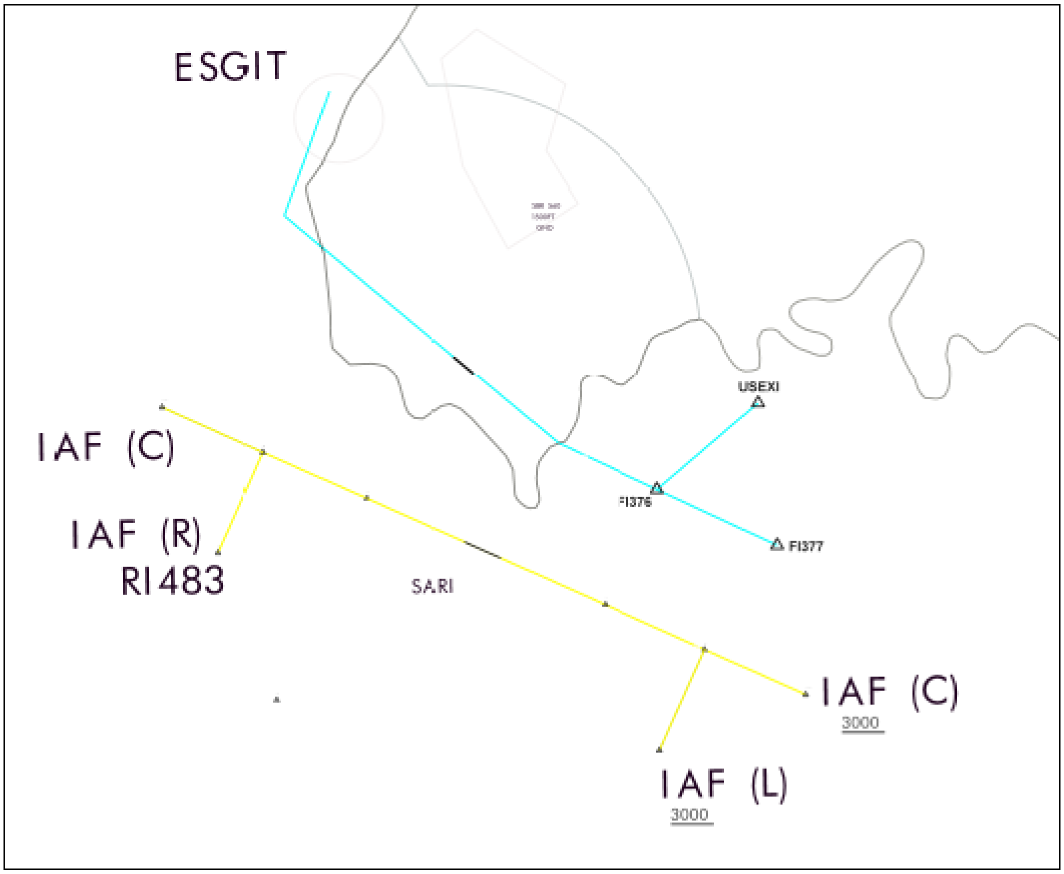
ANEXO J


ESGIT
USEXI
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FI377
IAF (R)
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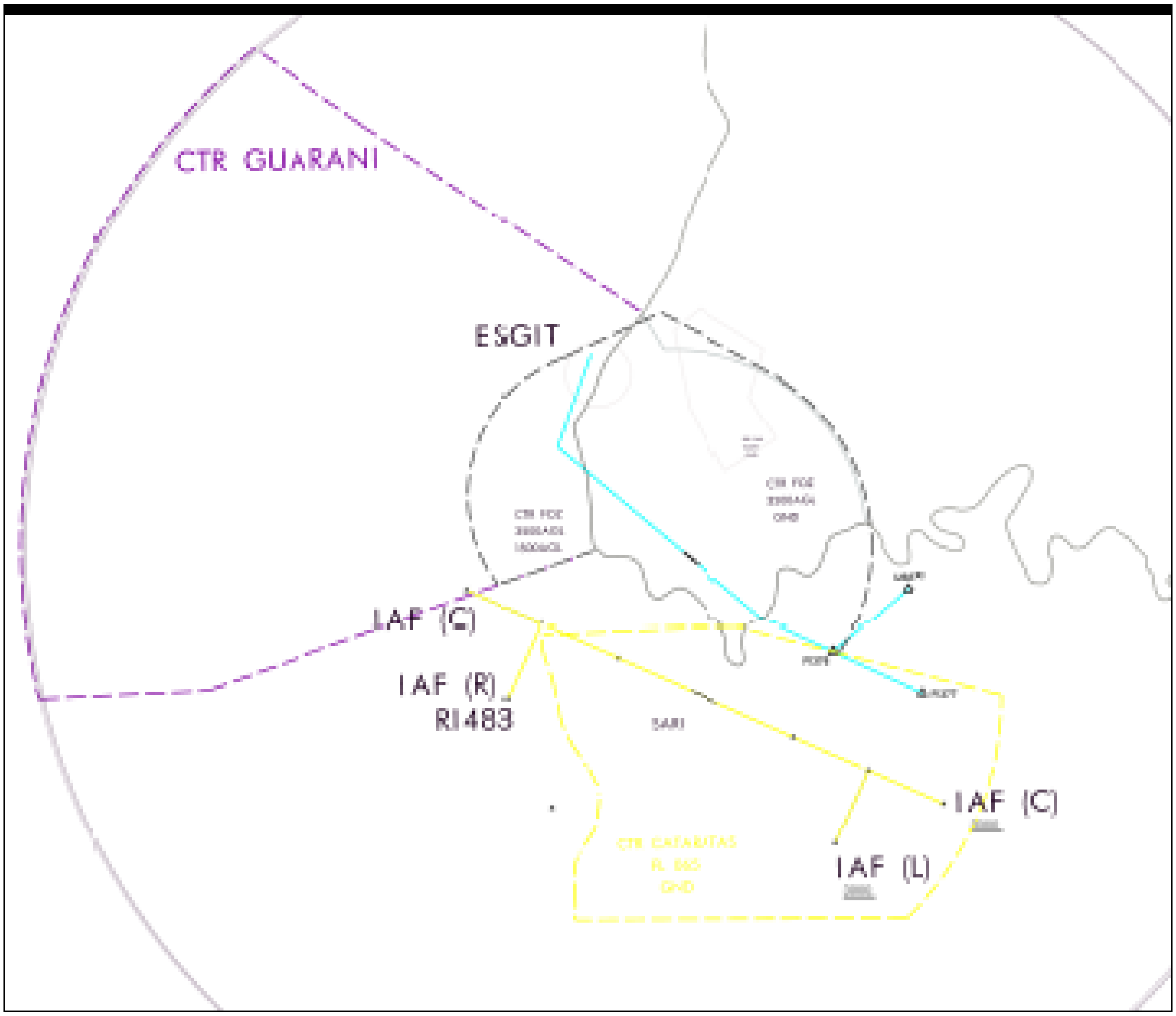
SARI
IAF (C)
3000
IAF (L)
3000

ANEXO K



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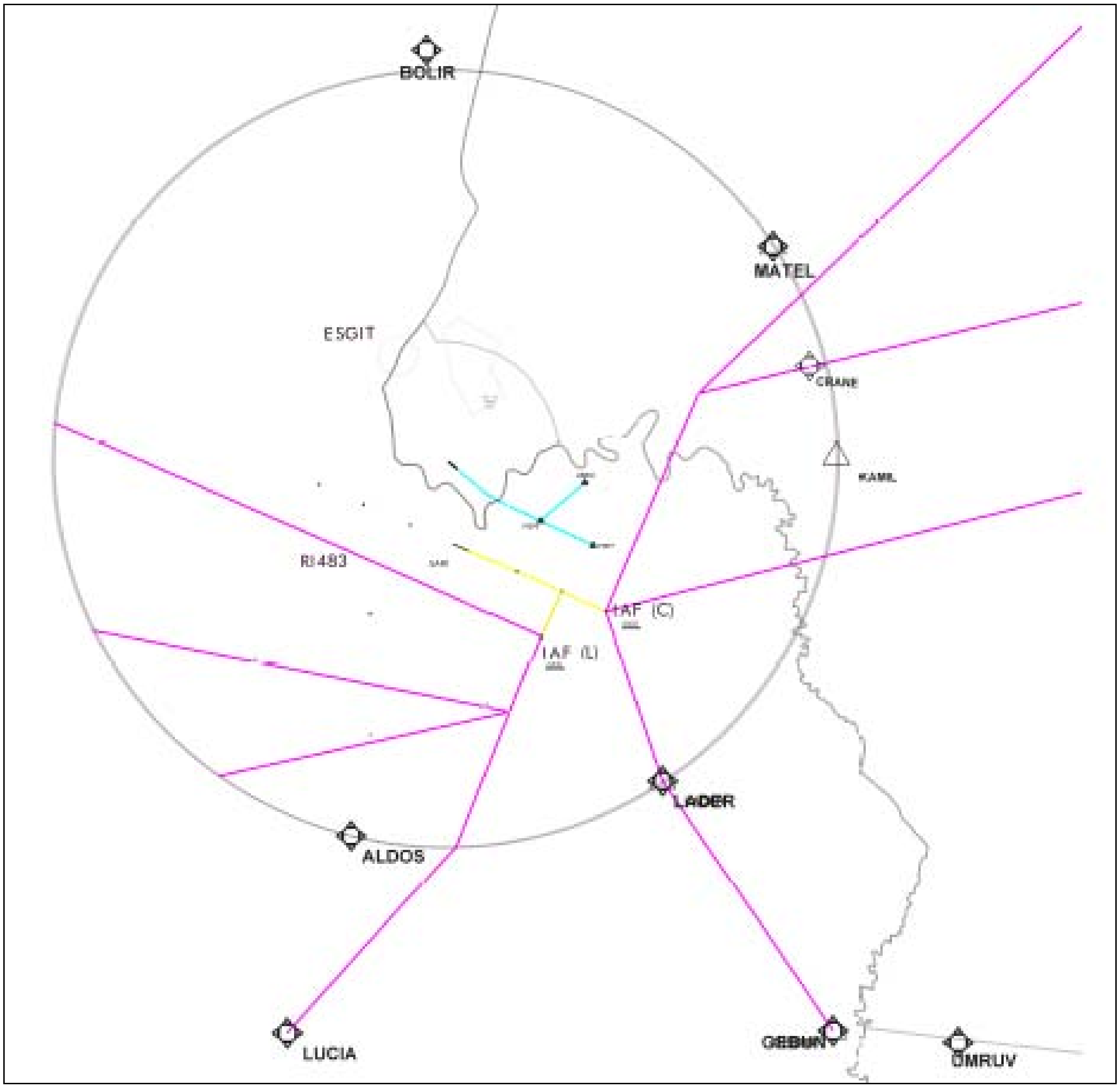
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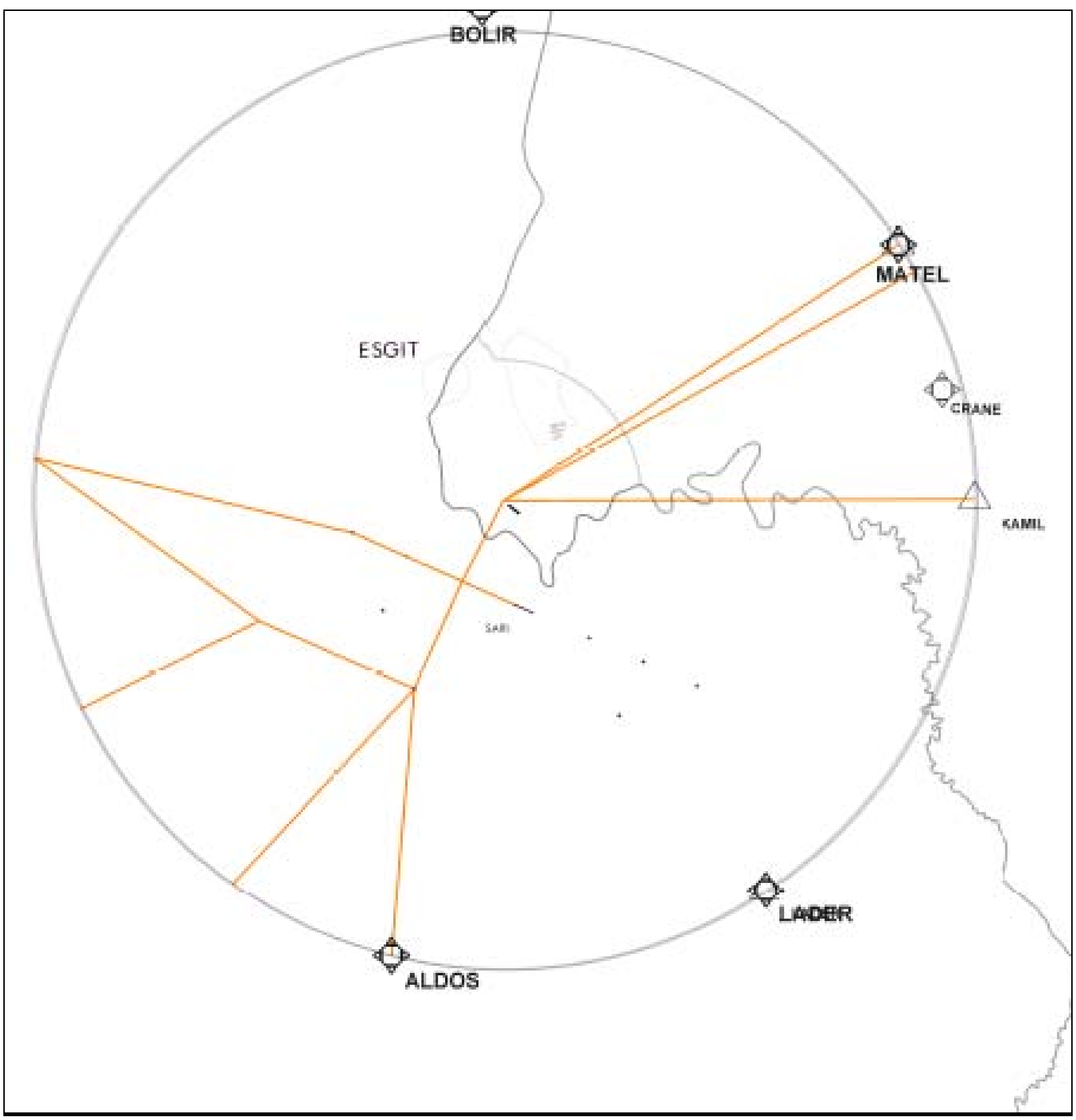
ANEXO M



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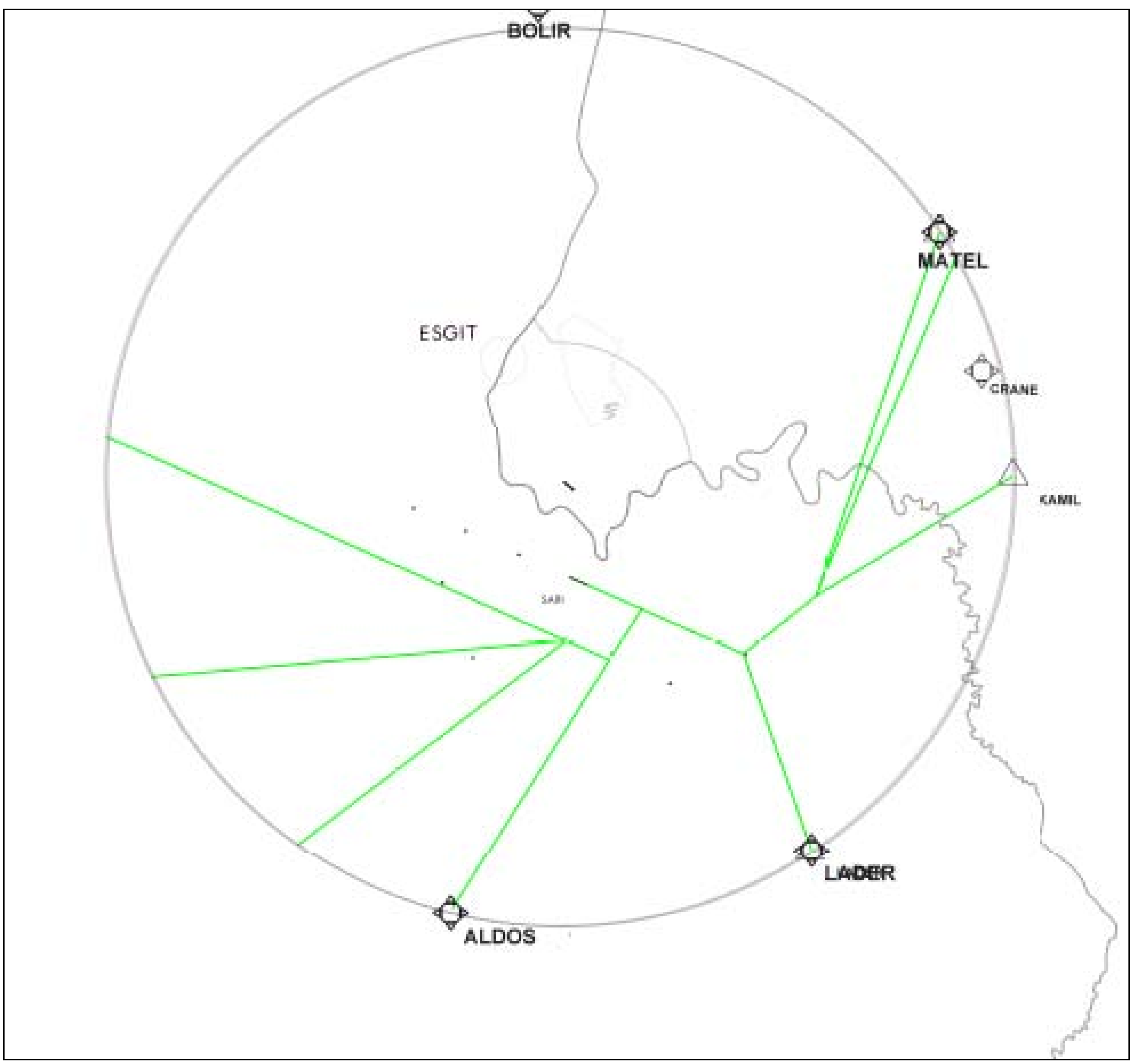

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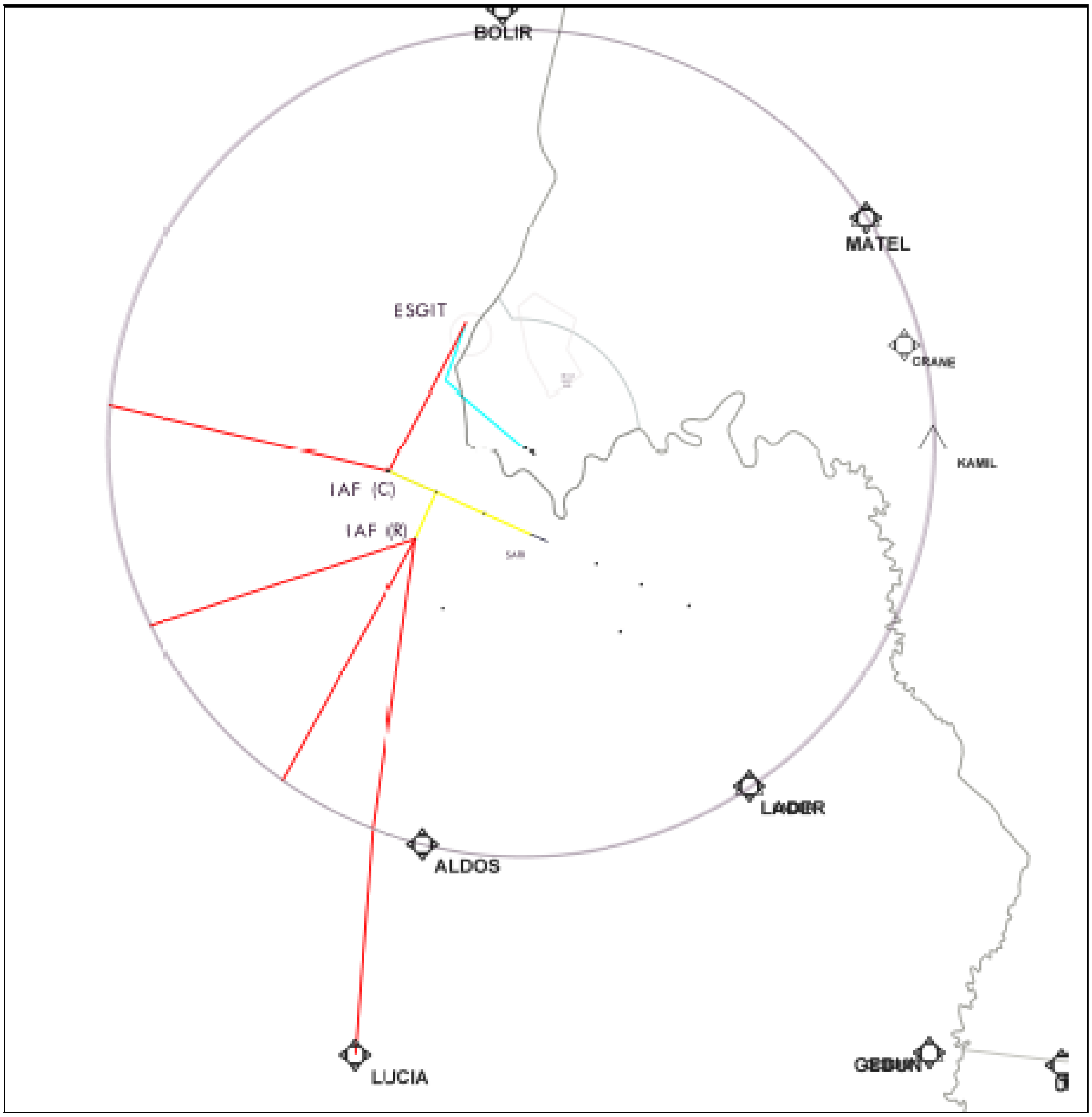
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IAF (R)
LADER
ALDOS
LUCIA
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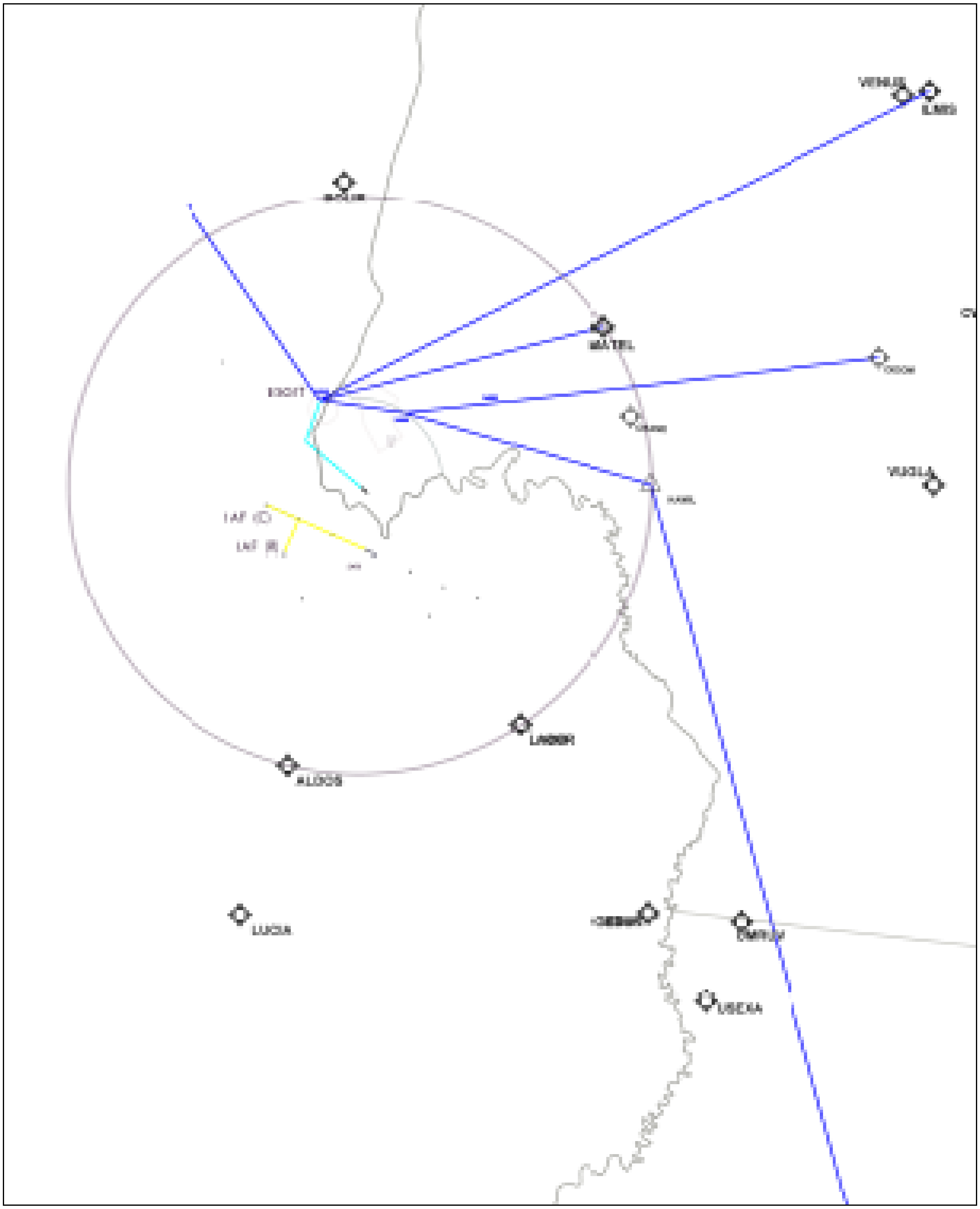
ANEXO P



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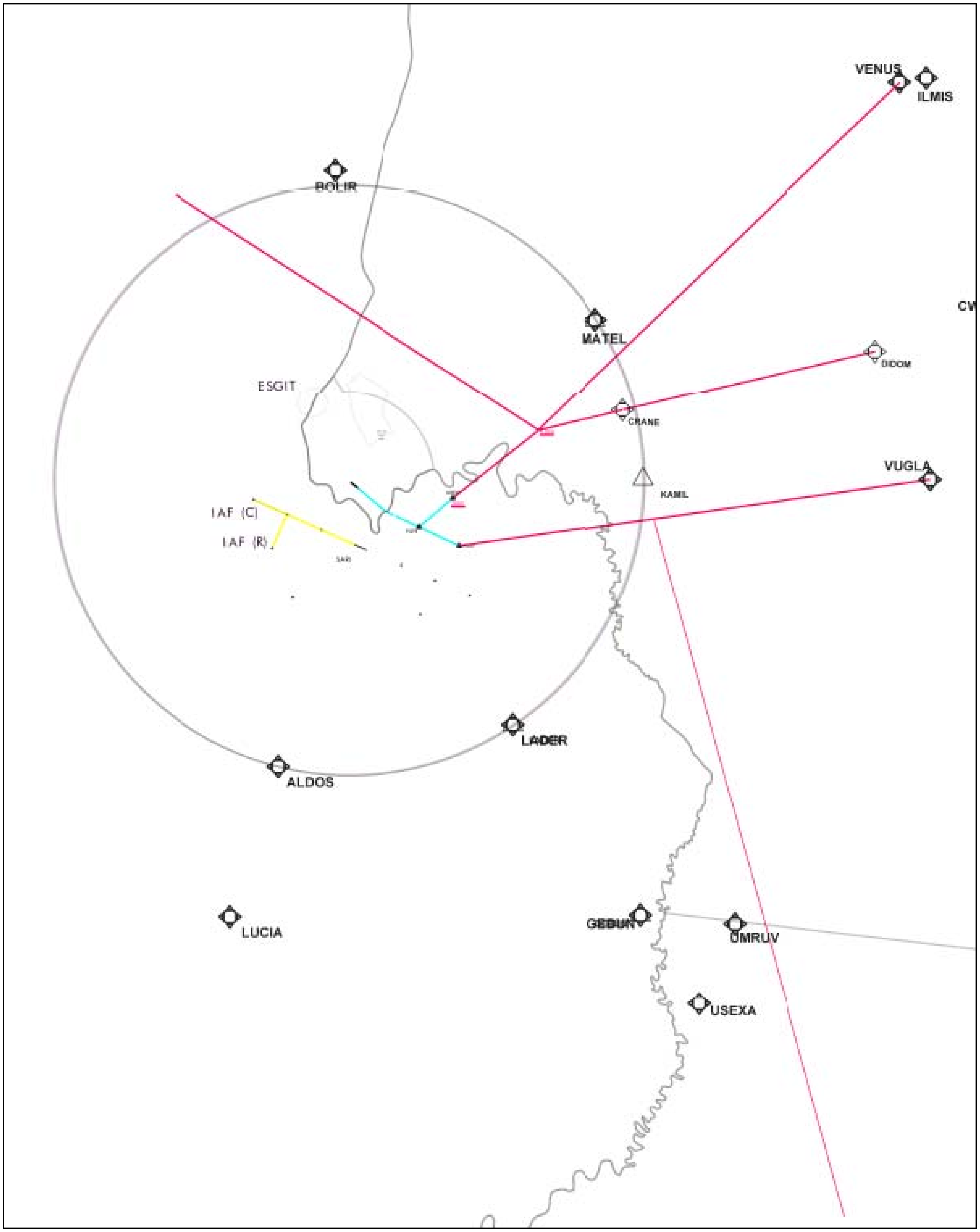
VENUS
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CRANE
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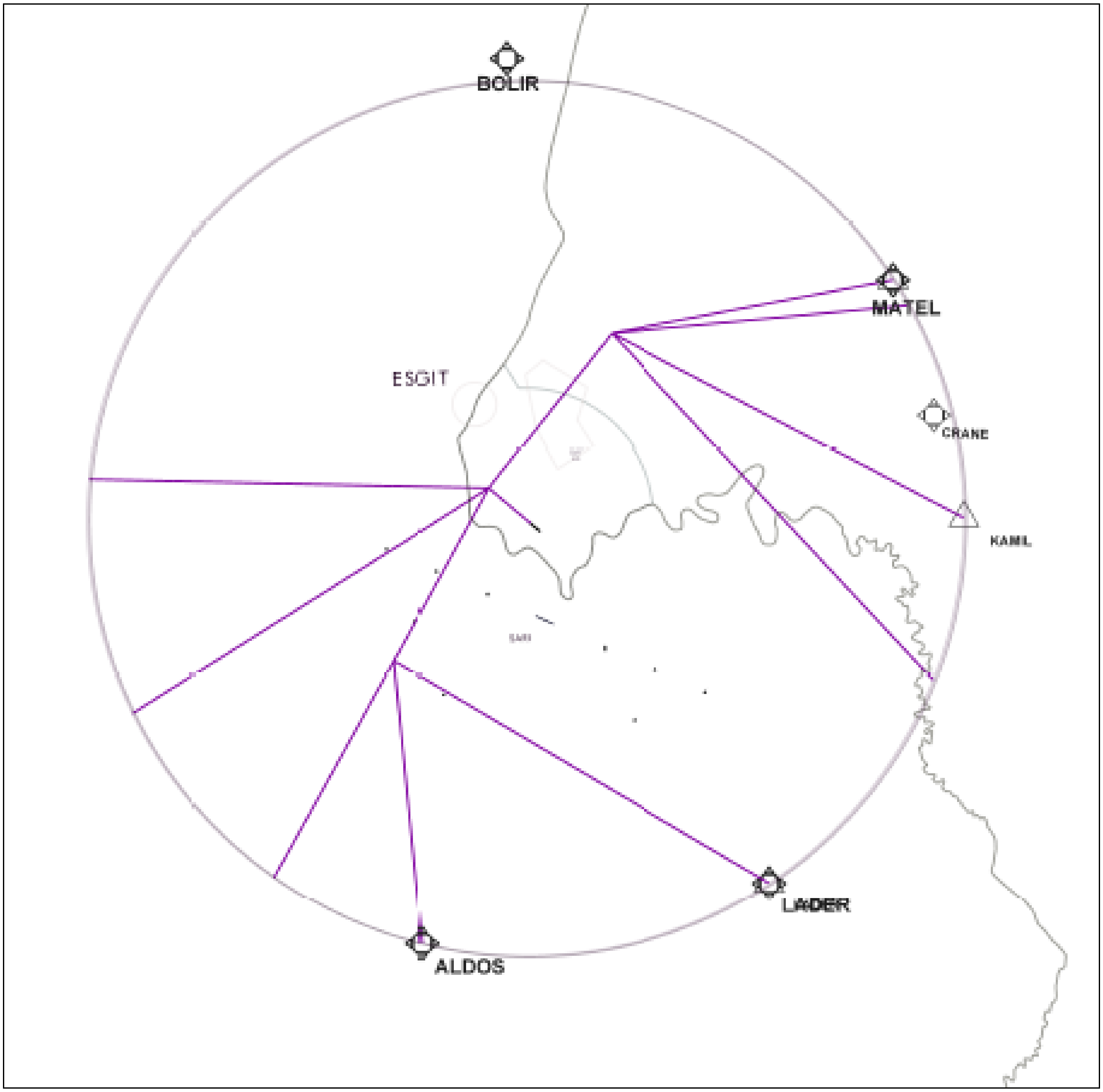
IAF (C)
IAF (R)
LADER
ALDOS
LUCIA
GEBUN
UMRUV
USEXA

ANEXO R



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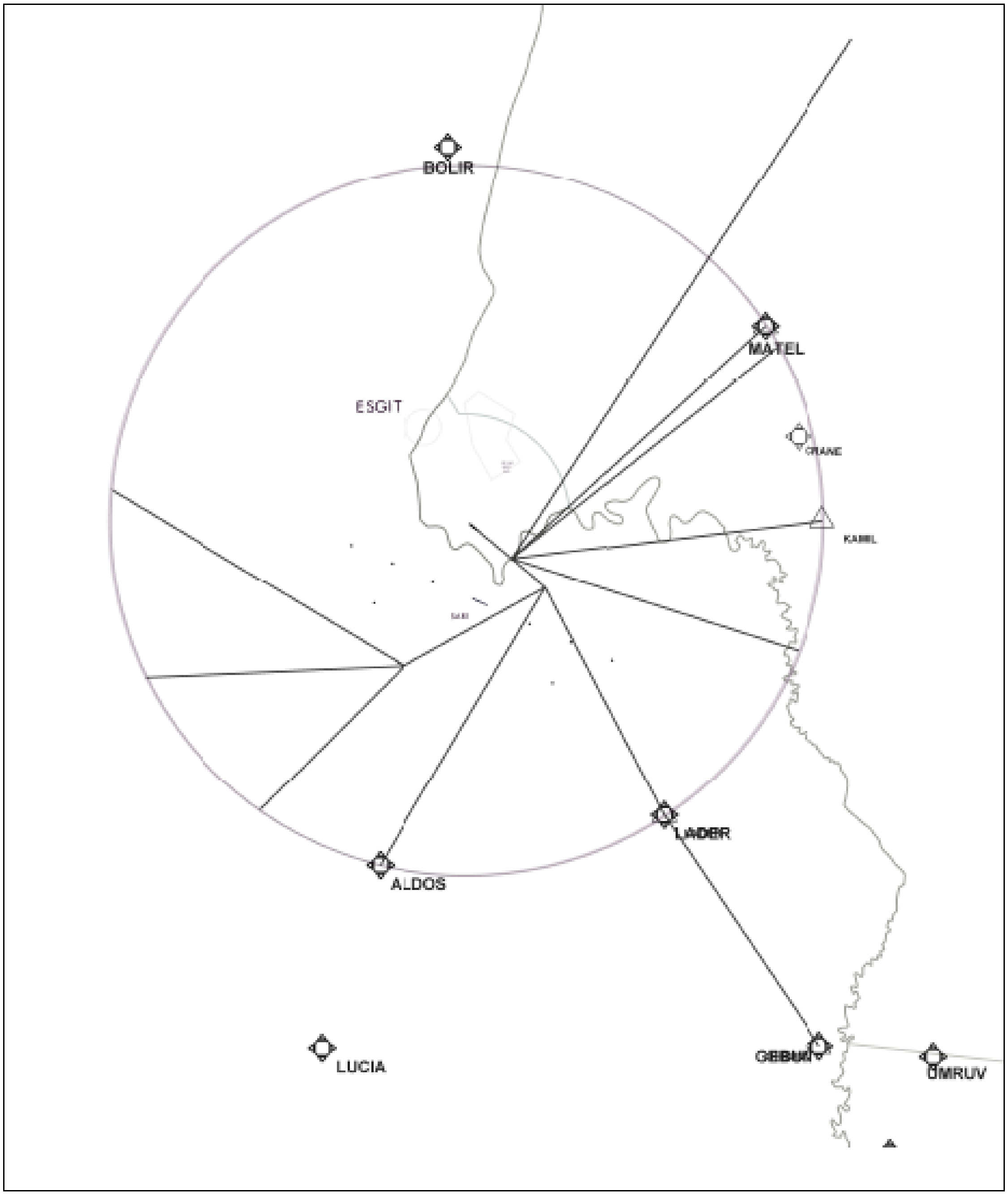
BOLIR
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ESGIT
CRANE
KAMIL
LADER
ALDOS
LUCIA
GEBUN
UMRUV

APPENDIX H

NAVEGACIÓN BASADA EN LA PERFORMANCE (PBN)

MANUAL OPERATIVO

PARAGUAY

(Spanish only)

NAVEGACIÓN BASADA EN LA PERFORMANCE (PBN)

MANUAL OPERATIVO

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CAPÍTULO 1

DEFINICIONES Y ABREVIATURAS

1.1 DEFINICIONES

Aplicación de Navegación.- Aplicación de una especificación para la navegación y de la correspondiente infraestructura NAVAID a rutas, procedimientos y/o a un volumen de espacio aéreo definido de conformidad con el concepto de espacio aéreo previsto.

> **Nota.-** La aplicación de navegación es un elemento, junto con comunicaciones, vigilancia ATS y procedimientos ATM, que cumple los objetivos estratégicos de un concepto de espacio aéreo definido.

Concepto de Espacio Aéreo.- Un concepto de espacio aéreo describe las operaciones previstas dentro de un espacio aéreo. Los conceptos de espacio aéreo se elaboran para satisfacer objetivos estratégicos explícitos como una mejor seguridad operacional, mayor capacidad de tránsito aéreo y mitigación de las repercusiones en el medio ambiente. Los conceptos de espacio aéreo pueden incluir detalles de la organización práctica del espacio aéreo y sus usuarios basada en determinadas hipótesis CNS/ATM, p. ej., estructura de rutas ATS, mínimas de separación, espaciado de rutas y franqueamiento de obstáculos.

Entorno mixto de Navegación.- Entorno en el que pueden aplicarse diferentes especificaciones para la navegación (por ejemplo, rutas RNP 10 y RNP 4) dentro del mismo espacio aéreo o en el que se permiten operaciones de navegación convencional y aplicaciones RNAV o RNP en el mismo espacio aéreo.

Especificación para la Navegación.- Conjunto de requisitos relativos a la aeronave y a la tripulación de vuelo necesarios para dar apoyo a las operaciones de la navegación basada en la performance dentro de un espacio aéreo definido. Existen dos clases de especificaciones para la navegación:

> **Especificación RNAV.-** Especificación para la navegación basada en la navegación de área que no incluye el requisito de vigilancia y alerta de la performance a bordo, designada por medio del prefijo RNAV, por ejemplo, RNAV 5, RNAV 1.
>
> **Especificación RNP.-** Especificación para la navegación basada en la navegación de área que incluye el requisito de vigilancia y alerta de la performance a bordo, designada por medio del prefijo RNP, por ejemplo, RNP 4, RNP APCH.

Función de Navegación.- La capacidad detallada del sistema de navegación (como ejecución de tramos de transición, capacidades de desplazamiento paralelo, circuitos de espera, bases de datos de navegación) requerida para satisfacer el concepto de espacio aéreo.

> ***Nota.-*** Los requisitos funcionales de navegación son uno de los elementos para la selección de una especificación para la navegación en particular.

Infraestructura de Ayudas para la Navegación (NAVAID).- Expresión que designa a las ayudas (radioayudas) para la navegación basadas en tierra o en el espacio disponible para satisfacer los requisitos de la especificación para la navegación.

Llegada Normalizada por Instrumentos (STAR).- Ruta de llegada designada según reglas de vuelo por instrumentos (IFR) que une un punto significativo, normalmente en una ruta ATS, con un punto desde el cual puede comenzarse un procedimiento publicado de aproximación por instrumentos.

Navegación Basada en la Performance (PBN).- Navegación de área basada en requisitos de performance que se aplican a las aeronaves que realizan operaciones en una ruta ATS, en un procedimiento de aproximación por instrumentos o en un espacio aéreo designado.

> ***Nota*.-** En las especificaciones para la navegación, los requisitos de performance se expresan en función de la precisión, integridad, continuidad, disponibilidad y funcionalidad necesarias para la operación propuesta en el contexto de un concepto de espacio aéreo particular.

Navegación de Área (RNAV).- Método de navegación que permite la operación de aeronaves en cualquier trayectoria de vuelo deseada, dentro de la cobertura de las ayudas para la navegación basadas en tierra o en el espacio, o dentro de los límites de la capacidad de las ayudas autónomas, o de una combinación de ambas.

> **Nota.-** La navegación de área incluye la navegación basada en la performance así como otras operaciones RNAV que no se ajustan a la definición de navegación basada en la performance.

Operaciones RNAV.- Operaciones de aeronaves en las que se usa navegación de área para aplicaciones RNAV. Las operaciones RNAV incluyen el uso de navegación de área para operaciones que no se desarrollan de acuerdo con el Doc 9613 – Manual de navegación basada en la performance (PBN).

Operaciones RNP.- Operaciones de aeronaves en las que se utiliza un sistema RNP para aplicaciones de navegación RNP.

Procedimiento de Aproximación con Guía Vertical (APV).- Procedimiento por instrumentos en el que se utiliza guía lateral y vertical, pero que no satisface los requisitos establecidos para las operaciones de aproximación y aterrizaje de precisión.

Ruta de Navegación de Área.- Ruta ATS establecida para el uso de aeronaves que pueden aplicar el sistema de navegación de área.

Ruta RNP.- Ruta ATS establecida para el uso de aeronaves que operan conforme a una especificación para la navegación RNP prescrita.

Salida Normalizada por Instrumentos (SID).- Ruta de salida designada según reglas de vuelo por instrumentos (IFR) que une un aeródromo o una determinada pista del aeródromo con un determinado punto significativo, normalmente en una ruta ATS, en el cual comienza la fase en ruta de un vuelo.

Servicio de Vigilancia ATS.- Expresión empleada para referirse a un servicio proporcionado directamente mediante un sistema de vigilancia ATS.

Sistema de Aumentación Basado en la Aeronave (ABAS).- Sistema de aumentación por el que la información obtenida a partir de otros elementos del GNSS se añade o integra a la información disponible a bordo de la aeronave.

> **Nota.-** La forma más común de ABAS es la vigilancia autónoma de la integridad en el receptor (RAIM).

Sistema de Aumentación Basado en Satélites (SBAS).- Sistema de aumentación de amplia cobertura por el cual el usuario recibe la información de aumentación transmitida por satélite.

Sistema de Vigilancia ATS.- Expresión genérica que significa, según el caso, ADS-B, PSR, SSR o cualquier sistema basado en tierra comparable que permite la identificación de aeronaves.

> ***Nota***.- Un sistema similar basado en tierra es aquel para el cual se ha comprobado, por evaluación u otra metodología comparativa, que los niveles de seguridad operacional y de performance son iguales o mejores que los correspondientes a los del SSR monoimpulso.

Sistema RNAV.- Sistema de navegación que permite la operación de aeronaves en cualquier trayectoria de vuelo deseada, dentro de la cobertura de las ayudas para la navegación referidas a la estación, o dentro de los límites de las capacidades de las ayudas autónomas, o de una combinación de ambas. Un sistema RNAV puede formar parte de un sistema de gestión de vuelo (FMS).

Sistema RNP.- Sistema de navegación de área que da apoyo al control (vigilancia) y alerta de la performance de a bordo.

Verificación por Redundancia Cíclica (CRC).- Algoritmo matemático aplicado a la expresión digital de los datos que proporciona un cierto nivel de garantía contra la pérdida de datos.

Vigilancia Autónoma de la Integridad en el Receptor (RAIM).- Forma de ABAS por la que un receptor procesador GNSS determina la integridad de las señales de navegación GNSS empleando únicamente señales GPS o señales GPS aumentadas con altitud (ayuda barométrica). Esto se determina mediante una verificación de la coherencia entre mediciones redundantes de seudodistancias. Para que el receptor realice la función RAIM es necesario disponer de por lo menos un satélite adicional con la geometría correcta y que exceda la necesaria para estimar la posición.

1.2 SIGLAS

AAC	Administración de Aviación Civil
ABAS	Sistema de aumentación basado en la aeronave
ADS-B	Vigilancia dependiente automática- radiodifusión
ADS-C	Vigilancia dependiente automática-contrato
AESA	Agencia Europea de Seguridad Aérea
AFM	Manual de vuelo de la aeronave
AIP	Publicación de información aeronáutica
ANSP	Proveedor de servicios de navegación aérea
AOC	Certificado de explotador de servicios aéreos
APCH	Aproximación
APV	Procedimiento de aproximación con guía vertical
ATC	Control del tránsito aéreo
ATM	Gestión del tránsito aéreo
ATS	Servicio de tránsito aéreo
CCO	Operaciones de ascenso continuo
CDI	Indicador de desviación de curso
CDO	Operaciones de descenso continuo
CDU	Unidad de control y visualización
CEAC	Conferencia Europea de Aviación Civil
CFIT	Impacto contra el suelo sin pérdida de control
CNS	Comunicaciones, navegación y vigilancia
CRC	Verificación por redundancia cíclica
DME	Equipo radiotelemétrico
DTED	Datos digitales de elevación del terreno
EUROCAE	Organización europea para el equipamiento de la aviación civil
EUROCONTROL	Organización Europea para la Seguridad de la Navegación Aérea
FAA	Administración Federal de Aviación (de los Estados Unidos)
FGS	Sistema de guía de vuelo
FMS	Sistema de gestión de vuelo
FRT	Transición de radio fijo
FTE	Error técnico de vuelo

FTS	Simulación en tiempo acelerado
GA	Aviación general
GBAS	Sistema de aumentación basado en tierra
GLS	Sistema de aterrizaje GBAS
GNSS	Sistema mundial de navegación por satélite
GPS	Sistema mundial de determinación de la posición
GRAS	Sistema de aumentación regional basado en tierra
HF	Alta frecuencia
IAP	Procedimiento de aproximación por instrumentos
IFP	Procedimiento de vuelo por instrumentos
ILS	Sistema de aterrizaje por instrumentos
INS	Sistema de navegación inercial
IRS	Sistema de referencia inercial
IRU	Unidad de referencia inercial
JAA	Autoridades Conjuntas de Aviación
LOA	Carta de autorización/carta de aceptación
MCDU	Unidad de control y presentación de funciones múltiples
MEL	Lista de equipo mínimo
MLS	Sistema de aterrizaje por microondas
MMEL	Lista maestra de equipo mínimo
MNPS	Especificación de performance mínima de navegación
MSA	Altitud mínima de sector
MSL	Nivel medio del mar
NAA	Autoridad nacional de aeronavegabilidad
NAVAID	Ayuda para la navegación aérea
NSE	Error del sistema de navegación
OEM	Fabricante del equipo original
OM	Manual de operaciones
PBN	Navegación basada en la performance
PSR	Radar primario de vigilancia
RAIM	Vigilancia autónoma de la integridad en el receptor
RF	Viraje de radio constante al punto de referencia
RNAV	Navegación de área

RNP	Performance de navegación requerida
RTS	Simulación en tiempo real
SB	Boletín de servicio
SBAS	Sistema de aumentación basado en satélites
SID	Salida normalizada por instrumentos
SIS	Señal en el espacio
SOP	Procedimiento operacional normalizado
SSR	Radar secundario de vigilancia
STAR	Llegada normalizada por instrumentos
STC	Certificado de tipo suplementario
TC	Certificado de tipo
TLS	Nivel deseado de seguridad operacional
TSE	Error del sistema total
TSO	Orden de norma técnica
UHF	Frecuencia ultra alta
VFR	Reglas de vuelo visual
VHF	Muy alta frecuencia
VNAV	Navegación vertical
VOR	Radiofaro omnidireccional VHF

CAPÍTULO 2

IMPLANTACIÓN PBN

2.1 INTRODUCCIÓN

La Dirección Nacional de Aeronáutica Civil (DINAC), ha elaborado el presente Manual Operativo de Navegación Basada en la Performance (PBN), con el objetivo de describir los Procedimientos PBN para uso del personal ATS que provee los Servicios de Control de Tránsito Aéreo en la República del Paraguay.

Es necesario que el personal ATS esté familiarizado con el contenido del mismo en lo concerniente a sus funciones y responsabilidades operacionales, para proporcionar un flujo de tránsito seguro y eficiente en beneficio de la capacidad del espacio aéreo, así mismo también deban poner en práctica su mejor criterio en caso de encontrar situaciones que no estén contempladas en este manual.

Para el desarrollo del Manual Operativo PBN se ha servido de documentos y recomendaciones emitidas por la OACI:

- ✓ Documento 8168 OACI “Construcción de procedimientos de vuelo visual y por instrumentos”
- ✓ Documento 9613 OACI “Manual de navegación basada en la performance (PBN)”
- ✓ Documento 9992 OACI “Manual sobre el uso de la navegación basada en la performance (PBN) en el diseño del espacio aéreo”
- ✓ Documento 9931 OACI “Manual de operaciones de descenso continuo (CDO)”
- ✓ Documento 9993 OACI “Manual de operaciones de ascenso continuo (CCO)”
- ✓ Documento 4444 OACI “Gestión del tránsito aéreo”
- ✓ Talleres de entrenamiento PBN OACI

Posterior a la implantación de RVSM, la principal herramienta para la optimización de la estructura del espacio aéreo es la implantación de la Navegación Basada en Performance (PBN), que propiciará las condiciones necesarias para el aprovechamiento de la capacidad RNAV (Navegación de Área) y RNP (Performance de Navegación Requerida), aplicadas a las operaciones de aeronaves, involucrando Aproximaciones por Instrumentos, Rutas de Salida Normalizadas por Instrumentos (SID), Rutas de Llegada Normalizadas por Instrumentos (STAR) y Rutas ATS.

CAPITULO 3

ANTECEDENTES

3.1 FUNDAMENTACIÓN

En concordancia con la Resolución A37-11 de la OACI, en la cual se mencionan las metas mundiales de la Navegación Basada en la Performance, que estable que los Estados completen un plan de implementación de la PBN con carácter urgente a fin de lograr la implantación de operaciones RNAV y RNP (donde se requiera) para áreas en ruta y terminales de acuerdo a los plazos establecidos, la Dirección Nacional de Aeronáutica Civil (DINAC), realiza una reestructuración del Área de Control Terminal de Asunción de acuerdo a las necesidades operacionales y obedeciendo a una planificación sustentable.

La estructura del espacio aéreo nacional (Rutas y TMA) están basados en los delineamientos de la OACI para la Región SAM y en la experiencia de los especialistas relacionados al gerenciamiento de tránsito aéreo, contemplando siempre la demanda creciente del tráfico aéreo y la implementación de nuevos conceptos CNS/ATM.

Con la implantación de la Navegación Basada en la Performance (PBN), se prevé el alcance de los objetivos estratégicos propuestos, con la utilización de herramientas como Procedimientos de Aproximación por Instrumentos (IAC), Procedimientos de Salida Normalizada por Instrumentos (SID) y Procedimientos de Llegada por Instrumentos (STAR) PBN, para operaciones en el Aeropuerto Internacional “Silvio Pettirossi”, considerando además técnicas de Ascenso Continuo (CCO) y Descenso Continuo (CDO), con el propósito principal de reducir la carga de trabajo a los controladores de tránsito aéreo, optimizando la gestión de mayores flujos de tránsito aéreo, además de incrementar la capacidad del espacio aéreo producto del establecimiento de trayectorias de vuelo más eficientes, incrementando los estándares de seguridad en la gestión del tránsito aéreo en el TMA Asunción y de los espacios aéreos adyacentes, así como mejorar la conciencia situacional de los ATCOs.

3.2 OBJETIVOS ESTRATÉGICOS

Seguridad Operacional

- ✓ Incrementar los estándares de seguridad en la gestión del tránsito aéreo en el TMA Asunción y de los espacios aéreos adyacentes.
- ✓ Mejorar la conciencia situacional del personal ATC.

Capacidad

- ✓ Reducir la carga de trabajo de los ATCOs, optimizando la gestión de mayores flujos de tránsito aéreo.
- ✓ Incrementar la capacidad del espacio aéreo producto del establecimiento de trayectorias de vuelo más eficientes.

Eficiencia

- ✓ Mejorar el rendimiento de las operaciones aéreas optimizando los perfiles de vuelo.
- ✓ Permitir el desarrollo de las demás actividades aéreas (instrucción, deportiva, militar, etc) sin interferencias con el tráfico aéreo comercial.
- ✓ Diseñar trayectorias de llegadas y salidas más expeditivas y ordenadas.

Medio Ambiente

- ✓ Reducir las emisiones de CO_2.
- ✓ Mitigar el impacto del ruido de las operaciones aéreas ante el crecimiento del área urbana.

3.3 ALCANCE

- Reestructuración del espacio aéreo del TMA Asunción.
- Aplicación del concepto de operaciones PBN a los principales flujos de tránsito del TMA Asunción.
- Gestión de operaciones VFR e IFR, en un marco de eficiencia y seguridad operacional.

3.4 PROPÓSITO

Este manual tiene el propósito de describir los procedimientos inherentes a la Navegación Basada en la Performance (PBN), que deben ser aplicados por el Servicio de Control de Tránsito Aéreo para una gestión eficiente del flujo de tránsito aéreo así como del espacio aéreo, lo que permitirá incrementar significativamente la seguridad operacional, la capacidad y la eficiencia del sistema en beneficio de la comunidad ATM.

CAPITULO 4

GENERALIDADES

4.1 DESCRIPCIÓN DE LA NAVEGACIÓN BASADA EN LA PERFORMANCE (PBN)

La Navegación Basada en la Performance (PBN), especifica que los requisitos de performance del sistema RNAV o RNP de la aeronave se definen en función de la precisión, integridad, continuidad y funcionalidad necesarias para las operaciones propuestas en el contexto de un concepto de espacio aéreo particular, con el apoyo de la infraestructura de NAVAID apropiada. El cumplimiento del WGS 84 y la calidad de los datos prescrita en el Anexo 15 Servicios de Información Aeronáutica son integrales de la PBN. El Concepto de PBN representa un cambio en la navegación, la misma está basada en sensores que determinan la performance de las aeronaves. Los requisitos de performance se expresan en especificaciones para la navegación, que también identifican la elección de los sensores y del equipo de navegación que pueden usarse para satisfacer los requisitos de performance. Estas especificaciones para la navegación proporcionan a los Estados y a los explotadores orientación específica para la implantación a fin de facilitar la armonización mundial.

En el marco de la PBN, los requisitos de navegación genéricos se definen principalmente en función de los requisitos operacionales. Por consiguiente, los explotadores evalúan las opciones con respecto a la tecnología y los servicios de navegación disponibles. La solución escogida sería la más eficaz con relación al costo para el explotador, en vez de ser una solución establecida como parte de los requisitos operacionales. La tecnología puede evolucionar con el tiempo sin que sea necesario revisar las operaciones propiamente dichas, siempre que el Sistema RNAV o RNP satisfaga el requisito de performance.

4.2 CONCEPTO DE ESPACIO AÉREO

El concepto de espacio aéreo describe las operaciones previstas dentro de un espacio aéreo y la organización de éste para posibilitarlas. Incluye muchos de los componentes del concepto operacional de ATM, comprendidos la organización y la gestión del espacio aéreo, el equilibrio entre la demanda y la capacidad, la sincronización del tránsito, las operaciones de los usuarios del espacio aéreo y la gestión de conflictos. Los conceptos de espacio aéreo se elaboran para satisfacer objetivos estratégicos explícitos e implícitos, tales como:

a) la mejora o el mantenimiento de la seguridad operacional;
b) el aumento de la capacidad de tránsito aéreo;
c) la mejora de la eficiencia;
d) las trayectorias de vuelo más precisas; y
e) la mitigación de las repercusiones en el medio ambiente.

Los conceptos de espacio aéreo incluiyen detalles de la organización práctica del espacio aéreo y de sus usuarios basándose en determinadas hipótesis sobre comunicaciones, navegación y vigilancia/gestión del tránsito aéreo (CNS/ATM), relativos a la estructura de las rutas de servicio de tránsito aéreo (ATS), las mínimas de separación, el espaciado entre rutas y el margen de franqueamiento de obstáculos.

El concepto de espacio aéreo describe en detalle la organización del espacio aéreo deseada y las operaciones que se sucedan dentro del mismo. Considera todos los objetivos estratégicos y determinará el conjunto de los elementos habilitantes de CNS/ATM, así como toda hipótesis operacional y técnica. Un concepto de espacio aéreo es un plan general del diseño del espacio aéreo previsto y de su funcionamiento.

4.3 BENEFICIOS DE LA PBN

La PBN ofrece múltiples ventajas con respecto a los métodos de navegación pasados convencionales, en los que los procedimientos de vuelo por instrumentos y las rutas aéreas se basaban en ayudas específicas para la navegación basadas en tierra y en los criterios de margen de franqueamiento de obstáculos conexos. Estas ventajas comprenden:

a) reducir la necesidad de mantener rutas y procedimientos en función de sensores específicos y de los costos conexos;
b) evitar tener que desarrollar las operaciones en función de sensores específicos cada vez que evolucionan los sistemas de navegación, lo que podría ser de un costo prohibitivo;
c) permitir un uso más eficiente del espacio aéreo (emplazamiento de rutas, rendimiento del combustible, atenuación del ruido, etc.);
d) aclarar el modo en que se usan los sistemas RNAV;
e) facilitar el proceso de aprobación operacional de los explotadores, proporcionando un conjunto limitado de especificaciones para la navegación previstas para que constituyan la base del material operacional y de certificación que podría aplicarse a escala mundial conjuntamente con la infraestructura de navegación apropiada; y
f) garantizar que la aprobación operacional en un Estado o región sea aplicable en otro Estado o región para aquellas aplicaciones de navegación que exijan la misma especificación para la navegación.

El desarrollo y la implantación de un concepto de espacio aéreo que utiliza PBN contribuye de manera significativa, por ejemplo, a la seguridad operacional, el medio ambiente, la capacidad y la eficiencia de vuelo:

a) el enfoque de asociación de la PBN al desarrollo del concepto de espacio aéreo garantiza que se procesen de forma integrada los requisitos contradictorios, y que se aborden intereses diversos sin comprometer los requisitos de seguridad operacional, atenuación de las repercusiones ambientales, eficiencia de vuelo o capacidad;

b) se mejora la seguridad operacional garantizando que el emplazamiento de rutas ATS y de los procedimientos de vuelo por instrumentos satisfagan íntegramente tanto los requisitos de ATM como de margen de franqueamiento de obstáculos;

c) aumenta la atenuación de las repercusiones ambientales al concederse igual importancia a las necesidades ambientales que al incremento de la capacidad en la definición de las operaciones que se suceden dentro de un espacio aéreo; y

d) se incrementan la capacidad del espacio aéreo y la eficiencia de vuelo perfeccionando el emplazamiento lateral y vertical tanto de las rutas ATS como de los procedimientos de vuelo por instrumentos.

4.4 ESPECIFICACIONES DE NAVEGACIÓN

Las especificaciones para la navegación que requieren vigilancia y alerta de la performance de a bordo son especificaciones RNP. Aquellas que no requieren vigilancia y alerta de la performance de a bordo se denominan especificaciones RNAV.

Una "aplicación de navegación" es la aplicación de una especificación para la navegación y de la correspondiente infraestructura NAVAID a rutas ATS, IAP o un volumen de espacio aéreo definido, de conformidad con el concepto de espacio aéreo.

Entre los ejemplos de cómo pueden usarse juntas la especificación para la navegación y la infraestructura NAVAID en una aplicación de navegación cabe mencionar las SID y STAR RNAV o RNP, las rutas ATS RNAV o RNP y los procedimientos de aproximación RNP.

Las especificaciones de navegación que serán utilizadas en el Área de Control Terminal - TMA Asunción, serán: RNAV 1 / RNP 1 básica, para apoyar operaciones RNAV en SID, STAR y en aproximaciones hasta el FAF/FAP, con vigilancia ATS RNP APCH, para apoyar operaciones de aproximación RNAV de hasta RNP 0,3 diseñadas con tramos rectos. Se incluyen requisitos de capacidades baro-VNAV.

Las operaciones PBN en el Área de Control Terminal TMA Asunción, estarán soportados por GNSS, como apoyo principal.

4.5 VOLUMEN DE ESPACIO AÉREO

El volumen del espacio aéreo del TMA Asunción, se ha reestructurado adecuando sus dimensiones estrictamente a lo necesario, luego del diseño de las rutas de llegadas y salidas por instrumentos, de modo a protegerlas, evitando diseñar rutas para ajustarse a los volúmenes pre-existentes.

Se mantendrán los volúmenes definidos como CTR y ATZ, con sus dimensiones actuales.

Se aplicará Clasificación "B" al espacio aéreo del TMA Asunción.

4.6 OPERACIONES DE LOS USUARIOS DEL ESPACIO AÉREO

Las operaciones de los usuarios del espacio aéreo se refieren al aspecto de las operaciones de vuelo relacionado con el espacio aéreo, como sigue:

a) se atenderán las necesidades de los usuarios, y las capacidades de navegación de las aeronaves serán identificadas a fin de mejorar la seguridad operacional y eficiencia;

b) los datos ATM pertinentes serán disponibles para mejorar la conciencia situacional táctica y estratégica de los usuarios del espacio aéreo y para la gestión de conflictos;

c) la información operacional relevante de los usuarios del espacio aéreo estará disponible para los ANSP para mejorar la conciencia situacional táctica y estratégica y para la gestión de conflictos; y

d) se fomentará la adopción de decisiones en colaboración para asegurar que las expectativas de los usuarios y las capacidades de las aeronaves se tengan en cuenta en el diseño del espacio aéreo.

4.7 TRIPULACIÓN DE VUELO Y OPERACIONES DE TRÁNSITO AÉREO

Los pilotos y los controladores de tránsito aéreo son los usuarios finales de la PBN, teniendo cada uno sus propias expectativas respecto a cómo el uso y la capacidad del sistema RNAV o RNP afecta a sus métodos de trabajo y operaciones cotidianas.

Lo que los pilotos necesitan saber acerca de las operaciones PBN es si la aeronave y la tripulación de vuelo reúnen las condiciones para operar en el espacio aéreo, en un procedimiento o a lo largo de una ruta ATS. Por su parte, los controladores suponen que la tripulación de vuelo y la aeronave tienen las calificaciones adecuadas para las operaciones PBN. Sin embargo, ellos también necesitan una comprensión básica de los conceptos de navegación de área, la relación entre las operaciones RNAV y RNP y de qué modo la implantación de las mismas afecta a los procedimientos, la separación y la fraseología de control. La necesidad de comprender la forma en que trabajan los sistemas RNAV y RNP así como las ventajas y limitaciones de los mismos tiene la misma importancia, para los controladores que para los pilotos.

Para los pilotos, una de las principales ventajas de usar un sistema RNAV o RNP es que la función de navegación la realiza un equipo de a bordo muy preciso y perfeccionado, lo que permite una disminución de la carga de trabajo en el puesto de pilotaje y, en algunos casos, más seguridad operacional. Por lo que respecta al controlador, la principal ventaja de las aeronaves que usan un sistema RNAV o RNP es que las rutas ATS pueden ser más directas, dado que no es necesario que pasen por lugares marcados por NAVAID convencionales. Otra ventaja es que las rutas de llegada y salida basadas en la RNAV pueden complementar, y hasta reemplazar, la guía vectorial radar, reduciendo así la carga de trabajo del controlador respecto a las aproximaciones y salidas. Las SID y STAR RNAV se usan ampliamente en casos de espacio aéreo terminal. Desde la perspectiva del franqueamiento de obstáculos, el uso de aplicaciones RNP puede permitir o aumentar el acceso a aeropuertos situados en lugares que, por su topografía, el acceso antes era limitado o no era posible.

Los controladores de tránsito aéreo algunas veces suponen que cuando todas las aeronaves que operan en un espacio aéreo deben ser aprobadas con el mismo nivel de performance, estas aeronaves tendrán sistemáticamente una performance de mantenimiento de la derrota totalmente o exactamente repetible y predecible. Esta no es una suposición acertada, porque los diferentes algoritmos que usan los diversos FMS y las diferentes formas de codificar los datos que usan en las bases de datos de navegación pueden afectar a la performance de una aeronave durante los virajes. La instrucción para el ATC es indispensable antes de implantar las aplicaciones RNAV y RNP, a fin de aumentar la comprensión y la confianza de los controladores y ganar la aceptación del ATC.

4.8 PROCEDIMIENTOS DE LA TRIPULACIÓN DE VUELO

Los procedimientos de la tripulación de vuelo complementan el contenido técnico de la especificación para la navegación y generalmente están comprendidos en el manual de operaciones de la empresa. Estos procedimientos podrían incluir, por ejemplo, que la tripulación de vuelo notifique al ATC las contingencias (es decir, fallas del equipo y/o condiciones meteorológicas) que pueden afectar a la capacidad de la aeronave para mantener la precisión de navegación; podrían requerir también que la tripulación de vuelo declare sus intenciones, coordine un plan de acción y obtenga una autorización ATC revisada en caso de contingencia. Los procedimientos de contingencia establecidos deberán estar disponibles para la tripulación de vuelo a fin de que ésta siga dichos procedimientos en caso de que no le sea posible notificar al ATC sus dificultades.

4.9 PROCEDIMIENTOS ATS

Los procedimientos ATS son necesarios para usarlos en el espacio aéreo que utiliza aplicaciones RNAV y RNP. Entre los ejemplos al respecto cabe incluir los procedimientos para poder usar la funcionalidad de a bordo para desplazamiento paralelo o para que sea posible la transición entre espacios aéreos que tienen requisitos de performance y funcionalidad diferentes (es decir, diferentes especificaciones para la navegación). A fin de facilitar una transición de ese tipo fue necesaria una planificación detallada, a saber:

a) determinación de los puntos específicos a los que se dirigirá el tránsito a medida que este pase de un espacio aéreo que requiere una especificación para la navegación con requisitos de performance y funcionales menos estrictos a un espacio aéreo que requiere una especificación para la navegación con requisitos de performance y funcionales más estrictos; y

b) coordinación de las actividades entre las partes interesadas, especificando las responsabilidades.

Los controladores de tránsito aéreo deberán adoptar las medidas pertinentes para proporcionar más separación y coordinar con otras dependencias ATC según corresponda, cuando se les informe que el vuelo no puede mantener el nivel de performance de navegación prescrito.

4.10 SISTEMA RNAV/RNP

CONCEPTO

La RNAV se define como un método de navegación que permite la operación de aeronaves en cualquier trayectoria de vuelo deseada, esto elimina la restricción impuesta a las rutas y los procedimientos convencionales cuando las aeronaves deben sobrevolar las ayudas para la navegación referidas, dando así flexibilidad y eficiencia operacional. Sin embargo, los sistemas RNP ofrecen mejoras en la integridad de las operaciones permitiendo, entre otras cosas, un espaciamiento menor entre rutas y pueden proporcionar suficiente integridad de modo que para navegar en un espacio aéreo específico únicamente se permita usar sistemas RNP. Por lo tanto, el uso de sistemas RNP puede ofrecer importantes beneficios operacionales y de seguridad y eficiencia operacional.

Dado que para cada especificación para la navegación se definen requisitos de performance específicos, una aeronave aprobada para una especificación RNP no está automáticamente aprobada para todas las especificaciones RNAV. Del mismo modo, una aeronave aprobada para una especificación RNP o RNAV que tiene un requisito de precisión más estricto (p. ej., RNP 0.3) no está automáticamente aprobada para una especificación para la navegación que tenga un requisito de precisión menos estricto (p. ej., RNP 4).

4.10.1 SISTEMAS RNAV

FUNCIONES BÁSICAS

Los sistemas RNAV están diseñados para proporcionar un nivel de precisión dado, con definición de trayectoria repetible y predecible, apropiado para la aplicación. Típicamente, el sistema RNAV integra la información de los sensores, tales como datos aeronáuticos, referencia inercial, radionavegación y navegación por satélite con la información de las bases de datos internas y los datos incorporados por la tripulación para realizar las siguientes funciones:

a) Navegación;
b) Gestión del plan de vuelo;
c) Guía y control;
d) Control de presentación en pantalla y del sistema

4.10.2 SISTEMAS RNP

FUNCIONES BÁSICAS

Un sistema RNP es un sistema RNAV que utiliza sus sensores de navegación, arquitectura y modos de operación para satisfacer los requisitos de la especificación para la navegación RNP, cuyas funcionalidades apoyan el control y alerta de la performance de a bordo.

Los requisitos específicos actuales incluyen:

a) Capacidad de seguir una derrota con fiabilidad, repetitividad y predictibilidad, incluidas las trayectorias curvas; y

b) Cuando se incluyen perfiles verticales para guía vertical, uso de ángulos verticales o de restricciones de altitud especificadas para definir la trayectoria vertical deseada.

Las capacidades de vigilancia y alerta de la performance pueden proporcionarse de diferentes formas, dependiendo de la instalación, la arquitectura y las configuraciones del sistema, que incluye:

a) Presentación en pantalla e indicación de la performance de navegación del sistema, tanto la requerida como la estimada;

b) Vigilancia de la performance del sistema y alerta a la tripulación cuando no se satisfacen los requisitos RNP; y

c) Presentaciones de la desviación lateral a escala RNP, juntamente con vigilancia y alerta separadas para la integridad de la navegación.

4.10.3 FUNCIONES ESPECÍFICAS RNAV Y RNP

Las operaciones de vuelo basadas en la performance se basan en la capacidad para asegurar trayectorias de vuelo fiables, repetibles y predecibles para mejorar la capacidad y eficiencia de las operaciones previstas. La implantación de las operaciones de vuelo basadas en la performance no sólo requiere las funciones tradicionalmente proporcionadas por el sistema RNAV, sino que también puede requerir funciones específicas para mejorar los procedimientos y las operaciones en el espacio aéreo y del tránsito aéreo.

Las especificaciones para la navegación que requieren control (vigilancia) y alerta de la performance de a bordo son especificaciones RNP. Aquellas que no requieren control y alerta de la performance de a bordo se denominan especificaciones RNAV. El uso del control y alerta de la performance de a bordo para distinguir entre RNP y RNAV es conveniente porque expone simplemente el hecho de que hay pocas diferencias y muchos aspectos funcionales comunes entre los sistemas de los aviones que deben realizar las operaciones de vuelo deseadas.

4.11 CONTROL (VIGILANCIA) DE LA INTEGRIDAD

Todos los sistemas de navegación lateral IFR, tanto convencionales como aquellos basados en la performance, deben satisfacer los requisitos de integridad. La integridad representa la confianza que ponemos en la capacidad del sistema para proporcionar información de navegación que no sea errónea. A pesar que un sistema de navegación puede proveer guía precisa, en aviación se requiere asegurar que dicha guía es válida en todas las circunstancias razonables por lo tanto se han implementado diversos medios para proporcionar esa seguridad.

La integridad en las ayudas para la navegación convencional está indicada por la ausencia de una banderola de advertencia en un indicador de radiofaro omnidireccional de muy alta frecuencia (VOR) o del ILS, o la presencia de un identificador Morse cuando se utiliza un equipo radiogoniómetro automático (ADF). Para los sistemas GNSS una pérdida de disponibilidad de la integridad se indica mediante un anuncio (en varias formas) que se presenta a la tripulación de vuelo.

Antes de la PBN, muchas operaciones que utilizaban GNSS fueron clasificadas como operaciones RNAV, tales como los procedimientos de aproximación RNAV (GNSS). Para ser coherentes con la definición RNP de la PBN, los procedimientos RNAV (GNSS) se clasifican ahora como procedimientos RNP APCH, debido a que cumplen con los requisitos de control y alerta de la performance de a bordo asociados con los sistemas RNP.

Por ejemplo, cuando los procedimientos operacionales se basan en el alineamiento de un procedimiento RNP con la pista de aterrizaje, podemos estar seguros de que la aeronave de forma fiable estará en la derrota prevista.

4.12 ESPACIO AÉREO PBN

El espacio aéreo del Área de Control Terminal de Asunción se organiza y gestiona a fin de dar cabida a todos los usuarios actuales y previstos del espacio aéreo, tales como aeronaves civiles y militares, transporte aéreo comercial y transporte aéreo de carga, aeronaves de aviación general, aviación ejecutiva, aviación deportiva y vuelos de instrucción.

La implementación de un Concepto de Espacio Aéreo PBN se apoya en el concepto operacional ATM mundial (Doc. 9854), el Manual PBN (Doc. 9613). El Concepto de Espacio Aéreo PBN permitirá mejoras directas del espacio aéreo por parte del proveedor de servicios de navegación aérea (ANSP).

La implementación integral del concepto de espacio aéreo PBN comprende una óptima revisión de rutas ATS en el espacio aéreo inferior y superior, la implementación de operaciones de ascenso continuo (CCO) y descenso continuo (CDO), mediante el uso del sistema de gestión de vuelo (FMS) instalados a bordo de las aeronaves, así como la implementación de procedimientos de aproximación RNAV/RNP, que también incrementarán la seguridad operacional, la capacidad y la eficiencia del sistema en beneficio de la Gestión ATM, permitirá la reducción de espaciamiento entre aeronaves y la reducción de utilización de guía vectorial ATC en rutas de salida y llegada, lo que resultará en una menor complejidad del espacio aéreo y reducción en la carga de trabajo del ATC.

El objetivo final será la optimización para una mayor capacidad del espacio aéreo, en el TMA Asunción.

El Concepto de Espacio Aéreo PBN permite mejoras directas a la organización y gestión del espacio aéreo, así como en otras actividades de implementación tales como la conciencia situacional ATM, el equilibrio entre demanda y capacidad del espacio aéreo y aeródromos, operaciones de aeródromo, provisión de información meteorológica y publicación de información en el AIP, etc.

La gestión eficiente del espacio aéreo mejorará la capacidad del proveedor de servicios de navegación aérea (ANSP), y también incrementarán la seguridad operacional, la capacidad y la eficiencia del sistema en beneficio de la comunidad ATM. Los beneficios de protección al medio ambiente serán medidos también periódicamente según los resultados de la implementación.

4.13 ORGANIZACIÓN Y GESTIÓN DEL ESPACIO AÉREO

Todo el espacio aéreo ATM será un recurso utilizable. La organización, la asignación y uso flexible del espacio aéreo se basarán en los principios de acceso y equidad. La organización del espacio aéreo será acorde a la clasificación del espacio aéreo.

La gestión del espacio aéreo proporcionará las estrategias, normas y procedimientos por medio de los cuales se estructurará el espacio aéreo para dar cabida a todos los tipos de operaciones aeronáuticas, volúmenes de tránsito, niveles de servicio y normas de operación.

La organización del espacio aéreo se basará en el principio de que todo el espacio aéreo es gestionado para cubrir las necesidades de la comunidad ATM. “Gestión” significa que la autoridad pertinente adoptará una decisión estratégica o táctica respecto al nivel de servicios que hayan de proporcionarse por los ANSP.

Se reconoce que es útil designar un espacio aéreo para fines particulares, pero no deberá estar organizado de forma que impida permanentemente la realización de operaciones mixtas o con equipo mixto. La prioridad de uso del espacio aéreo no deberá estar limitada por la utilización de equipamiento.

Para lograr una gestión dinámica del espacio aéreo mediante la aplicación estratégica, en la TMA Asunción de gestionarán los siguientes tipos de operaciones:

- ✓ Flota de aeronaves con capacidades PBN, operando bajo Reglas de Vuelo por Instrumentos (IFR), apoyadas exclusivamente en el GNSS, para la ejecución de los Procedimientos de Llegada Normalizada por Instrumentos, Salidas Normalizadas por Instrumentos y Procedimientos de Aproximación APV BARO VNAV.

- ✓ Flota de aeronaves con capacidades convencionales, operando bajo Reglas de Vuelo por Instrumentos (IFR), apoyadas en las Ayudas para la Navegación basadas en tierra.

- ✓ Flota de aeronaves operando bajo Reglas de Vuelo por Instrumentos (VFR).

La gestión de tránsito aéreo en el TMA Asunción, facilitará la operación de trayectorias RNAV y/o RNP optimizadas en toda condición meteorológica, que cumpla con los requisitos de franqueamiento de obstáculos y de protección al medio ambiente.

No debería haber ningún espacio aéreo restringido de forma permanente o fija, o por un período prolongado; el espacio aéreo debería estar sujeto a limitaciones de los servicios, intereses nacionales o cuestiones de seguridad operacional. Toda restricción del espacio aéreo deberá coordinarse adecuadamente con la Autoridad Aeronáutica. Además, para una dinámica gestión del espacio aéreo se requiere implantar una efectiva coordinación civil/militar a fin de lograr un uso flexible del espacio aéreo (FUA).

4.14 OPTIMIZACIÓN DE LA ESTRUCTURA DE RUTAS ATS - EN RUTA

A la fecha se ha logrado la implantación de varias rutas RNAV en el espacio aéreo superior de la FIR recomendadas por la OACI.

Estas implementaciones se han llevado a cabo identificando las necesidades particulares de los usuarios, operadores y proveedores de servicio ATS. El Plan de implementación ha generado importantes beneficios operacionales y económicos.

Al evaluar los resultados operacionales de trayectorias de vuelo más directas así como del ahorro de distancias y tiempos de vuelo obtenidos a raíz de la implantación de rutas RNAV, se concluye que se ha satisfecho en gran medida los requerimientos de los operadores aéreos de obtener ventajas operativas y económicas. Consistente con los beneficios obtenidos, se ha identificado la necesidad de adicionales rutas RNAV.

El retiro periódico de equipos NDB, acordado regionalmente, combinado con el aumento del tráfico, el incremento de trayectorias directas fuera de aerovías convencionales y la posible implementación de rutas RNAV adicionales puede llevar a una saturación en los diferentes espacios aéreos lo que complicaría la gestión del espacio aéreo. Por tal motivo, se realiza una revisión integral del espacio aéreo superior, considerando la posible implantación de rutas RNAV y la eliminación de aquellas rutas convencionales de muy baja utilización cuya trayectoria coincida o sea similar a rutas RNAV fijas o rutas aleatorias.

4.15 OPTIMIZACIÓN DE LA ESTRUCTURA DE RUTAS ATS EN EL ÁREA TERMINAL

Los STAR y SID se diseñan para conectarse directamente a la red de rutas ATS del espacio aéreo superior e inferior a fin de mejorar la gestión del espacio aéreo y proporcionar trayectorias de vuelo más consistentes y trayectorias de aproximación estabilizadas, mientras se reduce la carga de trabajo de pilotos y controladores, las transmisiones de radiofrecuencia, el consumo de combustible y la incidencia del impacto sobre el terreno sin pérdida de control (CFIT).

Se han implantado nuevos SIDS y STARS en el Área Terminal de Asunción. Sin embargo, considerando la actual capacidad de navegación de las aeronaves, es necesario considerar extender estos procedimientos enlazando la estructura de rutas del espacio aéreo superior directamente con las rutas de las áreas terminales.

La publicación del Manual de Descenso Continuo, Doc. 9931, permite la implementación de operaciones de descenso continuo (CDO) en todas las STAR, iniciando desde el punto de descenso en el espacio aéreo superior. Para este fin, los STAR han sido diseñados para que conecten directamente las rutas RNAV o rutas convencionales al procedimiento de aproximación por instrumentos.

El CDO permite un perfil de descenso óptimo en la ruta de llegada publicada, calculada por la computadora de gestión de vuelo (FMC) de la aeronave desde el punto de descenso inicial, u otro punto definido operacionalmente, hasta un punto donde se inicia el procedimiento de aproximación a la pista.

El concepto CDO permite ajustar las trayectorias de llegada y velocidad de una aeronave si es necesario mantener la separación y la secuencia desde otras aeronaves mientras se proporciona una substancial mejora operacional, y reduce la carga de trabajo de pilotos y controladores. El CDO también maximiza las ventajas para cada vuelo en términos de reducción de consumo de combustible, emisiones de gas y ruido, así como mejor posibilidad de previsión para la tripulación del vuelo y el explotador de la aeronave.

Las operaciones de descenso continuo se facilitan por el diseño del espacio aéreo, diseño de procedimientos, la facilitación para el ATC, y permite que las aeronaves desciendan continuamente empleando el mínimo uso de turbinas en una configuración baja. CDO es potencialmente utilizable por el 85% de las aeronaves, el 85% del tiempo de vuelo de descenso.

4.16 EVALUACIÓN DE LA SEGURIDAD OPERACIONAL

Previo a la implementación de un concepto de espacio aéreo PBN, una nueva ruta o procedimiento, o cambios en los mismos, se deberá llevar a cabo una evaluación de los riesgos para garantizar la seguridad operacional acorde a las provisiones SMS. La evaluación de la seguridad operacional podrá ser cualitativa o cuantitativa bajo la responsabilidad del proveedor de los servicios (ANSPs).

Se aplicará un programa de monitoreo para evaluar la seguridad operacional después de la implementación PBN mediante el análisis y medición de datos de la performance, según lo establecido en el Manual de Gestión del Tránsito Aéreo (Doc. 4444) y el Manual de Gestión de Sistemas de la Seguridad Operacional (Doc. 9859) de la OACI.

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CAPITULO 5

PROCEDIMIENTOS PBN

5.1 GENERALIDADES

El continuo crecimiento de la aviación nacional e internacional en el territorio paraguayo, especialmente las operaciones en el Aeropuerto Internacional "Silvio Pettirossi", demanda un incremento en la capacidad del espacio aéreo disponible y subraya la necesidad de utilizarlo en forma óptima, por lo tanto la eficiencia operacional dependerá del sistema de navegación de área RNAV-RNP (PBN).

Para establecer los requisitos de navegación aplicables sobre rutas específicas o dentro de un determinado espacio aéreo, es necesario que tanto las tripulaciones de vuelo así como los Servicios de Control de Transite Aéreo (ATC) estén conscientes de los requisitos de capacidad del sistema de navegación aérea y de la performance del sistema RNAV.

El concepto PBN especifica los requisitos de performance del sistema RNAV de las aeronaves en términos de exactitud, integridad, disponibilidad, continuidad y funcionalidad necesaria para las operaciones propuestas en el contexto de espacio aéreo cimentado por la infraestructura de navegación adecuada.

El advenimiento de los nuevos sistemas de navegación y la tecnología empleada en la provisión de los Servicios de Tránsito Aéreo a los vuelos PBN, permite optimizar el espacio aéreo utilizando rutas directas bajo el concepto CDO y CCO.

5.2 BENEFICIOS DE LOS PROCEDIMIENTOS PBN A LA NAVEGACIÓN AÉREA

Los Procedimientos PBN ofrecen una serie de ventajas con respecto al método de sensores específicos, empleados en la elaboración de criterios para el espacio aéreo, además de la seguridad respecto al debido franqueamiento de obstáculos:

a) Implantación de Procedimientos de Llegadas Normalizadas, que servirán de enlace entre la fase en ruta y la aproximación por instrumentos, utilizando técnicas de descenso continuo, Procedimientos de Salidas Normalizadas, utilizando técnicas de ascenso continúo que permitirán a las aeronaves proseguir directamente hasta interceptar la aerovía, además de la Implantación de Procedimientos de Aproximación APV BARO-VNAV, que facilitarán las aproximaciones estabilizadas, reduciendo significativamente el riesgo del impacto sobre el terreno sin pérdida de control (CFIT) y la seguridad operacional en general.

b) Implantación de trayectorias más directas, reduciendo distancias voladas y tiempo de vuelo, tanto para llegadas como para salidas, ahorro en el consumo de combustible, atenuación de ruido y disminución de emisiones de CO_2 al medio ambiente.

c) Uso de capacidades RNAV o RNP de las aeronaves actuales.

d) Disminución en las demoras en espacios aéreos y aeropuertos de alta densidad de tránsito.

e) Reducción de la separación lateral y longitudinal entre aeronaves.

f) Reducción de la carga de trabajo para Pilotos y Controladores de Tránsito Aéreo (ATC) por el uso de procedimientos RNAV/RNP

g) Reducción del uso de comunicaciones entre ATC y Pilotos

h) Los procedimientos STAR y SID se conectan directamente con la red de rutas RNAV del espacio aéreo superior, proporcionando trayectorias de vuelo más consistentes y estabilizadas.

i) El CDO (Descenso Continúo) permite un perfil de descenso óptimo en la ruta de llegada publicada, calculada por la computadora de gestión de vuelo (FMC) de la aeronave desde el punto de descenso inicial, u otro punto definido operacionalmente, hasta un punto donde se inicia el procedimiento de aproximación por instrumentos.

5.3 PLAN DE VUELO

a) Los operadores aéreos y las tripulaciones que planifiquen realizar operaciones RNAV deben llenar las casillas apropiadas del formato del plan de vuelo OACI.

b) El estado de aprobación de operadores y aeronaves en relación con cualquier tipo de especificaciones de navegación RNAV y/o RNP deben indicarse en el plan de vuelo presentado (FPL), mediante la inserción de la letra "R" en la casilla 10 del formulario de Plan de Vuelo.

c) El estado de aprobación de cada tipo de especificación de navegación aérea deberá ser detallado en la casilla 18 del FPL insertando los siguientes códigos alfanuméricos, no superior a 8 códigos o 16 caracteres, precedida por el designador PBN, como se indica a continuación:

Código de Plan de Vuelo y Especificaciones RNAV

Código	Especificaciones RNAV
A1	RNAV 10 (RNP 10)
B1	RNAV 5 – Permitidos todos los sensores
B2	RNAV 5 GNSS
B3	RNAV 5 DME/DME
B4	RNAV 5 VOR/DME
B5	RNAV 5 INS o IRU
D1	RNAV 1 – Permitidos todos los sensores
D2	

Código de Plan de Vuelo y Especificaciones RNP

Código	Especificaciones RNP
L1	RNP 4
O1	RNP 1 – Permitidos todos los sensores
O2	RNP 1 GNSS
S1	RNP APCH
S2	RNP APCH con BARO-VNAV
T1	RNP AR APCH con RF (requiere autorización especial)
T2	RNP AR APCH sin RF (autorización especial)

5.4 PROCEDIMIENTOS DE CONTROL

5.4.1 UTILIZACIÓN Y LIMITACIÓN DEL SISTEMA DE VIGILANCIA EN LOS PROCEDIMIENTOS PBN

El Centro de Control de Área Unificado (ACC-U), mediante el empleo del sistema de vigilancia, proporcionará servicios de control de tránsito aéreo a las operaciones PBN, dentro de las áreas de cobertura y espacios aéreos PBN, autorizadas por la Dirección Nacional de Aeronáutica Civil (DINAC), y debidamente publicadas en la Publicación de Información Aeronáutica, AIP Paraguay.

El servicio de control de aproximación, dará prioridad a la aeronave que realice un procedimiento de aproximación por instrumentos PBN (RNAV/RNP), sobre los otros tránsitos IFR o VFR, excepto cuando se trate de aeronaves declaradas en Emergencia. Además, deberá intercalar de manera segura y ordenada el tránsito convencional con el transito PBN, es necesario sopesar adecuadamente la carga de trabajo individual y las condiciones de operación de los equipos de comunicaciones aeroterrestres y de visualización radar así como la performance de las aeronaves involucradas, teniendo presente factores tales como régimen de ascenso y descenso, mínimos meteorológicos u otras situaciones que sean relevantes.

No se requiere, asignar régimen de ascenso o descenso, a las aeronaves que estén ejecutando un Procedimiento PBN. La información radar obtenida de la aeronave ejecutando un procedimiento PBN, se ajustará a lo publicado en los procedimientos PBN. La información obtenida del equipo respondedor a bordo de la aeronave, tales como rumbo que mantiene, nivel o altitud, velocidad y tipo de aeronave entre otros, deberá ser utilizada al máximo posible, para reducir las comunicaciones entre el controlador de tránsito aéreo y el piloto, en lo que respecta a dejar, alcanzar o cruzar niveles o altitudes de la aeronave que está realizando un Procedimiento PBN.

La tripulación, cuando realice un procedimiento de aproximación por instrumentos PBN (RNAV/RNP), en la medida de lo posible, no solicitará reducción o incremento de velocidades así como tampoco modificación de los niveles de vuelo o altitudes, la aeronave debe completar el procedimiento PBN y no debe ser interrumpido hasta que el piloto notifique sobre el punto final del procedimiento o el campo a la vista y pueda ser transferido a la frecuencia del Servicio de Control de Aeródromo.

5.4.2 SEPARACIONES POR VIGILANCIA RADAR PARA TRÁNSITO MIXTO

La prioridad a ser aplicada, en una determinada situación de tráfico mixto (Tránsito convencional y Tránsito PBN), deberá ser determinada por el propio Controlador de acuerdo a las posiciones, las distancias de ingreso al TMA Asunción, sin descuidar la coordinación realizada con anticipación con el centro de Control, no obstante, se deberá priorizar utilizar el sistema de vigilancia para el manejo del tráfico mixto.

La separación longitudinal y lateral mínima a ser aplicada para transito mixto será de 5 NM, entre el tránsito PBN y el tránsito convencional.

La separación longitudinal mínima a ser aplicada para tránsito PBN será de 7NM. Esta separación longitudinal y lateral, bajo ninguna circunstancia será inferior a 5 NM.

Estas separaciones implican un adecuado trabajo de espaciamiento, regulación de IAS y consideración de la performance de las aeronaves involucradas.

Cuando estén en progreso situaciones especiales, como aeronaves VIP, aeronaves en estado de emergencia, cierre de calles de rodaje, visibilidad reducida al mínimo o ante la solicitud de la Torre de Control, se empleará una distancia mayor a las especificadas anteriormente y que será determinada bajo coordinación entre dependencias involucradas.

Se autorizará la aproximación visual cuando el piloto notifique tener el aeródromo a la vista o que puede mantener referencia visual con el terreno y exista plena seguridad de que se mantendrá la separación mínima de 10 NM con la aeronave precedente en procedimiento PBN hasta que esta aterrice.

Cuando por cualquier situación no prevista durante la aproximación PBN, el piloto deba iniciar una aproximación frustrada, la aeronave se ajustará al procedimiento de Aproximación Frustrada publicado para procedimientos PBN a menos que específicamente el Servicio de Control de Aproximación en coordinación con el ACC y TWR indique algo diferente, tomando en cuenta que en esta modalidad de operación PBN, no deberá entregar instrucciones de alternativa.

Se podrán acortar eventualmente los procedimientos de salida PBN, a solicitud del piloto una vez que la aeronave cruce 13.000 ft o superior, las condiciones de tráfico así lo permitan y se cumplan con las altitudes mínimas de sector y de franqueamiento de obstáculos.

La coordinación entre dependencias se la realizará cumpliendo las disposiciones contenidas en la Carta de Acuerdo Operacional, normalmente se efectuará a través del Supervisor Operativo. La coordinación con organismos externos, se canalizará de igual manera.

La instrucción para que una aeronave cambie a la frecuencia de otra dependencia ATS con servicio de vigilancia, deberá ser oportuna utilizando la fraseología correspondiente.

No será necesario que el Controlador del sector aceptante comunique al transferidor que estableció comunicaciones con la aeronave transferida, a no ser que la aeronave que llega tenga un nivel de vuelo diferente al coordinado o no establezca comunicaciones al momento de ingresar al TMA Asunción.

La transferencia de control en procedimientos PBN entre dos dependencias con equipamiento de vigilancia radar será automática. Se deberá proponer las condiciones de transferencia de control a través de los datos actualizados de la etiqueta radar y de la faja electrónica. Todo cambio en las instrucciones de velocidad, nivel o rumbo entregadas a la aeronave y que tengan efecto en el punto de transferencia, se reflejará automáticamente en el panel de control del Controlador y comunicará oralmente al Controlador aceptante, antes de iniciar la transferencia automática.

5.4.3 APROXIMACION POR PROCEDIMIENTOS (PROCEDIMIENTOS NO RADAR) PARA TRANSITO MIXTO.

El Control de Aproximación por procedimientos, el Servicio de Información de Vuelo y Alerta se proporcionará dentro de la TMA Asunción y se especificará en la Publicación de Información Aeronáutica, AIP Paraguay.

Cuando una aeronave inicia aproximación PBN (RNAV/RNP) el controlador de Aproximación, debe dar prioridad al vuelo PBN sobre los otros tránsitos IFR o VFR, éstos vuelos PBN NO tendrán prioridad cuando estén en progreso situaciones especiales, como aeronaves VIP, aeronaves en estado de emergencia, etc.

Cuando una aeronave inicia la aproximación PBN, no necesita autorizar al piloto niveles de vuelo o altitudes, la aeronave debe completar el procedimiento PBN y no debe ser interrumpido hasta que el piloto notifique sobre el punto final del procedimiento o indique que tiene el campo a la vista y pueda ser cambiado de frecuencia a TWR de control, a no ser que otra aeronave que se encuentra dentro del TMA se declare o se sepa que se encuentra en estado de emergencia, la misma que tendrá prioridad absoluta.

El controlador de Aproximación debe sopesar adecuadamente su carga de trabajo individual, coordinar con el Supervisor de TWR de control las condiciones de pista en uso, tránsito próximo al despegue, funcionamiento de los equipos de comunicaciones aeroterrestres, condiciones meteorológicas u otros que sean relevantes para su dependencia.

La prioridad a ser aplicadas en una determinada situación de tráfico mixto (Tránsito convencional y Tránsito PBN) deberá ser determinada en coordinación entre el Supervisor y el Controlador de acuerdo a las posiciones del tránsito existente en ese momento y el orden y las distancias DME de ingreso al TMA, sin descuidar la coordinación realizada con anticipación con el centro de Control de Área Unificado (ACC-U).

La solicitud para la salida de una aeronave con FPL VFR será tratada de acuerdo a lo estipulado en la Carta de Acuerdo Operacional TWR/APP de la dependencia. Se autorizarán ascensos o descensos en VMC, salidas o llegadas visuales cuando las condiciones meteorológicas así lo permitan, exista la suficiente separación y no afecte la seguridad del tránsito PBN.

Se autorizará la aproximación visual cuando el piloto notifique tener el aeródromo a la vista o que puede mantener referencia visual con el terreno y exista plena seguridad de que se mantendrá la separación mínima adecuada en tiempo y distancia con la aeronave precedente en procedimiento PBN hasta que esta aterrice.

Cuando por las condiciones del tránsito, el Controlador requiere que la aeronave que llega para procedimiento convencional, efectúe un procedimiento de aproximación publicado después del tránsito en procedimiento PBN, el Controlador autorizará a la aeronave dirigirse a la radioayuda con instrucciones de espera y hora prevista de aproximación.

Cuando por cualquier situación no prevista durante la aproximación PBN y convencional el piloto deba iniciar aproximación frustrada, la aeronave se ajustará al procedimiento de Aproximación Frustrada PBN y convencional publicado en la carta de aproximación IAC, en éste caso sólo el piloto con aproximación convencional recibirá instrucciones de TWR, a menos que específicamente el Servicio de Control de Aproximación indique algo diferente para la aproximación PBN.

Se podrán acortar los procedimientos de salida PBN a solicitud del piloto y si las condiciones de tráfico lo permitan.

La coordinación entre dependencias que disponen aproximación PBN se la realizará observando la Carta de Acuerdo Operacional desarrollada para tal efecto.

La transferencia y entrega de datos de coordinación de una dependencia no radar y sin disponibilidad de transferencia automática, será inmediatamente después del despegue de la operación PBN o antes de que la aeronave con salida PBN ingrese al espacio aéreo de jurisdicción de la dependencia adyacente.

CAPITULO 6

CONTINGENCIAS

6.1 CONSIDERACIONES GENERALES

El piloto debe notificar al ATC toda pérdida de capacidad RNAV/RNP, además de cómo va a proceder si no puede cumplir con los requisitos de un procedimiento RNAV/RNP, los pilotos deben comunicar al ATC lo antes posible. En una situación de pérdida de capacidad RNAV/RNP queda incluida toda falla o suceso que haga que la aeronave deje de satisfacer los requisitos RNAV/RNP del procedimiento. El operador debe elaborar procedimientos de contingencia a fin de reaccionar en condiciones de seguridad operacional, después de la pérdida de capacidad RNAV/RNP durante una operación PBN.

Las medidas del ATC con respecto a una aeronave que no pueda cumplir con los requisitos de capacidad RNAV/RNP debido a una falla o degradación del sistema RNAV/RNP, dependerán de la naturaleza de la falla notificada y de la situación general del tránsito. En muchas situaciones podrán continuar las operaciones de conformidad con la autorización ATC vigente. Cuando esto no pueda hacerse podrá solicitarse una autorización revisada, para volver a la navegación por rutas ATS basadas en radioayudas convencionales.

Se dará prioridad sobre otras aeronaves, inclusive si la aeronave se encuentra en procedimiento PBN, a la aeronave que se sepa o se sospeche, que se encuentra en estado de emergencia, interferencia ilícita o se haya recibido un aviso de amenaza de bomba. El ATC debe cumplir con las instrucciones publicadas en el documento.

Las comunicaciones de emergencia y de urgencia se mantendrán, por lo general, en la frecuencia en que se iniciaron, hasta que se considere que puede prestarse mejor ayuda mediante su transferencia a otra frecuencia, pueden utilizarse según corresponda las frecuencias de emergencia. (121,5 MHz).

En los procedimientos PBN el ATC deberá evitar transmitir mensajes innecesarios durante el despegue, ascenso inicial o durante la aproximación, a menos que sea absolutamente necesario por razones de seguridad operacional. Evitar el intercambio de información no relacionada con la evolución del vuelo (polémicas, reclamos, comentarios, etc.).

En los procedimientos PBN no es necesario restringir o aumentar las velocidades porque las aeronaves se ajustan a las velocidades publicadas para cada fase el vuelo, a menos que sea absolutamente necesario por razones de seguridad operacional.

En caso de una eventual pérdida del servicio de vigilancia, esta situación no afectará a los procedimientos PBN de llegada o salida. La separación mínima, longitudinal y lateral, entre tránsitos en aproximación PBN será de 7NM y la separación mínima, longitudinal y lateral, entre tránsitos mixtos será de 5NM.

6.2 FALLA DE COMUNICACIONES.

Cuando una aeronave ejecutando un procedimiento salida PBN, experimenta una falla de comunicaciones, el piloto debe cumplir y completar el procedimiento de salida hasta el punto del límite de la TMA y luego cambiar de frecuencia al centro de control ACC. Se deberá cumplir las instrucciones publicadas en las cartas para falla de comunicaciones.

Cuando una aeronave ha despegado de un aeropuerto con servicio de vigilancia, la transferencia es automática y el ATC debe informar al ACC la falla de comunicaciones, cuando la aeronave ha despegado de un aeropuerto sin servicio de vigilancia, el ATC debe cumplir con las instrucciones publicadas en el documento para falla de comunicaciones y tratar de establecer contacto por cualquier medio, caso contrario informara inmediatamente al ACC.

Cuando la falla de comunicaciones se produce en el procedimiento de llegada PBN, el piloto debe cumplir y completar el procedimiento publicado en la carta, el ATC deberá mantener vigilancia de la aeronave hasta el punto en el cual la aeronave tenga pista a la vista e informará a la Torre de Control tal circunstancia indicando que cambia de frecuencia a TWR, para que ésta disponga la pista libre y esperar que la aeronave complete el procedimiento y aterrice.

En caso de falla de comunicaciones durante la guía vectorial guiando a la aeronave hacia una SID o STAR (PBN), ésta seguirá el procedimiento de falla de comunicaciones publicado en la carta aeronáutica.

Cuando existan dificultades de comunicación con la aeronave y que no se refieran a falla de comunicaciones, (problemas de cobertura, bloqueo de frecuencia, etc.) se podrá indicar a las aeronaves la hora/nivel/punto donde establecer el cambio de frecuencia requerido.

El Controlador aceptante avisará tan pronto como sea posible, cuando establezca comunicaciones con la aeronave transferida.

Para proteger una eventual falla de comunicaciones se evitará al máximo restringir el ascenso/descenso de una aeronave, empleando expresiones tales como “hasta nuevo aviso”/ “mantenga FL...inicial”.

Si el ATC no ha podido establecer contacto con la aeronave, después de haber llamado en las frecuencias principal y secundaria, solicitará a otras aeronaves que hagan puente y seguirá trasmitiendo a ciegas si fuera necesario.

Con respecto a la degradación o falla en vuelo del sistema RNAV, cuando la aeronave esté en una ruta ATS designada RNAV/RNP se procederá de la siguiente manera:

a) se autorizará a la aeronave a volar por las rutas ATS definidas con ayudas para la navegación convencionales; o

b) cuando no se disponga de los procedimientos mencionados, la dependencia ATC proporcionará a la aeronave, cuando sea posible, vectores radar hasta que la aeronave pueda reanudar su propia navegación.

Nota.- Las aeronaves autorizadas a volar de conformidad con a) o b) podrán requerir, cuando sea posible la vigilancia radar por parte de la dependencia ATC correspondiente.

Las medidas del ATC con respecto a una aeronave que no pueda cumplir con los requisitos RNAV debido a una falla o degradación del sistema RNAV, dependerán de la naturaleza de la falla notificada y de la situación general del tránsito.

En muchas situaciones podrán continuar las operaciones de conformidad con la autorización ATC vigente. Cuando esto no pueda hacerse podrá solicitarse una autorización revisada, para volver a la navegación por rutas ATS basadas en radioayudas convencionales.

CAPITULO 7

FRASEOLOGIA PBN

Las palabras entre paréntesis indican que debe insertarse información correcta, tal como un nivel, un lugar o una hora, etc., para completar la frase, o bien pueden utilizarse variantes.

7.1 AUTORIZACIÓN EN UNA SID

a) ASCIENDA VIA SID A (nivel) o ASCIENDA A (nivel)

CLIMB VIA SID TO (level) or CLIMB TO (level)

b) ASCIENDA VIA SID A (nivel), CANCELE RESTRICCION(ES) DE NIVEL

CILMB VIA SID TO (level), CANCEL LEVEL RESTRICTION(S)

c) ASCIENDA VIA SID A (nivel), CANCELE RESTRICCION(ES) DE NIVEL EN (punto)

CILMB VIA SID TO (level), CANCEL LEVEL RESTRICTION(S) AT (point)

d) ASCIENDA VIA SID A (nivel), CANCELE RESTRICCION(ES) DE VELOCIDAD

CILMB VIA SID TO (level), CANCEL SPEED RESTRICTION(S)

e) ASCIENDA VIA SID A (nivel), CANCELE RESTRICCION(ES) DE VELOCIDAD EN (punto)

CILMB VIA SID TO (level), CANCEL SPEED RESTRICTION(S) AT (point)

f) ASCIENDA SIN RESTRICCION A (nivel) o ASCIENDA A (nivel), CANCELE RESTRICCION(ES) DE NIVEL Y VELOCIDAD

CLIMB UNRESTRICTED TO (level) or CLIMB TO (level), CANCEL LEVEL AND SPEED RESTRICTION(S)

7.2 AUTORIZACIÓN EN UNA STAR

a) DESCIENDA VIA STAR A (nivel) o DESCIENDA A (nivel)

DESCEND VIA STAR TO (level) or DESCEND TO (level)

b) DESCIENDA VIA STAR A (nivel), CANCELE RESTRICCION(ES) DE NIVEL

DESCEND VIA STAR TO (level), CANCEL LEVEL RESTRICTION(S)

c) DESCIENDA VIA STAR A (nivel), CANCELE RESTRICCION(ES) DE NIVEL EN (punto)

DESCEND VIA STAR TO (level), CANCEL LEVEL RESTRICTION(S) AT (point)

d) DESCIENDA VIA STAR A (nivel), CANCELE RESTRICCION(ES) DE VELOCIDAD

DESCEND VIA STAR TO (level), CANCEL SPEED RESTRICTION(S)

e) DESCIENDA VIA STAR A (nivel), CANCELE RESTRICCION(ES) DE VELOCIDAD EN (punto)

DESCEND VIA STAR TO (level), CANCEL SPEED RESTRICTION(S) AT (point)

g) DESCIENDA SIN RESTRICCION A (nivel) o DESCIENDA A (nivel), CANCELE RESTRICCION(ES) DE NIVEL Y VELOCIDAD

DESCEND UNRESTRICTED TO (level) or DESCEND TO (level), CANCEL LEVEL AND SPEED RESTRICTION(S)

7.3 INTRUCCIONES PARA DESPUES DEL DESPEGUE

a) AUTORIZADO SALIDA

CLEARED DEPARTURE

b) AUTORIZADO DIRECTO (punto de recorrido), SE ESPERA REANUDAR SID (designador SID), EN (punto de recorrido)

CLEARED DIRECT (waypoint), EXPECT TO REJOIN SID (SID designator), AT (waypoint)

c) REANUDE SID (designador SID) EN (punto de recorrido)

REJOIN SID (SID designator), AT (waypoint)

d) AUTORIZADO DIRECTO (punto de recorrido),

CLEARED DIRECT (waypoint),

7.4 INTRUCCIONES PARA LA APROXIMACIÓN

a) AUTORIZADO (o prosiga) LLEGADA (designación)

CLEARED (or PROCEED) ARRIVAL (designation)

b) *AUTORIZADO HASTA (límite de la autorización) (designación)*

CLEARED TO (clearance limit) (designation)

c) AUTORIZADO (o prosiga) (detalles de la ruta que ha de seguir)

CLEARED (or PROCEED) (details of the route to be followed)

d) *AUTORIZADO DIRECTO (punto de recorrido) SE ESPERA REANUDAR STAR (designador STAR) EN (punto de recorrido)*

CLEARED DIRECT (waypoint) EXPECT REJOIN STAR (star designator) AT (waypoint)

e) *REANUDE STAR (designador STAR) EN (punto de recorrido)*

REJOIN STAR (star designator) AT (waypoint)

f) *AUTORIZADO DIRECTO (punto de recorrido)*

CLEARED DIRECT (waypoint)

g) *AUTORIZADO APROXIMACION (tipo de aproximación) PISTA (numero)*

CLEARED (type of approach) APPROACH (RUNWAY number)

h) *REANUDE VELOCIDAD PUBLICADA*

RESUME PUBLISHED SPEED

i) *SIN LIMITACIONES DE VELOCIDAD*
NO SPEED RESTRICTIONS

El piloto informará al ATC sobre degradación o falla de RNAV, se utilizará la siguiente fraseología:

- (distintivo de llamada de aeronave) IMPOSIBLE RNAV DEBIDO A EQUIPO
  (Aircraft call sign) UNABLE RNAV DUE EQUIPMENT

El piloto Informará al ATC que no hay capacidad RNAV

- (Distintivo de llamada de aeronave) RNAV NEGATIVO
  NEGATIVE RNAV

CUMPLIMIENTO

La Sub Dirección de Servicios Aeronáuticos, dependiente de la Dirección de Aeropuertos y la Dirección de Aeronáutica Civil a través de la Gerencia de Normas de Navegación Aérea , así como a las dependencias de los Servicios de Tránsito Aéreo (ATS) del Paraguay.

DIFUSIÓN

El presente manual queda a disposición para conocimiento y distribución a todo el personal operativo de la Sub Dirección de Servicios Aeronáuticos y personal normativo de la Dirección de Aeronáutica Civil, dependiente de la Dirección Nacional de Aeronáutica Civil (DINAC).

Dado en la ciudad de Mariano Roque Alonso, el 28 de Setiembre del 2016.

APROBADO POR:

ABOG. CTA. JOSÉ LUIS CHAVEZ MARTÍNEZ
Sub DIRECTOR DE SERVICIOS AERONÁUTICOS

DIRECCIÓN NACIONAL DE AERONÁUTICA CIVIL (DINAC)

SUB DIRECCIÓN DE SERVICIOS AERONÁUTICOS

PLAN DE ACCIÓN

"PROYECTO IMPLANTACIÓN DEL CONCEPTO DE NAVEGACIÓN BASADA EN LA PERFORMANCE (PBN) EN EL ÁREA DE CONTROL TERMINAL DE ASUNCIÓN"

FASE	ACTIVIDAD	DESCRIPCIÓN	DÍAS	ESTADO	INICIO	FINALIZACIÓN	RESPONSABLE
PLANIFICACIÓN	ACT 1	Acuerdo sobre los requisitos operacionales	5	TERMINADO	16/06/2014	23/06/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 2	Creación del equipo de diseño de espacio aéreo	6	TERMINADO	23/06/2014	01/07/2014	CTA. José Luis Chavez CTA. Roque Díaz
	ACT 3	Acuerdo sobre objetivos, alcance y plazo	5	TERMINADO	01/07/2014	08/07/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 4	Análisis del escenario de referencia	15	TERMINADO	08/07/2014	29/07/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 5	Selección de los criterios de seguridad operacional, política conexa y criterios de actuación	5	TERMINADO	29/07/2014	05/08/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 6	Acuerdos sobre hipótesis, elementos facilitadores y restricciones	5	TERMINADO	05/08/2014	12/08/2014	CTA. José Luis Chavez Eleno Centurión
DISEÑO	ACT 7	Diseño del Espacio Aéreo, Rutas y Circuitos de Espera (primera iteración)	10	TERMINADO	12/08/2014	26/08/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 8	Diseño inicial de procedimientos (primera iteración)	20	TERMINADO	26/08/2014	23/09/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 7	Diseño del Espacio Aéreo, Rutas y Circuitos de Espera (segunda iteración)	10	TERMINADO	23/09/2014	07/10/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 8	Diseño inicial de procedimientos (segunda iteración)	20	TERMINADO	07/10/2014	04/11/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 9	Análisis sobre Diseño de los volúmenes y sectores ATC	1	TERMINADO	04/11/2014	05/11/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 7 - 9	Finalizar el diseño del espaco aéreo	10	TERMINADO	05/11/2014	19/11/2014	CTA. José Luis Chavez Eleno Centurión
	ACT 10	Confirmación de las especificación para la navegación OACI necesarias	30	TERMINADO	19/11/2014	31/12/2014	CTA. José Luis Chavez Eleno Centurión
VALIDACIÓN	ACT 11	**Validación del concepto del espacio aéreo**					
		* Trabajo de pizarra el Concepto de Espacio Aéreo	15	TERMINADO	31/12/2014	21/01/2015	CTA. José Luis Chavez Eleno Centurión Robin Dacak
		* Análisis SMS, identificación de peligros y mitigación.	15	TERMINADO	21/01/2015	11/02/2015	CTA. Juan Álvarez
		* Cálculos del beneficio operacional, ahorro de combustible y CO2 (IFSET)	15	TERMINADO	11/02/2015	04/03/2015	Robin Dacak
		Reevaluación del proceso de Validación Básica considerando escenario de TMA de baja densidad de tráfico (trayectorias directas al IAF)	30	TERMINADO	04/03/2015	15/04/2015	CTA. José Luis Chavez Eleno Centurión Robin Dacak
	ACT 12	Finalización del diseño de procedimientos	10	TERMINADO	15/04/2015	29/04/2015	Eleno Centurión
	ACT 13	Validación en tierra de procedimientos		TERMINADO	29/04/2015	29/04/2015	CTA. José Luis Chavez Eleno Centurión Robin Dacak
		* Modelo de Espacio Aéreo (Google Earth)	15	TERMINADO	29/04/2015	20/05/2015	Eleno Centurión

IMPLANTACIÓN	ACT 14	**Sistema ATM**					
		* Actualización del sistema ATC	5	PENDIENTE	10/12/2016	16/12/2016	Sub Dirección de Servicios Aeronáuticos
		* Modificación del procesador de Datos de vuelo (FDP)	5	PENDIENTE	16/12/2016	23/12/2016	Sub Dirección de Servicios Aeronáuticos
		* Cambios en el procesador de datos radar (RDP)	5	PENDIENTE	23/12/2016	30/12/2016	Sub Dirección de Servicios Aeronáuticos
		* Diseño de Espacio Aéreo PBN en Consolas del Sistema de Vigilancia	60	EN PROCESO	05/09/2016	25/11/2016	CTA. Jorge Herrero CTA. Diego Aldana
	ACT 15	**Documentación y Respaldo**					
		* Elaboración de Manual Operativo PBN (Procedimientos de Contingencia y Respaldo)	25	TERMINADO	26/09/2016	28/10/2016	CTA. Margarita Cabrera Eleno Centurión
		* Procedimientos de contingencia y respaldo	25	EN PROCESO	26/09/2016	28/11/2016	CTA. Margarita Cabrera Eleno Centurión
		* Procedimientos entre Dependencias ATC	25	PENDIENTE	26/09/2016	28/11/2016	CTA. Sindulfo Ibarrola CTA. Margarita Cabrera CTA. Miguel Pérez
		* Publicación AIC informativa PBN	15	EN PROCESO	15/03/2017	15/02/2017	Lic. Lidia Cáceres
	ACT 16	**Capacitación PBN**					
		* Elaboración de Programa de Entrenamiento - Parte Teórica	5	TERMINADO	20/06/2016	24/06/2016	CTA. Liz Portillo
		* Charlas informativas PBN	3	TERMINADO	09/05/2016	11/05/2016	CTA. José Luis Chavez
		* Seminario PBN (dirigido a todo el personal operativo)	3	TERMINADO	09/08/2016	11/08/2016	Mayor Esp. CTA. Alexandre Dutra Bastos - MTAB
		* Seminario PBN (dirigido al publico en general)	3	PENDIENTE	20/03/2017	22/03/2017	Sub Dirección de Servicios Aeronáuticos
		* Capacitación de Instructores ATC - Parte Práctica	10	PENDIENTE	05/04/2017	15/04/2017	Sub Dirección de Servicios Aeronáuticos
		* Capacitación del Personal ATC - Parte Práctica	20	PENDIENTE	05/05/2017	15/05/2017	Sub Dirección de Servicios Aeronáuticos
	ACT 17	**Análisis SMS**	40	EN PROCESO	05/09/2016	28/11/2016	CTA. Juán Álvarez CTA. Jorge Herrero CTA. Alcides Delvalle
	ACT 18	**PUBLICACIÓN**					
		* Terminar Procedimientos por Instrumentos PBN (Designación de Puntos de Referencia - Gestión 5LNC OACI)	13	PENDIENTE	06/02/2017	22/02/2017	CTA. Liz Portillo Eleno Centurión
		* Entrega de datos al AIS y procesamiento del material para publicación	60	PENDIENTE	22/02/2017	23/04/2017	Eleno Centurión
		* Recepción de la publicación por los usuarios y entrada en vigencia	56	PENDIENTE	23/04/2017	22/06/2017	Lic. Lidia Cáceres
	ACT 19	**IMPLANTACIÓN PBN**	1	PENDIENTE	**22/06/2017**	**22/06/2017**	**Presidencia DINAC**
	ACT 20	**Análisis Post- Implantación**	365	PENDIENTE	22/06/2017	22/06/2018	Equipo de Trabajo PBN

Agenda Item 3: Implementation of air traffic flow management (ATFM)

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

a) WP/05 - *ATFM Project (ASBU: B0-SEQ, B0-FRTO, B0-NOPS AND B0-ACDM)* (presented by the Secretariat);
b) WP/15 - *ATFM implementation in Peru* (presented by Peru);
c) WP/16 - *Runway capacity and ATFM planning* (presented by Brazil);
d) IP/06 - *TATIC FLOW system applied to ATFM - Brazil* (presented by Brazil - Spanish only);
e) IP/08 - *CGNA ATFM operational website* (presented by Peru - Spanish only);
f) IP/09 - *ATFM and the results obtained during the Rio Olympic and Paralympic Games* (presented by Brazil - Spanish only); and
g) IP/11 - *SKYFUSION* (presented by IATA).

ATFM Project (ASBU: B0-SEQ, B0-FRTO, B0-NOPS and B0-ACDM)

3.2 Under this item, the Meeting took note that, in order to analyse the attainment of ATFM goals, the following indicators had been established:

- Percentage of States that have conducted runway and ATC sector capacity calculations
- Percentage of States that have implemented ATFM in Flow Management Units (FMUs) or Flow Management Positions (FMPs)

3.3 The Meeting took note that 85% of the States of the Region had performed their ATC runway and ATC sector capacity calculations as pre-implementation tasks, as shown in the following table:

Percentage of States that have conducted their runway and ATC sector capacity calculations

September 2016 85%	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN
	YES	YES	YES	YES	YES	YES	YES *	NO	YES	YES	YES	NO	YES	YES

* French Guiana only determined runway capacity

3.4 To date, only 63% of the States of the Region have implemented ATFM, as shown in the following table:

Percentage of States that have implemented ATFM Flow Management Units (FMUs) or Flow Management Positions (FMPs)

September 2016 63%	ARG	BOL	BRA	CHI	COL	FGY	ECU	GUY	PAN	PAR	PER	SUR	URU	VEN
	NO	NO	YES	YES	YES	NO	YES	NO	YES*	YES	YES	NO	YES	YES

* Panama (FMP in Panama FIR between 12:30 UTC and 01:00 UTC)

3.5 The States at the Meeting updated the Strategic Planning Table, as shown in **Appendix A** to this part of the report.

3.6 The States also updated **Appendix B** to this part of the report, which shows the current list of ATFM focal points. The Meeting highlighted that it was important for focal points to be individuals who worked in the ATFM area and that could be available for coordinating or holding teleconferences as needed.

3.7 The Meeting reviewed and approved the programmed tasks and completed those activities that were *pending implementation* in the ATFM Project Description, as shown in **Appendix C** to this part of the report.

3.8 The States also completed the data for the ATFM survey shown in **Appendix D** to this part of the report.

ATFM implementation in Peru

3.9 The Meeting took note that in 2015, Peru had drafted the action plan for ATFM implementation in the Lima FIR, and had analysed available capacity and expected demand, which helped to define the scenario for deciding on ATFM implementation.

3.10 On 25 January 2016, Peru implemented ATFM through the Lima FMP, with a view to the adoption of measures to promote an efficient, orderly, and safe air traffic flow, and to properly meet service demand in take-off and landing operations at domestic airports, since congestion levels were causing delays in public service itineraries that were essential for passengers.

3.11 The Meeting recalled that at the Seventeenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/17) held in May 2016, Peru had submitted IP/8 containing details of the action taken and the status of implementation of ATFM. Likewise, in item 3.28 of the final report of the meeting, the meeting had requested Peru to provide detailed information on ATFM implementation and operation, which was provided in SAM/IG/18-NE/15.

3.12 Furthermore, the Third Meeting of Air Navigation and Safety Directors, held in Lima on 22-24 August 2016, had requested Peru to make a presentation to explain the use of CTOT.

3.13 The Meeting took note that Peru had identified that the constant increase of itineraries was the main cause of the imbalance between demand and capacity. In June 2016, an initial Excel template was developed for use in strategic planning and itinerary organisation. Using the template, it was possible to compare air traffic demand with declared capacity, so as not to exceed such capacity when programming the itineraries. Currently, capacity analyses have been conducted at 19 airports.

3.14 Likewise, Peru informed that the improvements made to strategic planning through the organisation and programming of itineraries were reflected in flow management efficiency since, at present, it is no longer necessary to apply more restrictive measures, such as aircraft ground stop (GS) that was used during the initial phase of FMP during airspace saturation periods.

3.15 As part of the ATFM experience, Peru determined that the traffic management initiative (TMI) that was best suited to our scenario was the application of a ground delay programme (GDP) involving a continuous analysis of the daily scheduled flow of arrivals and departures. With the GDP, arrival slots were assigned to regulate inbound IFR traffic at the International Airport Jorge Chávez in Lima. To this end, the Lima FMP assigned departure slots at each aerodrome at national level, using ETD as the basis for calculation, in coordination with the pilot. To this end, consideration is given to traffic and meteorological conditions at the aerodrome in order to generate a calculated take-off time (CTOT), which is provided to users on an equal basis. All this process is executed with the basic ATFM tool of the INDRA AIRCON 2100 system. A video explaining this process was presented.

3.16 Peru informed that, following ICAO recommendations regarding the domino effect generated by NOTAMs concerning control of flows to adjacent FIRs and other Regions, and having improved flow management, flow control NOTAMs that established specific separations regardless of flight level had been cancelled to avoid their impact on flight planning and planned fuel reserves, especially on international flights.

3.17 The Meeting took note that the initiatives of the Global Air Navigation Plan contained strategies to improve the use of existing system capacity. Within this context, the implementation of short tow procedures had been completed on 15 August 2016 at the Jorge Chávez International Airport, with a view to improving the use of the movement area. This has generated the following benefits:

- Apron occupancy time for towing and start-up manoeuvres was reduced in 5 minutes per aircraft in average.

- Ground controller workload reduced since the phraseology used for the short tow procedure reduces significantly the time used for communications.

3.18 Continuing with the activities foreseen in the Plan for ATFM implementation at the Lima FIR (the updated ATFM plan of Peru appears in **Appendix E** to this part of the report), it was felt necessary to implement a flow management unit for the Cusco airport, since traffic demand exceeded available capacity at certain times of the day, mainly due to apron limitations. The Cusco FMP would start operating on 17 September 2016 on a trial basis. Its operation was based on ATFM tactical planning and its main objective was to manage traffic arriving in Cusco. The ATFM initiative applied was the ground delay programme (GDP), assigning a calculated take-off time (CTOT) to domestic traffic destined for Cusco. In order to offset the effect that this measure could have on the Lima airport, flights leaving from Lima to Cusco (category C or less aircraft) departed from the intersection of runway 15 with taxiway Bravo (15/B, remaining runway length 2300m).

3.19 Upon assessing the effect of departures from the intersection (15/B), which reduced runway occupancy time and improved sequencing of departures from Lima, it was concluded that this measure should be used as a tool to assist the ground controller to organise departure flow.

3.20 In order to introduce the use of ATFM messaging, the Cusco FMP was using this type of messages during the trial phase through the AMHS system to coordinate the application of ATFM initiatives with the Cusco control units.

3.21 Despite these measures, the constant growth of air traffic demand continued to cause congestion during certain periods of the day. Consequently, coordination started with IATA to declare the AIJCH as a coordinated airport of level 2, in accordance with IATA WSG (*Worldwide Slots Guidelines*). It was estimated that the itinerary adjustments agreed between the airlines and the designated itinerary coordinator would facilitate the operations of airlines that used or expected to use the airport.

3.22 In this regard, Peru informed that the following tasks were underway regarding itineraries:

- Itineraries will be approved for 2 seasons for purposes of strategic planning, starting the following season.

- Itineraries for the summer season of 2017 will be systematised, distributing them in 15-minute slots according to hourly capacity. At present, 92% of itineraries are systematised and easily recognizable.

- On-going coordination among the aeronautical community for the resolution of common problems in a transparent and equitable manner for all airlines.

3.23 Although CDM had not been formally established, its methodology as being applied for strategic planning, in order to find the best solution to ATFM-related issues, reducing delays and optimising the use of available resources. Within this process, a series of meetings had been held to provide information to stakeholders, support collaborative decision-making, and enhance safety and efficiency. This experience had highlighted the importance for all parties involved to be aware of the actual and foreseen conditions before making a decision.

3.24 The following difficulties had been identified during ATFM implementation:

- Some airlines were making improper use of the MEDEVAC (*medical evacuation*) STATUS in order to bypass the adopted ATFM measures, causing a negative impact on air traffic flow management, especially during peak hours. Accordingly, it is recommended that surveillance and continuous monitoring of operations be implemented during the period in which ATFM initiatives are being applied.

- An analysis was done to classify delays before take-off, showing that the main cause of congestion at the AIJCH and AIVA was the limited airport infrastructure. At present, infrastructure improvements are being planned to address demand growth. To this end, capacity studies are being updated.

3.25 In order to monitor ATFM system performance, initial performance indicators have been developed in order to establish continuous improvement processes to enhance system efficiency. Performance indicators have been selected based on historical data availability and the objectives defined for this stage (**Appendix F** to this part of the report describes these indicators in detail).

3.26 In order to promote ATFM implementation at regional level, Peru was coordinating with neighbouring administrations, and proposing the incorporation of ATFM measures in existing letters of operational agreement.

3.27 In this regard, communications/teleconferences had been held with Ecuador in order to coordinate and assess proposals. However, no consensus had been reached regarding actions to be taken within the ATC/FMP coordination loop and their impact on controller workload. It had been deemed advisable to establish a Letter of operational agreement between ATFM units.

3.28 Likewise, contact had been established with the Bolivian administration, pending the definition of a first meeting.

3.29 Coordination was currently taking place with the Colombian administration to update the respective Letter of operational agreement, expecting a favourable evolution of ATFM procedures between the two countries.

3.30 During the Meeting, the experts had the opportunity to watch a video prepared by the ATFM team of Peru on the use of AIRCON 2100 and Excel tools at ATFM units, illustrating the simple way in which capacity/demand balancing operations were conducted.

3.31 Finally, based on the experience obtained, the Peruvian Administration considers that analyses should be conducted based on studies of available capacity and air traffic demand projections, for defining the scope of the ATFM service.

3.32 The Meeting congratulated Peru for the excellent technical work done and deemed it convenient for States to carefully analyse the experience of Peru, since, with simple tools, it had been able to carry out a very successful implementation. The experience acquired will provide Peru with the necessary knowledge when using more sophisticated tools.

3.33 Likewise, IATA especially complimented Peru for the implementation, because, in addition to the emphasis placed on capacity management for better capacity/demand balancing, it had been able to minimise the impact on users.

Runway capacity and ATFM planning

3.34 The Meeting had the opportunity to get a better knowledge of the relationship between runway capacity and ATFM planning, taking into account the importance of knowing how much a system can support (capacity x demand), so that operations can be planned to meet a specific demand within a projected capacity.

3.35 The experience of Brazil tells that in many times the outcomes that were planned were affected by factors that not always are possible to spot. So, it is mandatory to assess the capacity of a system in order to measure how deep it can be affected by one of these factors. Then, it is of fundamental importance to determine a capacity value that is feasible to be practiced for most of the time.

3.36 In this sense, the strategy of Brazil to meet demand is to set an interval of capacity percentage that facilitates the absorption of flights even if there are alterations in the variables which cause the reduction of the capacity of one of the systems.

$\sum$ = % CAP {
- **General aviation**;
- **Military aviation**;
- **Alternate flights**; and
- **Delayed flights**

3.37 The methodology used for calculating the runway capacity developed by Brazil uses, as basic benchmarks, factors related to arrival and departure operations along with planning factors. As a result, a number based upon average numbers is found which will result in an average capacity of a system. Nevertheless, some planning factors may interfere in the operability of the system and they must be taken into account for the measurement of the capacity percentage to be employed in a certain system.

3.38 Despite of the fact that these factors are not represented by mathematic parameters in the calculations, they must however to be considered as planning variables for capacity parameters and must also be counted for the determination of the capacity percentage to be employed in a system. They are called percentage adjustment tools.

Capacity percentage to be used in a system

3.39 CGNA professionals take into account the relation between the systems and the variables for their planning. The strategy is to attend the aviation demand until a certain capacity percentage limit which allows the accommodation of the flights, even if alterations of the variables drive to a reduction of the capacity of one of the systems. Thus, this percentage limit aims to plan the strategic demand, accommodate the tactical demand and minimize the operational restrictions impacts.

Strategic demand planning

3.40 The main objective when establishing a capacity percentage is to guarantee the operation of a system within a range in which the balance between capacity and demand occurs, despite of the influence of some planning variables.

3.41 On an ATFM perspective, the relation between capacity and demand orientates the strategical decision makings, pre-tactical and tactical phases to maintain the balance of the variables and enhance the traffic flow as much as possible. After determining the percentage capacity interval to be applied, the personnel in charge of ATFM apply such numbers to identify the peak moments and system congestions.

3.42 In this way, it is possible to adjust the demand so that unbalance points are eliminated, turning decision makings easier by the air traffic flow managers.

Accommodating tactical demand

3.43 The percentage capacity employed within a system has another objective that is to facilitate the tactical demand accommodation by systems inside the available structures. This traffic demand varies from system to system and has as one of its characteristics, the low predictability.

3.44 In this sense, in a shared airport, for instance, there must be places for accommodation of tactical demand (general aviation, military aviation, alternate flights and delayed flights), without exceeding the runway capacity.

3.45 So, in this case ATC Facilities and Airport administrations need to accommodate not only the scheduled demand but also the demand which appears in the tactical phase, and thus there must be a capacity percentage which facilitates this accommodation.

Components of tactical demand

Alternate flights

3.46 The capacity must also include alternate flights due to a variety of contingencies which can occur in certain specific period of times. The average of these alternate flights may vary according to the parking plans of the airports.

Figure 1

Delayed flights

3.47 Another factor that must be taken into account especially at busy airports is the "*ripple effect*" caused by delayed flights. At many times this aerial mesh need to be accommodated in peak times, circumstance which may raise the runway capacity of a certain airport over its limits.

Minimizing operational restriction impacts

3.48 As described before, a system may be influenced by a great deal of factors that can impact negatively the operational variables driving the aerial demand absorption of the capacity to a downfall. Therefore, the ATFM must have a strategic reserve so as to minimize the negative impacts caused by meteorological situations, operational inconsistencies and deficient airport structures.

Meteorological impact on capacity

3.49 The meteorological effects not always can be forecasted. The greater the aerial demand is, the bigger the efforts to keep the flow within the levels of safety and consequently, the workload will rise.

3.50 Meteorology is usually related to the increase of spacing in final approach, increase of runway occupation, and sometimes it hinders traffic flow until it comes to an interruption. All these things are factors that reduce capacity absorption in a system. Meteorology is also responsible for some of the delays and alternations at main Brazilian airports.

Impact on capacity as a result of diverse operational patterns

3.51 When the methodology for measuring capability is applied, one of the parameters to be considered in the assessments is the percentage of the runway occupation at the aerodrome throughout the year. In this case the theoretical values will always reveal the occurrence of a particular procedure. In some aerodromes the operational procedures at a certain runway differs completely from the other. In these types of aerodromes, these differences impact directly on the capacity values.

3.52 Each operational pattern will be related to a specific runway procedure and consequently to a runway capacity value. All procedures are considered and analyzed in the calculations, but the runway capacity will be deeply influenced by the operational procedure with more incidence and by the most restrictive pattern.

Airport structure impact on capacity

3.53 The adequate runway positions, rapid exit taxiways availability, platform offers, suitable courtyard layouts to the aircraft mix, availability of aerodrome NAVAIDS and the appropriate number of passengers terminal are supposed to be planned to meet demands of passengers in high seasons, or busiest periods.

3.54 The problem is that not always the airport structure is able to meet 100% of the runway capacity because, in some cases, there are limitations of courtyards and platforms.

3.55 Inside the airport logistics the structure amongst runway, courtyard and platform must be harmonized in such way that isolated capacity of a certain system does not hinder the capacity of the other. But as long as it does not happen it is mandatory to adopt a capacity percentage so as to meet demands considering the existing structure limitations.

3.56 When a capacity percentage is to be determined, the systemic issues related to capacity are analyzed. The State does not only considers isolated researches but also other relevant pieces of information about the airport operations, for instance. Besides data related to tactical demands and infrastructure, the operations as a whole are also taken into account, namely, the total number of operations in a year, the existence of restrictive configurations, purpose of the airport, number of passengers carried in a year time, airline companies demand, airport strategic importance in the national scenario, seasons, and likewise, the sensitivity level of the airport in relation to the economic scenario of the country.

3.57 It is important to highlight that these parameters used by the Brazilian State **- i.e., the adoption of 80% capacity percentage in some airports -** were practiced during the Major International Events held in the country namely the FIFA 2014 World Cup and the Olympics and Paralympics Rio 2016, in which, according to surveys, the busiest operations at airports directly or indirectly concerned in such events were registered, and the maximum capacities projected for those airports were never exceeded.

3.58 Actually, the capacity percentage to be applied depends still on the changes to occur at each of the systems. When 80% of the capacity is applied, it is not limiting one of the systems. To the contrary, it is allowing this system to be able to keep a safe and ongoing operation. Moreover, it is of fundamental importance to bear in mind that capacity is not a static number but an average.

3.59 After, of course, the system itself could exceed its capacity. Nevertheless, this will happen within the tolerable limits for all of those that are somehow connected to this system.

3.60 However, it is important to consider that each State must assess its internal characteristics and taking strategic decisions, apply the percentage that fits the most with its reality in order to keep the safety standards established. There is no way to establish a unique pattern for all States, as there are different political, operational and economic realities.

The *Tatic Flow* applied to ATFM - Brazil

3.61 A presentation was made by SAIPHER on a system that has been used in Brazil for more than two years in ATFM, called TATIC FLOW, which permits to monitor the real-time indicators of operational conditions at aerodromes and scheduled and ongoing flights at 35 domestic airports, based on data provided by EFPS (*Electronic Flight Progress Strip*) systems at control towers. Detailed information on this system is provided in SAM/IG/18-NI/06.

CGNA ATFM operational website

3.62 The Meeting took note that, in order to collect in a single tool all the information about standards, contingencies, runway and air traffic control sector capacity, aeronautical information, and meteorological conditions, the Air Navigation Management Centre (CGNA) of Brazil launched its operational website with Internet access, with important functionalities for maintaining air navigation safety and smooth flow.

3.63 The website provides information that is fundamental for ATFM, such as the capacity of the airports of interest, daily briefings, current ATFM measures, weather forecasts, contingencies, and other services of interest to the aeronautical community.

3.64 The Meeting was invited to analyse the functionalities of the CGNA ATFM operational website at www.portal.cgna.gov.br and review the information of interest to the SAM Region. Detailed information on this functionality is available in SAM/IG/18-NI/08.

ATFM and the results obtained at the 2016 Rio Olympic and Paralympic Games

3.65 The Meeting took note of the results obtained by Brazil at the 2016 Rio Olympic and Paralympic Games and considered that the States should take this experience into account for the development and management of ATFM during large events involving SAM States. Details of the Brazilian experience during the 2016 Rio Olympic and Paralympic Games may be found in SAM/IG/18-NI/09.

SkyFusion

3.66 IATA presented the *SkyFusion* tool that provides a situational awareness service designed to assist ATFM and CDM. It was developed in cooperation with IATA and Harris, and could be an interesting option for States implementing ATFM. The tool is offered on a trial basis for 3 months through IATA, with no purchase commitment, so that States may test this platform and analyse its benefits. More detailed information appears in SAM/IG/18-NI/11.

APPENDIX A

STRATEGIC PLANNING TABLE FOR THE DEVELOPMENT OF ATFM														
CONC. PPRC/3-5 action of compliance	**ARG**	**BOL**	**BRA**	**CHI**	**COL**	**ECU**	**FGY**	**GUY**	**PAN**	**PAR**	**PER**	**SUR**	**URU**	**VEN**
	Month/ Year	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**	**Month/ Year**
1- Replica of ATFM courses to speccialized personnel	09/2015 to 11/2015	10/2015	IMP.	09/2015 07/2016	IMP.	1st Quarter 2015	2015		04/2015 02/2016	11/2016	02/2016		IMP.	IMP.
2- Bilateral Letters of Agreement with appropriate ATFM procedures without impacting on safety	04/2016	02/2014	IMP.	2nd. Quarter 2017	IMP.	2nd Quarter 2016	2015		1st Trim/2016	10/2015	05/2016		IMP.	IMP.
3- Implementation of Flow Control Positions or Units (FMPs/FMUs)	NO	NO	IMP.	IMP. FMP ACC/ 2016	IMP. unified ACC	IMP.	NO		IMP.	IMP.	IMP.		IMP.	IMP.

APPENDIX B / APÉNDICE B

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

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

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
ARGENTINA*	Marcelo Rodolfo Popowicz Jefe de Departamento Auditorías Dirección Inspecciones y Auditorías de Navegación Aérea Administración Nacional de Aviación Civil (ANAC) Teléfono: +5411 5941 3000, Ext. 69756 E-mail: mpopowicz@anac.gob.ar	Nicolas Borovich Jefe de Departamento Planificación (EANA) Tel.: +5411 4320 3947 Cel.: +59411 3119 9377 E-mail: Nborovich@eana.com.ar Víctor Marcelo de Virgilio Jefe del Departamento Servicios de Tránsito Aéreo Tel.: +5411 5789 8400, Ext 68454 E-mail: dsna@faa.mil.ar

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
BOLIVIA (Plurinational State of) / **BOLIVIA (Estado Plurinacional de)***	ATCO Jesús I. Villca Jiménez Inspector ATM/SAR Dirección General de Aeronáutica Civil (DGAC) Teléfono: +591 2 211-4465 Cel.: +591 72023263 E-mail: jvillca@dgac.gob.bo	ATCO. Marco Sergio Barrios Barzola Supervisor ACC La Paz Jefe Navegación Aérea Reg. La Paz Tel/Fax: +591 2 281-0203 (ACC/La Paz) Tel/Fax: +591 2 282-1717 (Nav. Aérea) Tel: +591 2 223-8339 (Home/domicilio) Cel.: +591 7 052-3884 E-mail: mbarrios@aasana.bo masebarbar@hotmail.com
BRAZIL / BRASIL	James Souza Short Jefe de Operaciones del CGNACentro de Gerenciamento e Navegação Aérea – CGNA Chefe Geral Tel.: +55 21 2101-6531 Cel.: +55 21 99499-1658 E-mail: short@cgna.gov.br José Airton Patricio Centro de Gerenciamento e Navegação Aérea – CGNA Oficial ATM Tel.: +55 21 2101-6448 Cel.: +55 21 98554-4425 E-mail: patriciojap@cgna.gov.br	ENVIO DE FORMULARIO: atfmu@cgna.gov.br Gerente Nacional – GNAC Tel.: +55 21 2101-6409 E-mail: gnac@cgna.gov.br Gerente Nacional de Fluxo – GNAF Tel.: +55 21 2101-6546 E-mail: grt@cgna.gov.br Gerencias Regionais – GER Tel.: +55 21 9949-6492 / +55 21 2101 98554 3598 E-mail: gr1@cgna.gov.br / gr2@cgna.gov.br

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
CHILE*	Jorge Caro Gálvez Dirección General de Aeronáutica Civil Dirección de Aeródromos y Servicios Aeronáuticos (DASA) Sub Departamento de Servicios de Tránsito Oficina ATFM (FMU) Tel.: +56 2 2836-4022 E-mail: jcarog@dgac.gob.cl	FMP ACC Santiago Tel.: +56 2 2836 4017 ACC Santiago Cel.: +56 9 158 1865 Supervisor ATC de turno E-mail: sup.accu@dgac.gob.cl

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

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
ECUADOR	Marcelo Valencia Taco Responsable ATM Nacional Tel.Ofc: +593 2 2947400 ext 4520 Móvil: +593 979097292 E-mail: marcelo_valencia@aviacioncivil.gob.ec marcelovalencia_qa@gmail.com	FMP Guayaquil E-mail: fmp-accgye@aviacioncivil.gob.ec Supervisores Centro de Control DDI: +593 4 292 4219 REDDIG: 5060 / 5051 / 5052 / 5053 Clemente Pinargote Móvil : +593 994035543 E-mail: clemente.pinargote@aviacioncivil.gob.ec clementepinargote@yahoo.com Elías Ulloa Móvil : +593 997852130 E-mail: elias.ulloa@aviacioncivil.gob.ec ulloaelias@hotmail.com
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
GUYANA		

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
PANAMA*	Flor Silvera Directora de Navegación Aérea Tel.: +50 7 6982-1215/ 315-9846 E-mail: fsilvera@aeronautica.gob.pa	Supervisor de turno del Centro de Control Administración de Aeronáutica Civil Tel.: +50 7 315 9871 E-mail: cerap@aeronautica.gob.pa
PARAGUAY	ATCO. Sindulfo Ibarrola Dirección Nacional de Aeronáutica Civl (DINAC) Gerencia Tránsito Aéreo Aeropuerto Intl. Silvio Pettirossi Tel./Fax: +595 21 64 5598 Cel.: +595 983 35 0818 Email: sind.ibarrola@gmail.com	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 21 68 8109 E-mail: fmu.asu@gmail.com Mariano Roque Alonso-Paraguay Edificio del Nuevo Centro de Control Unificado. 2-Unidad de Flujo (SGES) – FMU SGES (Unidad Operativa). Current responsible / Responsable actual de dicha Unidad: Lic. ATCO. David Gavilán Tel./Fax: +595 64 420-842 Cel.: +595 983 830-404 E-mail: daga_978@hotmail.com Minga Guazú-Paraguay Aeropuerto Internacional Guaraní. E-mail: abethancourt@aeronautica.gob.pa

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
PERU	Martha Soto Ansaldi Dirección General de Aeronáutica Civil (DGAC) Inspector de Navegación Aérea Tel.: +51 1 615-7880 Cel.: +51 997367352 E-mail: msoto@mtc.gob.pe	FMU Lima E-mail: fmu_lima@corpac.gob.pe Dante Samaniego Bilbao Responsable del FMU Lima- CORPAC Tel.: +511 1 230 1000 ext. 2482 - 2483 E- mail: dsamaniego@corpac.gob.pe
SURINAME	Mr. Soeknandan Andre Chief Air Traffic Services Tel.: +59 7 530-433 Cel.: +59 7 7 216-108 Fax: +59 7 491-743 E-mail : atmcnslvd@yahoo.com	Mr. Gaddum R. Coordinator ATS Supervisor ATS Unit Zanderij Phone Operations : +597 032-5208 Cel: +597 853-1681 E-mail: g.rperez@hotmail.com
URUGUAY	Dirección Nacional de Aeronáutica Civil (DINACIA) Tte Cnel. (Nav.) Gabriel Falco Sub- Director de Circulación Aérea Tel: +598 2 604 0408 Ext 5101 Cel: +598 9 804 6848 FAX +598 2 604 0408 E-mail: gfalco@dinacia.gub.uy	Dirección Nacional de Aeronáutica Civil (DINACIA) C.T.A. Luis A. Otheguy Director de Tránsito Aéreo (ATM) Tel.: +598 2 604-0408, Int. 5105 Cel: +598 99592113 E-mail: atfmuruguay@dinacia.gub.uy Email: dta@dinacia.gub.uy ACC Montevideo Tel.: +598 260-00619 REDDIG

State/ Estado	STATE ATFM FOCAL POINTS PUNTOS FOCALES ATFM DEL ESTADO	OPERATIONAL ATFM FOCAL POINTS AND ESTABLISHED ATFM UNITS PUNTOS FOCALES ATFM OPERACIONALES Y UNIDADES ATFM ESTABLECIDAS
VENEZUELA (Bolivarian Republic of) / **VENEZUELA (República Bolivariana de)***	Maribel Mayora Vallenilla Responsable ATFM Tel: +58 212 303-4532 (13:00 – 21:00 UTC) Cel: +58 416 611-0607 (H24) E-mail: atfm@inac.gob.ve m.mayora@inac.gob.ve Omar Enrique Linares Planificador de Espacios Aéreos Instituto Nacional de Aviación Civil - INAC Aeropuerto Internacional Simón Bolívar Edificio ATC, piso 1, Oficina AIS Maiquetía, Vargas República Bolivariana de Venezuela Tel: +58 212 355 2898 E-mail: o.linares@inac.gob.ve ollinaresomar2@gmail.com	Carlos Armas Jefe ACC-Maiquetía Tel: +58 212 355-2912 (13:00 – 21:00 UTC) Cel: +58 416 632-6204 (H24) E-mail: atfm@inac.gob.ve ACC-Maiquetía Tel: +58 212 355-2216 (H24) Cel: +58 416 623-6427 (H24)

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**
	Julio de Souza Pereira Assistant Director, Safety Flight Operations IATA Avda. Ibirapuera, 2332, cj 22 Torre I Sao Paulo, Brasil Tel: +55 11 21874236 Cel: +55 11 993800953 Email: pereiraj@iata.org	Roberto Sosa España RO/ANS & SFTY Tel.: +511 611 8686, Ext. 104 E-mail: rsosa@icao.int Roberto Arca Jaurena ATM/SAR Consultant / Consultor ATM/SAR Tel.: +511 611 8686, Ext. 106 E-mail: rarca@icao.int

* Updated SAM/IG/18 / Actualizados en la SAM/IG/18

APPENDIX C

PROJECT B1: IMPROVE DEMAND/CAPACITY BALANCING

<table>
<tr><th>SAM Region</th><th>PROJECT DESCRIPTION (DP)</th><th colspan="2">DP N° B1</th></tr>
<tr><td>Programme</td><td>Title of the Project</td><td>Start</td><td>End</td></tr>
<tr><td>Air traffic flow management (ATFM)

(Programme Coordinator: Roberto Arca Jaurena)</td><td>Improve demand/capacity balancing

Project Coordinator: Martha Soto Ansaldi</td><td>2012</td><td>2016</td></tr>
<tr><td>Objective</td><td colspan="3">Avoid overloading the ATC and airport systems, while strengthening safety, taking into account the reduction in the number of delays caused by meteorological and traffic conditions, thus reducing fuel consumption and contaminating emissions. Likewise, improve prediction and management of surplus demand for services in ATC sectors and aerodromes.</td></tr>
<tr><td>Scope</td><td colspan="3">The scope of this project establishes that ATFM implementation should start with airport and airspace monitoring in order to identify significant increases in ground delays and in-flight holding, as well as bottlenecks (ATC sector, runway, apron, and airport facilities). Furthermore, capacity calculation and air traffic demand analysis are important elements to improve demand/capacity balancing.</td></tr>
<tr><td>Metrics</td><td colspan="3">• % of States that have calculated runway and ATC sector capacity.
• % of States that have implemented ATFM in Flow Management Units (FMU) or Flow Management Positions (FMP).</td></tr>
</table>

Strategy	Project execution defines ATFM implementation in the SAM Region through an airspace demand and capacity analysis, taking into account that States that are in the process of implementation shall coordinate with the ATM community to define the actions required for ATFM implementation. The infrastructure and the database, as well as the policy, standards, and procedures, are important components for the execution of this Project.
Goals	• SAM States with experts trained in the calculation of runway capacity and airspace (ATC SECTOR) capacity of States' airspace regions. • ATFM system performance oversight plan. • CAR/SAM inter-regional coordination.
Rationale	GREPECAS considered that early ATFM implementation should ensure optimum air traffic flow to or through certain areas during periods in which demand exceeded or was expected to exceed the available capacity of the ATC system. Therefore, the ATFM system should reduce aircraft delays, both in flight as on the ground, and avoid system overload.
Related projects	• Automation.

Project deliverables	Relationship with the performance-based regional plan (PFF)	Responsible party	Status of implementation*	Delivery date	Comments
Assess the progress made in the ATFM implementation work programme	B0-NOPS	Programme Coordinator		2016	Permanent Task
Calculation of airspace (ATC SECTOR) capacity.	B0-NOPS	Juarez Franklin Gouveia		SAM/IG/9	Brazil and Colombia submitted their studies.
List of airspace sectors subject to periods in which demand exceeds the existing capacity, including, if necessary, simulations by the States.	B0-NOPS	Juarez Franklin Gouveia		SAM/IG/9 SAM/IG/10	Brazil and Colombia submitted their studies.
List of operational factors affecting demand and airspace capacity for the optimisation of the existing capacity, including simulations, if necessary.	B0-NOPS	Juarez Franklin Gouveia		SAM/IG/9	Brazil and Colombia submitted their studies. Brazil, Paraguay and Peru presented data at the SAM/IG/11 meeting.
Definition of the common elements of situational awareness	B0-NOPS	Paulo Vila		2012	The States that exchange information are: Chile, Colombia, Paraguay and Venezuela.

Personnel trained in strategic ATFM measures for airspace	B0-NOPS	Project RLA/06/901		2010	In 2010, an ATFM/CDM course was conducted in Brazil with the participation of several States. In March 2009, a course on runway and ATC sector capacity calculation was conducted in Brazil. In 2012, a course for training instructors on runway and ATC sector capacity calculation was conducted in Lima.
List of factors affecting the implementation decision	B0-NOPS	Programme Coordinator		2010	The following causes were identified at the SAM/IG/11 meeting: - States that do not have the requirement or the need to implement ATFM; - Budgetary and organisational reasons; - Lack of personnel specifically devoted to ATFM activities; - The personnel responsible for ATFM is involved in other functions.
Update the calculation of airspace (ATC SECTOR) capacity and runway capacity.	B0-NOPS	Programme Coordinator		November 2015	85% of States updated ATC sectors and runway capacity calculations. Guyana and Suriname lack capacity calculation; French Guiana lack ATC sectors calculation.

Airspace monitoring processes. Air traffic demand analysis. ATFM standards and procedures of an FMU/FMP. Implementation of preliminary ATFM measures. Implementation of TMI. ATFM messaging. Coordination of special events. Civil/military coordination processes and ATFM exemption procedures.	B0-NOPS	CGNA Course Project RLA/06/901		November 2014	Completed on schedule
Replication of ATFM courses at national level	B0-NOPS	States		15/05/2015	States replicated the ATFM courses at national level.
ATFM measures during the realization of Olympic and Paralympic Games Rio 2016 in Brazil	B0-NOPS	Brazil		13/05/2016	Detail of Brazilian AIC can be found under following link on the internet: http://publicacoes.decea.gov.br/?i=publicacao&id=4339
ATFM Implementation Status	B0-NOPS	Programme Coordinator		31/10/2015	56% of States implemented ATFM.
ATFM tool information	B0-NOPS	IATA		SAM/IG/18	
CTOT use demonstration	B0-NOPS	Project Coordinator		SAM/IG/18	Show benefits of ground delays application in ATFM management. Example Cuzco and Lima
Demonstration of possible indicators to measure system performance	B0-NOPS	Project Coordinator		SAM/IG/18	Practical examples

Benefits of the application of preliminary CDM strategic processes	B0-NOPS	Project Coordinator		SAM/IG/18	Examples of practical coordination
Review of ATFM Manual messages	B0-NOPS	Project Coordinator		SAM/IG/18	

Resources required	Designation of experts in the execution of some of the deliverables.

*

Grey *Task not started*
Green *Activity underway as scheduled*
Yellow *Activity started with some delay but expected to be completed on time*
Red *It has not been possible to implement this activity as scheduled; mitigating measures are required*

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**	**NO**			**YES**	**YES**	**NO**		**NO**	**YES**	Panama: The responsible is the Control Centre supervisor
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**	**1**	**0**	**0**	**0**	**1**		**0**	**1**	**2**		**0**	**0**	**<u>Brazil</u>:** 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). **<u>Chile</u>:** We believe that SCEL, SCIE, and Loa de Calama require this calculation. **<u>Colombia</u>**: None. It is required for several airports since airport capacity is not being managed to address growing demand. **<u>Ecuador</u>**: None of the airports in the country has apron capacity calculations. However, it is estimated that the airports of Quito, Guayaquil, Nueva Loja, Coca, Shell Mera, Cuenca, and Manta require these calculations. **<u>Panama</u>**: MPTO. **<u>Paraguay</u>**: 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. **<u>Peru</u>**: Cusco 7 C/D and 4 A/B positions. **<u>Uruguay</u>**: SUMU and SULS. **<u>Venezuela</u>**: None. We still do not have personnel duly trained to conduct these calculations, which would be required for the international airport of Maiquetía.
6. Number of operations per hour at the airport considered to be the most important one:															**<u>Chile</u>**: SCEL **<u>Peru</u>:** SPIM.
Runway capacity			**SBGR 52**	**SCEL 40**	**70 SKBO**	**29**	**6**		**MPTO 44**	**SGAS 23**	**SPJC 32**		**SUMU 25 SULS 18**	**SVMI 34**	
Apron capacity	**NO**	**NO**	**SBGR 90**	**NO**	**NO**	**NO**	**NO**	**NO**	**MPTO 49**	**NO**	**SPJC**	**NO**	**NO**	**NO**	

ATFM SURVEY	ARG	BOL	BRA	CHI	COL	ECU	FGY	GUY	PAN	PAR	PER	SUR	URU	VEN	REMARKS
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:															
Runway capacidty	**20**	**12**	**18**	**15**	**4**	**1**	**3**		**2**	**1**	**8**		**5**	**2**	
Apron capacity	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**2**	**NO**	**3**	**NO**	**NO**	**NO**	
ATS sector capacity	**5**	**10**	**18**	**4**	**4**	**1**	**3**		**2**	**1**	**8**		**5**	**2**	

APPENDIX E

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

(UPDATED TO 30 SEPTEMBER 2016)

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
1. Demand and capacity analysis: Airport and airspace				
1.1. Calculate runway capacity of the main airports. a) Calculate runway capacity at AIJCH (Lima) b) Calculate runway capacity at AIVA (Cusco)	Jul/2014 Feb/2015	Completed Completed	DGAC - Peru DGAC - Peru	Calculation results shall be updated if a significant variation in factors affecting capacity is observed.
1.2. Calculate airspace capacity. a) Lima ACC ATC sector capacity b) Cusco TMA ATC sector capacity	Sep/2014 Feb/2015	Completed Completed	CORPAC S.A. DGAC - Peru	
1.3. Calculate apron capacity at the main airports. a) Apron capacity at AIJCH (Lima) b) Apron capacity at AIVA (Cusco)	Sep/2015 Feb/2015	Completed Completed	LAP DGAC - Peru	At present, information is available for 19 airports at national level.
1.4. Calculate airport capacity at the main airports in terms of operation of aircraft. a) Airport capacity at AIJCH (Lima) b) Airport capacity at AIVA (Cusco)	Sep/2015	Completed Underway	LAP CORPAC S.A	CORPAC submitted plans for conducting the AIVA airport capacity study.
1.5. Present the conclusions of sector, runway, and apron capacity studies.	Sep/2014 - Apr/2015 - May/2015	Completed	DGAC - Peru	If necessary, studies will be updated in coordination between DGAC and CORPAC

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
2. **Foreseeing demand**				
2.1. Conduct airspace and major airport demand studies for the next 10 years as a minimum.	Oct 2014	Completed	DGAC - Peru	LAP and LAN developed demand forecasts up to 2040; studies were presented at the ACC (Airport Consultative Collaborative) meeting.
2.2. Identify operational factors affecting demand and capacity at major airports and airspaces in order to optimise existing capacity, including simulations as needed.	Sep/2014 - Apr/2015- May/2015	Completed	DGAC - Peru	Factors have been identified and measures are being taken to optimise capacity.
2.3. Develop a database to analyse arrival and departure demand at major airports and airspaces in annual, monthly, daily, and hourly increments.	-	Completed	DGAC - Peru CORPAC S.A	The DGAC has an application for recording flight intentions of airlines. At present, the IATA WSG best practices are being adopted for itinerary scheduling.
2.4. Identify periods during which demand exceeds actual and foreseen capacity, and then take the measures required for demand/capacity balancing during the 3 ATFM phases: strategic, tactical, and pre-tactical.		Ongoing	CORPAC S.A DGAC - Peru	Traffic evolution is regularly assessed in order to identify the most appropriate TMIs.

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
3. **Coordination with ATM community**				
3.1. Define and conduct briefing meetings with stakeholders regarding ATFM/CDM development plans, processes and procedures.	Start Oct/2014	Ongoing	DGAC - Peru	An A-CDM Committee was created for AIJCH, chaired by LAP. Coordination meetings were held and inaugural CDM scheduled for March 2016.
3.2. Train stakeholders in CDM processes and procedures.		Pending	DGAC - Peru	This will be achieved through seminars, replicating ATFM courses, and developing training programmes.
3.3. Establish CDM processes for effective management and exchange of information, allowing each participant to be aware of relevant information for decision-making by the other participants.		Underway	CORPAC S.A. DGAC - Peru	CDM methodology is applied for strategic planning.
3.4. Identify the staff and operational telephone numbers that will serve as points of contact for TFM issues in each ACC, TMA, TWR, airline CCO, airport CCO, meteorology, military, general aviation, and others.		Ongoing	CORPAC S.A. DGAC - Peru	List of ATFM contacts updated in August 2016.

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
4. Policies, standards, and procedures				
4.1. Publish the information on ATFM at the Lima FIR in the corresponding AIP/AIC.	May/2016	Completed	DGAC - Peru	AIP SUPPLEMENT 18/16 published on 2 May 2016
4.2. Develop a basic ATFM operational concept. a) Development of ATFM CONOPS for the LIMA FIR b) Development of the ATFM Manual for the LIMA FIR	Jan/2016	Completed	DGAC - Peru	CONOPS expected to be completed for FMP operational stage
4.3. Develop procedures for communication and coordination among ATFM units for the implementation of air traffic flow management measures.	Jan/2016	Completed	DGAC - Peru CORPAC S.A.	During the first stage for the Lima FMP, ACC, Lima TWR, and provincial units.
4.4. Identify meteorological information that could be shared to assess the impact of meteorological conditions on capacity.	Mar/2016	Completed	CORPAC S.A.	Continuous assessment
4.5. Develop letters of operational agreement between ATFM units for demand/capacity balancing.		Underway	CORPAC S.A.	Initial coordination procedures have been developed between CUSCO FMP and LIMA FMP
4.6. Apply a strategy for the implementation of flexible use of airspace (FUA): a) Assess airspace management processes. b) Improve domestic airspace management for the introduction of dynamic traffic flow changes during the tactical stage. c) Improve ground ATS systems and associated procedures for extending the FUA. d) Dynamic implementation of ATC sectorisation in order to improve demand/capacity balancing for real-time response to changing flow conditions.		Pending	CORPAC S.A. DGAC - Peru	The corresponding studies shall be conducted for the implementation of the flexible use of airspace in Peru.

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
5. **Training**				
5.1. Replicate ATFM implementation courses and workshops provided by ICAO.	Apr/2016	Completed	DGAC - Peru	ATFM seminar/workshop was conducted
5.2. Develop ATFM training plans for the ATM community, including: a) ATFM workshops b) FMP/FMU training c) Training in CDM and A-CDM		Ongoing	DGAC - Peru	To be conducted periodically.
6. **ATFM implementation**				
6.1. Define the required ATFM structure (organisational chart)	Jan/2016	Completed	CORPAC S.A. DGAC - Peru	Structures included in ATFM manuals of both DGAC and CORPAC
6.2. Define the location and implementation of FMP units at the main airports.	Dec/2015	Completed	DGAC - Peru	An FMP was implemented in Lima, the Cusco FMP starts testing period on 17 September 2016
6.3. Declare ATFM implementation by stages. a) Testing stage (6 months) b) Pre-operational stage for the Lima-Cuzco flow (3 months) c) Operational stage (3 months)	Dec/2015	Completed	CORPAC S.A. DGAC - Peru	This statement was made in AIC 15/15, updated in AIP Supplement 18/16.
6.4. Establish a date for starting FMP operations.	25/01/2016	Completed	CORPAC S.A. DGAC - Peru	Testing stage started on 25/01/2016, at present in pre-operational stage.

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
7. System performance monitoring				
7.1. Develop performance indicators in accordance with the CDM manual		Completed	DGAC - Peru CORPAC S.A.	Performance indicators have been developed based on the CDM manual. Other indicators are expected to be developed based on the ATFM system of Peru and available information.
7.2. Develop a performance indicator monitoring programme		Underway		
7.3. Develop an ATFM post-implementation monitoring programme		Underway		

APPENDIX F

PERFORMANCE INDICATORS OF THE ATFM SYSTEM IN PERU

I. USE OF RUNWAY DECLARED CAPACITY

STRATEGIC OBJECTIVE Increase and optimise runway performance		
PERFORMANCE DIRECTIVE	**PERFORMANCE INDICATOR**	**PERFORMANCE MEASUREMENT**
FILL THE GAP BETWEEN OPERATIONAL AND DECLARED RUNWAY CAPACITY AT AIJCH	COMPLIANCE WITH DECLARED RUNWAY CAPACITY	COMPARE NUMBER OF ACTUAL OPERATIONS WITH DECLARED CAPACITY
ANALYSE IMBALANCE BETWEEN NUMBER OF ARRIVALS AND DEPARTURES	OPERATIONAL CAPACITY BELOW OR ABOVE DECLARED CAPACITY	COMPARE NUMBER OF ARRIVALS (BY SCHEDULE, TYPE, AND ORIGIN), AND EFFECT ON OPERATIONAL CAPACITY

Note 1: Runway declared capacity (RDC) of AIJCH - 35 operations at 95%

1. **Compare the actual number of operations with declared capacity:**

1.1. **Daytime shift: 1200-1600 UTC**

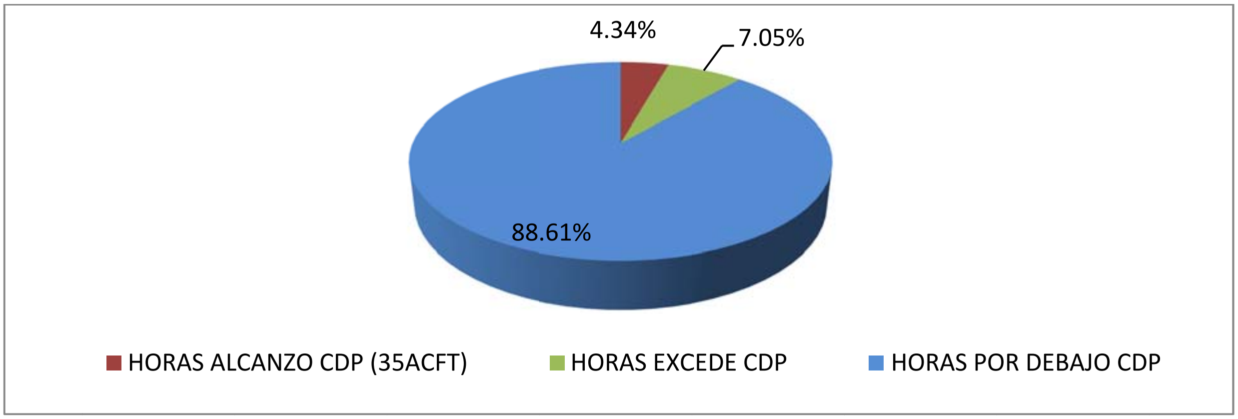
In a total sample of 1220 hours of operation of the Lima FMP, RDC was reached in 4.35% of total, was exceeded in 7%, and remained below in 88.65%. (See table 1 and graph 1)

Table 1 - Compliance with runway declared capacity at AIJCH – daytime shift

	HORAS TOTAL FMP DIA	TOTAL OP FMP DIA	HORAS ALCANZO CDP (35ACFT)	% HORAS ALCANZO CDP (35ACFT)	HORAS EXCEDE CDP	% HORAS EXCEDE CDP	HORAS POR DEBAJO CDP	% HORAS POR DEBAJO CDP
ENERO	155	4317	8	5.16	11	7.10	136	87.74
FEBRERO	145	4025	7	4.83	4	2.76	134	92.41
MARZO	155	4362	8	5.16	12	7.74	135	87.10
ABRIL	150	4169	11	7.33	9	6.00	130	86.67
MAYO	155	4328	3	1.94	7	4.52	145	93.55
JUNIO	150	4031	1	0.67	7	4.67	142	94.67
JULIO	155	4392	10	6.45	16	10.32	129	83.23
AGOSTO	155	4422	5	3.23	20	12.90	130	83.87
TOTAL	**1220**	**34046**	**53**	**4.35**	**86**	**7.00**	**1081**	**88.65**

** Data from SIRSO CORPAC, prepared by the DGAC ATFM team*

Graph 1 - Percent distribution of compliance with runway declared capacity at AIJCH – daytime shift



1.2. **Nighttime shift: 2200-0300 UTC**

For the nighttime shift, a total sample of 1464 hours of operation of the Lima FMP was analysed, 99.66% of which remained below the RDC, and RDC was reached in 0.34%. Consequently, the imbalance between the number of arrivals and departures makes it difficult to optimise RDC.

2. <u>**Compare the number of arrivals (by schedule, type, and origin), and their impact on operational capacity**</u>

2.1. **Nighttime shift: 2200-0300 UTC**

The acceptance rate at AIJCH is 18 arrivals per hour. In a sample of 1464 hours of operation of the FMP, the established rate was reached 7.79% of the time, it was exceeded 17.9% of the time, and was not reached 74.32% of the time. (See table 2 and graph 2)

If the RDC is not achieved, there is airspace congestion due to:

- Arrival/departure imbalance: many arrivals and few departures make it difficult to optimise capacity.
- Originating sector:
  a) Daytime shift: 70% of flow from the South and 30% from the North.
  b) Nighttime shift: 17% of flow from the South and 83% from the North.
- Type of flow:
  a) Daytime shift: 73.3% domestic flow and 26.7% international flow
  b) Nighttime shift: 22.87% domestic flow and 77.13% international flow

Note 2: Domestic traffic is subject to ATFM measures (GDP); inasmuch as possible, priority is given to international traffic.

Table 2 - Compliance with acceptance rate established for the Lima FMP at AIJCH

HORAS TOTAL FMP NOCHE	TOTAL ARR FMP NOCHE	HORAS ALCANZÓ REGIMEN	% HORAS ALCANZÓ REGIMEN	HORAS EXCEDE REGIMEN	% HORAS EXCEDE REGIMEN	HORAS POR DEBAJO DEL REGIMEN	% HORAS POR DEBAJO DEL REGIMEN
186	2575	13	6.99	38	20.43	135	72.58
174	2389	10	5.75	22	12.64	142	81.61
186	2619	13	6.99	26	13.98	147	79.03
180	2636	18	10.00	37	20.56	125	69.44
186	2803	9	4.84	41	22.04	136	73.12
180	2624	14	7.78	31	17.22	135	75.00
186	2808	16	8.60	37	19.89	133	71.51
186	2737	21	11.29	30	16.13	135	72.58
1464	21191	114	7.79	262	17.90	1088	74.32

** Data from SIRSO CORPAC, develped by the DGAC ATFM team*

2.2. **Daytime shift: 1200-1600 UTC**

RDC is optimised during this shift given the balance that exists between the number of scheduled arrivals and departures.

II. COMPLIANCE WITH THE CALCULATED TAKE-OFF TIME (CTOT)

STRATEGIC OBJECTIVE Compliance with ATFM measures		
PERFORMANCE DIRECTIVE	**PERFORMANCE INDICATOR**	**PERFORMANCE MEASUREMENT**
INCREASE THE PERCENTAGE OF FLIGHTS WITHIN THE CTOT	COMPLIANCE WITH THE CTOT	COMPARE THE CTOT WITH ACTUAL TAKE-OFF TIME FOR FLIGHTS SUBJECT TO ATFM MEASURES CALCULATE THE PERCENTAGE OF NON-COMPLIANCE WITH CTOT

Note 1: The Lima FMP has established a CTOT compliance range of -1´/+1´.

1. <u>Compare CTOT with the actual take-off time for flights subject to ATFM measures and assess the percentage of non-compliance with the CTOT</u>

1.1. **Daytime shift: 1200-1600 UTC**

A sample of 3256 flights conducted during the Lima FMP operating hours was taken, of which 1996 flight were subject to a CTOT.

Out of this total, 67.48% complied and the remaining 32.52% missed the assigned time due to events mainly related to the airline or interfacility coordination failures, airspace saturation, and airport infrastructure limitations. (See table 1 and graph 1).

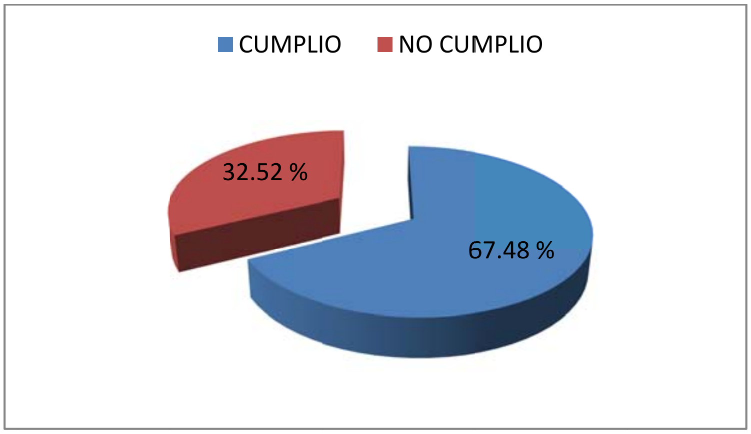
Table 1.- Compliance with the CTOT during the daytime shift

	TOTAL DE VUELOS	SIN TMI (CTOT)	CON CTOT	**CUMPLIO**	**NO CUMPLIO**			**CUMPLIO**	**NO CUMPLIO**
				CTOT 1	CTOT 2	CTOT 3	TOTAL	**%**	**%**
TURNO MAÑANA	3256	1260	**1996**	1347	574	76	650	**67.48**	**32.52**

** Data from the Lima FMP, prepared by the DGAC ATFM team*

Note 2.- CTOT 1 is the first calculated take-off time assigned by the Lima FMP to traffic foreseen to arrive at AIJCH in order to maintain the arrival acceptance rate. CTOT 2 is the second calculated take-off time assigned by the Lima FMP to aircraft that missed their departure turn in CTOT 1. CTOT 3 is the third calculated take-off time assigned to aircraft that missed their last time slot.

Graph 1.- Percentage of compliance with the CTOT – daytime shift



1.2. **Nighttime shift: 2200-0300 UTC**

A sample of 3603 flights conducted during the Lima FMP operating hours was taken, out of which 2559 flights were subject to a CTOT.

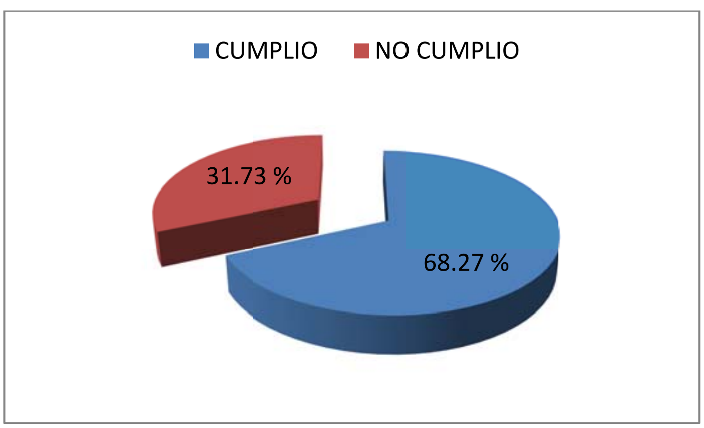
Out of this total, 68.27% complied, and the remaining 31.63% missed the time assigned due to events mainly related to the airline. (See table 2 and graph 2)

Table 2 - Compliance with the CTOT during the nighttime shift

	TOTAL DE VUELOS	SIN TMI (CTOT)	CON CTOT	CUMPLIO	NO CUMPLIO			CUMPLIO	NO CUMPLIO
				CTOT 1	CTOT 2	CTOT 3	TOTAL	%	%
TURNO NOCHE	3603	1044	**2559**	1747	736	76	812	**68.27**	**31.73**

** Data from the Lima FMP, developed by the DGAC ATFM team*

Graph 2 - Percentage of compliance with the CTOT – Nighttime shift



1.3. **Delay due to non-compliance with the CTOT**

When the assigned departure slot is missed, it generates delays for aircraft. However, it is better to absorb the delay on ground instead of in the air, due to fuel consumption, environmental impacts, and airspace saturation.

Table 3 shows the average delay in flights that did not comply with the assigned CTOT.

- Daytime shift: Average delay CTOT 2 of 10 minutes and CTOT 3 of 17 minutes
- Nighttime shift: Average delay CTOT 2 of 10 minutes and CTOT 3 of 15 minutes

Table 3.- Average delay due to non-compliance with the CTOT

SHIFT	NEW CTOT	AVERAGE DELAY
MORNING	CTOT 2	00:10:17
	CTOT 3	00:17:22
NIGHT	CTOT 2	00:10:52
	CTOT 3	00:15:15

** Data from the Lima FMP, developed by the DGAC ATFM team*

III. APPLICATION OF THE SHORT-TOW PROCEDURE

STRATEGIC OBJECTIVE Reduce tow time and improve apron usage at AIJCH		
PERFORMANCE DIRECTIVE	**PERFORMANCE INDICATOR**	**PERFORMANCE MEASUREMENT**
REDUCE DEPARTURE TOW TIME	TOW TIME, IN ACCORDANCE WITH AIRPORT AREA	COMPARE CONVENTIONAL AND SHORT TOW TIMES

1. **Compare conventional and short tow times**

The average time of a short tow is 7 minutes and the average time of a conventional tow is 12 minutes, a saving of 39% in tow time.

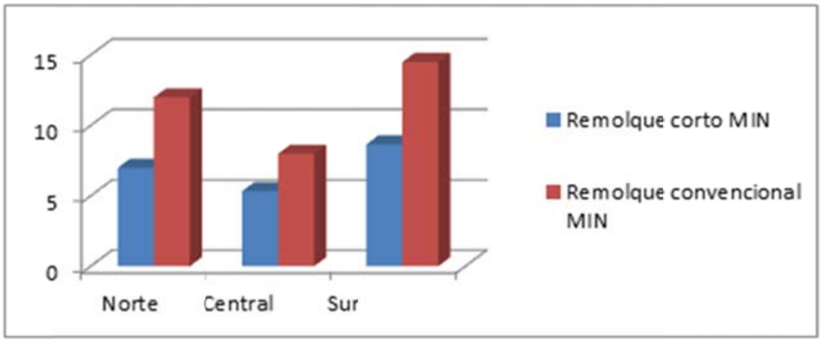
Table 1 shows average apron occupancy time for towing manoeuvres, according to apron sector used. Graph 1 shows the level of optimisation that can be obtained in apron occupancy time with the short tow.

Table 1 - Average reduction in tow manoeuvring times

	Norte	Central	Sur	TOTAL
Remolque corto MIN	7	5	9	7
Remolque convencional MIN	12	8	15	12
Diferencia en minutos	5	3	6	5
Reducción en porcentaje	42%	33%	40%	39%

** Data from LAP, developed by the DGAC ATFM team*

Graph 1.- Comparison between short tow and conventional tow, in minutes



** Data from LAP, prepared by the DGAC ATFM team*

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

4.1 Under this agenda item, the following papers were discussed:

a) WP/06 - *Analysis of activities corresponding to REDDIG II* (presented by the Secretariat);
b) WP/07 - *Follow-up on the implementation of AMHS interconnection* (presented by the Secretariat);
c) WP/08 - *Results of the Seminar/workshop on navigation infrastructure in support of PBN* (presented by the Secretariat);
d) WP/12 - *AMHS interconnections of the Brasilia centre (*presented by Brazil)*;*
e) IP/05 - *ICAO Frequency finder application* (presented by the Secretariat);
f) IP/10 - *AIREON and its distribution via a Pan-Regional Network* (presented by AIREON); and
g) IP/13 - *Seminar on operational data link and PBCS implementation in Argentina* (presented by Argentina).

4.2 The aforementioned working papers covered the following topics:

- Activities carried out under the SAM ATN Architecture Project, D1.
- Activities carried out under the ATN ground-ground and air-ground applications project, D2.
- Other CNS activities

ACTIVITIES CARRIED OUT UNDER THE ATN ARCHITECTURE PROJECT – D1

Status of implementation of REDDIG II

4.3 The Meeting took note of the main activities carried out since the SAMIG/17 meeting concerning:

- REDDIG II node in Brasilia
- Pending REDDIG II activities
- LEVEL 3 ground network
- Training activities and technical-operational meeting
- Security assessment of REDDIG II
- Analysis of REDDIG II connection configuration for SITA data link services
- Migration of the REDDIG II node in Bogota
- MEVAIII/REDDIGII interconnection activities
- Other REDDIG II activities

REDDIG II node in Brasilia

4.4 Since the commissioning of the Brasilia node in April 2016, the AMHS circuit between Brazil and Peru became operational, and the AFTN circuit between Brasilia and Cayenne was commissioned on 3 October 2016, as well as three administrative speech circuits. **Appendix A** to this agenda item contains the configuration of the Cayenne-Brasilia AFTN circuit.

Pending REDDIG II activities

4.5 In order to solve the random freezing problem in some REDDIG II nodes, INEO has been taking the following action:

- Change of LNBs and establishment of redundancy of the 10MHz signal sent by the Skywan equipment to the IBUC equipment, and new LNBs. This was done at six (6) stations: SAEZ-Argentina, SBMN-Brazil, SBRF-Brazil, SOCA-French Guiana, SPIM-Peru, and SEGU-Ecuador. INEO will make the changes in the LNBs of the remaining 11 nodes in view of the improvements obtained with the changes made.

- Re-configuration of the ‘profile’ of the entire Skywan network, which was completed on 20 July 2016, after which the satellite network went into an assessment phase.

4.6 It is expected that INEO will complete all of the aforementioned activities before the end of 2016 so as to proceed with the final acceptance of REDDIG II.

LEVEL 3 ground network

4.7 The REDDIG Administration has programmed and added ‘Active Monitors’ in the monitoring and control application of the Manaus, Ezeiza, and Lima stations, in order to monitor the availability of all Level 3 circuits. The availability of three locations improves accuracy when calculating circuit availability.

4.8 Since January 2016, this tool is being used for calculating monthly (numerical and graphical) availability of each of Level 3 ground circuits, which, in turn, is used for analysing compliance with the respective SLA (Service Level Agreement). Monthly meetings are carried out with a representative of LEVEL 3 either at the Lima Office or through teleconferencing to review SLA compliance.

Training activities and technical-operational meeting

4.9 As part of the training activities in REDDIG II, a basic course on REDDIG II operation and maintenance was held for REDDIG node maintenance personnel that had not participated in the courses conducted by INEO in 2015.

4.10 The basic course for Spanish-speaking States, including Brazil, was held at the facilities of the *Centro de Instrucción, Perfeccionamiento y Experimentación* (CIPE) of ANAC, Argentina, on 5-9 September 2016. The one for English-speaking States was held in Guyana on 26-30 September 2016. Technical personnel of all REDDIG nodes participated, with the exception of Colombia.

4.11 The Fifth technical-operational meeting of REDDIG II (RTO/5) was held *via* WEB teleconferences on 26 July for Spanish-speaking States and on 27 July for non-Spanish-speaking States.

This meeting addressed aspects concerning REDDIG II performance, the review and updating of REDDIG II maintenance and operation procedures, the security assessment of REDDIG and its recommendations.

Security assessment of REDDIG II

4.12 Pursuant to Conclusion SAM/IG/17/01: *Implementation of actions to maintain the security in REDDIG II*, the RTO/5 meeting analysed general aspects concerning REDDIG security, such as the updating of antivirus software in the servers, the classification and analysis of 'threats', and the respective recommendations.

4.13 In July 2016, INEO updated the antivirus software in REDDIG II NMS servers. Some stations had not yet installed the antivirus software in their servers. Consequently, the REDDIG Administration requested at the RTO/5 meeting that they coordinate such installation as soon as possible.

4.14 Likewise, the RTO/5 meeting considered that 'threats' or risks should be classified into two groups, internal and external to REDDIG, as follows:

- Internal level. Potential risk factors to be taken into account and the respective recommendations to eliminate or minimise such factors:

  - LEVEL 3 network
    That the ICAO Office request Level 3 to confirm compliance with standard RFC 5920 concerning the security of its service, using MPLS technology. Regarding RFC 5920, Level 3 informed that rather than defining technical aspects, it defined the best security practices. In this sense, Level 3 noted that all its procedures were based on best practices (see Appendix D to working paper 6)**.**

  - VPN access *via* Internet
    Currently, INEO is using VPN access in a recurrent manner in Manaus, Ezeiza, and Brasilia to resolve network issues or to update equipment configuration, and will continue using this access until final acceptance of the network. After that, all Internet connection cables will be withdrawn from all VPN routers in the network, and access will be on demand. This modality will apply to all VPN routers of the network.

  - Human factors
    The RTO/5 meeting recommended not to copy any file from/to the NMS server using a USB port without first verifying (antivirus scanning) that the portable device ('pen drive') was free of virus.

    Regarding the password to access NMS servers after network acceptance, the REDDIG Administration will change the access passwords of all network servers. Thus, station maintenance personnel will only have access to the equipment of their own station.

- External level

  - This level refers mainly to users and their equipment connected to the REDDIG. In this regard, the RTO/5 highlighted the importance of standardising the REDDIG connection, which would also permit standardisation of security policies in border router/switch units of the States. Using as an example the implementation at the SCEL-Chile station, an explanation was given of the general connection diagram for IP native services, shown in Appendix E to working paper 6**.**

  - The RTO/5 also considered that any radiofrequency interference in REDDIG stations was a ‘threat’ to network operation and security, causing degradation or even disruption of aeronautical communication services. In this sense, it was recommended that attention be paid to any installation by public telecommunication operators in the vicinity of the REDDIG station, and to keep in close communication and coordination with local authorities in charge of managing the radio electric spectrum.

Analysis of the REDDIG II connection configuration for the transmission of SITA data link services

4.15 Pursuant to Conclusion SAM/IG/17/02: *Analysis of REDDIG II connection configuration for the transport of SITA data link services,* the teleconference scheduled for 21 June 2016 was held among REDDIG member States, the REDDIG Administration, and SITA to discuss the proposal submitted by SITA. The corresponding graphical schemes are shown in Appendix F to working paper 6. Likewise, the configuration was discussed at the RTO/5 meeting, giving rise to the following comments:

- SITA does not have any equipment of its own on the client side.
- The connection link (client node-gateway node) is exclusive between REDDIG nodes.
- SITA should install its router(s) ‘behind’ the border router/switch of the gateway node, and not directly to the REDDIG switch.
- For redundancy purposes, SITA requires two (2) simultaneous on-line connections in two (2) gateway nodes. In this regard, the REDDIG Administration noted that it would continue optimising REDDIG resources in terms of use of ports and satellite bandwidth for current and future services to be carried over the network.
- The delegate of Chile noted that Chile would analyse and assess SITA’s proposal, taking into account the overall dual connection scheme locally available in Chile.

4.16 Pursuant to paragraph 4.15, the Meeting noted that in order to maintain high availability of the data link service, two links should be established in REDDIG II: one to the REDDIG II satellite network input routers, and the other to the REDDIG II ground network router. The ground network router is used in REDDIG II for transferring services to the ground network in case of total failure of the REDDIG II satellite network.

4.17 The Meeting considered conducting a teleconference on 2 December 2016 among REDDIG member States, the REDDIG Administration, and SITA for a final review of the REDDIG II connection configuration to carry SITA data link services.

Migration of the REDDIG II node in Bogota

4.18 The activities for the transfer of the REDDIG II node in Bogota have been postponed until the first quarter of 2017 in view of the fact that the aeronautical administration of Colombia had transferred the ATS speech communication services carried over the REDDIG to the new control centre in Bogota, with no need to transfer the existing node. However, this is temporary, since all the equipment installed at the site of the old control centre must be relocated.

MEVAIII/REDDIG II interconnection activities

4.19 Regarding MEVA III/REDDIG II interconnection activities scheduled for late August 2016, an ATS direct speech circuit (hot line (ring down)) was implemented and commissioned between the Maiquetía ACC and the San Juan ACC.

Other REDDIG II activities

4.20 The Meeting was informed by AIREON of the operation of space ADS B and the use of the EUROCONTROL PENS network for the distribution of processed information from satellite ADS B to air navigation service providers interested in that service and that this distribution in the SAM Region could be done through REDDIG II. In this sense, and in order to determine if REDDIG II could support ADS B distribution, the Meeting requested AIREON to send to the ICAO SAM Office the technical requirements, bandwidth, and other considerations to be met by the network. AIREON will analyse the information and will present the results on the next REDDIG II coordination meeting (RCC/20).

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

4.21 The Meeting took note that, since the SAM/IG/17 meeting, the only AMHS interconnection that had been implemented was between Argentina and Venezuela, which was operational since June 2016. With this AMHS interconnection, there were 6 AMHS interconnections already operational in the SAM Region (Peru-Colombia, Peru-Ecuador, Guyana-Suriname, Argentina-Paraguay, Argentina-Venezuela, and Brazil-Peru).

4.22 The Meeting was informed of the status of the remaining AMHS interconnections, as follows:

- ✓ Full P1 connections at the intra-regional level, and positive AMHS operational trials conducted between Argentina-Brazil, Argentina-Peru, Peru-Venezuela, Brazil-Colombia, and Brazil-Venezuela, and positive trials between Chile and Peru.
- ✓ At inter-regional level, full P1 connection and positive operational trials conducted between Brazil and Spain.

- ✓ Initial coordination for the conduction of connectivity trials between Brazil and Paraguay (28 July 2016), Brazil-United States (12 September), and between the SAM and AFI Regions (Recife-Dakar and Ezeiza-Johannesburg) (8 September 2016).

4.23 During the Meeting, the Peruvian delegation described the problem they were having to interconnect the AMHS systems of Peru and Chile, due to the fact that in the CAAS addressing of Chile, the name inserted in PRMD and O does not correspond to that published in the AMC (EUROCONTROL), which was the CAAS addressing scheme adopted in the SAM Region. See http://www2010icaoint/SAM/Pages/ES/eDocumentsDisplay_ESaspx?area=CNS. It was different from the one implemented by Chile in its AMHS system. The names that should appear in PRMD and O are Chile and SCEL respectively. Consequently, the Meeting urged Chile to insert for PRMD and O the names established in the CAAS addressing plan for the SAM Region.

4.24 The Meeting took note that very few States of the Region had nominated candidates to become external operators of the Eurocontrol ATS messaging management centre (AMC). AMC registration can be done through the website http://www.eurocontrol.int/amc.

4.25 In this regard, the Meeting also recalled that parallel to AMC registration, the State must send an official letter to the ICAO SAM Office indicating the name of the person nominated for AMC external operator. A maximum of two persons per State can be nominated for AMC external operators. The candidates to be nominated for AMC external operators must be AMHS operation and AMHS addressing management personnel. In this regard, the Meeting formulated the following conclusion:

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.

4.26 Likewise, the Meeting was informed that, in late August 2016, the Brazilian Administration had finished modernising the Brasilia aeronautical messaging management centre (CTMA-BR), which would be the only aeronautical messaging centre in Brazil. Consequently, the Manaus aeronautical messaging management centre was disabled for international communications in September of this year.

4.27 The new MTA of the CTMA-BR was implemented with a four-server (node) cluster architecture providing high availability and performance for the AMHS 2 system (MTA-SBBR-1). Likewise, as a component of the CTMA-BR, there was a specific server for interconnection testing (*test platform*). **Appendix B** to this agenda item contains the CTMA-BR configuration and its AMHS interconnections with international centres.

4.28 The Meeting took note that the only AMHS interconnection that had been implemented in Brasilia was the one with Lima, with P1 connections with Argentina, Colombia, and Venezuela. Likewise, positive IP connectivity trials have been conducted with Uruguay.

4.29 At inter-regional level, the Meeting took note that the AMHS connection between Brazil and Madrid was in the pre-operational stage, expecting to become operational by November 2016. With respect to the connection between Brasilia and SITA, they were waiting for SITA to establish a link in order to implement the AMHS connection. At present, the United States was analysing the IP addressing to be used in order to proceed with the connectivity tests.

4.30 The Meeting also considered the conduction of a teleconference in mid-November 2016 between Brazil, Guyana, Suriname, and the Secretariat in order to coordinate initial activities for testing the AMHS connection.

4.31 The Meeting took note of initial coordination for the conduction of AMHS connectivity tests between the SAM and AFI Regions (Recife-Dakar and Ezeiza–Johannesburg).

4.32 Finally, the Meeting updated the AMHS interconnection implementation dates, as shown in **Appendix C** to this agenda item, and reviewed the list of AMHS interconnection focal points, as shown in **Appendix D**.

4.33 Pursuant to Conclusion COM/MET/12/03 *Trials of OPMET exchange in digital format* (*XML/GML*) of the COM MET/12 meeting, the Meeting took note that the aeronautical administrations of Brazil and Peru had conducted trials, successfully routing AMHS messages with an attached XML file (uncompressed), AMHS messages with an attached file (compressed using GZIP), and AMHS messages with an attached file (compressed using EXI), and had been able to retrieve the attached messages. The ICAO document shown in **Appendix E** was used for conducting the trials. The OPMET (METAR) message in XML format that was transmitted is shown in **Appendix F.**

Operational integration of international AIDC connections in the SAM Region

4.34 Regarding this activity, the Meeting took note of the progress made in AIDC interconnections. These activities are described in detail under Agenda item 5.

Ground-air applications

4.35 The Meeting took note of a workshop on operational data links that had been held in the city of Accra, Ghana, on 8-12 August 2016, organised by the civil aviation authority of Ghana (GCAA), the ICAO Regional Offices of Dakar, Lima, and Paris, in coordination with the FAA, with the participation of West African States and Argentina, in accordance with letter LN 3/1.4.22 – SA295 circulated to the States.

4.36 The Meeting took note that the purpose of the event had been to advance the provision of air traffic services in the South Atlantic Region, providing information on the results of ADS-C/CPDLC system operation and monitoring. It had also presented the concepts and guidelines for the implementation of Performance-based communications and surveillance (PBCS) and its continuous monitoring during the operational phase.

4.37 The delegate of Argentina noted that, in order to strengthen the use of data link, a new edition of the Workshop on operational data link was being organised by the National civil aviation organisation of Argentina, with the cooperation of the FAA, and which was to be held in Buenos Aires, Argentina during the first half of 2017. Other members of the aeronautical community of the Region (air navigation service providers, operators, industry) would be invited to participate.

OTHER CNS ASPECTS

Navigation infrastructure in support of PBN

4.38 The Meeting took note of the results of the seminar/workshop on the implementation of navigation infrastructure in support of PBN and GNSS precision approach operations in the NAM/CAR/SAM Regions, which was held in Lima, Peru, on 15-17 August 2016. It then went on to approve the final recommendations and conclusions of the seminar/workshop, which are shown in **Appendix G** to this agenda item.

Use of the ICAO "Frequency Finder"

4.39 The Meeting took note of the "Frequency Finder", which is an ICAO application to assist States and Regional Offices in the assignment of frequencies. This application would replace the existing regional database developed in ACCESS for COM1, 2, and 3 lists used in the CAR/SAM Regions.

4.40 The Meeting was informed that the Tenth coordination meeting of Project RLA/06/901 (RCC/10, 25-26 August 2016) approved the conduction of a workshop on the use of the tool, to be held in early March 2017. For this event, there were 11 fellowships available for Project RLA/06/901 member States.

AeroMACS Aeronautical mobile airport communication system

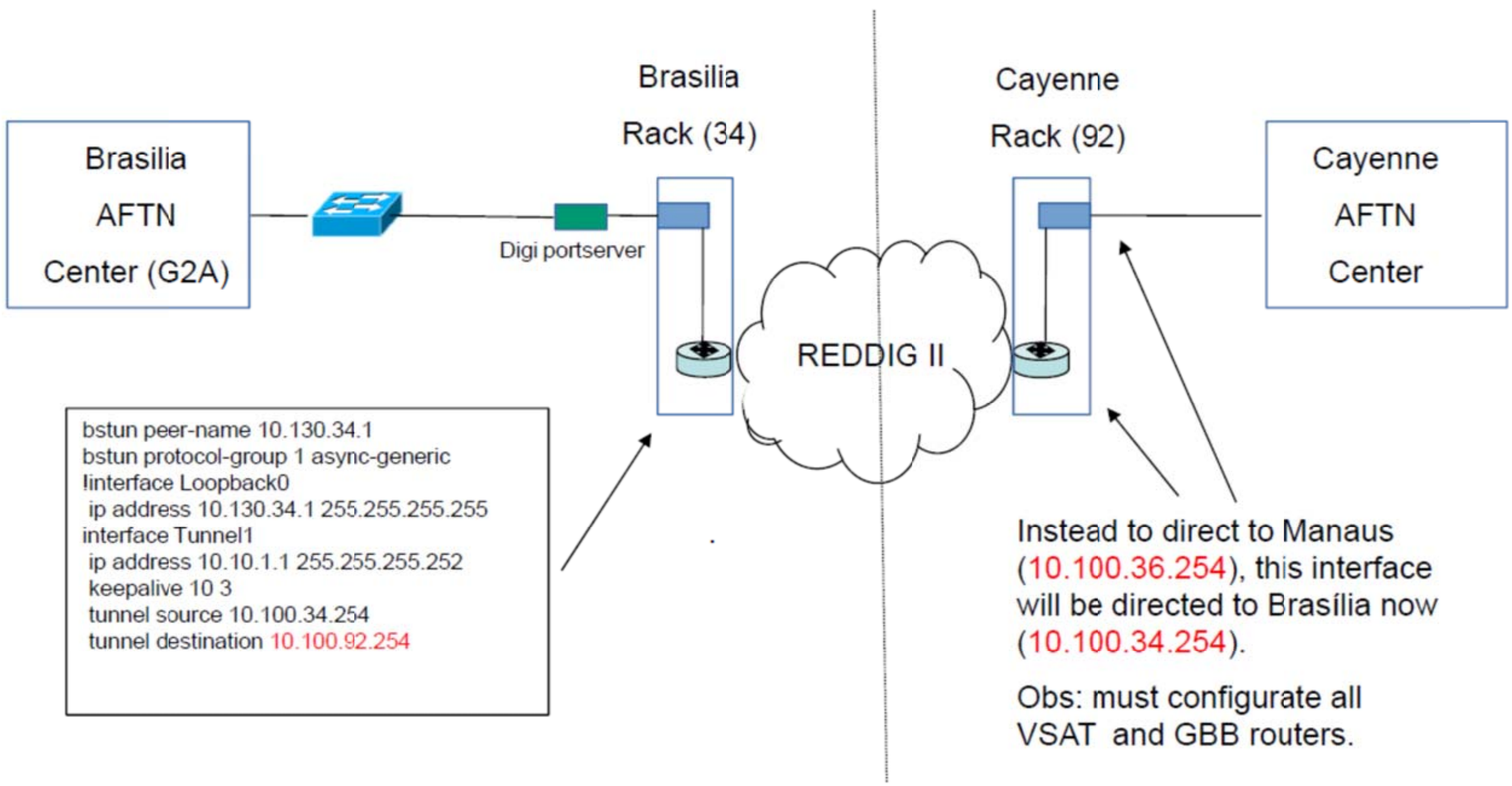
4.41 NASA, as a member of the Wimax forum, made a presentation on an aeronautical mobile airport communication system (AeroMACS) that used wireless technology for surface communications at airports having a large volume of ground movement.

4.42 The Meeting was informed that Amendment 90 to Volume III of Annex 10, effective on 10 November 2016, introduces the AeroMACS.

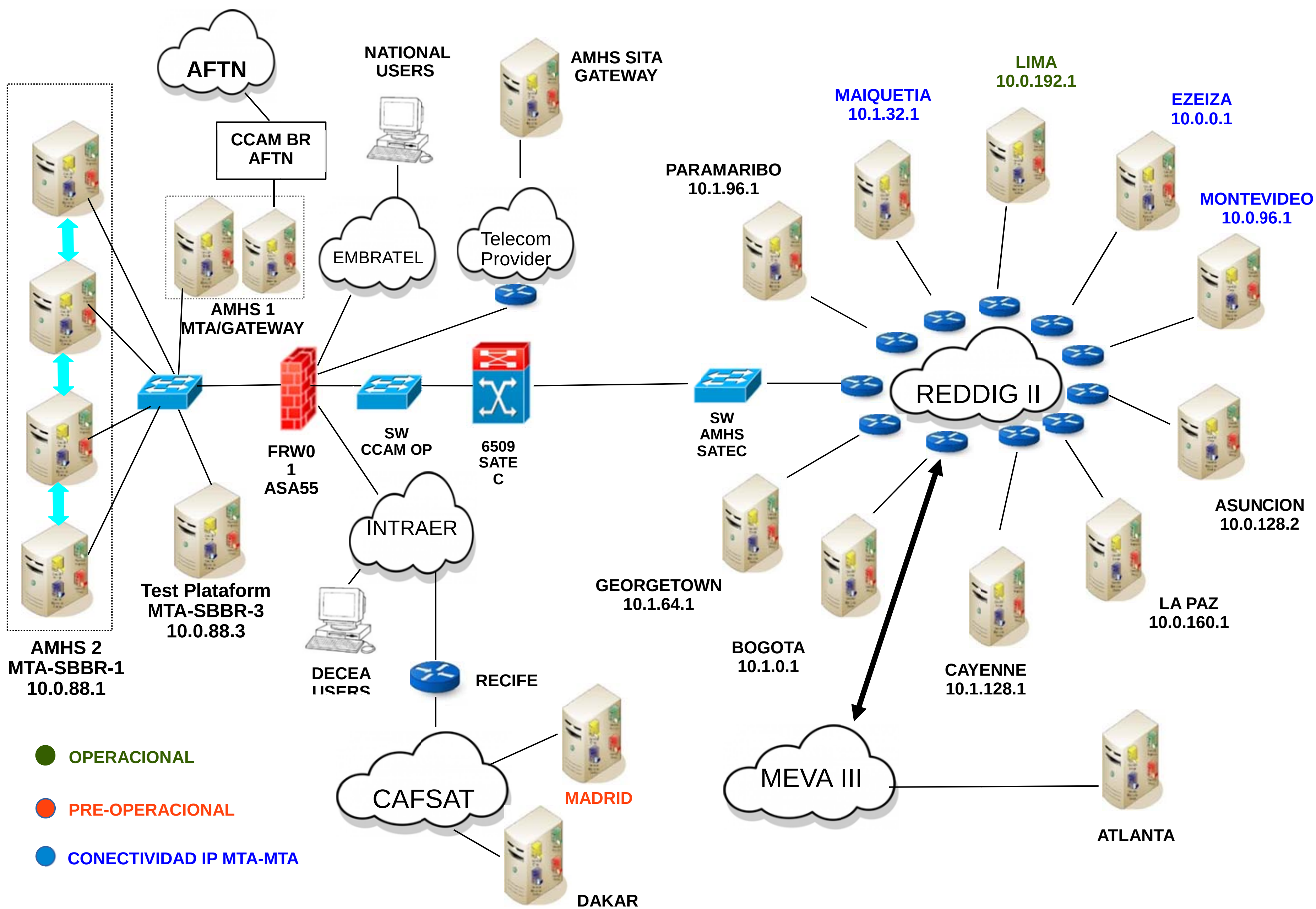
APPENDIX A

AFTN Circuit

Brasilia/Cayenne



APPENDIX B
Centro AMHS de Brasília



APPENDIX C

AMHS INTERCONNECTION REQUIREMENT AND DATE OF IMPLEMENTATION

<table>
<tr><th>STATES</th><th>AMHS INTERCONNECTION REQUIREMENTS</th><th>DATE OF IMPLEMENTATION</th><th>COMMENTS</th></tr>
<tr><td rowspan="7">Argentina</td><td>Bolivia</td><td>Dec 2016</td><td></td></tr>
<tr><td>Brazil</td><td>October 2016</td><td>Pending operational implementation. Final operational tests for AMHS interconnection between Brasilia and Ezeiza were successfully completed on 18 May 2016. Beginning of implementation on 25 October.</td></tr>
<tr><td>Chile</td><td>Dec 2016</td><td></td></tr>
<tr><td>Paraguay</td><td>Mar 2012</td><td>Implemented and operational</td></tr>
<tr><td>Peru</td><td>Nov 2016</td><td>Positive P1 connectivity between MTA Ezeiza y MTA Lima (March 2016). Pending operational tests. Operational test re-starting on first week November.</td></tr>
<tr><td>Uruguay</td><td>Dec 2016</td><td>Connectivity in Protocol P1 level between MTA Ezeiza – Montevideo achieved, pending Montevideo – Ezeiza tests (March 2016). Connectivity tests will continue on the second week of November.</td></tr>
<tr><td>Venezuela</td><td>June 2016</td><td>Implemented and operational</td></tr>
<tr><td rowspan="3">Bolivia</td><td>Argentina</td><td>Dec 2016</td><td></td></tr>
<tr><td>Brazil</td><td>Dec 2016</td><td></td></tr>
<tr><td>Peru</td><td>Dec 2016</td><td></td></tr>
<tr><td rowspan="8">Brazil</td><td>Argentina</td><td>Oct 2016</td><td>Pending operational implementation. Final operational tests for AMHS interconnection between Brasilia and Ezeiza were successfully completed on 18 May 2016. Implementation begins 25 October.</td></tr>
<tr><td>Bolivia</td><td>Dec 2016</td><td></td></tr>
<tr><td>Colombia</td><td>Dec 2016</td><td>Connectivity in Protocol P1 level between Brasilia and Bogota achieved (October 2016)</td></tr>
<tr><td>Guyana</td><td>Dec 2016</td><td>Brazil submitted proposal for tests. Pending reply from Guyana.</td></tr>
<tr><td>French Guiana</td><td>TBD</td><td></td></tr>
<tr><td>Paraguay</td><td>Oct 2016</td><td>Tests of P1 interconnectivity started mid July 2016 MTA. Connectivity tests will continue on 1 November.</td></tr>
<tr><td>Peru</td><td>Dec 2015</td><td>Implemented and operational 14 December 2015</td></tr>
<tr><td>Suriname</td><td>Dec 2016</td><td>Brazil submitted proposal for tests.
Pending reply from Suriname.</td></tr>
</table>

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
Chile	Uruguay	Dec 2016	IP connectivity completed. (First week October 2016).
	Venezuela	Dec 2016	Connectivity in Protocol P1 level between Brasilia and Caracas achieved (October 2016)
	Spain	Sep 2016	Pending operational implementation. Operational tests successfully completed. Connection made through CAFSAT. Spain is updating its AMHS system. Operational implementation will follows.
	United States	Mar 2017	Technical coordination began May-Sep 2016. IP configuration under assessment by FAA.
	Argentina	Dec 2016	
	Peru	Dec 2016	Positive test made on early October 2016. For the commissioning Chile is making changes in the name of fields PRMD and O in the CAAS addressing
Colombia	Brazil	Dec 2016	Connectivity in Protocol P1 level between Brasilia and Bogota achieved (October 2016).
	Ecuador	Dec 2016	
	Panama	Dec 2016	
	Peru	Sep 2010	Implemented and operational
	Venezuela	Dec 2016	
Ecuador	Colombia	Dec 2016	
	Peru	Julio 2012	Implemented and operational
	Venezuela	Dec 2016	
French Guiana (France)	Brazil	TBD	AMHS pending implementation
	Venezuela	TBD	AMHS pending implementation
Guyana	Brazil	Dec 2016	Brazil submitted proposal for tests. Pending reply from Guyana.
	Suriname	Jun 2011	Implemented and operational
	Venezuela	Dec 2016	
Panama	Colombia	Dec 2016	
Paraguay	Argentina	Mar 2012	Implemented and operational
	Brazil	Oct 2016	IP interconnectivity tests began mid July 2016. Connectivity tests will continue on 1 November
Peru	Argentina	Nov 2016	Positive P1 connectivity between MTA Ezeiza y MTA Lima (March 2016). Operational test restarting first week November
	Bolivia	Dec 2016	
	Brazil	Dec 2015	Implemented 14 December 2015

STATES	AMHS INTERCONNECTION REQUIREMENTS	DATE OF IMPLEMENTATION	COMMENTS
	Chile	Dec 2016	Positive test made on early October 2016. For the commissioning Chile is making changes in the name of fields PRMD and O in the CAAS addressing.
	Colombia	Sep 2010	Implemented
	Ecuador	Jul 2012	Implemented
	Venezuela	Oct 2016	Positive P1 connectivity between MTA Lima y MTA Maiquetia. Pending operational tests
Suriname	Brazil	Dec 2016	Brazil submitted proposal for tests. Pending reply from Suriname.
	Guyana	Jun 2011	Implemented and operational
	Venezuela	Dec 2016	
Uruguay	Argentina	Dec 2016	Positive P1 connectivity between Ezeiza and Montevideo achieved. Pending tests between Montevideo and Ezeiza (March 2016). Connectivity tests will continue on the second week of November.
	Brazil	Dec 2016	IP connectivity tests completed.
Venezuela	Argentina	Jun 2016	Implemented and operational
	Brazil	Dec 2016	Connectivity in Protocol P1 level between Brasilia and Caracas achieved (October 2016)
	Colombia	Dec 2016	
	Ecuador	Dec 2016	
	Guyana	Dec 2016	
	French Guiana	TBD	AMHS pending implementation
	Peru	Jun 2016	Positive P1 connectivity between MTA Lima y MTA Maiquetia. Pending operational tests
	Suriname	Dec 2016	

APÉNDICE D / APPENDIX 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	DGCTA/ANAC	Javier Vittor	Especialista CNS EANA	(54 11) 4480-2362 (54 911) 6894-0692	javiervittor@gmail.com
		Javier Schenk	Jefe Departamento CNS EANA	+549 11 5848 6936	Jschenk@eana.com.ar
		Moira Callegari	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	Francisco Almeida	Jefe de División de Coordinación técnica SDTE/DECEA	(55 21) 2101-6461 (55 21) 99499-6762 (5521) 98552-0829	franciscoalmeida@hotmail.com
		Tomy Marques de Souza	Asesor de comunicaciones	(21) 21016392 (5521)982547971	tomytms@decea.gov.br
COLOMBIA	UAEAC	Gabriel Guzmán	Especialista de Comunicaciones	(571) 296-2940 (57) 317-656 7202	gabriel.guzman@aerocivil.gov.co
CHILE	DGAC	Christian Vergara	Especialista comunicaciones	(56 2) 2836-4005 (56 2) 2644-8345	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

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
GUYANA FR.	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)	Daniel de Avila	Supervisor Dep. de COM	(507) 315 9877/78/44	ddavilah@hotmail.com
		Abdiel Vásquez	Jefe Depart. CNS	(507) 315-32/78/44	abvasquez@aeronautica.gob.pa
PARAGUAY	DINAC	Víctor Morán Maldonado	Jefe Departamento de Comunicaciones	(595 21) 758 5208 (595 21) 758 5252 (595 21) 758 5286	moranchu@gmail.com
		Alejandro Ibarrola	Jefe sección AMHS		aleiba40@gmail.com
PERÚ	CORPAC	Jorge Garcia	Jefe de Comunicaciones	(511) 2303131	jgarcia@corpac.gob.pe
		Raúl 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	Wilson Pelayo	Jefe de Comunicaciones	(598) 26826224	wiledda@hotmail.com
VENEZUELA	INAC	Samuel Sánchez	Jefe coordinación AMHS		s.sanchez@inac.gob.ve
		Norelys Blanco	Servicios Integrados COM Maiquetía (SIM-COM)	(58 212) 3552010	norelys.blanco@inac.gob.ve

APPENDIX E

(Draft) IWXXM Bi-Lateral Testing
using
File Transfer Body Part (FTBP)

Project Test Plan

Version: 1.0

REVISION HISTORY

ID	***Date***	***Revised By***	***Summary of Changes***

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

This Project Test Plan provides the strategy for evaluating the readiness of the system components required for the exchange and application of International Civil Aviation Organization (ICAO) Operational Meteorological (OPMET) information encoded in eXtensible Markup Language (XML) format. This plan documents the project scope, responsibilities, tasks and schedules required in testing the bi-lateral exchange of ICAO XML OPMET information using the ICAO Weather Information Exchange Model (IWXXM).

1.2 Project Background

In November of 2013, amendments to ICAO Annex 3 – *Meteorological Service for International Air Navigation* and WMO Document No. 49 were made allowing the bi-lateral exchange of four OPMET products (i.e., METAR, SPECI, TAF, and SIGMET)[1] in XML, between states in a position to do so. Concurrently the IWXXM 1.0 was released, which is an XML representation of those OPMET products. The current plan for implementing the exchange of XML products is based on the ICAO three year amendment cycle:

> **November 2016** - ICAO Annex 3 amended to make the exchange of XML products a recommended practice. Additionally, more ICAO Annex 3 products will be allowed to be exchanged in XML
>
> **November 2019** - ICAO Annex 3 amended to make the exchange of XML products a mandatory practice. Additionally, the remaining ICAO Annex 3 products will be allowed to be exchanged in XML

IWXXM has not been tested for operational readiness in a bi-lateral fashion. As part of the activities under the MIE a suite of tests should be developed to discover operational issues prior to 2016 when IWXXM exchange becomes a recommended practice.

In support, a Concept of Operations for the Transition of OPMET Data Exchange using IWXXM to enable System-Wide Information Management (SWIM) has been developed by the European Data Management Group (DMG) [Ref A]. The proposed bi-lateral testing will verify the feasibility of the DMG concepts and help identify implementation issues for consideration.

Currently ICAO OPMET data is exchanged in TAC format using AFTN/CIDIN or AMHS (basic service). The format of the OPMET data is limited to fit within traditional AFTN messaging limitations. Whilst this has met the needs of the Aviation community it is not possible to exchange more Modern XML format messaging.

1.3 Test Scope

The goal of the bi-lateral testing activity is to implement an operational prototype environment that would be used to:

- identify any limitations in the IWXXM model that can be discovered through pseudo-operational bi-lateral exchanges

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1

Per ICAO Doc 8400 – *Procedures for Air Navigation Services, ICAO Abbreviation and Codes*: METAR = Aerodrome routine meteorological report. SPECI = Aerodrome special meteorological report. TAF = Aerodrome forecast. SIGMET = Information concerning en-route weather phenomena which may affect the safety of aircraft operations

- track and feed discovered limitations back to the responsible groups for resolution (such as the IWXXM developer group)
- serve as a basis for evaluating the concepts and procedures of the operational environment that will eventually be implemented
- engage with OPMET organizations to increase communication and awareness regarding upcoming changes
- Provide validated answers to some of the questions raised in the CONOPS

The prototype environment is needed for initial testing for the 2016 rollout. In addition, it may also be useful in future phases of IWXXM testing as updates are made to the IWXXM model.

The testing environment should be as close to the operational environment as practical:

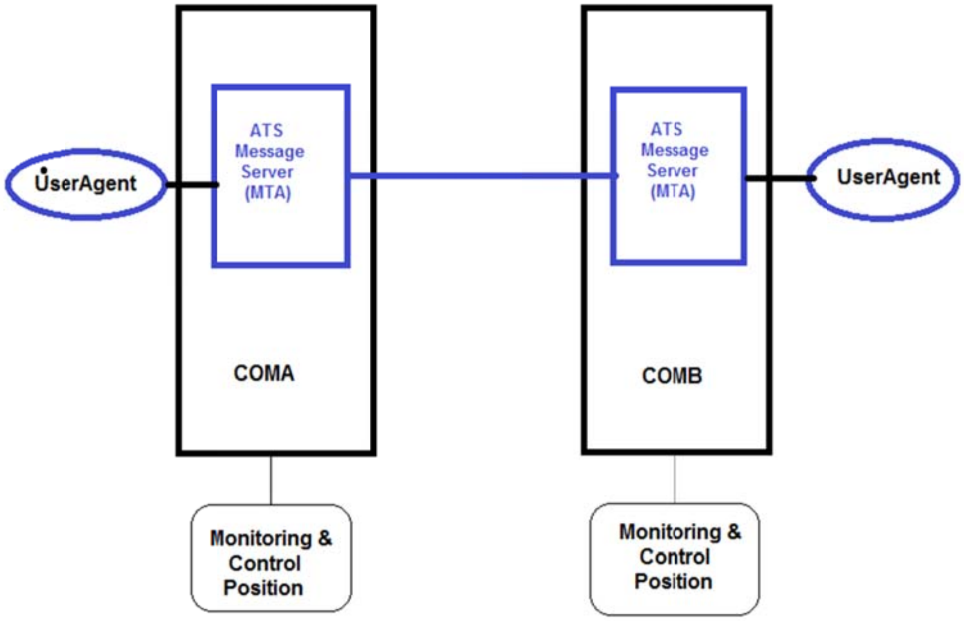
- involving the operational organizations who will be responsible for IWXXM; or those who are responsible for producing and consuming OPMET information which is currently encoded in the Traditional Alphanumeric Code (TAC)
- using protocols and methods (such as network infrastructure) as similar as possible to that envisioned for future XML exchanges

1.4 IWXXM Bilateral Testing

The message exchange testing with international and national partners should proceed in phases. The objectives of each phase are outlined in Section 1.4.2. The details for each test phase are contained the Annexes A-D.

1.4.1 Project Test System

Both test systems should have operational AMHS link, and P1 connection setup. Two User Agents should be used to exchange traffic with File Transfer Body Part. The User Agent can be either a P3 or P7 User Agent. The testing environment is as shown in the figure below:



Network Analysis software can be used to monitor X.400 traffic and its effect on network Bandwidth. The software can be agreed on prior the test.

1.4.2 Test Phases

1.4.2.1 Phase I – Communications Capability Verification

Phase 1 will test whether the AFS network infrastructure is capable of passing XML/IWXXM messages. Testing network infrastructure is not the primary focus of testing, but it is an important prerequisite for IWXXM testing. Static (not real time) IWXXM messages for each product would be exchanged across the circuits in the simplest manner.

Note 1: *These can be retrieved from various internet sources.*
Note 2: *Messages would ideally be passed over the network in World Meteorological Organization (WMO) Collections as defined in the IWXXM 1.0, similar to WMO bulletins today with the Traditional Alphanumeric Code (TAC) messages.*

The required AMHS infrastructure required is an AMHS UA connected to an MTA in one state, and a UA connected to an MTA in another state. The 2 MTA's should be interconnected. It is desirable that the MTA's are in a non-operational environment, but with correct addressing this could be achieved over an operational network.

This phase will comprise two stages.

1.4.2.1.1 Stage One

Messages could initially be passed in an uncompressed XML form these do not necessarily need to be iWXXM messages. This would demonstrate AMHS's capability to exchange the full XML character set.

1.4.2.1.2 Stage Two

Once this is successful they would be transmitted in a compressed form using GZIP[2] and Efficient XML Interchange (EXI) compression or whatever format is prescribed by ICAO. The compressed XML data will be exchanged in an AMHS FTBP. Messages will be transmitted both directions.

IMPORTANT NOTE: *It is understood that certain ICAO Regions have undertaken this testing already. Successful completion of such tests, means that testing can begin with Phase II.*

1.4.2.2 Phase II – IWXXM Encoding and Exchange Verification

Phase II expands Phase 1 to include real-time data and traffic volumes. It should also test file extensions, traffic flooding, compression techniques etc. OPMET products, METAR, SPECI, TAF, SIGMET will be exchanged bi-laterally encoded as XML. This phase would verify that real data can be exchanged in real-time and as well identify and correct any system errors (IWXXM and/or TAC converters) prior to operational use. Where the above cannot be done, an alternative option is provided below. Regardless of the approach taken the testing shall be as per the next two following steps:

Creation and Use (Host state -> International Partner):
Information is created as normal TAC messages by the Host State. These are converted to IWXXM for international distribution and then placed onto international circuits by the Host State. The messages are then received by International Partner.

Creation and Use (International Partner -> Host State):
Messages are passed to the Host State as IWXXM messages across international circuits (AHMS) as FTBP. These messages are integrated into Host State systems and operational consumers review the information and assess its correctness and utility.

Alternative option:
If a test network is not available or if real time data or the means to simulate realistic traffic volumes are not available. The above tests can be performed by sending between 20 and 50 messages directly from a message queue. In this case it will be critical to monitor network and system response times to allow a post-analysis to be performed to assess the network impact. This should be carefully monitored to ensure that live traffic is not adversely affected.

1.5 Reference Materials

A. *Concept of Operations for the Transition of OPMET Data Exchange using IWXXM to enable SWIM, Version V2.2, 15 July 2014, ICAO Meteorological Group in Europe (METG), European Data Management Group (DMG).*

B. *ICAO Annex 10 – Aeronautical Telecommunication; Vol. II, Communication Procedure*

C. *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), First Edition – 2010*

D. *EUR Doc 020 – AMHS Manual*

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2 GZIP is a file format and a software application used for file compression and decompression

2. PROJECT MANAGEMENT AND OVERVIEW

TBD

ANNEX A: PHASE 1 – COMMUNICATIONS CAPABILITY VERIFICATION

Phase 1 will test whether the network infrastructure is capable of passing XML/IWXXM messages. Testing network infrastructure is not the primary focus of testing, but it is an important prerequisite for IWXXM testing. Static (not real time) XML messages would be exchanged across the circuits in the simplest manner demonstrating the FTBP capability in AMHS.

Messages would initially be passed in an uncompressed XML form. Once this is successful they would be transmitted in a compressed form using the defined compression method possibly GZIP and EXI compression. Messages will be transmitted both directions.

A-1: Steps

1. Create static example of an XML message (preferably a METAR/TAF or SIGMET).

   a. For additional testing these could be in XML, GZIP compressed XML, and EXI compressed XML, embedded in a WMO XML Collection.

2. Create test circuit or identify operational circuit for testing with International Partners via AMHS
3. Exchange and verify correct message structure of static example messages in XML
4. Exchange, decompress, and verify GZIP-compressed static messages
5. Exchange, decompress, and verify EXI-compressed static messages
6. Compile test results and also describe the capabilities of AFTN and AMHS to distribute compressed and uncompressed XML messages.
7. Compile test results and describe the implications of observed XML data volumes on AMHS circuits.

A-2: Test Criteria/Metrics:

In-depth network or detailed protocol tests are out of scope. Phase I is included as a way to identify network issues separately from other issues. The primary purpose of the overall bi-lateral testing is to demonstrate AMHS's capability to meet the requirements to be able to exchange IWXXM product into the future.

Test Results are to be captured in the Test Report Form, given in Appendix C.

TEST REPORT FORM – PHASE 1			
Task	**Description/Result**	**Date**	**Performed By:**
Test Partners Identified			
Establish Test Circuit(s)			
Description (UAs, MTAs, intermediate switching centres, etc;)			
- Protocol(s)			
- Speed(s)			
Execute Test Plan			
Stage 1 - XML			
- iWXXM (Yes/No?)			
- Message Types			
- Message Volumes			
- Results			
Stage 2 - EXE			
- Message Types			
- Message Volumes			
- Results			
Stage 2 - GZIP			
- Message Types			
- Message Volumes			
- Results			
Results/Observations			

ANNEX B: PHASE II – IWXXM ENCODING AND EXCHANGE VERIFICATION

Phase II will expand Phase I to include real-time data. All four IWXXM products (METAR, SPECI, TAF, SIGMET) would be exchanged bi-laterally with data encoded as XML. This phase would verify that real data can be exchanged in real-time with all the variances and corner cases of the true operational environments.

Creation and Use (Host State-> International Partner):
METAR/SPECI, TAF and SIGMET as provided in TAC are converted to IWXXM for international distribution, which is placed onto the test international circuits, to demonstrate AMHS capability to meet the traffic volumes required, message flood scenarios should be introduced.

Creation and Use (International Partner -> Host State):
Messages are passed to the participant as IWXXM via AMHS as FTBP and are integrated into systems User Agents to look at the information and assess its correctness and utility.

B-1: Schedule

- Set up computing hosts, infrastructure.
- Create and test AMHS interconnection for bi-directional communications of XML messages
- Get real time IWXXM data (METAR, SPECI, TAF, SIGMET) data feeds running.
- Validate network and protocol capability to exchange high volumes of data this will look at virus checking, security, timeliness etc.

B-2: Test Criteria/Metrics:

Test Results are to be captured in the Test Report Form, given in Appendix C.

TEST REPORT FORM – PHASE 2			
Task	**Description/Result**	**Date**	**Performed By:**
Test Partners Identified			
Establish Test Circuit(s)			
Description (UAs, MTAs, intermediate switching centres, etc;)			
- Protocol(s)			
- Speed(s)			
Execute Test Plan			
Step 1 – TAC converted to IWXXM			
- Message Types			
- Message Volumes (low)			
- Results			
- Message Types			
- Message Volumes (high)			
- Results			
Step 2 – IWXXM as FTBP			
- Message Types			
- Message Volumes (low)			
- Results			
- Message Types			
- Message Volumes (high)			
- Results			
Alternative Option -			
- Message Types			

TEST REPORT FORM – PHASE 2			
Task	**Description/Result**	**Date**	**Performed By:**
- Message Volumes (low)			
- Results			
- Message Types			
- Message Volumes (high)			
- Results			
Results/Observations			

APPENDIX F

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APPENDIX G

INTERNATIONAL CIVIL AVIATION ORGANIZATION
South American Regional Office

SEMINAR/WORKSHOP FOR THE IMPLEMENTATION OF NAVIGATION INFRASTRUCTURE TO SUPPORT PBN AND GNSS PRECISION APPROACH OPERATIONS IN THE NAM/CAR/SAM REGIONS

SUMMARY

Lima, Peru, from 15 to 17 August 2016

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HISTORY

ii-1 PLACE AND DURATION

The Workshop/Seminar for the Implementation of Navigation Infrastructure to Support PBN and GNSS Precision Approach Operations in the NAM/CAR/SAM Regions was held at the ICAO South American Regional Office, Lima, Peru, from 15 to 17 August 2016.

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/Seminar was conducted from 08:30 to 15:00 hours.

The Meeting had two Secretaries: Mr. Onofrio Smarrelli, Regional CNS Officer of the Lima Regional Office, and Miss Mie Utsunomiya, Regional CNS Officer of the Mexico Regional 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 48 participants from 18 CAR/SAM States (Argentina, Aruba, Bolivia, Brazil, Chile, Colombia, Cuba, United States, France, Jamaica, Mexico, Panama, Peru, Dominican Republic, Suriname, Uruguay, and Venezuela), one International Organization (COCESNA), as well as representatives from AERODATA AG, AEROLINEAS ARGENTINAS, BOEING, INVAP, HONEYWELL, MIRUS TECHNOLOGY, NAVBLUE, THALES ALENIA SPACE, and Universidad de la Plata (Argentina), in addition to ICAO Officers. The list of participants appears in **Appendix B.**

1 SUMMARY OF THE WORKSHOP

1.1 Objective

1.1.1 The objective of the workshop was to provide technical and operational information to the States, air navigation service providers (ANSPs), and users for the effective implementation of air navigation infrastructure to support PBN and GNSS precision approach operations.

1.1.2 The workshop was designed to support the implementation of Aviation System Block Upgrade (ASBU) B0 modules, mainly: B065/APTA-Optimization of approach procedures including vertical guidance, B0-10/ FRTO Improved operations through enhanced en-route trajectories, B0-05/CDO: Improved flexibility and efficiency in descent profiles, and B0-20/CCO Improved flexibility and efficiency in departure profiles - Continuous climb operations.

1.2 Introduction

1.2.1 The workshop was conducted in six sessions, as follows:

- Session 1: Global and regional implementation considerations of the navigation infrastructure to support PBN and GNSS precision approach operations in the NAM/CAR/SAM Regions
- Session 2: ICAO standards and recommended practices (SARPS) and documentation on the navigation infrastructure to support PBN and GNSS precision approach operations
- Session 3: Current status and evolution of GNSS
- Session 4: Ionospheric and tropospheric effects on GNSS
- Session 5: Ground and flight testing considerations
- Session 6: Final recommendations and conclusions

1.2.2 Twenty eight presentations were made and posted on the following website: http://www2010.icao.int/SAM/Pages/MeetingsDocumentation.aspx?m=2016-PBNGNSS

1.3 Global and regional implementation considerations of the navigation infrastructure to support PBN and GNSS precision approach operations in the NAM/CAR/SAM Regions.

1.3.1 In this session, two presentations were made: P/02, in which ICAO reported on Global Air Navigation Plan considerations on the navigation infrastructure to support PBN, including an explanation of the benefits of PBN implementation, the global status of PBN implementation and the way forward. This presentation focused on the global perspective of PBN, but also provided information on regional coordination and support, which would expedite PBN implementation in the CAR/SAM Regions.

1.3.2 In the other presentation (P/03), ICAO informed on regional planning, strategies and implementation of navigation infrastructure to support PBN and GNSS precision approach operations in the NAM/CAR/SAM Regions, according to the requirements of the Regional Air Navigation Plan (Document 8733 eANP), GREPECAS, and the Performance-based Implementation Plan.

1.4 ICAO standards and recommended practices (SARPS) and documentation on the navigation infrastructure to support PBN and GNSS precision approach operations

1.4.1 In this session, two presentations were made: P/04, in which ICAO presented its SARPs and the documentation on navigation infrastructure to support PBN. This presentation introduced ICAO SARPs and guidance materials related to PBN operations and navigation aid infrastructure to support PBN. Focusing on the performance-based approach and following the ASBU framework that assigns top priority to PBN, these documents are useful guidance for PBN planning, implementation and validation.

1.4.2 In the second presentation (P/05), ICAO shared some considerations regarding the frequency spectrum for navigation use, such as frequency registration and coordination, radio navigation frequency allocation, separation criteria, ICAO documents and results of the WRC 15.

1.5 Current status and evolution of GNSS

1.5.1 In this session, 12 presentations were made, 6 of them related to the ground-based augmentation system (GBAS), 4 on the satellite-based augmentation system (SBAS), and two on RAIM availability prediction.

Ground-Based Augmentation System (GBAS) presentations

1.5.2 Presentation P/06, by Benoit Roturier, of DSNA from France, dealt with the status of GBAS Cat I station deployment worldwide and the complexity of implementing Cat I GNSS procedures, compared to basic GPS approach procedures. The presentation reported that a small number of GBAS certified stations had been deployed so far (less than 10) and that the number was not expected to increase significantly in the near future (with the possible exception of Russia) due to: 1) current deployments of ILS systems in potential GBAS airports, and 2) additional GBAS infrastructure costs. On the other hand, major aircraft manufacturers have made huge efforts to equip different types of aircraft with GBAS, which has led to about 1200 users of GBAS-enabled avionics today.

1.5.3 Presentation P06 also introduced the new GBAS Cat II/III SARPs being developed by ICAO, and the regional efforts being made, such as SESAR in Europe. The ICAO Navigation System Panel (NSP) has been finalizing the first generation of Cat II/III standards based on the GPS L1 signal alone. To increase the robustness and availability of GBAS, especially in equatorial regions, consideration has been given to the possibility and need for a second generation of Cat II/III standards, based on dual frequency (L1/L5) and multi-constellation.

1.5.4 The presentation also showed a study conducted by France to assess the operational benefits of GBAS Cat II/III at Paris CDG, where currently 8 ILS units support A/L operations. The aim is to increase airport capacity under ILS operations using low visibility procedures and/or to reduce ILS infrastructure costs. Several scenarios were investigated, such as a segregated GBAS runway, or the need for specific approach sequencing tools, but the study could not quantify the benefits of introducing GBAS, since the level of fleet mix (ILS- *vs* GBAS-equipped) to be managed by still inexistent ATM tools played a major role there. CDG operational teams did not support the notion of a GBAS specialized runway due to its complexity, nor of removing ILS, until the fleet was 100% GBAS.

1.5.5 In P/07, Carlos Rodriguez from the FAA informed that GBAS CAT I had been implemented at Newark and Houston and was used on a daily basis by domestic and international air carriers. FAA was working closely with the international community to complete the validation of GAST-D (CAT III) standards, and with Honeywell on the design approval of their GAST-D system. In addition, FAA was reviewing the benefits of advanced GBAS capabilities (extended service volume, reduced RVR, RNP to GLS, variable glide path/displaced threshold operations). He noted that the FAA maintained a close relationship with international service providers and the user community by co-chairing the International GBAS Working Group with Eurocontrol.

1.5.6 Alessander Santoro from Brazil presented P/08, on the Brazilian experience with GBAS. He began by discussing the emergence of PBN as a way of addressing global air traffic growth, along with GNSS technologies, given that conventional navaids had limitations to accompany this growth. He then explained the complexity and size of the Brazilian airspace, and described the evolution of GPS in Brazil, starting with the testing of the Honeywell SLS-2000 SCAT-I station up to the testing of the SBAS system within the context of ICAO project RLA/00/009. These tests revealed the severe behavior of the ionosphere around the geomagnetic equator and demonstrated that SBAS implementation did not have a favorable cost/benefit ratio.

1.5.7 In 2013, through an agreement with the FAA, DECEA (Airspace Control Department) installed a GBAS prototype station in SBGL (Rio de Janeiro) and equipped GEIV aircraft (Brazilian Flight Inspection Group) to test GBAS procedures. The flights showed the capacity, flexibility, and stability of GBAS for curved approaches, but data analysis was inconclusive due to data acquisition issues and the possible influence of the ionosphere. To eliminate variables, a Honeywell SmartPath SLS-4000 (certified by FAA) was installed in SBGL (Rio de Janeiro) to collect data during the peak of solar cycle 24 and check the behavior of the station. Since its installation, the availability of the station has been below the required level, forcing the disabling of monitors to allow for constant data collection.

1.5.8 Data collected from 180 GPS L1/L2 receivers installed throughout Brazilian territory and analyzed by a group of experts from DECEA, ICEA, FAATC, USTDA, Mirus Technology, SDTP, Stanford University, INPE, Boston College, UNESP, and KAIST, who measured S4, Kp and Dst indexes, revealed the occurrence of 127 severe ionospheric events. The result was a report submitted in March 2015, which concluded that the SLS-4000 station, at low latitudes, did not meet ICAO integrity and availability requirements. The report is posted in the ICAO website, together with all the presentations of the event.

1.5.9 He also reported on new technologies and procedures concurrent with GBAS GAST C, such as: GAST D (GBAS CAT II/III), GBAS MF/MC (multi-frequency, multi-constellation), LPV200 SBAS, SBAS MF, BARO VNAV and RNP-AR procedures. Finally, he noted that GBAS GAST C was operational in a few countries in mid-latitudes but was still a challenge in low latitudes. In 2003, Brazil tested GBAS stations in SBGL and the technology did not meet ICAO SARPs for availability and integrity. Brazil continues making efforts to set SLS-4000 operational at SBGL for public use, and new technologies were emerging to challenge GBAS GAST C.

1.5.10 Ricardo Abregu and Manuel Alvarez from ANAC (Argentina) informed in presentation P/09 that, in accordance with the ICAO strategy set forth in the Global Air Navigation Plan, ANAC opted for PBN implementation and GBAS as the best future option for CAT 1 precision approaches to replace ILS systems.

1.5.11 The presentation also described the CAT I GBAS implementation schedule, starting with the design, manufacture, implementation, and approval of a GBAS system at the San Carlos de Bariloche international airport in January 2014, the technical assessment conducted in the laboratory in 2014-2015, the on-site technical assessment model (2016), the certification and approval process (2016), and after that, the test period and initial manufacturing of 6 CAT 1 GBAS units. It also described the technical configuration of the GBAS and the test bench implemented for the correction algorithm.

1.5.12 Presentation P/10 by INVAP supplemented presentation P/09, providing more detailed technical information about the CAT 1 GBAS hardware and software and service provisions.

1.5.13 Patrick J. Reines from Honeywell presented P/17 on avionics support for GBAS and performance-based navigation. This presentation showed the cost-effectiveness of GBAS, since it could provide 48 possible approaches from a single ground station and enabled advanced PBN approach procedures. He also explained that GLS (GBAS avionics) equipage by airlines was being expedited and confirmed that GBAS and GLS were ICAO-compliant systems, in accordance with the following data: a. Formal approvals in multiple nations, b. In use on revenue passenger flights in IMC weather, c. GLS equipped airlines are already flying in the CAR/SAM Regions. In addition, he provided additional information, including that GBAS Cat I growth path to Cat II and Cat III was underway, that Brazil was leading the GBAS low latitude safety case, that the regional GBAS approval and implementation was an optimal approach, and that, so far, only the Honeywell GBAS was ICAO-compliant and was being used in revenue passenger service.

Satellite-Based Augmentation System (SBAS) presentations

1.5.14 Presentation P/11 by Benoit Roturier of France described the status of SBAS worldwide (EGNOS/Europe, MSAS/Japan, GAGAN/India, and WAAS). The vertical navigation service (LPV) is deployed over three regions, but not yet in Japan. Since SBAS does not involve local airport infrastructure costs, it is frequently considered a government-based multimodal infrastructure serving different user communities. SBAS represents a very low-cost infrastructure opportunity for aviation and supports a high rate of implementation of Cat I (LPV 200) or near-Cat I (LPV 250) approach procedures.

1.5.15 Using WAAS, more than 4000 approach procedures with vertical guidance were implemented during the last decade, and 440 were expected in Europe by 2018. The number of equipped aircraft is also increasing on a regular basis, with more than 80,000 SBAS users registered in North America. GAGAN has developed a specific ionospheric model that provides good availability of LPV in the equatorial region.

1.5.16 France showed how PBN was improving significantly the performance of its approach and landing national network, while also reducing infrastructure costs through an ILS phase out program. The second part of the presentation introduced 4 new SBAS programs: SDCM/Russia, SBAS/ASECNA, BDSBAS/China and KASS/South Korea. It was also developing new ionospheric algorithms for EGNOS in the equatorial region, with the support of the ASECNA ABAS program (see the Thales presentation).

1.5.17 Finally, the evolution of SBAS toward a dual frequency, multi-constellation system was described, showing long-term potential to cover all the land masses of the world with Cat I signals when current SBAS evolved to this technology and additional networks were deployed in the Southern hemisphere.

1.5.18 In P/12, Carlos Rodriguez from the FAA presented the status and evolution of SBAS. Related FAA activities included investments by the FAA in upgrades to the WAAS network to address obsolescence issues and to prepare the system for the implementation of the L5 (dual) frequency. The FAA continues to manage the acquisition of GEO satellite services to maintain optimum coverage and service level for the WAAS. The WAAS system provides the service required to meet ADS-B positioning requirements and to support PBN implementation. The FAA continues to support the development and publication of WAAS supported procedures and user equipage. The GPS follows the program for the development of the next generation of satellites and control segments and the FAA maintains close coordination for the implementation of aviation requirements in the GPS system.

1.5.19 In P/13, ICAO showed the results of the SBAS-type WAAS test bed trials conducted under technical cooperation project RLA/00/009 between 2001 and 2007 in the CAR/SAM Regions. Project activities were described, together with the recommendations made as a result of the trials.

1.5.20 In presentation P/14, COCESNA (Central American Corporation for Air Navigation Services) provided information about project RLA/03/902 SACCSA, in which several CAR/SAM States and agencies participated under the leadership of ICAO, and which consisted of three phases.

1.5.21 Its objective was to study the ionospheric behavior in the CAR/SAM Regions in order to find an SBAS solution for the development of an GNSS applicable to the CAR/SAM Regions, where ionospheric behavior is different from other regions that already have SBAS.

1.5.22 It was noted that phase III contemplated studies on the operation of the monitoring network and the Central Processing Unit, as well as a comparison of complementary solutions in areas of poor or limited performance. In addition, the meeting was informed that the project contractor, GMV, had enabled the link http://magicgnss.gmv.com/sam/, as a platform to analyze SACCSA benefits using its magic SBAS and MagicGemini tools.

1.5.23 In order to meet APV-I horizontal and vertical accuracy requirements, the system should take advantage of the multi-constellation of satellites (GPS/GLONASS and others) and dual frequency to minimize the impact of solar activity on the ionosphere, and particularly on the SBAS signal.

RAIM availability

1.5.24 Two presentations were made on this item: P/15, by ICAO, describing the reasons why the SAM Region had implemented a regional RAIM availability service called SATDIS, and its functionality in approach and terminal areas.

1.5.25 In P/16, NAV BLUE presented an overview of GPS operation and the errors and key parameters that affected RAIM (*e.g.,* geometry), a brief description of SATDIS, the SAM RAIM prediction tool, an overview of other regional solutions provided by NAVBLUE to AeroThai, CAAS and EUROCONTROL, and finally an overview of additional functionalities that could be added to SATDIS, including ADS-B, NOTAMs, and mapping capabilities.

1.6 Ionospheric and tropospheric effects on GNSS

1.6.1 Francisco Azpilcueta, from the University of La Plata, Argentina, presented P/18, on the ionospheric and tropospheric effects on GNSS. He showed a method to characterize the behavior of the nominal ionosphere in Bariloche, which had favorable ionospheric conditions. The method was applied to characterize the behavior of the ionosphere in Argentinian territory and identify the different ionospheric regions of Argentina. In summary, University of La Plata is expecting to obtain results and conduct a statistical analysis based on the infrastructure installed at the Bariloche airport. At present, the first phase has been completed. The next step will be to characterize the irregular behavior of the ionosphere over Argentina, in order to define the parameters typical of an ionospheric threat model, and implement the management module.

1.6.2 In presentation P/19, Rich Cole (Mirus Technology) provided information on the effects of the troposphere and ionosphere on GNSS and an overview of the upcoming GBAS safety case project. He also summarized the findings of the low-latitude threat model project, comparing three ionospheric threat models from the U.S., St. Helena's Island (UK), and Brazil. The results of the Brazil threat model were dramatic compared to the U.S. and St. Helena. Then, a short description was given of the project sponsored by the U.S. Trade Development Agency (US TDA) for the development of a safety case for low-latitude GBAS operations. The safety case will provide the foundation for system design approval and allow DECEA to complete the commissioning of the GIG installation. It will also provide other nations in low-latitude regions the information required to approve GBAS in their respective airspace.

1.6.3 In P/20, Thales Alenia reported that the ionosphere was one of the main concerns in South America, where many low-latitude countries underwent the worst gradients and scintillation effects. Activities have been carried out in the past to deploy a test bed with an old version of "mid-latitude" WAAS algorithms (more than 10 years old). These studies did not lead to any conclusion as to the feasibility of conducting precise approaches with vertical guidance over South America. In addition, GBAS was facing the same kind of issue, as it was not able to separate ionosphere delays from other sources of GNSS ranging error, contrary to SBAS. Furthermore, the qualified GBAS threat model used for binding errors caused by the non-separation of ionosphere delay was not suitable to ensure integrity in low latitudes.

1.6.4 Other studies like SACCSA have been performed with new algorithms but fed by GLONASS, which unfortunately cannot be used today for safety purposes. (This is the reason why EGNOS does not provide GLONASS augmentation.) Thales Alenia Space, the prime contractor of the European SBAS - EGNOS, performed studies in low-latitude regions (in mid Africa – ASECNA countries) for several years. These studies allowed to understand ionosphere behavior in low latitudes (high gradients, depletion, bubbles, and scintillation) and to design a new generation of algorithms capable of operating even in severe equatorial ionosphere conditions. The results obtained in Africa during test campaigns showed that these algorithms were capable of providing at least APV-1 precision approaches (with vertical guidance, almost Cat 1 service) in Africa, even during geomagnetic storms, with the availability level required by ICAO SARPs (>99%).

1.6.5 These algorithms have also been run on the EGNOS network during severe geomagnetic storms, showing that they were not affected, contrary to current operational EGNOS and WAAS. These results show the huge improvement provided by Thales Alenia Space equatorial algorithms. Finally, preliminary studies have been performed in Brazil thanks to INPE and DECEA/ICEA, confirming the feasibility of APV-1 service, just as in Africa. To conclude, Thales Alenia Space invited South American countries to participate in new SBAS test bed campaigns, which will now use Thales equatorial algorithms. It will be a first step to support a future SBAS deployment over the South American region.

1.7 Ground- and flight-testing considerations

1.7.1 In P/21, Bob Stuckert, from the United States, presented GNSS flight inspections. GNSS flight inspections validate the data used in procedure design and ensure that the procedure delivers the aircraft to the correct position for landing. Valid data depends on compliance with up-to-date survey standards developed for GNSS application. The United States performs Preflight Coding Validation. This is a comprehensive check of the procedure data and ARINC 424 coding. Once completed, flight inspection validates the procedure design, insures obstacle clearance, and confirms communications with air traffic control. An FAA program of flight inspection courses for international students scheduled for 2017 was also presented.

1.7.2 In P/22, Beniot Roturier reported on the status of PBN flight inspections in France. The presentation showed ICAO material applicable to PBN procedure design and validation, the logic behind it, and how this has been incorporated into French regulations. States should follow this process for procedure commissioning and when changes are made to the procedure. A description was then provided of the flight inspection structure in France, aircraft systems and teams, also showing several cases of interference on PBN procedures, which were detected thanks to the flight inspection teams and systems. This experience highlights the need for proper spectrum management and aviation tools to maintain high availability of PBN procedures.

1.7.3 In P/24, P26, P27, and P28, Argentina, Bolivia, Cuba, and COCESNA presented respectively the current status and expectations in terms of flight inspection of navigation infrastructure to support PBN. Additionally, Aerolineas Argentinas presented P/25, describing PBN flight validation procedures in Argentina.

1.7.4 In P/23, Frank Musmann, from AERODATA, provided information on Avionic Navigation Infrastructure to support PBN. When designing Instrument Flight Procedures (IFP), consideration should be given to many limiting factors, such as: terrain, obstacles, environmental constraints, and suitability for air traffic management. Accordingly, instrument flight procedures are increasingly based on area navigation (RNAV) or performance-based navigation (PBN), which permits the definition of a complex flight path. The capabilities of modern flight management systems (FMS) enable procedure designers to use new elements for the definition of the procedure path. Typical elements are radius-to-fix (RF) segments for the definition of arcs, and the final approach segment (FAS) for the definition of precision approaches with vertical guidance. This presentation highlighted some typical undesired effects that could be observed during flight validation of procedures based on RF and FAS. In order to simplify the validation process, software tools and functions have been developed. Based on case examples, it has been shown how such effects could be easily identified through an automated process.

2 FINAL RECOMMENDATIONS AND CONCLUSIONS

2.1 Based on the presentations and discussion, the participants agreed on the following conclusions and recommendations:

General aspects and development of SARPs

a) PBN is the foundation for safety, operational and environmental improvements as described in the Global Air Navigation Plan, its technological roadmaps, and the ICAO ASBU methodology.

b) The PBN framework is well established and there are a lot of SARPs and guidance materials related to PBN procedures to assist States in the: 1) implementation, including technical requirements of the navigation infrastructure to support PBN and GNSS operations, 2) validation, and 3) operation. Furthermore, ICAO is now providing more assistance to States in their planning and implementation, by providing guidance materials, offering CBT training, and conducting workshop and seminars.

c) Follow-up activities are needed to allow the PBN concept to further mature and to provide adequate procedures and technical requirements to enable PBN-related ASBU modules B1 and B2.

d) This includes assessment activities and the development of SARPs for GBAS Cat II/III operations by the Navigation System Panel (NSP). The development of GBAS Cat II /III SARPs is nearly complete, and the amendment of Annex 10 Volume I to introduce GBAS Cat II/III is scheduled to become effective in November 2018.

e) It was noted that the NAM/CAR/SAM Regions had enough DME-DME coverage to support PBN procedures, but there were areas that were not yet covered and required the implementation of additional DME.

f) In order to avoid the interruption of GNSS signals and interference, States should:

- prohibit all actions leading to the interruption of GNSS signals;
- develop and implement a strong regulatory framework governing the use of intentional in-band diffusers, including GNSS repeaters, pseudolites, spoofers, and jammers;
- have particular care with off-band diffusers that are in a harmonically GNSS-related frequency, such as some television broadcast channels and other industrial applications;
- support the position of ICAO at the ITU WRC;
- protect the frequency spectrum for aeronautical use; and
- coordinate frequency allocation with the respective ICAO Regional Offices

Ground-Based Augmentation System (GBAS)

g) GBAS is being used as a satellite-based alternative to the Instrument Landing System (ILS) for precision approach and landing, providing differential corrections and integrity monitoring of global navigation satellite systems (GNSS), which are fundamental for PBN operation as described in ASBU modules.

h) The implementation of GBAS CAT-I is underway worldwide and is already operational at several airports in mid-latitude States.

i) These operations and assessments confirmed various benefits of GBAS operations, including the high accuracy, availability, and integrity required for CAT I and, eventually, Cat II/III precision approaches. In addition, some assessments showed robustness under severe snow conditions and a good cost/benefit ratio, since a GBAS covers multiple runway ends, and provides up to 48 approaches per system.

j) However, it is important to note that these GBAS operations were conducted mainly in mid-latitude States and it is still a big challenge to operate GBAS in low latitudes because of the ionospheric effect.

k) Brazil was leading a low-latitude GBAS safety case, and it was recognized that the lessons learnt would provide great guidance for States interested in deploying GBAS in their States and who were facing the same challenges in their GBAS development and assessment projects.

l) It was also noted that several promising technical improvements were under development, such as multi-constellation and dual frequency GBAS, which was expected to provide enhanced robustness with respect to ionosphere anomalies and radio frequency interference.

m) Since many CAR/SAM States were located in equatorial regions, safety case assessments should be conducted if they intended to implement and operate GBAS in their States.

n) It was also recognized that the implementation of GBAS CAT II/III had to be carefully considered and assessed so that each State could decide whether the use of GBAS would allow them to achieve their particular goals and meet their operational needs, since those operations could depend on market demand, maturity of standards/regulatory requirements, availability of infrastructure and other business factors.

o) A cost-benefit analysis based on the operational demand of each State was needed to identify those airports suited for the installation of GBAS CAT I stations.

p) For each eligible airport, a GBAS ionosphere threat model would be required for certification and commissioning purposes.

SBAS

q) States were encouraged to continue assessing the technical, operational, and financial feasibility of SBAS systems in a multi-constellation and dual frequency environment. But it was noted that an ionospheric model that supported a good availability of LPV in the equatorial region (low latitude) had been developed through GAGAN, the African SBAS test campaigns, and SACCSA in the CAR/SAM Regions.

r) Studies conducted under the SACCSA project have shown that an augmentation solution for the CAR/SAM Regions is feasible and its interoperability with other systems is based on the SARPs/MOPS. In addition, the use of multi-constellation (GPS+GLONASS+Others) and multi-frequency (dual frequency) is recommended to minimize the impact of solar activity on the ionosphere and the SBAS signal.

s) SACCSA studies are consistent with recommendations 6/5 and 6/9 of the 12th Air Navigation Conference.

t) As a result of the SBAS-type WAAS test bed developed in the CAR/SAM Regions, the following recommendations were made:

i) The SBAS-type WAAS tests carried out in the CAR/SAM Regions between 2001 and 2007 concluded that, because of the severe ionosphere conditions in the geomagnetic equatorial region (+/- 20° degrees around the equatorial line), it was recommended that the CAR/SAM Regions consider the possible implementation of an SBAS only for lateral navigation (LNAV) or non-precision approach (NPA).

ii) In the future, GNSS-based precision approach services in the region should be provided only after a Cat I capable ground-based augmentation system (GBAS) that can account for ionosphere error as recorded at/near the geomagnetic equator, or a global second civil GPS signal at L5, is available.

RAIM availability prediction

u) In the SAM Region, where a RAIM availability prediction tool has been implemented, the following recommendations were made:

- The aeronautical community should be aware of SATDIS functions in support to the GNSS-based navigation (basically GNSS - ABAS). In this respect, an AIC should be issued.
- For the approval of PBN by the aeronautical authority, users must be required to implement an availability prediction system (RAIM) (SATDIS is a service that meets the requirement, as stated in the advisory circulars issued in the Region, for the approval of PBN operations).
- Any State that has published in its AIP the PBN procedures at an aerodrome should also publish a NOTAM in case availability prediction for that aerodrome is not available (SATDIS makes 24-, 48-, and 72-hour predictions).
- Additional functionalities that can be added to SATDIS include ADS-B, NOTAMs, and mapping capabilities.

Ionospheric and tropospheric effects on GNSS

a) GBAS operations in low latitude cannot meet ICAO integrity requirements using the mid-latitude threat model.

b) To support GBAS operations in low-latitude regions, a safety case is required to ensure compliance with ICAO Annex 10 and overall system safety criteria. The safety case is a critical part of the certification process and requires rigor, structure, and a process to make sure that the highest level of safety is maintained.

Ground and Flight Testing Consideration

a) The validation process and the flight testing experience of States have underlined the need for proper spectrum management to avoid interference and for aviation tools to maintain high availability of PBN procedures.

b) It is recognized that GNSS flight testing is important for validating the data used in PBN procedure design and making sure that the procedure delivers the aircraft to the correct position during operations.

b) Instead of only validating the signal-in-space, States should take into account the validation process described in the PBN Manual and in Doc 9906, which highlight the importance of a full validation process, including validating the data used in the PBN procedure design.

d) The PBN Manual, the Quality Assurance Manual for Flight Procedure Design (Doc 9906) and the Manual on Testing of Radio Navigation Aids (Doc 8071), Volume II, Testing of Satellite-based Radio, should be referred to when performing PBN procedure validations.

e) It was confirmed that the technical requirements and specifications for the GNSS flight testing were described in the Manual on Testing of Radio Navigation Aids (Doc 8071), Volume II, Testing of Satellite-based Radio Navigation Systems.

APPENDIX A

AGENDA
WORKSHOP/SEMINAR FOR THE IMPLEMENTATION OF NAVIGATION INFRASTRUCTURE TO SUPPORT PBN AND GNSS PRECISION APPROACH OPERATIONS IN THE NAM/CAR/SAM REGIONS
(Lima, Peru, 15 to 17 August 2016)

MONDAY, 15 AUGUST 2016		
HOUR	**SUBJECT**	**EXPOSITOR**
08:30-09:00	Registration	
09:00-09:150	Opening ceremony	SAM ICAO RD Franklin Hoyer
09:15-09:30	Introduction workshop/seminar	ICAO Onofrio Smarrelli
SESSION 1: GLOBAL AND REGIONAL IMPLEMENTATION CONSIDERATION OF NAVIGATION INFRASTRUCTURE TO SUPPORT PBN AND GNSS PRECISION APPROACH OPERATIONS IN THE NAM/CAR/SAM REGIONS		
09:30-10:00	Global air navigation plan consideration on navigation infrastructure to support PBN	ICAO Mie Utsunomiya
10:00-10:30	Regional air navigation plans implementation consideration on navigation infrastructure to support PBN in the NAM/CAR and SAM Regions	ICAO Onofrio Smarrelli Mie Utsunomiya
10:30-11:00	***Coffee break***	
11:00-11:30	*Questions / Session 1 summary*	
SESSION 2: ICAO SARPS AND DOCUMENTATION OF NAVIGATION INFRASTRUCTURE TO SUPPORT PBN AND GNSS PRECISION APPROACH OPERATIONS		
11:30-12:00	ICAO SARPS and documentation on navigation infrastructure to support PBN	ICAO Mie Utsunomiya
12:00-12:30	Spectrum consideration of navigation infrastructure	ICAO Onofrio Smarrelli
12:30-13:30	***Lunch break***	
13:30-14:00	*Questions / Session 2 summary*	
SESSION 3: CURRENT GNSS SITUATION AND EVOLUTION		
14:00-14:30	GBAS world implementation and France GBAS Cat III opportunities and challenges at Paris Charles de Gaulle experience	France Benoit Roturier
14:30-15:00	GBAS current situation and evolution	United States FAA Carlos Rodriguez

TUESDAY, 16 AUGUST 2016		
HOUR	**SUBJECT**	**EXPOSITOR**
SESSION 3: CURRENT GNSS SITUATION AND EVOLUTION		
9:00-10:00	Brazilian GBAS experience	Brazil Alessander de Andrade Santoro
10:00-10:30	GBAS future vision and other CNS development	Argentina (ANAC) Ricardo Abregu and Manuel Álvarez
10:30-11:00	***Coffee Break***	
11:00-11:30	GBAS development in Argentina	INVAP Isidoro Vaquilla and Oscar Bria
11:30-12:00	PBN and EGNOS implementation status in France and other SBAS world implementation (Current situation and evolution)	France Benoit Roturier
12:00-12:30	SBAS current situation and evolution	Estados Unidos FAA Carlos Rodriguez
12:30-13:30	***Lunch break***	
13:30-14:00	SBAS type WAAS test bed Project in CAR/SAM Region	ICAO Onofrio Smarrelli
14:00-14:30	SBAS NAM CAR SAM experience SACCSA Project	COCESNA Rony Montenegro
14:30-14:45	RAIM availability prediction tool in SAM Region SATDIS	ICAO Onofrio Smarrelli
14:45-15:15	GNSS integrity	NAVBLUE John Wilde
15:15-15:45	Avionic navigation infrastructure to support PBN	Honeywell Patrick Reines
15:45-16:15	*Questions / Session 3 summary*	

WEDNESDAY, 17 AUGUST 2016		
HOUR	**SUBJECT**	**EXPOSITOR**
SESSION 4: IONOSPHERIC AND TROPOSPHERIC EFFECTS ON GNSS		
09:00-09:30	Ionospheric and tropospheric effects on GNSS	Universidad La Plata (Argentina) Francisco Azpilcueta
09:30-10:00	Regional ionospheric update and low-latitude GBAS threat model synopsis	United States Rich Cole
10:00-10:30	Latest SBAS performances under severe and equatorial ionosphere conditions	Thales Alenia Space Franck Haddad
10:30-11:00	***Coffee Break***	
11:00-11:30	*Questions / Session 4 summary*	
SESSION 5: GROUND AND FLIGHT TESTING CONSIDERATION		
11:30-12:30	GNSS Flight Inspection	United States Bob Stuckert
12:30-13:30	***Lunch break***	
13:30-14:00	PBN flight inspection status in France	France Beniot Roturier
14:00-15:00	CAR/SAM GNSS flight inspection	ARGENTINA BOLIVIA COCESNA CUBA
15.00-15:30	Avionic navigation infrastructure to support PBN	AERODATA Frank Musmann
15:30-16:00	*Questions / Session 5 summary*	
SESSION 6: FINAL RECOMMENDATIONS AND CONCLUSION		
16:00-16:30	Workshop/Seminar final recommendation and conclusion	ICAO/STATES
16:30	Closing ceremony and delivery of certificate	

APÉNDICE B / APPENDIX B

Seminario/Taller para la Implementación de infraestructura de navegación para soportar PBN y las operaciones de aproximación de precisión GNSS en las regiones NAM/CAR/SAM

Workshop/Seminar for the implementation of navigation infrastructure to support PBN and GNSSS precision approach operations in the NAN/CAR/SAM Regions

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

5.1 Under this Agenda item, the following papers were discussed:

a) WP/10 **–** *Follow-up to the implementation of AIDC interconnection between adjacent ACCs* (presented by the Secretariat);
b) WP/11 – *Follow-up to the implementation of activities to improve ATM situational awareness in the SAM Region* (presented by the Secretariat);
c) WP/13 – *Analysis of flight plan availability in the SAM Region* (presented by the Secretariat); and
d) IP/06 – *TATIC FLOW system applied to ATFM – Brazil* (presented by Brazil).

FOLLOW-UP TO THE IMPLEMENTATION OF AIDC INTERCONNECTION BETWEEN ADJACENT ACCs

Guide for AIDC implementation through the interconnection of automated centres

5.2 The Meeting reviewed the amendments to the *Guide for AIDC implementation through the interconnection of automated centres*, which were incorporated after the Second meeting on AIDC implementation (AIDC/2). The amendments introduced some corrections and updates, as well as 3 new appendices: Appendix A – Communications and support mechanisms, Appendix C – Model procedures for conducting AIDC exchange trials, and Appendix D – AIDC operation manual, and PAC and MAC messages within the minimum AIDC message set.

5.3 During the review, an inconsistency was found in the table in section 2.2.3 – 1):

- It reads: ABI, CPL, CDN, FPL, EST, ACP, LAM, LRM, RJC, TOC, AOC
- It should read: FPL, ABI, CPL, EST, CDN, ACP, REJ, PAC, MAC, TOC, AOC, LAM, LRM

5.4 After the corresponding review and correction, the Meeting approved the update of the *Guide for AIDC implementation through the interconnection of automated centres,* shown in **Appendix A** to this agenda item (it will be included in the final report). However, the Meeting recommended that in the next version of the Guide, the main body should be more concise, focusing on information that was relevant for implementation.

Activities for the implementation of AIDC interconnection between adjacent ACCs in the SAM Region

AIDC interconnections in Brazil

5.5 The Meeting acknowledged the significant progress made by Brazil with respect to the implementation of AIDC between its internal ACCs and their transition to the operational phase. The following AIDC interconnections were conducted from May to July 2016:

ACC	AIDC implementation date
Curitiba – Recife	July 2016
Recife – Brasilia	June 2016
Curitiba – Brasilia	July 2016
Curitiba – Amazónica	July 2016
Amazónica – Brasilia	June 2016
Amazónica – Recife	May 2016

5.6 Regarding the implementation of AIDC interconnection between the Atlántico ACC and adjacent domestic ACCs, Brazil reaffirmed that its implementation was foreseen for the first half of 2017.

AIDC interconnection between the Lima ACC and the Guayaquil ACC

5.7 The representatives of Ecuador and Peru informed that the AIDC interconnection between the Lima ACC and the Guayaquil ACC was suspended since early September 2016 due to technical problems reported in both units.

5.8 In this regard, the delegate of Peru informed the Meeting that, due to reports of LHD events and operational errors that were initially attributed to AIDC by the personnel involved in those events, an investigation had been conducted, which revealed that more than 80% of the cases were errors related to human performance (inadequate management of LRM messages, deficient interaction with the automated system, lack of updating of the XFL field, etc.). It was also noted that the AIDC was a functionality of automated systems that works on the basis of information provided by the automated system itself, which can be updated to reflect the reality, so that it may be properly processed and transmitted by the AIDC to the adjacent ACC.

5.9 Regarding the other errors reported, it was determined that those attributable to technical aspects of the automated system were due to the following problems and limitations of the Lima ACC surveillance system:

- Coverage restrictions, insufficient overlap, areas of uncertainty in coverage limits, and cones of silence of the Lima FIR radars. This caused erroneous readings when processing the data of the affected targets, and generated errors in estimates to transfer points, affecting AIDC performance when an EST message was generated while the aircraft was flying over these areas.

- Aircon 2100 software errors, where, when a target left the surveillance coverage area, the system erroneously erased the content of the XFL field. When the value of the CFL field differed from the value of the RFL field in the original FPL, this generated undesired level renegotiations that, if not detected and corrected on a timely basis by the ATCO, could lead to an LHD event.

5.10 In this regard, following the analysis of these events, the Meeting made the following recommendations to avoid errors in the AIDC:

- Set up the EST message delivery time in such a way that it will not coincide with an area of uncertainty in surveillance systems.

- Adopt the necessary measures to eliminate the cones of silence and areas of uncertainty in route segments between the EST message delivery time and the COP (transfer of control point). These measures may include the incorporation of new sensors, or the exchange of radar data with the adjacent FIR.

- Prioritise the updating of the Aircon 2100 system to the most recent version.

5.11 Based on these recommendations, and as measures for error mitigation, the following decisions were made:

- Reduce the EST message generation time from 30 minutes to 20 minutes between the Lima and the Guayaquil FIRs. This measure had already been taken in September and had proven successful.

- Adopt tactical measures to route aircraft flying along route UM542 out of the cone of silence of the Talara radar. In this regard, the aeronautical authority of Peru would coordinate with the Air Force to ease, by means of a NOTAM, flights over prohibited area SPP78, at least from FL250 to UNL, until a definitive solution was found to the technical problems of the Aircon 2100 system.

5.12 Thus, both parties agreed to resume use of AIDC as the primary means of coordination between the adjacent ACCs of Lima and Guayaquil.

Other AIDC interconnections in the SAM Region

5.13 The Meeting took note of the following AIDC interconnections that had been in the pre-operational phase for more than one year, without any significant progress:

- Lima ACC – Bogotá ACC
- Guayaquil ACC – Bogotá ACC
- Bogotá ACC – Panamá ACC
- Ezeiza ACC – Córdoba ACC

5.14 In this regard, the Meeting urged the States involved to migrate from the pre-operational to the operational phase before the end of 2016.

5.15 Panama reported at the AIDC/2 meeting that the ATC personnel of the Panama ACC had expressed their full confidence in the automated data transfer system, because they had confirmed that the AIDC significantly reduced controller workload. They also suggested their use despite constant message flow interruptions due to technical problems with the automated system of the Panama ACC.

5.16 The representatives of Ecuador and Peru reported that the issue of route mutilation by the personnel of the Bogota ACC still persisted, affecting AIDC performance. Likewise, no significant progress by the Bogota ACC had been observed regarding activities corresponding to the pre-operational phase in which the Lima, Guayaquil, and Panama ACCs had been for more than one year.

5.17 Regarding AIDC interconnection trials, successful results had been obtained in trials conducted between the following ACCs:

- Iquique ACC – Lima ACC
- Iquique ACC – Córdoba ACC
- Bogotá ACC – Barranquilla ACC
- Lima ACC – Amazónico ACC (ATECH test environment)

5.18 The representatives of Brazil and Peru informed that trials would be conducted between the operational ACCs of Lima and Amazónico on the last week of October. Regarding the results of these interconnection trials, the Meeting urged that these interconnections migrate as soon as possible to the pre-operational phase.

Inter-regional AIDC interconnection activities

5.19 During the AIDC/2 meeting, Panama reported that the CENAMER ACC authorities submitted to the aeronautical administration of Panama a draft letter of operational agreement between the Panama ACC and CENAMER, which is currently being reviewed by Panama prior to signing it.

5.20 Operational trials between the Panama ACC and CENAMER have been conducted using a test protocol established between the parties, but could not be completed due to failure of the automated system (Top Sky de Thales) of the Panama ACC. An update of the automated system of the Panama ACC was foreseen for the first quarter of 2017. It was expected that by the end of the first half of 2017, the AIDC between the Panama ACC and CENAMER would be in the operational phase. Panama also reported that they had started coordination between Panama and Jamaica for AIDC implementation between the Panama ACC and the Kingston ACC. Interconnection trials between the Guayaquil ACC and CENAMER were still pending.

5.21 As to inter-regional AIDC interconnections, note was taken of initial coordination between the SAM and AFI Regions to meet the requirements for AIDC implementation between the two Regions. In this sense, technical trials would be conducted between Argentina and South Africa at the end of October 2016 through the AFTN connection of the CAFSAT satellite network.

Status of implementation of the AIDC interconnection in accordance with the Declaration of Bogota

5.22 Taking into account AIDC interconnections that are in the pre-operational and operational phase, the Meeting noted that 11 AIDC interconnections had been implemented to date, reaching 73.33% of all (15) AIDC interconnections foreseen and contemplated in the Declaration of Bogota.

5.23 It should be noted that 6 out of the 11 AIDC interconnections already implemented corresponded to AIDC interconnections between internal ACCs of Brazil. It is extremely important to complete the remaining AIDC interconnections between the States of the Region.

5.24 In this regard, at the Third Meeting of Air Navigation and Safety Directors, the air navigation directors informed that AIDC interconnections that were still pending would be completed by the end of 2016 in order to comply with the Declaration of Bogota, thus contributing to operational improvement and safety enhancement at the State and regional level.

5.25 The Meeting expressed its concern for the delay in AIDC implementation and the implications for the States in case such delays were to persist, in view of the investments on equipment and training of the personnel involved, for the purpose of meeting the regional commitments undertaken by all the States of the Region in the Declaration of Bogota to increase safety in the Region. In this sense, the Meeting urged the States of the Region to fulfil the commitments assumed in the Declaration of Bogota and to carry out AIDC activities on the dates agreed.

5.26 The Meeting went on to review the AIDC interconnection requirements of the SAM Region, as well as the list of AIDC focal points, which are shown in **Appendices B** and **C** to this agenda item.

Plan of activities for AIDC interconnection between adjacent ACCs

5.27 The Meeting updated the AIDC plan of activities. In this regard, Argentina informed that AIDC would be implemented at pre-operational and operational level at regional and inter-regional level by the second semester of 2017, but AIDC test dates would not be modified. Note was also taken that the AIDC course to be held in Asunción, Paraguay had been rescheduled for 14-18 November 2016 and that the AIDC course in Curitiba had been cancelled at the request of Brazil. The updated plan of activities is shown in **Appendix D** to this agenda item.

ANALYSIS OF FLIGHT PLAN AVAILABILITY IN THE SAM REGION

5.28 The Meeting reviewed the status of implementation of automated systems in the Region in compliance with Amendment 1 to Edition 15 of Document 4444 (FPL 2012). In this sense, 62% of all ACCs in the SAM Region have updated the flight plan processors (FDP), 23% continues using converters, and the remainder continues applying the manual solution in view of the fact that the automated systems installed in the ACCs do not meet FPL 2012 or are not automated. Regarding the implementation of AMHS/AFTN terminals having the FPL 2012 template capable of detecting completion errors, 85% of the States have them.

5.29 In this regard, the Meeting took note of a 16% increase with respect to that reported at the SAM/IG/17 meeting (46% implementation) due to the implementation of new automated systems at the Comodoro Rivadavia, Mendoza, Resistencia, and Punta Arenas ACCs, whose FDPs accept FPL 2012. No change was observed in those States that had converters, or in the flight plan transcription template at AMHS/AFTN terminals. **Appendix E** contains an updated table showing the status of automation in compliance with Amendment 1 to Edition 75 of Document 4444.

5.30 The Meeting reviewed and approved the guide to avoid errors in the FPL and ATS messages, presented at the second meeting on AIDC implementation, contained in **Appendix F**. Note was also taken of flight plan filing procedures, shown in **Appendix G** to this agenda item.

5.31 The Meeting reviewed the errors identified in flight planning. It also reviewed and approved the recommendations to mitigate such errors. The list of errors and the recommendations for their mitigation are shown in **Appendix H.**

FOLLOW-UP TO THE IMPLEMENTATION OF ACTIVITIES OF THE PROJECT TOIMPROVE ATM SITUATIONAL AWARENESS IN THE SAM REGION

5.32 The Meeting took note that the *Guide on technical considerations in support of ATFM implementation* was expected to be ready on the first week of December 2016, thanks to the support of Project RLA/06/901. A mission by an automation expert of Brazil to the ICAO South American Office has been scheduled for drafting the guide.

5.33 The Meeting analysed the inclusion of new activities in GREPECAS project C2, such as the implementation of ADS B multilateration and A-SMGCS surveillance systems, taking into account plans for conducting CNS activities (surveillance area) presented at the RAAC/14 meeting, the ADS B implementation action plan for the SAM Region, and the Unified CAR/SAM regional surveillance strategy.

5.34 The Meeting reviewed the *Unified CAR/SAM regional surveillance strategy*, taking into account the status of implementation of surveillance systems, the surveillance considerations contained in the fifth edition of the GANP, as endorsed by the 39th Session of the ICAO Assembly (A39), the SAM Performance-based air navigation implementation plan (PBIP), the planning of air navigation implementation activities in the CNS area (surveillance) for the period 2017-2019, shown in **Appendix I** to this agenda item.

5.35 Likewise, the Meeting reviewed the ADS B implementation action plan, shown in **Appendix J** to this agenda item. It felt that, in order to follow up ADS B implementation, the States of the Region should designate a focal point to coordinate activities concerning ADS B planning and implementation, and inform the Regional Office no later than 30 December 2016. In this sense, the Meeting formulated the following conclusion:

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.

APPENDIX A

GUIDE FOR THE IMPLEMENTATION OF AIDC

THROUGH THE INTERCONNECTION OF ADJACENT AUTOMATED

CENTRES IN THE SAM REGION

International Civil Aviation Organization

SAM Region

GUIDE FOR THE IMPLEMENTATION

OF AIDC

THROUGH THE INTERCONNECTION

OF

ADJACENT AUTOMATED CENTRES

Lima, Peru – September 2016

TABLE OF CONTENTS

APPENDIXES

REFERENCES

Document ID	Name of document
ICAO Doc 4444	Air traffic management
ICAO Annex 10, Volume II	Aeronautical telecommunications
ICAO Annex 11	Air traffic services
ICAO Doc 9694	Manual of air traffic services -Data Link Applications (Part VI)
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 Trafiffic Services Message Handling Services (ATSMHS)
CAR/SAM/ICD	Interface Control Document for Data Communications between ats units in the Caribbean and South American Regions
Doc. NAT/APAC ICD	Pan Regional (NAT and APAC) Interface Control Document for ATS Interfacility Data Communications (PAN AIDC ICD) - Version 1.0 — September 2014

PURPOSE

The purpose of this document is to serve as a practical guide for the implementation of AIDC between two adjacent automated centres of the SAM Region.

The development of this document for AIDC implementation and interconnection is contemplated amongst the activities of Regional Project RLA/06/901, *Assistance for the implementation of a regional ATM system, taking into account the ATM operational concept and the corresponding technological support in communications, navigation and surveillance (CNS).*

The Fourth edition of the ICAO Global Air Navigation Plan (GANP), in Area 2 on Efficiency Enhancement: *Globally interoperable systems and data*, for increased interoperability, efficiency, and capacity through ground-ground integration, contemplates the implementation of the FICE modules in blocks 0, 1, 2, and 3. FICE block 0 (2013-2018) includes the implementation of AIDC to improve coordination between air traffic service units (ATSUs) through data communication between ATS facilities (AIDC), as defined in the ICAO Manual of air traffic services data link applications (Doc 9694).

The *Performance-based implementation plan for the SAM Region* (PBIP Version 1.4 November 2013), in alignment with the GANP, includes FICE B0 module, considered essential for interoperability and safety.

In the Declaration of Bogota (December 2013), SAM States undertake to implement air navigation and safety priorities during the period 2014-2016. One of these priorities is the implementation of AIDC between adjacent ACCs.

This document will support the States of the Region in the implementation of AIDC through the interconnection of automated systems between adjacent ACCs, and its development was discussed at the Tenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/10), held in Lima on 1-5 October 2012, and approved by the Sixth Coordination Meeting of Project RLA/06/901 (Lima, 21-23 November 2012).

SCOPE

The two main aspects contained in this document for AIDC implementation are:

technical aspects

operational aspects

implemented in a setting of adjacent automated centres.

CHAPTER I

1. **GENERAL**

1.1. **Introduction**

1.1.1. One of the key features of the future air traffic management system is the bidirectional exchange of data between the aircraft and the ATC system, and between ATC systems. Communications with the aircraft increasingly tend towards the use of digital data links. At the same time, the automatic exchange of data between ATC systems will support the timely broadcast of flight data, especially for coordination and transfer of flights between ATS units.

1.1.2. The AIDC application shall provide important benefits, including:

a) Reduced controller workload;

b) Reduction in the number of read-back/hear-back errors during coordination;

c) Reduction in the number of gross navigation errors and large height deviations caused by errors in the "controller-to-controller" coordination loop;

d) Gradual replacement of the ATS speech service as main coordination tool.

1.1.3. AIDC permits the exchange of information between ATS units in support of critical ATC functions. This includes the reporting of flights approaching a border flight information region (FIR), coordination of border crossing conditions, and transfer of control.

1.1.4. The AIDC provides interoperability between automated systems, enabling the exchange of data between ATSUs that are harmonised to a common standard. AIDC supports reporting, coordination and transfer of communications and control functions between these ATSUs. The capacity provided by the AIDC is compatible with a greater flexibility in separation minima applied in the adjacent airspace. The AIDC promotes seamless transfer of aircraft between the participating ATSUs.

1.1.5. AIDC defines the messages related to the three coordination phases as perceived by an ATSU.

a) *reporting phase*, in which the path of the aircraft and any change may be broadcast to an ATSU from the current ATSU prior to coordination;

b*) coordination phase*, in which the path of the aircraft is coordinated between two or more ATSUs when the flight is approaching a common border; and

c) *transfer phase*, in which communications and executive control are transferred from one ATSU to another.

1.2 **Capacity and growth**

1.2.1 Before implementing this interface between two automated centres, an analysis will be done of traffic expected between the centres. Also, the proposed communication links will be verified to make sure they meet the requirements for this purpose. Traffic estimates must take into account expected, current and future traffic levels.

1.2.2 Furthermore, the strategies developed by the SAM Region for the integration of automated ATM systems based on a safe, gradual, evolutionary and interoperable vision must be adopted. This will facilitate the exchange of information and collaborative decision-making amongst all the components of the ATM system, resulting in transparent, flexible, optimum, and dynamic airspace management.

CHAPTER II

2. TECHNICAL ASPECTS FOR THE IMPLEMENTATION OF AIDC BETWEEN ADJACENT AUTOMATED SYSTEMS

2.1. Introduction

2.1.1. When referring to AIDC-related communications, it should be noted that AIDC is an ATN application used for the exchange of ATS information between two units that have automated centres that support its implementation.

2.1.2. AIDC allows for the exchange of ATS information about active flights, with respect to flight notification, coordination, transfer of control, surveillance data and free text data.

2.1.3. When talking about this automated exchange, we are basically referring to ATS interfacility data communication (AIDC), as defined by ICAO.

2.1.4. Although technical provisions have been defined in various documents cited in this document, the current scenario in the SAM Region calls for an AIDC conceived in function of the means of telecommunication and facilities available in the States.

2.1.5. At present, the SAM Region has different systems and a multiservice platform (REDDIG II) that are optimal and adequate. Consequently, the Region must work on three relevant elements: the concrete use of the AMHS system, the incorporation of automated systems that support AIDC, and a multiservice platform like REDDIG II based on a satellite network and a terrestrial IP MPLS network.

2.1.6. Beyond the various examples we can find --for example, CAR/SAM/ICD and PAN AIDC ICD—for NAT/APAC Regions, this chapter will address the platforms and means that SAM States have or will have available in the short term. In this sense, emphasis will be placed on the AMHS and the ATN IP network for the implementation of AIDC.

2.1.7. It should be noted that the provisions on AIDC are also contained in ICAO Doc 4444, Chapter 11, as well as Doc. 9694 Manual of Air Traffic Services Data Link Applications (Part VI).

2.1.8. Although there are no communication protocols or physical path set for AIDC, different recommendations and practical references will be presented to facilitate implementation.

2.2. Communication considerations for the interconnection of automated centres

2.2.1. First of all, it should be noted that coordination can take place between the following ATSUs: ACC and ACC, ACC and APP, APP and APP, and APP and TWR.

2.2.2. Details about aspects related to of communications on the header, the AFTN priority, data optional field (ODF), addressing, message number of identification, reference information, time stamp, CRC, time of response, interpretation of the AIDC header y measurement of the performance are presented in **Appendix** A to this guide.

2.2.3. It should be noted that, at present, the Plan for the Interconnection of Adjacent Automated Centres of the SAM Region, as relates to AIDC systems between the States, can be implemented in three ways:

1) AFTN: message format using the ITA-2 or IA-5 protocol, and using the header field for optional information (Vol. II, Annex 10, 4.4.15.2.2.6). It has a length of 69 characters. Implementation is recommended through REDDIG II node ports. The caveat is that it only accepts the ASCII format.

The typical configuration of an AFTN channel is shown below.

AFTN interface	Parameters
Type	Synchronous - Asynchronous
Data	AIDC
Format	ICAO
Message identity	FPL, ABI, CPL, EST, CDN, ACP, REJ, PAC, MAC, TOC, AOC, LAM, LRM
Message definition	Ref. Doc 4444
Data speed	9600bps or upper
Physical connection	25 pin type "D"
Electrical characteristics	RS232c V24/V28
Data bits, parity, stop bits, protocol	8 bits, NP, 1 stp, IA-5 / ITA- 2

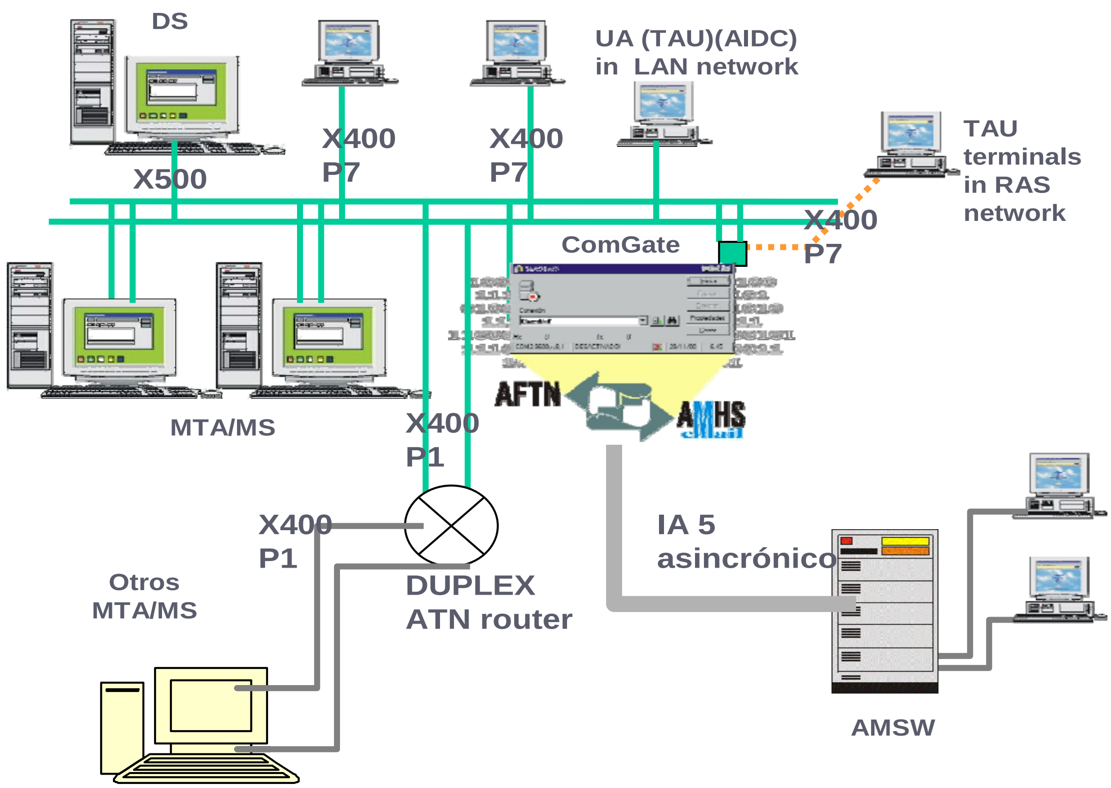
Table 1. AFTN channel configuration

2) Dedicated channel (point-to-point): involves the use of dedicated lines that meet safety and performance requirements. It is recommended that this be used through the REDDIG, and depending on the ports to be used.

3) AMHS: using the REDDIG II WAN network applying the recommendations concerning the SAM REDDIG IP Plan. It is important to highlight the importance of interconnecting the MTAs between States as a precondition.

4) In the case of the AMHS, the required bandwidth is 4,8 Kbps and 14,4 Kbps (taking into account the additional bandwidth) (see Doc SAM ATN – Study on the implementation of a new digital network for the SAM Region (REDDIG II)).

2.2.4. The following graph illustrates a scenario with the different components of an AMHS architecture coexisting with AFTN.



Graph 1 - AFTN/AMHS scenario (source: Skysoft)

- UA: User agents (the customers, in this case, AIDC).
- MS: Message storage for handling message delivery and retrieval.
- MTA: Agent responsible for routing messages between MTAs, MSs and UAs.
- P7: Protocol used for retrieval from the MS (ITU-T X.413) ("push" type) by the UA
- P3: Delivery protocol ("pull" type)
- P1: Protocol for communicating and routing messages between MTAs (ITU-T X.411)
- DS: Directory server that communicates using X.500 protocols

2.2.5. Regarding the bandwidth required for the three aforementioned cases, document SAM ATN – Study on the implementation of a new digital network for the SAM Region (REDDIG II)), states the following:

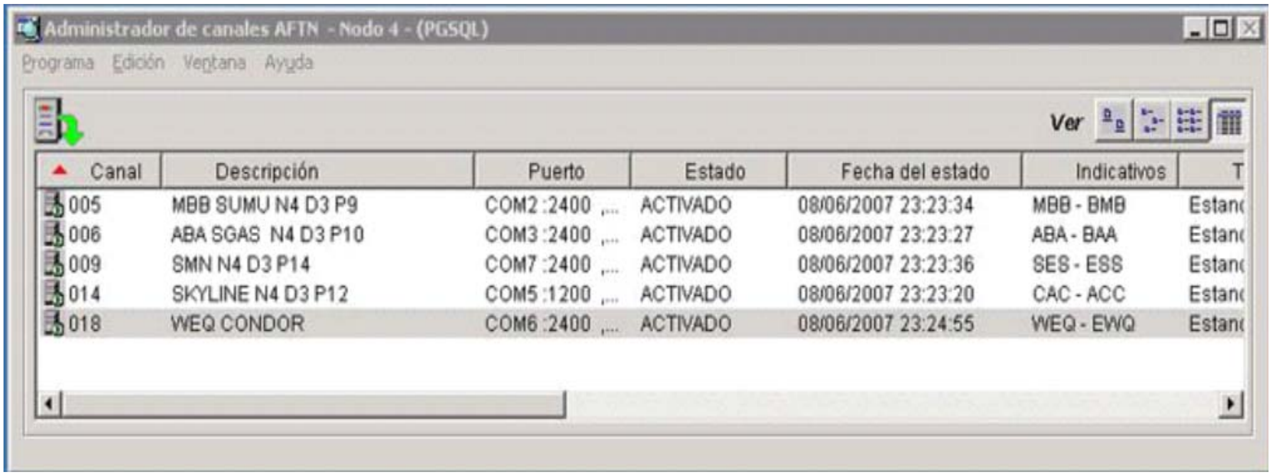
In the case of AFTN and AMHS, *"these are AFTN messages generated/received by automated systems, which travel over the respective AFTN or AMHS systems (or a combination of both). Accordingly, the increase in the amount of information will only result as an increase in the number of AFTN messages circulating through the ATN"*.

2.2.6. *"Since ATS traffic has historically accounted for only 15% of total AFTN traffic, assuming a 3-fold increase (300%) of ATS messages, this will only result in a 30% increase in AFTN traffic"*.

2.2.7. In the case of a dedicated link, each centre will send the information to the corresponding adjacent centre, *and the bandwidth will be increased in function of the number of control messages to be generated by each automated centre, which will obviously be a function of surrounding air traffic.*

2.2.8. This ICD mainly refers to the implementation of AIDC based on AMHS and AFTN systems.

2.2.9. AIDC messages will be exchanged through the AFTN and the AMHS. However, AFTN/AMHS gateways shall be used to allow the two systems to continue coexisting, both at present and in the future. Accordingly, these gateways convert AFTN messages to the AMHS format and *vice versa*.



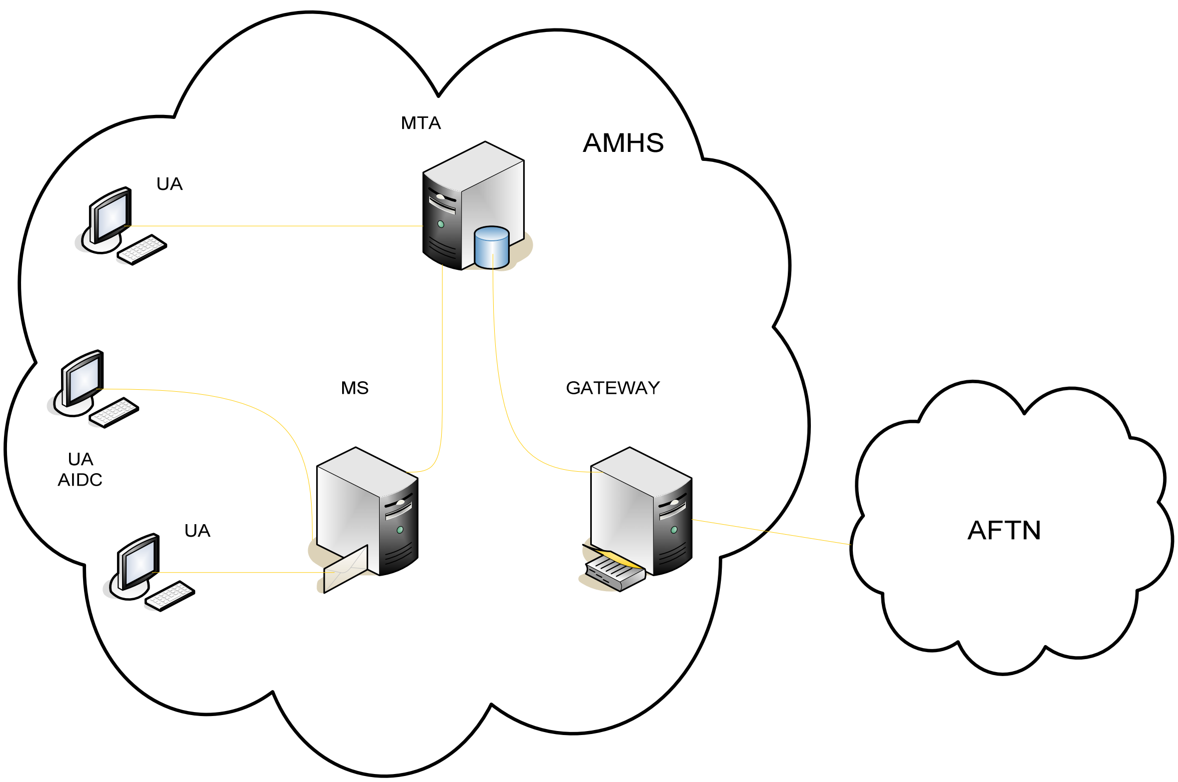
Administrador de canales AFTN - Nodo 4 - (PGSQL)

Programa Edición Ventana Ayuda

Ver

Canal	Descripción	Puerto	Estado	Fecha del estado	Indicativos	T
005	MBB SUMU N4 D3 P9	COM2 :2400 ,...	ACTIVADO	08/06/2007 23:23:34	MBB - BMB	Estan
006	ABA SGAS N4 D3 P10	COM3 :2400 ,...	ACTIVADO	08/06/2007 23:23:27	ABA - BAA	Estan
009	SMN N4 D3 P14	COM7 :2400 ,...	ACTIVADO	08/06/2007 23:23:36	SES - ESS	Estan
014	SKYLINE N4 D3 P12	COM5 :1200 ,...	ACTIVADO	08/06/2007 23:23:20	CAC - ACC	Estan
018	WEQ CONDOR	COM6 :2400 ,...	ACTIVADO	08/06/2007 23:24:55	WEQ - EWQ	Estan

Graph 2 – Channel display for a SAEZ gateway administrator



Graph 3 – Schematic of gateway function

2.2.10. It should be noted that in 2005, SAM States decided to start replacing their AFTN aeronautical messaging systems with AMHS messaging systems, which have been implemented over IP networks (version 4), especially for the interconnection of MTAs between States.

2.3. Phases to be taken into account for the implementation of AIDC between adjacent automated centres of different States

2.3.1. A practical guide on the steps to follow to ensure an effective implementation of AIDC for coordination between adjacent automated centres of different States should take into account the following aspects.

2.3.2. As already stated, this mainly refers to the use of the means already available or to be implemented in the short term in the States.

2.3.3. In conclusion, the following items must be taken into account:

1) Drafting of the memorandum of understanding between the States
2) Provision of connectivity between the AMHS server or AFTN CCAM or dedicated channel and the automated system
3) Establish the physical and logical connection between the States
4) Create the required AMHS or AFTN user accounts (mailbox)
5) Verify the user accounts
6) Incorporate user accounts into the automated systems that support AIDC
7) Establish a test protocol
8) Conduct pre-operational tests
9) Conduct operational tests
10) Establish and define definitive operating stages (letters of agreement)

2.4. Prepare the memorandum of understanding between the States

2.4.1. First, the States must sign a memorandum of understanding (bilateral agreement) clearly expressing the commitment of the parties to implement the interconnection of automated air traffic systems, especially for AIDC.

2.4.2. Basically, this document must contain the references on which the work will be based; the purpose; the operational, technical, administrative and financial aspects; and everything that the intervening States deem important to include in the document.

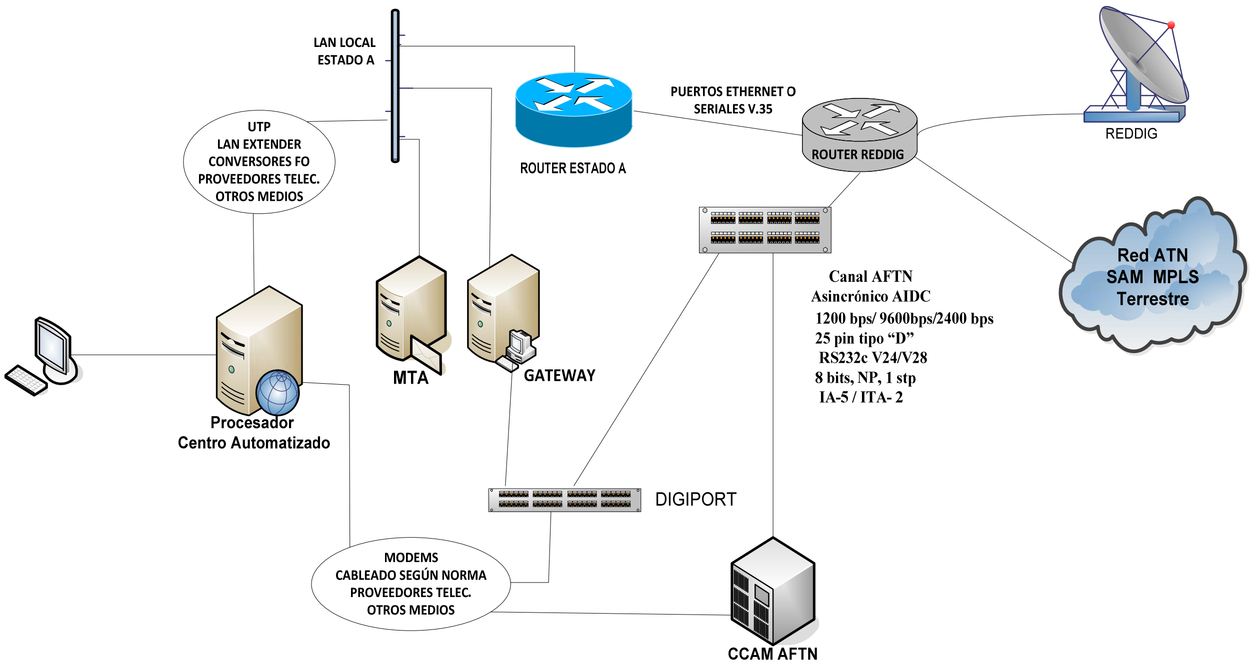
2.4.3. It is important to note that, for purposes of the implementation, the States must identify the focal points (coordinators) to be responsible for coordinating the respective work teams to be established as required (that is, technical, operational or technical-operational teams).

2.4.4. These focal points (coordinators) shall be designated by an Interconnection Management Committee, which, in turn, will be composed of a Coordinator, a Technical Group, and an Operational Group.

2.4.5. In this regard see Appendix A showing a model Memorandum of Understanding (MoU) based on the Memorandum of Understanding for Automated Systems.

2.5. Provision of connectivity between an AMHS server or AFTN CCAM or dedicated channel and the automated system

2.5.1. The first thing that must be available in each State is the connectivity between the AMHS server, or AFTN CCAM, or the dedicated channel (which is supposedly integrated to its users), whether through a TCP/IP platform, synchronous/asynchronous port, or dedicated channel, respectively. Within this framework, it is understood that the connection between the telecommunication node (that physically hosts the connection that allows linkage with the other State) and the automated system will be achieved through the IP network, or local gateway, or specific cabling, as applicable.

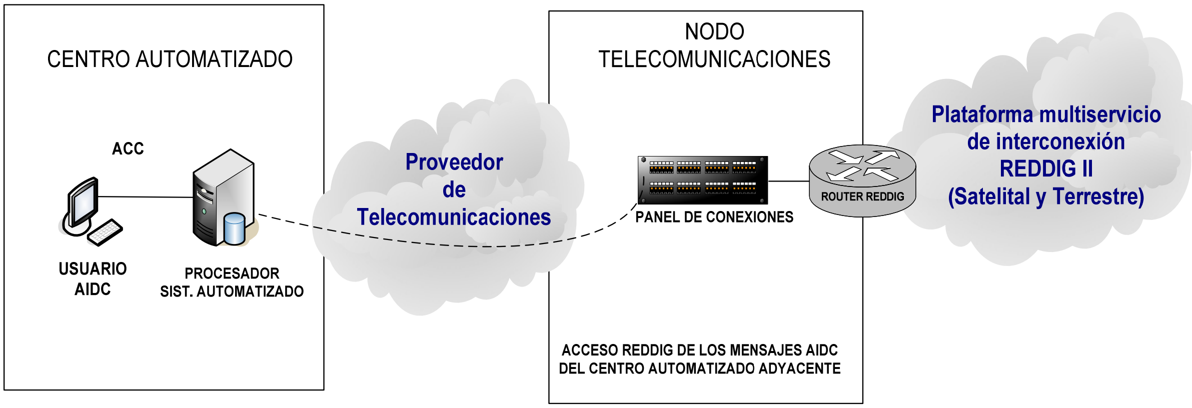


Graph 4 – Possible last-mile connectivity scenarios

2.5.2. In this regard, the aforementioned would seem of minor significance, since the respective telecommunication node or server is generally close to the automated centre. But this aspect acquires significance when considering those cases in which structured cabling and physical interface standards (distance factor, cable characteristics, connector, protocol, etc.) demand technical solutions that may require economic resources. For example: State A has a local IP network at the same location as the REDDIG II telecommunication node, and the automated system is located in B, which is in another city or at a distance greater than 100 meters.

2.5.3. In this example, this is an important factor to bear in mind due to technical-administrative timings and the budgetary element involved. This is an important aspect since it could affect implementation times and thus the bilateral agreement.

2.5.4. We know that an automated centre receives the flight plans and it is to be assumed that, given the above scenario, the aforementioned would be no major problem. However, it should be taken into account, especially when talking about point-to-point connections.



Graph 5 – Illustration of the case in which the AIDC message telecommunication access node is far from the automated centre

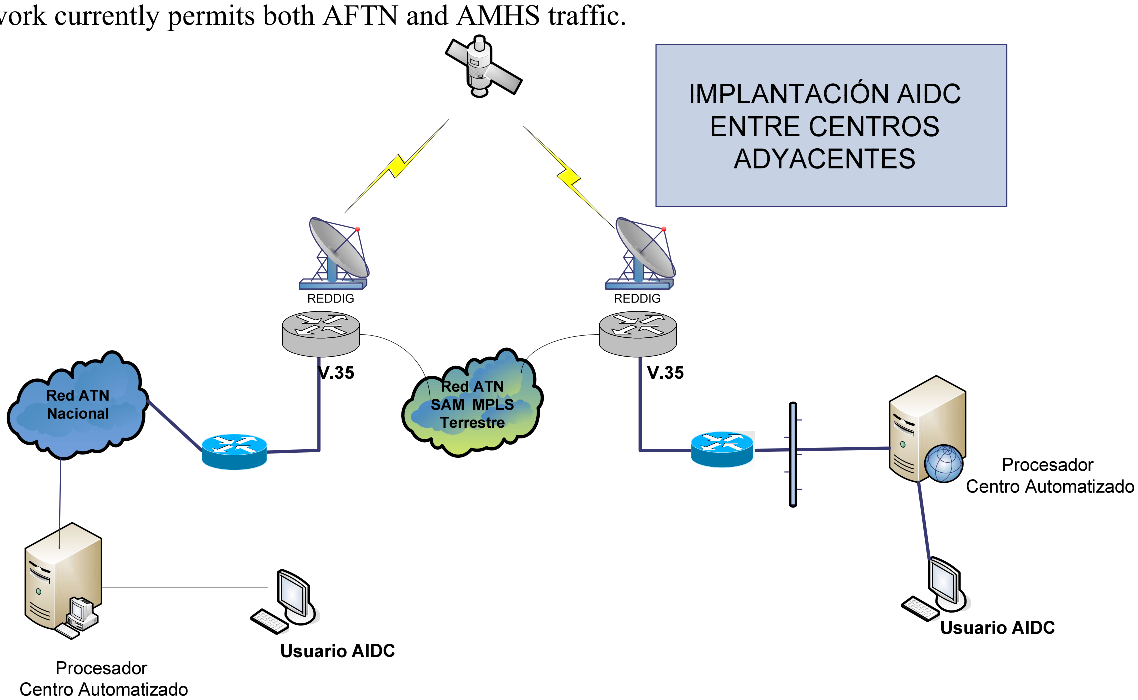
2.6. **Establish physical and logical connectivity between States**

2.6.1. Once local connectivity is achieved, physical and logical connectivity between the States must be established.

2.6.2. For the completion of this phase, the tools and means available in the SAM Region to implement AIDC between the States are presented below.

2.6.3. *REDDIG II. Regional multi-service platform*

2.6.4. It should be first noted that the REDDIG II is a multi-service platform on which the physical and logical connectivity between States for AIDC must be established. Furthermore, this network currently permits both AFTN and AMHS traffic.



Graph 6 – Integration of AIDC users of adjacent centres

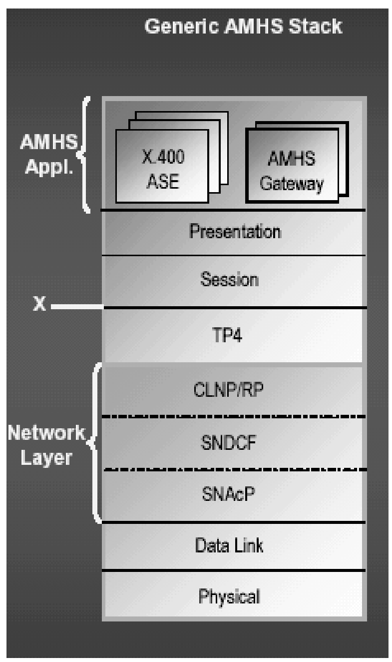
2.6.5. In this regard, the definition of connectivity adopted in the Memorandum of Understanding must be taken into account.

2.6.6. Although already mentioned, some considerations and elements to be taken into account when establishing the link between States are iterated below.

2.6.7. For each case, it shall be noted that AFTN channels are normally configured at 9600bps, 8 bits, NP, 1stp, IA-5, synchronous/asynchronous, RS 232c V24/V28, physical connection: 25-pin, type 'D'.

2.6.8. For an AMHS system, the following elements are taken into account: MTA, MS, DS (X.500), gateway to support AFTN channels, CAAS addressing, **message exchange protocols: MTA-MTA: P1** / UA-MS: P7, users – machines (Flight Data Processor – AU), users – humans (terminals - UA), Mailbox: 2100. The required bandwidth will be 4,8 Kbps and 14,4 Kbps (considering the additional bandwidth).

2.6.9. Likewise, in the case of the AMHS, the reference used is the OSI model, which defines the elements to be taken into account, depending on the layer. For dedicated links, based on the experience of the Region, ports of characteristics similar to those of AFTN channels are used. In this sense, note should be taken of that mentioned in paragraphs 2.2.3, 2.2.4, 2.2.5 and 2.2.6.



Graph 7 – OSI model reference

2.7. Possible scenarios

2.7.1. Currently, most SAM States have incorporated AMHS. In reality however not all States have interconnected their MTAs. Therefore, those States that have AMHS also have an associated gateway that does the conversion from the AMHS "world" to the AFTN "world" and *vice versa.* This is an important issue to be taken into account during AIDC implementation.

2.7.2. *Connectivity through asynchronous ports.* This case may be applied both to a dedicated link or to an AFTN application.

2.7.3. Paragraph 2.6.6 and Doc 9880 must be taken into account.

2.7.4. *Connectivity through an IP network.* Currently, there is a REDDIG IPv4 Addressing Plan in the SAM Region, **Appendix B**, which establishes 8190 IP addresses assigned to each State. It is understood that this availability of addresses would be enough to meet current needs.

2.7.5. Furthermore, the SAM REDDIG IPv4 addressing plan gives flexibility to each State/Territory in the design of its ATN networks and in local implementation of aeronautical applications over IP networks. Likewise, this scheme takes into account future requirements based on address availability.

2.7.6. In order to establish this type of link between States, some physical and logical aspects must be considered.

a. Follow the REDDIG IPv4 addressing scheme set for the Region.
b. Identify the physical port to be used for connecting to the networking equipment of the State network (router)
c. Define, if applicable, the V.35 DCE/DTE interface or protocol
d. Set the configuration parameters for networking equipment:

   * Type of encapsulation
   * DLCI for frame relay, or port priority (QoS) for MPLS,
   * Type of LMI protocol for frame relay,
   * REDDIG WAN IP address (see SAM REDDIG IPv4 addressing plan, Annex C, graph 9).
   * REDDIG LAN IP address (see SAM REDDIG IPv4 addressing plan, Annex B, graph 9)

e. States that have had local addressing prior to the implementation of the SAM REDDIG IPv4 addressing plan or that have not taken it into account shall use NAT (network address translation) or some other mechanism to adapt the national IP network to the regional IP network. See graph 8.

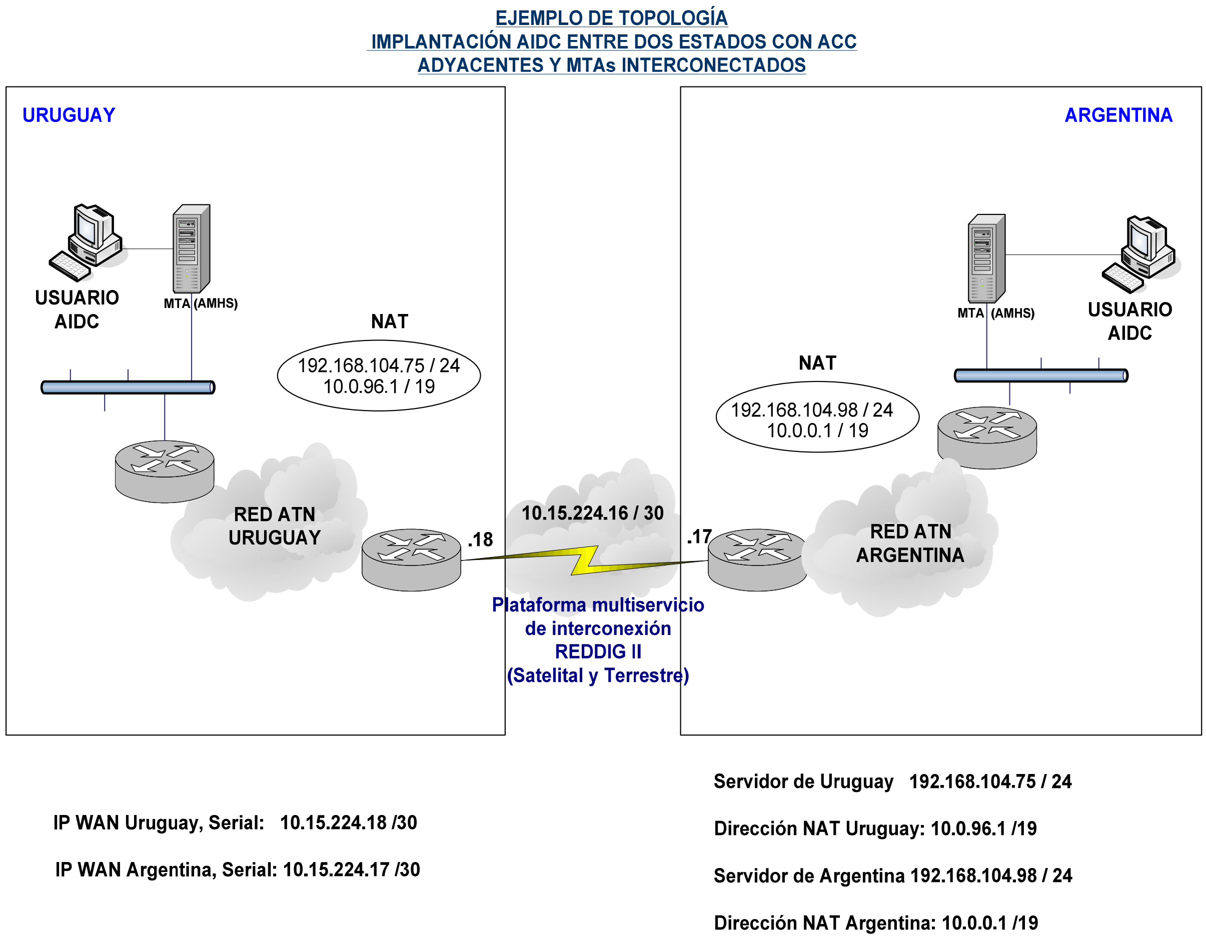
```
AMHS-RT-EZE-03#sh ip nat translations
Pro Inside global      Inside local       Outside local      Outside global
--- ---                ---                192.168.48.100     10.0.0.1
--- ---                ---                192.168.104.34     10.0.0.10
--- ---                ---                192.168.104.233    10.0.96.10
tcp 10.0.0.1:102       192.168.48.100:102 10.0.64.2:12341    10.0.64.2:12341
tcp 10.0.0.1:102       192.168.48.100:102 10.0.64.2:16023    10.0.64.2:16023
tcp 10.0.0.1:102       192.168.48.100:102 10.0.64.2:38573    10.0.64.2:38573
tcp 10.0.0.1:102       192.168.48.100:102 10.0.64.2:63718    10.0.64.2:63718
tcp 10.0.0.1:102       192.168.48.100:102 10.0.64.2:64317    10.0.64.2:64317
--- 10.0.0.1           192.168.48.100     ---                ---
udp 10.0.0.10:4001     192.168.104.34:4001 10.0.113.99:4001  10.0.113.99:4001
udp 10.0.0.10:4001     192.168.104.34:4001 10.0.114.99:4001  10.0.114.99:4001
--- 10.0.0.10          192.168.104.34     ---                ---
--- 10.0.96.10         192.168.104.233    ---                ---
```

Graph 8 – Verification of address translation

2.7.7. In order to understand address translation between two States, the previous graph shows that IP 10.0.0.1 is consistent with the SAM REDDIG IPv4 plan, and is associated to IP 192.168.48.100, which is an MTA of Argentina (local IP address of the State ATN), while 10.0.64.2, also consistent with the SAM REDDIG IPv4 plan, is the IP assigned to an MTA of Brazil.

2.7.8. Basically, in order to comply with the above, each State must have the networking equipment (router) that will be connected, on the one hand, to the State LAN and, on the other, to the REDDIG networking equipment (FRAD or router) through a serial port or Ethernet. In this case, the SAM REDDIG IPv4 plan defines the REDDIG WAN and LAN addresses.

2.7.9. The connection scheme described above is shown below.



Graph 9 – Example of AIDC topology using the SAM REDDIG IPv4

2.7.10. After verifying the connection between the end networking units and the connectivity with the respective local networks, the following phases shall be implemented.

2.7.11. Taking into account the SAM REDDIG IPv4 addressing plan for REDDIG LAN networks (see Appendix A), each State may use the addresses and the addressing scheme of its choice. Nevertheless, a redistribution of network segments is proposed in **Appendix C**.

2.7.12. The purpose of this recommendation is to be able to specify what network segments will be assigned to certain services. It basically means dividing the REDDIG LAN networks of each State into VLANs. But these VLANs must have the same structure in all States.

2.7.13. This recommendation is not only intended for application in AIDC but also in all current and future services to be exchanged between SAM States. It also permits the establishment of a pre-established order that will contribute to an orderly implementation of services (see Annex D to this document).

2.7.14. It is also advisable that:

1) Network addresses are assigned in continuous blocks.

2) Address blocks are distributed in hierarchical order to enable routing scalability.

3) Sub-network configuration is made possible in order to take maximum advantage of each assigned network (subnetting).

4) Super-network configuration is made possible in order to take maximum advantage of each assigned network (supernetting)

5) The quality of service in an MPLS (REDDIG II) environment is specified.

2.7.15. The only assigned addresses that are known to the rest of the States will be those of the interfaces of the communication equipment used at the *interconnection boundaries* between the internal and external networks of each State.

2.7.16. For the interconnection between their bordering equipment, the States will agree on the routing protocol to be used, unless REDDIG II implementation requires otherwise.

2.7.17. Each State shall ensure routing through its network to the internal address(es) of the application servers it uses *vis-a-vis* other States.

2.7.18. The Regional Office, by virtue of the corresponding institutional arrangements, will coordinate the implementation of the selected *regional routing*.

2.8. Create the required AMHS or AFTN user accounts (mailbox)

2.8.1. At this point, the user accounts that will operate with AIDC for the interconnection between automated centres must be defined. In this regard, it should be noted that the eight-letter designator would not be affected whether AMHS or AFTN systems are used.

2.8.2. This is relevant for AMHS because the address of the AMHS server must be associated to a REDDIG IPv4 address of the SAM addressing plan. For example: the AIDC user of State A, in addition to its eight-letter address, will be associated to an IP address of the national ATN. When the AIDC user of State A sends an AIDC message to an AIDC user of adjacent State B, the AMHS server will interpret that it is a message for State B. At this point, two things may happen:

1) If both States have an AMHS system and the respective MTAs are interconnected, traffic shall be routed through an IP address specified in the SAM REDDIG IPv4 plan and associated to the servers of the States.

2) If neither State has AMHS, or one does and the other one does not, or both have it but their MTAs are not interconnected, traffic will be routed to the gateway so that it is transferred to the AFTN world; or will use the assigned AFTN port directly to the destination State. In the case of the AFTN, the channel must be configured in the gateway or AFTN system (data rate, type of channel, standard, type of interface, mode, etc.).

2.8.3. According to the experience in Argentina, it would be required to have at least two user accounts. One will be defined for traffic of AIDC operative messages and the other account for simulation and testing of AIDC traffic and eventually as alternative user account if necessary.

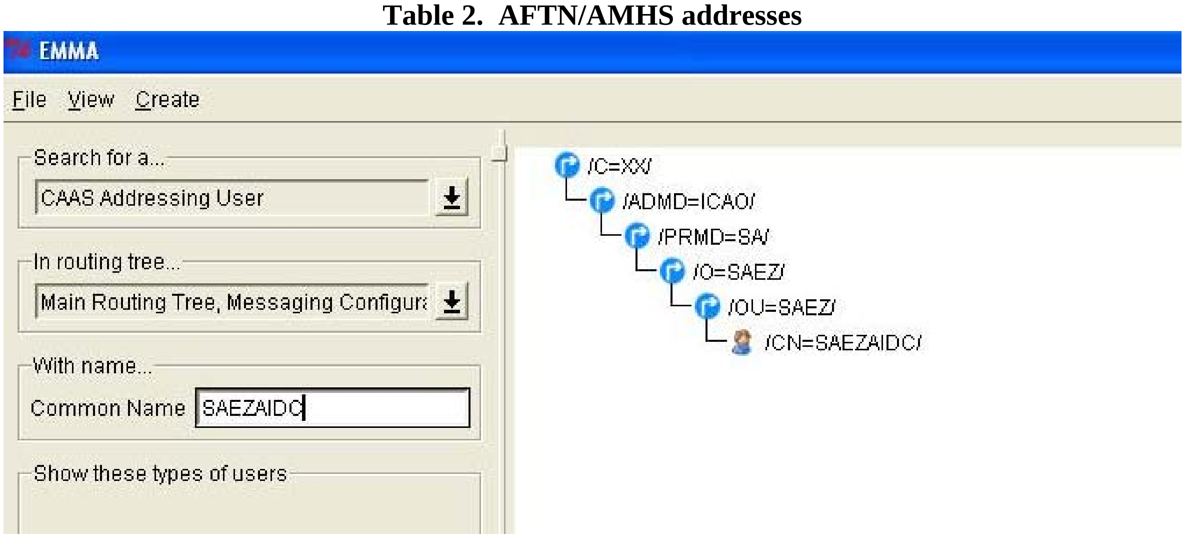
2.8.4. In order to standardise user accounts, this document proposes that the last four letters of the assigned address should be: for AIDC operative traffic messages and CADI for simulation, testing or alternative. In this manner, all the personnel of the States of the Region will readily identify that the message belongs to AIDC and what type of traffic is concern.

2.8.5. Example:

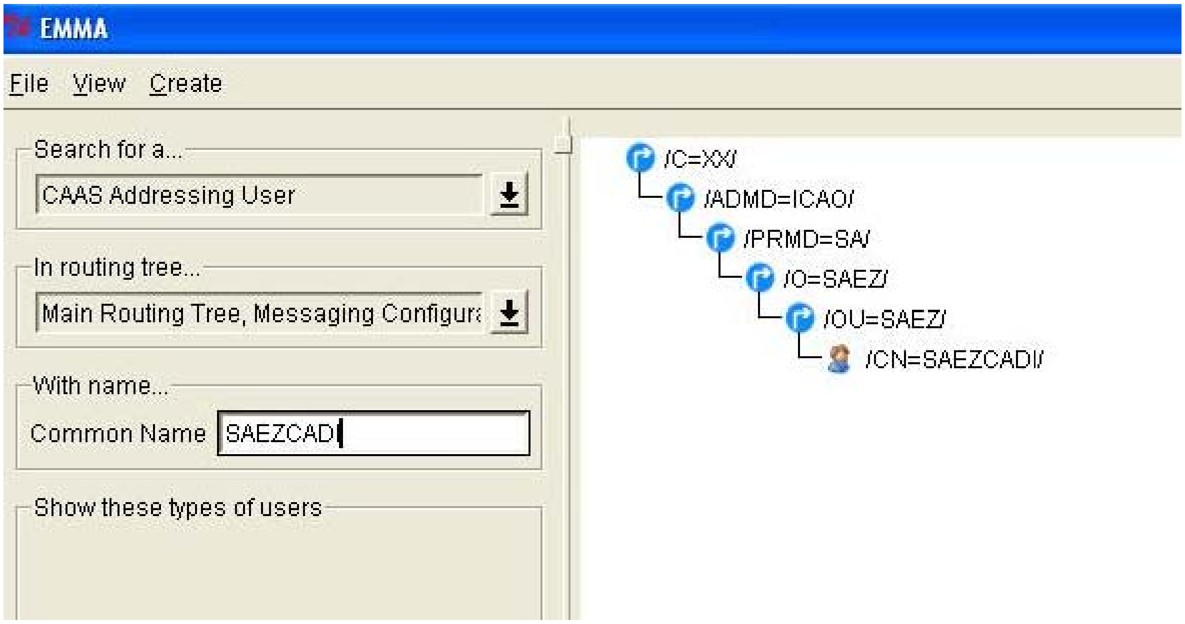
"Assuming the automated centres of Uruguay and Argentina are interconnected, the following addresses will be defined":

	AFTN/AMHS address for operative traffic	AFTN/AMHS address for simulation testing or alternative
Uruguay	SUMU**AIDC**	SUMU**CADI**
Argentina	SAEZ**AIDC**	SAEZ**CADI**

Table 2. AFTN/AMHS addresses



Graph 10 – Configuration of the AIDC account in the AMHS system



Graph 11 – Configuration of the CADI account in the AMHS system

2.9. **Verify the user accounts**

2.9.1. Although the operational verification of user accounts is simple and basic, it is a vital step prior to implementation, where members of the Technical Group and the Operational Group of the Interconnection Management Committee will test the delivery and reception of AIDC messages between AIDC accounts users.

2.9.2. To this end, test AFTN or AMHS terminals must be available and configured as if they were end users (automated systems). See Doc 9880 and Doc 4444.

2.9.3. For message transmission, the AIDC application requires that:

a) messages be generated and sent in the required time sequence; and
b) messages be delivered in the order they are sent.

2.10. **Incorporate user accounts to the automated systems that support AIDC**

2.10.1. Once the proper operation of user accounts has been verified, the next step is to coordinate with the technical-operational personnel--which should be part of the Interconnection Management Committee--for their incorporation into the automated systems.

2.10.2. It is recommended that this task be fulfilled preferably in a simulator, if available. More details in this regard are provided in Chapter III of this document, which deals with operational aspects.

2.11. **Establish a test protocol**

2.11.1 Once user accounts have been incorporated into the automated system, the Interconnection Management Committee, which is made up by personnel from both States, will establish a test protocol based on that stated below.

2.11.2 This protocol must cover all aspects related to AIDC operation. In this sense, Annex A contains a general model that must be enriched with the experience gained from various implementations between States.

2.11.3 The development of this test protocol will allow to carry out the pre-operational test which must take place within a safe context to prevent these AIDC messages from entering the operational system that is operating at that moment.

2.12. **Conduct pre-operational tests**

2.12.1. The test protocol will permit the conduction of pre-operational tests and all traffic controllers must participate.

2.12.2. During this phase all coordination between concerned ATSUs will be made as usual through speech means and the correct AIDC performance will be verified, making the necessary actions to ensure the continuity of the automatic coordination.

2.12.3. Consideration should also be given to the requirement of informing all stakeholders, as necessary, about the conduction of these tests.

2.12.4. This part of the document is further explained in Chapter III and **Appendix C**.

2.13. **Conduct operational tests**

2.13.1. Once the correct operation of the AIDC has been corroborated in the previous stage, the operational test will be conducted. During this phase all coordination between concerned ATSUs will be made through AIDC and speech means will be verified.

2.14. **Establish and define the definitive operating stages**

2.14.1. Although more details in this respect will be provided later, it must be noted outright that stages need to be defined. Basically:

a) in the pre-operational phase, the AIDC will support speech coordination between centres.

b) in the operational phase, the opposite will occur, where speech communication will support the AIDC system.

2.15. **Associated automation functionality**

2.15.1. Each ATS service provider must be required to have the necessary support in each automation system that is implemented or to be implemented in order to be initially capable of:

- Error verification: check all incoming messages for the right format and logical consistency
- Making sure that only messages from authorised senders are accepted and processed
- When necessary, alerting the responsible controller about the flight data received.
- Making sure that the appropriate personnel can configure the logical-automatic response time of a message initiated at the other control unit.

2.16. Solutions or recommendations in case of failure or recovery

2.16.1. Automation systems may have different mechanisms for avoiding major failures and for error recovery. Basically, each participating system shall have the following characteristics:

- If the recovery process preserves the current message number at the time of the occurrence, in the sequence established between each intervening system, the notification is not required.
- If the recovery process requires the resetting of the sequence number to 000, a means must be established to notify the receiver unit that message numbers have been reinitiated. This may be established as a procedure agreed between the parties instead of being automated.

2.16.2. Once a LAM is received, if a recovery process takes place following an occurrence, the CPL is not sent automatically, so any CPL for which a LAM had been received must be sent again. This is relevant if the system was able to recover information on the status of coordinated flight plans that have been coordinated and has no need to restore message sequence numbers.

2.17. Security considerations

2.17.1. Privacy

2.17.1.1. The ICD does not define mechanisms to ensure privacy. It may be assumed that data sent through this interface can be seen by undesired third parties, either by intercepting messages or through disclosure at the receiving centre.

2.17.1.2. All communications that require privacy must be identified, and communications and procedures properly defined. In this sense, it is recommended that mechanisms be used for preserving the confidentiality of information (*e.g.,* firewalls, private networks, trained technical and administrative personnel, etc.). Thus the critical importance of using the REDDIG II as part of a private network.

2.17.1.3. It is also recommended that, during coordination between the States, the security policy to be implemented be taken into account as a determining factor. Even more so if the trend is to use IP networks, regardless of the platform.

2.17.1.4. In order to avoid threats and vulnerabilities, these security policies should be aimed at:

- Protecting confidentiality
- Preserving integrity
- Ensuring availability

2.17.1.5. Security risks cannot be completed eliminated or prevented; however, they can be minimised through effective risk management and assessment. Although the future ATN network supported by the REDDIG II is not available for the non-aeronautical world, it is open to the aeronautical world.

2.17.1.6. ATN network users expect security measures to ensure:

- That users will only be able to carry out authorised tasks.
- That users will only be able to obtain authorised information.
- That users will not be able to damage the data, applications or the operating environment of a system.

- A system that can track user actions and the network resources to which these actions have access.

2.17.1.7. The "safety policy" is key to the implementation not only of AIDC but also of all the services in the Region. Consequently, special attention should be paid to the "Guidance on Safety for the Implementation of IP Networks", Project D1, SAM ATN Architecture, April 2013.

2.17.2. **Authentication**

2.17.2.1. Each system must verify that messages received are from the source stated in Field 03, which identifies the message type designator, message number, and reference data (see Doc 4444).

2.17.3. **Access control**

2.17.3.1. Each system participating in the interface will implement access controls to ensure that the source of the message is authorised to send a given type of message and that it has the right authority over the flight in question.

2.18. **Performance considerations**

2.18.1. Communication systems. Requirements and parameters

2.18.2. In addition to the requirements specified in this document, all data link applications require that:

a) the probability of not receiving a message be 10^{-6} or less;

b) the probability that a message not received is not be notified to the sender be 10^{-9} or less; and

c) the probability that a message is erroneously routed be 10^{-7} or less.

2.18.3. The figures in Table 3 reflect the various performance levels that may be selected for the provision of data link services. Depending on the level of service to be provided, a State may define its performance requirements based on factors such as separation minima applied, traffic density, or traffic flow.

Application	**Availability (%)**	**Integrity**	**Reliability (%)**	**Continuity (%)**
DLCI	99.9	10^{-6}	99.9	99.9
ADS	99.996	10^{-7}	99.996	99.996
CPDLC	99.9	10^{-7}	99.99	99.99
FIS	99.9	10^{-6}	99.9	99.9
AIDC	99.996	10^{-7}	99.9	99.9
ADS-B	99.996	10^{-7}	99.996	99.996

Table 3. Performance requirements

2.18.4. Except under catastrophic circumstances, and based on the previous parameters, there may only be one end-to-end interruption that shall not exceed 30 seconds. (End-to-end availability can be achieved through the provision of alternate communication routes wherever possible. In this sense, REDDIG II contemplates this scenario).

2.18.5. For flight planning messages, controllers need a failed message transmission indication within 60 seconds of the message being sent. Therefore, the response time from the moment a message is sent until a LAM (or LRM) is received shall be less than 60 seconds at least 99% of the time under normal operating conditions. However, this can vary depending on the requirements of each centre. This may be modified following an analysis to ensure service efficiency.

2.18.6. Consequently, the response time from the moment a message is sent until a LAM (or LRM) is received shall be less than 60 seconds at least 99% of the time under normal operating conditions. A fast response time is desirable and will result in more efficient operations.

2.19. **Availability and reliability**

2.19.1. The software and hardware resources required for providing an interface service to users in the SAM Region must be developed in such a way that reliability is inherent to interface availability, which should be at least the same as that for end-to-en systems (for example, 99,7% availability for the systems at each end, which operate with 99,7% reliability).

CHAPTER III

3. OPERATIONAL ASPECTS FOR THE IMPLEMENTATION OF AIDC BETWEEN ADJACENT AUTOMATED SYSTEMS

3.1. Introduction

3.1.1. This application of data communications between air traffic control units is not intended to fully replace voice communications. Initially, it will supplement traditional (voice) communications and will gradually become the main coordination channel, supplemented by speech communication.

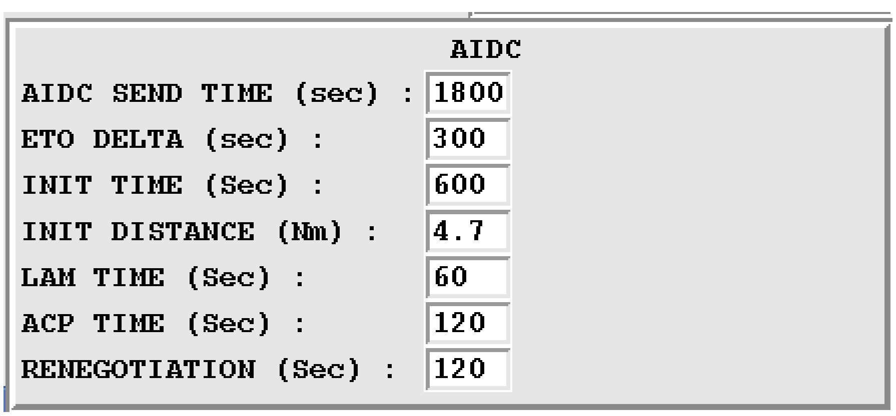
3.1.2. The notification, coordination and transfer stages will continue to be the same as those described in ICAO Doc 4444 in Chapter 10, with the difference that, when using an AIDC application, the intervention of the operator will be minimal.

3.1.3. AIDC messages will have the same format and content as those normally used, as shown in ICAO Doc 4444, Chapter 11.

3.2. Letter of Operational Agreement

3.2.1. Prior to AIDC implementation, a new letter of agreement between ATC units will be drafted, taking into account aspects concerning how much time in advance will messages be transmitted from one unit to the other.

3.2.2. This agreement between the parties will result in the configuration of each automated system according to the following example:



Graph 12. AIDC configuration

- *AIDC SEND TIME (sec):* Time before arrival to the ABI message delivery coordination fix.
- *ETO DELTA (sec):* Difference in the estimated time of flight over the coordination fix that triggers the delivery of a new ABI message.
- *INIT TIME (sec):* Time before arrival to the coordination fix, which generates an EST message.
- *INIT DISTANCE (Nm):* Distance to the coordination fix, which generates an EST message.
- *LAM TIME (sec):* Waiting time of the LAM message.
- *ACP TIME (sec):* Waiting time of ACP message.

- *RENEGOTIATION (sec):* Waiting time to renegotiate coordination.

3.3. Minimum AIC message set

Category	Message	Name	Description
Pre-departure coordination of flights	FPL	Filed flight plan	Flight plan, as filed before the ATS unit.
	ABI	Notification	Notification messages will be sent in advance to ATS units.
Coordination of active flights	CPL	Current flight plan	The flight plan, including changes resulting from clearances.
	EST	Estimate	Time expected to cross the point of transfer or boundary point.
	CDN	Coordination	Proposal of amendment to coordination conditions.
	PAC	Pre-activation	Time expected of passage through the transfer point or boundary point for a flight that still does not take off, but is at an aerodrome near the border (optional use).
	MAC	Cancelation	Cancels the previous coordination
	ACP	Acceptance	Acceptance of proposed coordination or amendment.
	RJC	Rejection	Coordination rejected
Transfer of control	TOC	Transfer	The controller of the transferring unit has instructed the flight to establish communication with the controller of the accepting unit.
	AOC	Acceptance of transfer	The flight has established communication with the accepting controller
Logical	LAM	Logical acknowledgment	Acceptance of application.
	LRM	Logical rejection	Rejection of application.

Table 4. ATC message set

3.3.1. **Appendix D** to this document shows the format of messages in the minimum set.

3.4. AIDC procedures

3.4.1. Notification stage

3.4.1.1. The FPL enters the system and is in pre-notification state.

(FPL-SAEZ/SACO-ARG1502-IS-A320/M-SW/C-SAEZ1235-N0450F320 ATOVO3B ATOVO UW5 CBA-SACF0055-EET/SACF0037)

This is a flight plan for a flight from the International Airport of Ezeiza, in Buenos Aires to the International Airport of Cordoba, in Cordoba, with a proposed time of departure of 1235 UTC.

3.4.1.2. A predetermined time before the estimated time of passage over the coordination fix, the system sends an ABI. The coordination changes to the notified State.

(ABI-ARG1502/A1701-SAEZ-UBREL/1330F320-SACO-8/IS-9/A320/M-10/SW/C)

This is the ABI message that the automated system of Ezeiza sends to indicate to the Cordoba automated system that ARG1502 will be in the UBREL position at 1330.

3.4.1.3. The system receives a LAM, confirming that the system of the adjacent centre has a flight plan.

(LAM)

3.4.1.4. During the notification phase, the system sends an ABI message with each notification about the FPL, receiving a LAM for each ABI sent.

3.4.2. **Coordination stage**

3.4.2.1. A given time before the estimated time of passage over the point of notification or at a given distance from it, the system sends an EST message, and the FPL changes to the coordination state.

(EST-ARG1502/A1701-SAEZ-UBREL/1345F320-SACO)

This is an EST message sent by the Ezeiza system to the Cordoba system, notifying that the aircraft is in the air and estimated to arrive at the coordination fix at 1345.

3.4.2.2. The system receives a LAM acknowledging receipt of the EST message.

(LAM)

3.4.2.3. The operator of the receiving control centre must accept (ACP) or negotiate (CDN) the coordination.

3.4.2.4. If the operator of the receiving control centre accepts the coordination, the FPL changes to the Coordinated state.

(ACP-ARG1502-SAEZ-SACO)

3.4.2.5. The system receives an ACP and sends a LAM.

(LAM)

3.4.3. **Negotiation stage**

3.4.3.1. If the operator of the receiving control centre renegotiates the coordination (CDN), the FPL changes to the Renegotiation state.

(CDN-ARG1502-SAEZ-SACO-14/UBREL/0450F340)

This is a CDN message sent by the operator in Córdoba requesting that flight ARG1502 be transferred with FL340.

3.4.3.2. The system receives a CDN and sends a LAM.

(LAM)

3.4.3.3. The operator of the originating control centre must accept (ACP) or negotiate (CDN) the coordination.

3.4.3.4. If the operator of the originating control centre accepts the coordination (ACP), the FPL changes to the Coordinated state.

(ACP-ARG1502-SAEZ-SACO)

3.4.3.5. The system sends an ACP and receives a LAM.

(LAM)

3.4.3.6. If the operator of the originating control centre renegotiates the coordination (CDN), the FPL changes to the Renegotiation state.

(CDN-ARG1502-SAEZ-SACO-14/UBREL/0450F300)

This is a CDN message sent by the operator in Ezeiza requesting the operator in Córdoba to clear FL300 for ARG1502.

3.4.3.7. The system sends a CDN and receives a LAM.

(LAM)

3.4.4. **Transfer stage**

3.4.4.1. When the aircraft is close to the coordination FIX, at a distance or under the conditions established in the letter of agreement between the units, the operator of the originating control centre must send a transfer message (TOC). The FPL changes to the Transferring state.

(TOC-ARG1502/A1701-SAEZ-SACO)

3.4.4.2. The system sends a TOC and receives a LAM.

(LAM)

3.4.4.3. The operator of the receiving control centre must accept the transfer with an acceptance of transfer of control message (AOC). The FPL changes to a Transferred state.

(AOC-ARG1502/A1701-SAEZ-SACO)

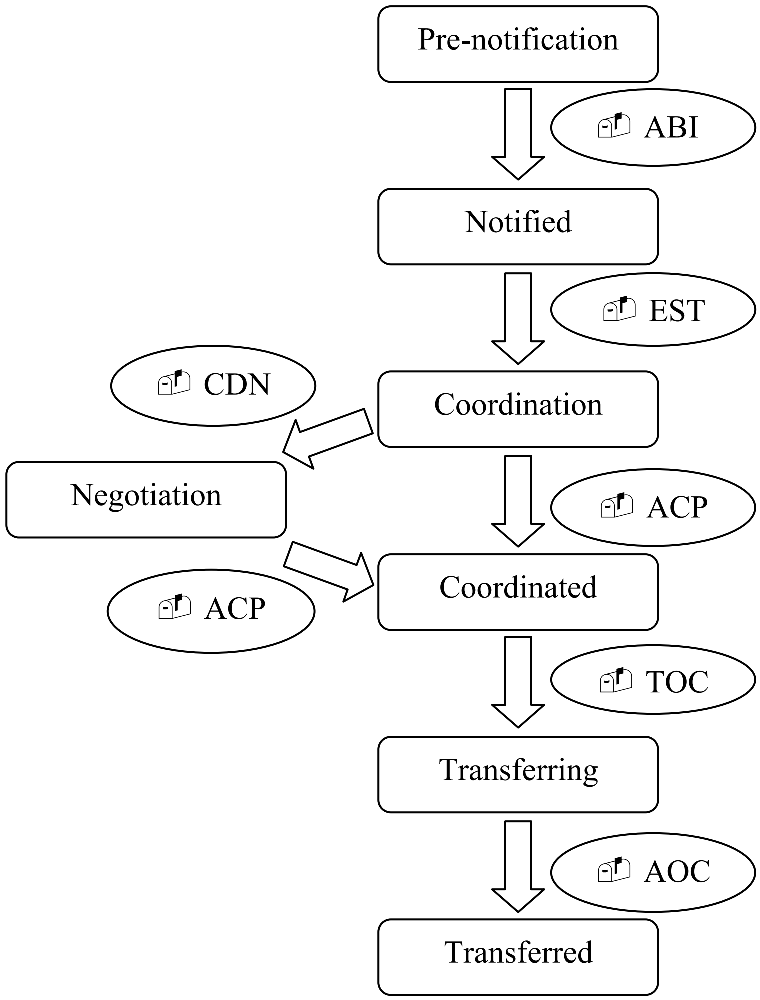
3.4.4.4. The system receives an AOC and sends a LAM.

(LAM)

3.4.4.5. Negotiations can be conducted after the transfer of a flight.

3.4.4.6. Note that, under normal coordination conditions, the function of the operator of the sector where the flight originates is limited to just observing the status of coordination in the flight table. In turn, the operator of the unit that will receive the flight must only accept the coordination in the system. Thus, the workload of operators/coordinators is significantly reduced, together with any errors due to misinterpretation, lapse of memory or neglect.

3.5. **Flow chart**



3.6. **Implementation testing phases**

3.6.1. **First phase**

3.6.1.1. ATC automated systems must be configured in such a way that they can mimic as best as possible the times and distances contemplated by controllers for starting coordination with adjacent control units.

3.6.1.2. Whoever adapts and configures the system must know which will be the mailboxes to be used for testing (its own and those of the counterpart).

3.6.1.3. It should be noted that tests would take place between simulators and all AFTN/AMHS addresses of those control units that will not be affected by the tests must be blocked. For example, the addresses of aerodromes to which take-off messages are normally sent automatically must be removed from the databases.

3.6.2. **Second phase**

3.6.2.1. A test protocol--covering the widest possible range of cases--will be developed to conduct tests between the two control units, with the participation of technical, database management, and operational personnel. An example of test protocol is presented as **Appendix C**.

3.6.2.2. Tests will involve generating FPLs in both control units and verifying that the systems automatically transmit the notification and coordination messages in accordance with the times and distances established in the configuration.

3.6.2.3. It is recommended that the AIDC or TEST designator be used as the aircraft ID (box 07), followed by a test sequence number.

3.6.2.4. The test will also involve verifying the proper operation of acceptance, rejection, and transfer messages, and an analysis of the reasons why the system may be sending or receiving LRM messages.

3.6.3. **Third phase**

3.6.3.1. Once the previous phase has been successfully completed and the correct exchange of messages between the systems has been verified, operational tests will be conducted with the participation of supervisors, instructors, and controllers of each control unit.

3.6.3.2. To complete this stage, consideration should be given to training of operational personnel on the use of AIDC and its benefits.

3.6.4. **Fourth phase**

3.6.4.1. Once AIDC coordination procedures have been tested and accepted by the operational personnel, the new letters of agreement will be signed between the control units, incorporating AIDC as an alternate means of coordination initially, sand subsequently as the main means of coordination.

APPENDIX A

COMMUNICATIONS AND SUPPORT MECHANISMS

1 Introduction

1.1 Coordination communication requirements are divided into two groups, based on voice and data communication requirements between ATS units. As stated throughout the document, and as an objective goal, it is anticipated that the continuing implementation of automated data communications between ATSUs will result in a reduction in the use of voice communications, with the corresponding increase of data communications.

1.1 It has also been clearly stated that AIDC messages could be exchanged on any of the platforms implemented in the Region, whether AMHS and/or AFTN. AIDC messages can also be exchanged through dedicated lines.

1.2 A description follows of AIDC communication considerations concerning header, AFTN priority, optional data field (ODF), addressing, message identification number, reference information, time stamp, CRC, response time, interpretation of AIDC header, and performance measurement.

2 AIDC communication considerations

Message header

2.1 The AFTN IA-5 message header includes the use of an **optional data field (ODF),** which is used for the exchange of all AIDC messages. The AFTN message header (known in this document as AIDC message header) is defined in Annex 10, Vol. II. When using AMHS or a dedicated line, the ODF in the AFTN IA-5 message header still needs to be included as the first line of text in the message. The message header, following the IA-5 standard, which includes an ODF, must be used in both AMHS / AFTN.

2.2 Annex 10, Volume II makes reference to this. In this regard, an extract follows:

"4.4.4.4.1 Recommendation. – When additional addressing information in a message needs to be exchanged between source and destination addresses, it should be conveyed in the optional data field (ODF), using the following specific format:

2.2.1.1. characters one and full stop (1.) to indicate the parameter code for the additional address function;
2.2.1.2. three modifier characters, followed by an equal sign [=] and the assigned 8-character ICAO address; and
2.2.1.3. the character hyphen (-) to terminate the additional address parameter field.

4.4.4.4.1.1 Recommendation. – When a separate address for service messages or inquiries is different from the originator indicator, the modifier SVC should be used.

4.4.4.5 The origin line shall be concluded by an alignment function [<=].

4.4.15.2.2.6.1 Recommendation. – When additional addressing information in a message needs to be exchanged between source and destination addresses, it should be conveyed in the optional data field (ODF), using the following specific format:

a) characters 1 and full stop (1.) to indicate the parameter code for the additional address function;

b) three modifier characters, followed by an equal sign (=) and the assigned 8-character ICAO address; and

c) the character hyphen (-) to terminate the additional address parameter field.

AFTN priority

2.3 Normally, the priority indicator FF in AFTN/AMHS messages must be used for all AIDC messages, except for EMG, which must be assigned a priority indicator SS.

2.4 Annex 10, Vol. II, states:

"*4.4.1.2 Order of priority*

4.4.1.2.1 The order of priority for the transmission of messages in the aeronautical fixed telecommunication network shall be as follows:

Transmission priority	*Priority indicator*
1	*SS*
2	*DD FF*
3	*GG KK*

4.4.1.2.2 Recommendation. – Messages having the same priority indicator should be transmitted in the order in which they are received for transmission."

flight safety messages
(*see* 4.4.1.1.3) Priority indicator

Message category

distress messages (*see* 4.4.1.1.1)	……………………………	SS
urgency messages (*see* 4.4.1.1.2)	…………………………..	DD
flight safety messages (*see* 4.4.1.1.3)	…………………………..	FF
meteorological messages (*see* 4.4.1.1.4)	…………………………..	GG
flight regularity messages (*see* 4.4.1.1.5)	…………………………	GG
aeronautical information services messages (*see* 4.4.1.1.6)	………	GG
aeronautical administrative messages (*see* 4.4.1.1.7)	………….	KK
service messages (*see* 4.4.1.1.9)	…………………….	*(as appropriate)*

4.4.1.1.3 Flight safety messages (priority indicator FF) shall comprise:

a) movement and control messages, as defined in PANS-ATM (Doc 4444), Chapter 11;

b) messages originated by an aircraft operating agency of immediate concern to aircraft in flight or preparing to depart;

c) meteorological messages restricted to SIGMET information, special air-reports, AIRMET messages, volcanic ash and tropical cyclone advisory information, and amended forecasts.

2.5 From Doc 4444, Air Traffic Management

11.1.3 Movement and control messages

This message category comprises:

a) movement messages (FF), including:

- filed flight plan messages
- delay messages
- modification messages
- flight plan cancellation messages
- departure messages
- arrival messages;

b) coordination messages (FF), including:

- current flight plan messages
- estimate messages
- coordination messages
- acceptance messages
- logical acknowledgment messages;

c) supplementary messages (FF), including:

- request flight plan messages
- request supplementary flight plan messages
- supplementary flight plan messages;

d) AIDC messages, including:

- notification messages
- coordination messages
- transfer of control messages
- general information messages
- application management messages;

e) control messages (FF), including:

- clearance messages
- flow control messages
- position-report and air-report messages.

11.1.4 Flight information messages

11.1.4.1 This category comprises:

a) messages containing traffic information (FF);

b) messages containing meteorological information (FF or GG);

c) messages concerning the operation of aeronautical facilities (GG);

d) messages containing essential aerodrome information (GG);

e) messages concerning air traffic incident reports (FF).

Optional data field (ODF)

2.6 ODF provides a flexible way to transmit and respond to AIDC messages, undisturbed by the communication processes along the path of the network.

2.7 ODF 1 has already been allocated for additional addressing use, and is described in Annex 10, Volume II. ODFs 2 and 3 have been defined for computer applications to convey message identification and reference information.

2.8 Use of the ODF is required to ensure success in the exchange of AIDC messages. When AMHS or AFTN/AMHS gateways are used for the exchange of AIDC messages, the specified ODFs must be compatible.

2.9 The proposed encoding would have no impact on AFTN switching centres, as they ignore this part of the origin line.

Addressing

2.10 The source and destination addresses of the AFTN header convey the direction and logical identity of the application processes exchanging AIDC information. The application process must be aware of the AFTN addresses that are used for this function.

2.11 The first four characters in the address form the location, in accordance with the location indicators specified in ICAO documentation (Doc 7910), while the next three characters specify an office/agency or a processor at the given location, in accordance with Doc 8585. The eighth character of the address indicates the end system application and is determined by the corresponding AIP.

```
12:28:09 --------------------
BSA1675 22122808
FF SCDAAIDC
221227 SACOCADI 2.000001-4.160322122737-5.C4D5-
(ABI-SACO105/A2504-SACO-KONRI/1441F340-SPJC-8/IS-9/A320/M-10/SWYDE1E2
FGHIR/E-15/N0447F320 DCT ALGAR KONRI LOA)
```

Example from tests conducted between the Córdoba ACC (Argentina) and the Iquique ACC (Chile) in April 2016

Message identification number

2.11 The message identification number is a 6-digit number that is encoded in the AIDC message header ODF 2.

2.13 Each AIDC message will be assigned a message identification number. In this regard, each ATSU must check the message identification numbers to ensure they are not duplicated.

2.14 Consequently, message identification numbers must be sequential. Reception of a message that does not follow the sequence should trigger a warning to the originator.

```
12:29:02 --------------------
BSA1677 22122901          ODF 2 (6-digit message identification number)
FF SCDAAIDC
221228 SACOCADI 2.000002-4.160322122825-5.4604-
(ABI-SACO106/A2505-SANT-KONRI/1403F320-SPJC-8/IS-9/A320/M-10/SWYDE1E2
FGHIR/E-15/N0447F320 DCT ALGAR KONRI LOA)
```

Example from tests conducted between the Córdoba ACC (Argentina) and the Iquique ACC (Chile) in April 2016

Reference information

2.15 The message reference number is a way of linking an answer to a previously transmitted or received AIDC message.

2.16 The message reference number has two parts:

- The ICAO location indicator of the immediately preceding message in the exchange. This is required because the referenced AIDC message may have originated from an origin number (that is, different ATS units); and
- The message identification number of the first message in the exchange.

2.17 The message reference number is encoded in the AIDC message header ODF 3

```
13:01:58 --------------------
BSA1745 22130156          ODF 3
FF SCDAAIDC
221259 SACOCADI 2.000007-3.SCDA-4.160322130028-5.D3AB-
(LRM-RMK/058)
```

Example from tests conducted between the Córdoba ACC (Argentina) and the Iquique ACC (Chile) in April 2016

Time Stamp

2.18 The time stamp consists of 12 digits that express the year, month, day, hours, minutes, and seconds (YYMMDDHHMMSS) and represents the moment at which the AIDC message is released from the ATS system. The resolution of the Time Stamp in seconds will support computation of transmission delays.

2.19 The Time Stamp is encoded in the AIDC message header ODF 4.

05:08:48 --------------------

SBA0151 220508

FF SACOCADI

220508 SCDAAIDC 2.001448-4.160322050845-5.5D0B-

(ABI-ARG1365/A5635-SPJC-KONRI/0558F350-SAEZ-8/IS-9/B738/M-10/SWDFGHIRZ/S-15/N0455F370 DCT PANED UL550 KONRI UL550 ALGAR UL550 ROS UA558 MULTA UW24 SNT SNT6A-18/PBN/B2B3D2D3O2O3S1S2 NAV/B4B5O4D4 DOF/1

05:08:56 --------------------

60322 REG/LVFRK EET/SCFZ0106 SACF0202 SAEF0314 SEL/BRGQ)

ODF 4 – Time Stamp corresponds to YY:2016 MM: March; DD: 22 HHMMSS: 05:08:45

Cyclic redundancy check (CRC)

2.20 The CRC is a 4-digit hexadecimal number that is used to ensure end-to-end message integrity. The method used is the CRC-CCITT (XModem). The CRC is computed over the message text, from the beginning left parenthesis to the closing right parenthesis, both inclusive. Non-printable characters such as line feeds and carriage returns must be excluded from the CRC calculation.

2.21 The CRC is encoded in the AIDC message header ODF 5.

2.22 The CCITT (International Telegraph and Telephone Consultative Committee) has different methods available for CRC calculation. It is important to ensure that the XModem method is used. When AIDC messages are exchanged among different ATS units, the use of a different CRC can create interoperability problems. In order to assist in AIDC system testing, the table below contains a series of AIDC messages and their associated CRCs.

FF SACOCADI **ODF 5 – CRC: 5D0B**

220508 SCDAAIDC 2.001448-4.160322050845-5.5D0B-

(ABI-ARG1365/A5635-SPJC-KONRI/0558F350-SAEZ-8/IS-9/B738/M-10/SWDFGHIRZ/S-15/N0455F370 DCT PANED UL550 KONRI UL550 ALGAR UL550 ROS UA558 MULTA UW24 SNT SNT6A-18/PBN/B2B3D2D3O2O3S1S2 NAV/B4B5O4D4 DOF/160322 REG/LVFRK EET/SCFZ0106 SACF0202 SAEF0314 SEL/BRGQ)

AIDC message	CRC
(ABI-ARG1365/A5635-SPJC-KONRI/0558F350-SAEZ-8/IS-9/B738/M-10/SWDFGHIRZ/S-15/N0455F370 DCT PANED UL550 KONRI UL550 ALGAR UL550 ROS UA558 MULTA UW24 SNT SNT6A-18/PBN/B2B3D2D3O2O3S1S2 NAV/B4B5O4D4 DOF/160322 REG/LVFRK EET/SCFZ0106 SACF0202 SAEF0314 SEL/BRGQ)	5D0B
FF SCDAAIDC 221552 SACOCADI 2.000029-4.160322155215-5.630F- (CDN-SACO02/A2514-SANT-SPJC-14/KONRI/1613F360)	630F
FF SACOCADI 221148 SCDAAIDC 2.001459-4.160322114808-5.BF76- (MAC-AMX028-MMMX-SAEZ-14/KONRI/1149F390)	BF76
FF SCDAAIDC 221544 SACOCADI 2.000028-3.SCDA001486-4.160322154418-5.CF71- (LAM)	CF71
FF SCDAAIDC 221543 SACOCADI 2.000027-4.160322154307-5.6D32- (CPL-SACO02/A2514-IS-B738/M-SWDE1E2E3GHRVI/H-SANT-KONRI/1613F340-N0460F340 DCT ALGAR KONRI LOA-SPJC-0)	6D32

Message confirmation response time

2.23 The message confirmation response time determines the maximum period of time for a responding application to confirm receipt of a given message. The default value for this timer nominally should be three minutes. If there is no valid answer from the application, the initiating processor must retransmit the message and reset the timer, or initiate local recovery procedures. When local procedures allow retransmission, a maximum value, such as three, must be determined before local recovery procedures are initiated. The response time must be cancelled upon reception of any message with the corresponding message/data reference identifier, which will typically be a LAM or LRM. Retransmissions use the same message identification number as the original message.

Interpretation of the AIDC header

2.24 The content of the following AIDC message header is shown, in parts, in the following table:

221505 SACOCADI 2.000024-3.SCDA001482-4.160322150532-5.1416-

Optional Data Field	Use	Example
1	AFTN address	SACOCADI
2	Message identification number	000024
3	Message reference number	SCDA001482
4	Time stamp	160322150532
5	CRC	1416

Note. The script following the CRC (ODF 5) is required to separate the AIDC message header from the AIDC message text.

2.25 The following examples show two AIDC messages encoded according to the previous procedures.

2.26 The first message is the AIDC CDN number (message identification number 001489) sent by the Iquique ACC (Chile) (SCDAAIDC) to the Córdoba AIRCOM ACC (Argentina) (SACOCADI) at 160322160600:

16:06:05 --------------------

SBA0643 221606

FF SACOCADI

221606 SCDAAIDC 2.001489-4.160322160600-5.EFB8-

(CDN-SACO02/A2514-SANT-SPJC-14/KONRI/1613F380-15/N0460F340 DCT TIKPI UL550 ALDAX UL550 EVLEP UL550 SCO)

2.27 The following AIDC ACP message shows the response of Córdoba to the CDN message of the previous example.

2.28 Córdoba AIRCOM ACC (Argentina) (SACOCADI) accepts the coordination proposal received from the Iquique ACC (Chile) (SCDAAIDC) by sending an ACP message with message identification number 000032 SACOCADI to SCDAAIDC at 160322160647. The message makes reference to the message previously transmitted by SCDAAIDC, with message reference number SCDA001489. This reference number is a combination of the location indicator (SCDA) and the message identification (001489) of the original message.

```
16:07:36 --------------------
BSA2509 22160734
FF SCDAAIDC
221606 SACOCADI 2.000032-3.SCDA001489-4.160322160647-5.FF17-
(ACP-SACO02/A2514-SANT-SPJC)
```

Engineering considerations

2.29 Traditionally, AIDC messages have been exchanged through the AFTN. However, use of AMHS over TCP/IP platforms is currently proliferating, to which end AMHS/AFTN gateways are used for interconnecting these worlds when so required.

Performance criteria

2.30 In order to use the AIDC application effectively for the exchange of ATC coordination data, the ATSUs must monitor the performance of communication links to make sure that the required performance is achieved. This monitoring must measure AIDC message traffic latency between ATS systems in terms of measured time, from the transmission of the message at the originating ATS system to message reception at the destination ATS system.

2.31 The performance of communication links must be such that 95% of all messages must be received within 12 seconds of transmission, and 99.9% of all messages must be received within 30 seconds of transmission.

2.32 In bilateral agreements, the ATSUs may agree on different performance requirements, according to the operation between adjacent users.

2.33 The speed of the communication signal between ATS systems using AFTN / AMHS must exceed 2400 bps.

AIDC performance measurement

2.34 Monitoring of AIDC performance ensures detection of delays in AFTN or AMHS, as well as the identification of AIDC interoperability issues between adjacent ATS units. As described below, there are different methods that can be used for measuring AIDC performance.

Performance of a transmitted AIDC message

2.35 The difference between the time stamp in the header of the transmitted message and the time stamp in the header of the application response message (LAM / LRM) is calculated:

Example:

ATSU	Message	Time stamp	Transit time
ATSU 1 Iquique	—————————— 13:57:08 -------------------- SBA0536 221357 FF SACOCADI 221357 SCDAAIDC 2.001475-4.160322135705-5.6970- (TOC-DA01/A5136-SCDA-SABE)	160322135705 Year:2016 Month: March Day: 22 Hour:13 Min: 57 **Sec: 05**	
ATSU 2 Córdoba	—————————— 13:57:50 -------------------- BSA2143 22135748 FF SCDAAIDC 221357 SACOCADI 2.000017-3.SCDA001475-4.160322135717-5.61F8- (LRM-RMK/57)	160322135717 Year:2016 Month: March Day: 22 Hour:13 Min: 57 **Sec: 17**	**12 sec** TT= (17-05) =12 sec

Performance of a received AIDC message

2.36 The difference between the time stamp in the header of the received message and the time stamp in the header of the application response (LAM / LRM) is calculated. Example:

ATSU	Message	Time stamp	Transit time

ATSU 2 Córdoba	—————————————— 12:28:09 -------------------- BSA1675 22122808 FF SCDAAIDC 221227 SACOCADI 2.000001- 4.160322122737-5.C4D5- (ABI-SACO105/A2504-SACO- KONRI/1441F340-SPJC-8/IS-9/A320/M- 10/SWYDE1E2FGHIR/E-15/N0447F320 DCT ALGAR KONRI LOA) ——————————————	160322122737	
ATSU 1 Iquique	—————————————— 12:28:14 -------------------- SBA0456 221228 FF SACOCADI 221228 SCDAAIDC 2.001460- 3.SACO000001-4.160322122810-5.E2E8- (LRM-RMK/41/15/DCT ALGAR KONRI LOA) ——————————————	160322122810	**33 seconds**

Note. Instead of using the time stamp in the header of the application response message, an alternative method is to use the network time stamp of reception of an ABI message sent by ATSU 2.

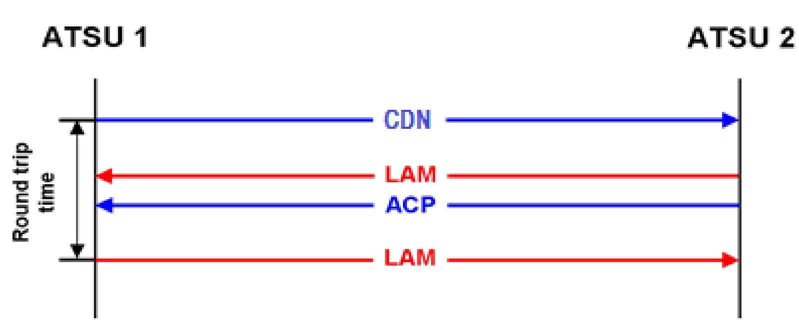
Round trip performance in the exchange of AIDC messages

2.37 Round trip performance can be calculated as follows:

- Comparing the time stamps in the message headers with the time stamps of the network for the first and last messages in the AIDC exchange.

2.38 An alternative method using information derived exclusively from the AIDC message is described below.

Calculation of the difference between the time stamp in the header of the first AIDC message in the exchange and the time stamp in the header of the application response message (LAM / LRM) that is sent when the operational response to the first message is received:



Example:

ATSU	Message	Time stamp	Transit time
ATSU 1 Córdoba	—————————————— 15:52:47 -------------------- BSA2468 22155246 FF SCDAAIDC 221552 SACOCADI 2.000029-4.160322155215-5.630F- (CDN-SACO02/A2514-SANT-SPJC-14/KONRI/1613F360)	160322155215	
ATSU 2 Iquique	—————————————— 15:52:53 -------------------- SBA0631 221552 FF SACOCADI 221552 SCDAAIDC 2.001487-3.SACO000029-4.160322155249-5.CF71- (LAM)	160322155249	
ATSU 2 Iquique	15:53:12 -------------------- SBA0632 221553 FF SACOCADI 221553 SCDAAIDC 2.001488-3.SACO000029-4.160322155309-5.FF17- (ACP-SACO02/A2514-SANT-SPJC) ______________________________	160322155309	54 sec
ATSU 1 Córdoba	—————————————— 15:54:00 -------------------- BSA2470 22155359 FF SCDAAIDC 221553 SACOCADI 2.000030-3.SCDA001488-4.160322155337-5.CF71- (LAM)	160322155337	28 sec 1 min 22 sec (round trip)

2.39 Other parameters to be taken into account in the analysis may include the percentage of success in EST/ACP, CDN/ACP and CPL/ACP dialogues, the percentage of successful AOC/TOC exchanges, and the delay of negotiations between CPL and CDN.

2.40 A continuous analysis of LRMs received is also recommended in order to identify AIDC interoperability issues between adjacent ATS units.

Recording of AIDC data

2.41 The content and time stamps of all AIDC messages must be recorded in both end systems, in accordance with the current requirements for ATS messages.

2.42 Facilities must be available for the retrieval and display of the recorded data.

Testing considerations

2.43 An alternative to monitoring and analysing the exchange of AIDC messages is to conduct the required tests in non-operational ATS systems.

2.44 When required to use the operational system to conduct AIDC testing, the AIDC message text should have the same format as operational messages, but be distinguishable from operational traffic by the use of non-operational identifiers. However, these identifiers or way of exchanging test traffic must be coordinated and specified in bilateral agreements.

Failures and scheduled maintenance

2.45 ANSPs must be aware that maintenance on AIDC and AFTN/AMHS systems may have an operational effect on these and other applications. An example could be the updating of AIRCOM systems, which may require verification of versions and their respective compatibilities, since this would directly affect the use of AIDC. Another example is the loss of AIDC message functionality due to flooding of messages or out of sequence messages following an AIDC server reboot. Any maintenance affecting AIDC and AFTN/AMHS systems must be previously coordinated with ANSP counterparts, and backup procedures applied to safeguard traffic.

2.46 In case of failure of AIDC support systems, ANSPs must immediately inform counterparts and apply procedures to recover their operational capacity, make backup copies, and restore services as soon as possible.

APPENDIX B

IPv4 ADDRESSING

In order to define the SAM IPv4 addressing plan, the following addresses shall be used for each State:

Región	Nro	Estado / Territorio	Red	Direcciones utilizables	Notacion Decimal	Notacion Binaria			
							Región	Estado / Territorio	Host's
SAM	1	Argentina	10.0.0.0 /19	Primera	10 . 0 . 0 . 1	00001010 .	0000	0000 . 000	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 0 . 31 . 254	00001010 .	0000	0000 . 000	11111 . 11111110
	2	Chile	10.0.32.0 /19	Primera	10 . 0 . 32 . 1	00001010 .	0000	0000 . 001	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 0 . 63 . 254	00001010 .	0000	0000 . 001	11111 . 11111110
	3	Brasil	10.0.64.0 /19	Primera	10 . 0 . 64 . 1	00001010 .	0000	0000 . 010	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 0 . 95 . 254	00001010 .	0000	0000 . 010	11111 . 11111110
	4	Uruguay	10.0.96.0 /19	Primera	10 . 0 . 96 . 1	00001010 .	0000	0000 . 011	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 0 . 127 . 254	00001010 .	0000	0000 . 011	11111 . 11111110
	5	Paraguay	10.0.128.0 /19	Primera	10 . 0 . 128 . 1	00001010 .	0000	0000 . 100	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 0 . 159 . 254	00001010 .	0000	0000 . 100	11111 . 11111110
	6	Bolivia	10.0.160.0 /19	Primera	10 . 0 . 160 . 1	00001010 .	0000	0000 . 101	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 0 . 191 . 254	00001010 .	0000	0000 . 101	11111 . 11111110
	7	Peru	10.0.192.0 /19	Primera	10 . 0 . 192 . 1	00001010 .	0000	0000 . 110	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 0 . 223 . 254	00001010 .	0000	0000 . 110	11111 . 11111110
	8	Ecuador	10.0.224.0 /19	Primera	10 . 0 . 224 . 1	00001010 .	0000	0000 . 111	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 0 . 255 . 254	00001010 .	0000	0000 . 111	11111 . 11111110
	9	Colombia	10.1.0.0 /19	Primera	10 . 1 . 0 . 1	00001010 .	0000	0001 . 000	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 1 . 31 . 254	00001010 .	0000	0001 . 000	11111 . 11111110
	10	Venezuela	10.1.32.0 /19	Primera	10 . 1 . 32 . 1	00001010 .	0000	0001 . 001	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 1 . 63 . 254	00001010 .	0000	0001 . 001	11111 . 11111110
	11	Guyana	10.1.64.0 /19	Primera	10 . 1 . 64 . 1	00001010 .	0000	0001 . 010	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 1 . 95 . 254	00001010 .	0000	0001 . 010	11111 . 11111110
	12	Surinam	10.1.96.0 /19	Primera	10 . 1 . 96 . 1	00001010 .	0000	0001 . 011	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 1 . 127 . 254	00001010 .	0000	0001 . 011	11111 . 11111110
	13	Guyana Francesa (France)	10.1.128.0 /19	Primera	10 . 1 . 128 . 1	00001010 .	0000	0001 . 100	00000 . 00000001
				-	-			-	
				-	-			-	
				Ultima	10 . 1 . 159 . 254	00001010 .	0000	0001 . 100	11111 . 11111110

APPENDIX C

MODEL PROCEDURES FOR CONDUCTING AIDC EXCHANGE TESTS

Protocol for testing AIDC operation and functionality between ACC "A" and ACC "B"

1. Coordination using the EST message

1.1. SYSTEM CONFIGURATION

ABI SEND TIME (min):	60
ETO DELTA (min):	3
FL DELTA (hFt):	10
EST/CPL MSG (min):	30
EST/CPL MSG (Nm):	60
LAM TIME (min):	2
ACP TIME (min):	5
RENEGOTIATION TIME (min):	5

AIDC SEND TIME: Time before arrival to the ABI message delivery coordination fix.

ETO DELTA: Difference in the estimated time of flight over the coordination fix that triggers the delivery of a new ABI message.

FL DELTA: Difference in FL at the coordination fix that triggers the delivery of a new ABI message.

EST/CPL MSG min Time before arrival to the coordination fix that triggers an EST or CPL message.

EST/CPL MSG Nm Distance to the coordination fix that triggers an EST or CPL message.

Waiting time of LAM message.

Waiting time of ACP message.

RENEGOTIATION: Waiting time time to renegotiate coordination.

1.2. ABI / EST / LAM / TIME OUT TEST

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
1.2.1. Create and deliver a FPL for a flight leaving an aerodrome in FIR "A", that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **more than 60 minutes** from current time.	The ACC "A" system must **not** deliver any automatic message. Coordination must be in PRE-NOTIFYING status.	
1.2.2. 60 minutes before the time at which the created flight should fly over the coordination fix, review the FPL template history.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination must change to NOTIFYING status.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination must change to NOTIFYING status.
1.2.3. Activate the FPL by inserting a take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE mode.	Coordination must be in NOTIFYING status.
1.2.4. 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send an EST message and receive a LAM message. Coordination status must change to COORDINATING.	The ACC "B" system must receive an EST message and send a LAM message. Coordination status must change to COORDINATING and the FPL must change to ACTIVE mode.
1.2.5. DO NOT ACT UPON THE FPL.	Coordination must remain in COORDINATING status and FPL ACTIVE. 5 minutes after sending the EST message, the system will show TIME OUT.	Coordination must remain in COORDINATING status and FPL ACTIVE. 5 minutes after receiving the EST message, the system will show TIME OUT.

Example:
At 12:00 UTC
(FPL-TEST01-IS-B737/M-SW/C-SAEZ1330-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

Note: This test will not be conducted on automatic ACP response systems.

1.3. ABI / EST / LAM / ACP / TOC / AOC TEST

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
1.3.1. Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **more than 60 minutes** from current time.	The ACC "A" system must **not** send any automatic message. Coordination must be in PRE-NOTIFYING status.	
1.3.2. 60 minutes before the time at which the flight should fly over the coordination fix, review the FPL template history.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
1.3.3. Activate the FPL by inserting a take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE.	Coordination must be in NOTIFYING status.
1.3.4. 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send an EST message and receive a LAM message. Coordination status must change to COORDINATING.	The ACC "B" system must receive an EST message and send a LAM message. Coordination status must change to COORDINATING and the FPL must change to ACTIVE.
1.3.5. From the ACC "B" system, send an ACP message. Delivery can be manual or automatic.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
1.3.6. From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
1.3.7. From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST02-IS-B737/M-SW/C-SAEZ1330-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

1.4. ABI / EST / LAM / ACP / TOC / AOC TEST

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
1.4.1. Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **less than 60 minutes** from the current time.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
1.4.2. Activate the FPL by inserting the take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE mode.	Coordination must be in NOTIFYING status.
1.4.3. 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send an EST message and receive a LAM message. Coordination status must change to COORDINATING.	The ACC "B" system must receive an EST message and send a LAM message. Coordination status must change to COORDINATING and the FPL must change to ACTIVE mode.
1.4.4. From the ACC "B" system, send an ACP message. Delivery can be manual or automatic.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
1.4.5. From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
1.4.6. From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST03-IS-B737/M-SW/C-SAEZ1250-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

1.5. ABI / PAC / LAM / ACP / TOC / AOC TEST

ACTION	EXPECTED RESULT ACC "A"	EXPECTED RESULT ACC "B"
1.5.1. Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **less than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **less than 60** minutes between current time and the time at which this flight should fly over the coordination fix.	The ACC "A" system must send an ABI message and receive a LAM message and send a PAC message and receive a LAM message. Coordination status must change to COORDINATING.	The ACC "B" system must receive an ABI message and send a LAM message and receive a PAC message and send a LAM message. Coordination status must change to COORDINATING.
1.5.2. From the ACC "B" system, send an ACP message.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
1.5.3. Activate the FPL by inserting a take-off time (current time).	Coordination must remain in the COORDINATED status and the FPL ACTIVE.	Coordination must remain in the COORDINATED status and the FPL must be activated by detection and correlation.
1.5.4. From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
1.5.5. From the ACC "B" message, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST04-IS-B737/M-SW/C-SAAR1230-N0450F260 ROS UL550 LIM-SPIM0330-0)

1.6. (Multiple) ABI / EST / LAM / ACP / TOC / AOC TEST

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
1.6.1. Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **less than 60 minutes** from current time.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
1.6.2. In the FPL template, change the EOBT, FL, ROUTE or DESTINATION.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination must remain in NOTIFYING status.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination must remain in NOTIFYING status. The FPL must be modified in accordance with the change made in the ACC "A" system.
1.6.3. Activate the FPL by inserting a take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE.	Coordination must be in NOTIFYING status.
1.6.4. 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send an EST message and receive a LAM message. Coordination status must change to COORDINATING.	The ACC "B" system must receive an EST message and send a LAM message. Coordination status must change to COORDINATING and the FPL must change to ACTIVE.
1.6.5. From the ACC "B" system, send an ACP message. Delivery can be manual or automatic.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
1.6.6. From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
1.6.7. From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST05-IS-B737/M-SW/C-SAEZ1250-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

1.7. ABI / EST / LAM / ACP / CDN / TOC / AOC TEST

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
1.7.1. Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **less than 60 minutes** from the current time.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
1.7.2. Activate the FPL by inserting a take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE mode.	Coordination must be in NOTIFYING status.
1.7.3. 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send an EST message and receive a LAM message. Coordination status must change to COORDINATING.	The ACC "B" system must receive an EST message and send a LAM message. Coordination status must change to COORDINATING and the FPL must change to ACTIVE mode.
1.7.4. From the ACC "B" system, send an ACP message. Delivery can be manual or automatic.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
1.7.5. From the ACC "A" system, send a CDN message.	The ACC "A" system must send a CDN message and receive a LAM message. Coordination status must change to RE-NEGOTIATING.	The ACC "B" system must receive a CDN message and send a LAM message. Coordination status must change to RE-NEGOTIATING.
1.7.6. From the ACC "B" system, send an ACP message.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
1.7.7. From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
1.7.8. From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to

		TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST06-IS-B737/M-SW/C-SAEZ1250-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

2 Coordination using the CPL message

2.1 SYSTEM CONFIGURATION

ABI SEND TIME (min):	60
ETO DELTA (min):	3
FL DELTA (hFt):	10
CPL MSG (min):	30
CPL MSG (Nm):	60
LAM TIME (min):	2
ACP TIME (min):	5
RENEGOTIATION TIME (min):	5

2.2 ABI / CPL / LAM / TIME OUT TEST

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
2.2.1 Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **more than 60 minutes** from current time.	The ACC "A" system must **not** send any automatic message. Coordination must be in PRE-NOTIFYING status.	
2.2.2 60 minutes before the time at which the flight should be flying over the coordination fix, review the FPL template history.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
2.2.3 Activate the FPL by inserting the take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE mode.	Coordination must be in NOTIFYING status.
2.2.4 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send a CPL message and receive a LAM message. Coordination status must change to NEGOTIATING.	The ACC "B" system must receive a CPL message and send a LAM message. Coordination status must change to NEGOTIATING and the FPL must change to ACTIVE mode.
2.2.5 DO NOT ACT UPON THE FPL.	Coordination must remain in NEGOTIATING status and the FPL ACTIVE. 5 minutes after sending the CPL message, the system will show TIME OUT.	Coordination must remain in NEGOTIATING status and the FPL ACTIVE. 5 minutes after receiving the CPL message, the system will show TIME OUT.

Example:
At 12:00 UTC
(FPL-TEST07-IS-B737/M-SW/C-SAEZ1330-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

ABI / CPL / LAM / ACP / TOC / AOC TEST

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
2.2.6 Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **more than 60 minutes** from current time.	The ACC "A" system must **not** send any automatic message. Coordination must be in PRE-NOTIFYING status.	
2.2.7 60 minutes before the time at which the created flight should fly over the coordination fix, review the FPL template history.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
2.2.8 Activate the FPL by inserting the take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE mode.	Coordination must be in NOTIFYING status.
2.2.9 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send a CPL message and receive a LAM message. Coordination status must change to NEGOTIATING.	The ACC "B" system must receive a CPL message and send a LAM message. Coordination status must change to NEGOTIATING and the FPL must change to ACTIVE mode.
2.2.10 From the ACC "B" system, send an ACP message.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
2.2.11 From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
2.2.12 From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST08-IS-B737/M-SW/C-SAEZ1330-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

2.3 ABI / CPL / LAM / ACP / TOC / AOC TEST

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
2.3.1 Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **less than 60 minutes** from current time.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
2.3.2 Activate the FPL by inserting a take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE mode.	Coordination must be in NOTIFYING status.
2.3.3 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send a CPL message and receive a LAM message. Coordination status must change to NEGOTIATING.	The ACC "B" system must receive a CPL message and send a LAM message. Coordination status must change to NEGOTIATING and the FPL to ACTIVE mode.
2.3.4 From the ACC "B" system, send an ACP message.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
2.3.5 From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
2.3.6 From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST09-IS-B737/M-SW/C-SAEZ1250-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

2.4 **ABI / CPL / LAM / ACP / TOC / AOC TEST**

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
2.4.1 Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **less than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **less than 60** minutes between current time and the time at which this flight should fly over the coordination fix.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to COORDINATING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to COORDINATING.
2.4.2 Activate the FPL by inserting a take-off time (current time).	The ACC "A" system must send a CPL message and receive a LAM message. Coordination status must change to NEGOTIATING.	The ACC "B" system must RECEIVE a CPL message and send a LAM message. Coordination status must change to NEGOTIATING.
2.4.3 From the ACC "B" system, send an ACP message	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
2.4.4 From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
2.4.5 From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST10-IS-B737/M-SW/C-SAAR1230-N0450F260 ROS UL550 LIM-SPIM0330-0)

(Multiple) ABI / CPL / LAM / ACP / TOC / AOC TEST

ACTION	**EXPECTED RESPONSE ACC "A"**	**EXPECTED RESPONSE ACC "B"**
2.4.6 Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is more than 30 minutes flight time from take-off to the coordination fix (FIR boundary), whose EOBT is less than 60 minutes from current time.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
2.4.7 In the FPL template, make a change in EOBT, FL, ROUTE or DESTINATION.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination must remain in NOTIFYING status.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination must remain in the NOTIFYING status. The FPL must be modified according with the change made in the ACC "A" system.
2.4.8 Activate the FPL by inserting a take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL change to ACTIVE mode.	Coordination must be in NOTIFYING status.
2.4.9 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send a CPL message and receive a LAM message. Coordination status must change to NEGOTIATING.	The ACC "B" system must receive a CPL message and send a LAM message. Coordination status must change to NEGOTIATING and the FPL must change to ACTIVE mode.
2.4.10 From the ACC "B" system, send an ACP message.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
2.4.11 From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
2.4.12 From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST11-IS-B737/M-SW/C-SAEZ1250-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

2.5 **ABI / CPL / LAM / ACP / CDN / TOC / AOC TEST**

ACTION	EXPECTED RESPONSE ACC "A"	EXPECTED RESPONSE ACC "B"
2.5.1 Create and send an FPL for a flight leaving from an aerodrome in FIR "A" that is **more than 30 minutes** flight time from take-off to the coordination fix (FIR boundary), whose EOBT is **at least 60 minutes** from current time.	The ACC "A" system must send an ABI message and receive a LAM message. Coordination status must change to NOTIFYING.	The ACC "B" system must receive an ABI message and send a LAM message. Coordination status must change to NOTIFYING.
2.5.2 Activate the FPL by inserting a take-off time (current time).	The ACC "A" system must **not** send any automatic message. Coordination must be in NOTIFYING status and the FPL must change to ACTIVE mode.	Coordination must be in NOTIFYING status.
2.5.3 30 minutes before the time at which the activated flight must fly over the coordination fix, review the FPL template history.	The ACC "A" system must send a CPL message and receive a LAM message. Coordination status must change to NEGOTIATING.	The ACC "B" system must receive a CPL message and send a LAM message. Coordination status must change to NEGOTIATING and the FPL change to ACTIVE mode.
2.5.4 From the ACC "B" system, send an ACP message.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
2.5.5 From the ACC "A" system, send a CDN message.	The ACC "A" system must send a CDN message and receive a LAM message. Coordination status must change to RE-NEGOTIATING.	The ACC "B" system must receive a CDN message and send a LAM message. Coordination status must change to RE-NEGOTIATING.
2.5.6 From the ACC "B" system, send an ACP message.	The ACC "A" system must receive an ACP message and send a LAM message. Coordination status must change to COORDINATED.	The ACC "B" system must send an ACP message and receive a LAM message. Coordination status must change to COORDINATED.
2.5.7 From the ACC "A" system, send a TOC message.	The ACC "A" system must send a TOC message and receive a LAM message. Coordination status must change to TRANSFERRING.	The ACC "B" system must receive a TOC message and send a LAM message. Coordination status must change to TRANSFERRING.
2.5.8 From the ACC "B" system, send an AOC message.	The ACC "A" system must receive an AOC message and send a LAM message. Coordination status must change to TRANSFERRED.	The ACC "B" system must send an AOC message and receive a LAM message. Coordination status must change to TRANSFERRED.

Example:
At 12:00 UTC
(FPL-TEST12-IS-B737/M-SW/C-SAEZ1250-N0450F320 ATOVO UW5 ROS UL550 LIM-SPIM0430-0)

APPENDIX D
AIDC OPERATIONS MANUAL

1 INTRODUCTION

1.1 The purpose of this manual is to make it easier for all ATS personnel involved to use the AIDC interface for successful and seamless automatic coordination between adjacent ACCs.

1.2 Accordingly, the manual has been conceived in a format that is easy to read, with specific instructions focusing on issues specifically related to AIDC, and, where possible, activity checklists. The manual is divided into sections intended for air traffic service personnel involved in flight and flight plan management.

1.3 It is important for each group of ATS personnel to become familiar with the content of this manual and, especially, the part that concerns them, and to keep it at hand for use as a reference when in doubt about how to proceed in a given situation.

1.4 An attempt has been made to include all possibly known situations. However, this manual does not intend to be exhaustive and it is foreseen that it will continue evolving as the use of the AIDC becomes widespread among ATS personnel.

2 TECHNICAL COMMUNICATIONS PERSONNEL (AFTN/AMHS)

2.1 The technical communications personnel must provide on-going support, paying special attention to message traffic reception and delivery times, so they will not exceed the parameters established in the PAN NAT/APAC ICD and the SAM AIDC Guide, and to avoid timeout events.

3 ARO-AIS/COM PERSONNEL

3.1 Upon receiving an FPL, the ARO-AIS/COM operator must make sure that it has been completed according to the instructions contained in the AIP.

3.2 Instructions for completing the flight plan form:

ITEM 7: Aircraft identification (maximum 7 characters)

Insert one of the following aircraft identifications, not exceeding 7 alphanumeric characters and without hyphens or symbols:

a) the ICAO designator for the aircraft operating agency, followed by the flight identification (*e.g.,* KLM511, NGA213, JTR25) when the radiotelephony call sign to be used by the aircraft will consist of the ICAO telephony designator for the aircraft operating agency, followed by the flight identification (*e.g*., KLM511, NIGERIA 213, JESTER 25); or
b) the nationality or common mark and registration mark of the aircraft (*e.g*., EIAKO, 4XBCD, N2567GA) when:
    1) the radiotelephony call sign to be used by the aircraft will consist of this identification alone (*e.g*., CGAJS), or when preceded by the ICAO telephony designator for the aircraft operating agency (*e.g*., BLIZZARD CGAJS);
    2) the aircraft is not equipped with radio;

Note 1. — Standards for nationality, common, and registration marks to be used are contained in Annex 7, Chapter 2.

ITEM 8: Flight rules and type of flight (one or two characters)

Flight rules. Insert one of the following letters to denote the category of flight rules with which the pilot intends to comply:

- I if it is intended that the entire flight will be operated under the IFR
- V if it is intended that the entire flight will be operated under the VFR
- Y if the flight initially will be operated under the IFR, followed by one or more subsequent changes of flight rules, or
- Z if the flight initially will be operated under the VFR, followed by one or more subsequent changes of flight rules

Specify in Item 15 the point(s) at which a change of flight rules is planned.

Type of flight: Insert one of the following letters to denote the type of flight when so required by the appropriate ATS authority:

- S if scheduled air service
- N if non-scheduled air transport operation
- G if general aviation
- M if military
- X if other than any of the defined categories above

Specify status of a flight following the indicator STS in Item 18, or when necessary to denote other reasons for specific handling by ATS, indicate the reason following the indicator RMK in Item 18.

ITEM 9: Number and type of aircraft and wake turbulence category

Number of aircraft (1 or 2 characters): Insert the number of aircraft, if more than one.

Type of aircraft (2 to 4 characters): Insert the appropriate designator, as specified in ICAO Doc 8643, Aircraft type designators or, if no such designator has been assigned, or in the case of formation flights comprising more than one type, insert ZZZZ and specify the number(s) and type(s) of aircraft in Item 18, preceded by TYP/.
Wake turbulence category (1 character): Insert an oblique stroke, followed by one of the following letters to indicate the wake turbulence category of the aircraft:

- H Heavy, to indicate an aircraft type with a maximum certificated take-off mass of 136,000 kg or more;
- M Medium, to indicate an aircraft type with a maximum certificated take-off mass of less than 136,000 kg, but more than 7,000 kg;
- L Light, to indicate an aircraft type with a maximum certificated take-off mass of 7,000 kg or less.

ITEM 10: Equipment and capabilities

Capabilities comprise the following elements:

1. presence of relevant serviceable equipment on board the aircraft;
2. equipment and capabilities commensurate with flight crew qualifications; and

3. where applicable, authorisation from the appropriate authority.

Radio communication, navigation and approach aid equipment and capabilities:
Insert one letter, as follows:

N if no COM/NAV/approach aid equipment for the route to be flown is carried, or the equipment is unserviceable; or

S if standard COM/NAV/approach aid equipment for the route to be flown is carried and serviceable (see Note 1),

and/or insert one or more of the following letters to indicate the serviceable COM/NAV/approach aid equipment and capabilities available:

A	GBAS landing system	J7	CPDLC FANS 1/A SATCOM (Iridium)
B	LPV (APV with SBAS)	K	MLS
C	LORAN C	L	ILS
D	DME	M1	ATC RTF SATCOM (INMARSAT)
E1	FMC WPR ACARS	M2	ATC RTF (MTSAT)
E2	D-FIS ACARS	M3	ATC RTF (Iridium)
E3	PDC ACARS	O	VOR
F	ADF	P1-P9	Reserved for RCP
G	GNSS (see Note 2)	R	PBN approved (see Note 4)
H	HF RTF	T	TACAN
I	Inertial navigation	U	UHF RTF
J1	CPDLC ATN VDL Mode 2 (see Note 3)	V	VHF RTF
J2	CPDLC FANS 1/A VDL HFDL	W	RVSM approved
J3	CPDLC FANS 1/A VDL Mode A	X	MNPS approved
J4	CPDLC FANS 1/A VDL Mode 2	Y	VHF with 8.33 kHz channel separation capability
J5	CPDLC FANS 1/A SATCOM (INMARSAT)		
J6	CPDLC FANS 1/A SATCOM (MTSAT)	Z	Other equipment carried or other capabilities (see Note 5)

Any alphanumeric characters not indicated above are reserved.

Note 1. — If the S letter is used, standard equipment is considered to be VHF RTF, VOR, and ILS, unless another combination is prescribed by the appropriate ATS authority.

Note 2. — If the letter G is used, the types of external GNSS augmentation, if any, are specified in Item 18 following the indicator NAV/, and separated by a space.

Note 3. — See RTCA/EUROCAE Interoperability Requirements Standard For ATN Baseline 1 (ATN B1 INTEROP Standard – DO-280B/ED- 110B) for data link services / air traffic control clearance and information / air traffic control communications management / air traffic control microphone check.

Note 4. — If the letter R is used, the performance-based navigation levels that can be met are specified in Item 18 following the indicator PBN/. Guidance material on the application of performance-based navigation to a specific route segment, route, or area is contained in the Performance-based navigation manual (ICAO Doc 9613).

Note 5. — If the letter Z is used, specify in Item 18 the other equipment carried or other capabilities, preceded by COM/, NAV/ and/or DAT, as appropriate.

Note 6. — Information on navigation capability is provided to ATC for clearance and routing purposes.

Surveillance equipment and capabilities
Insert N if no surveillance equipment for the route to be flown is carried, or the equipment is unserviceable;
or
Insert one or more of the following descriptors, to a maximum of 20 characters, to describe the type of serviceable surveillance equipment and/or capabilities on board:

SSR Modes A and C

A Transponder — Mode A (4 digits — 4 096 codes)

C Transponder — Mode A (4 digits — 4 096 codes) and Mode C

SSR Mode S

E Transponder — Mode S, including aircraft identification, pressure-altitude and extended squitter (ADS-B) capability

H Transponder — Mode S, including aircraft identification, pressure-altitude and enhanced surveillance capability

I Transponder — Mode S, including aircraft identification, but no pressure-altitude capability

L Transponder — Mode S, including aircraft identification, pressure-altitude, extended squitter (ADS-B) and enhanced surveillance capability

P Transponder — Mode S, including pressure altitude, but no aircraft identification capability

S Transponder — Mode S, including both pressure-altitude and aircraft identification capability

X Transponder — Mode S with neither aircraft identification nor pressure-altitude capability

Note.─ Enhanced surveillance capability is the capability of the aircraft to down-link aircraft-derived data *via* a Mode S transponder.

ADS-B

B1 ADS-B with dedicated 1090 MHz ADS-B “out” capability

B2 ADS-B with dedicated 1090 MHz ADS-B “out” and “in” capability

U1 ADS-B “out” capability using UAT

U2 ADS-B “out” and “in” capability using UAT

V1 ADS-B “out” capability using VDL Mode 4

V2 ADS-B “out” and “in” capability using VDL Mode 4

ADS-C

D1 ADS-C with FANS 1/A capabilities

G1 ADS-C with ATN capabilities

Alphanumeric characters not indicated above are reserved.

Example: ADE3RV/HB2U2V2G1

Note.─ Additional surveillance applications should be listed in Item 18, following the indicator SUR/.

ITEM 13: Departure aerodrome and time (8 characters)

Insert the ICAO 4-letter location indicator of the departure aerodrome, as specified in ICAO Doc 7910, Location indicators,
Or, if no location indicator has been assigned,
Insert ZZZZ, and specify, in Item 18, the name and location of the aerodrome, preceded by DEP/,
Or, the first point of the route or the marker radio beacon preceded by DEP/…, if the aircraft has not taken off from the aerodrome.
Or, if the flight plan is received from an aircraft in flight,
Insert AFIL, and specify, in Item 18, the ICAO four-letter location indicator of the ATS unit from which supplementary flight plan data can be obtained, preceded by DEP/.
Then, without a space,
Insert for a flight plan submitted before departure, the estimated off-block time (EOBT),
Or, for a flight plan received from an aircraft in flight, the estimated or actual time over the first point of the route to which the flight plan applies.

ITEM 15: Route

Insert the first cruising speed as in (a) and the first cruising level as in (b), without a space between them.
Then, following the arrow, insert the route description as in (c).

Cruising speed (maximum 5 characters)

Insert true airspeed for the first or the whole cruising portion of the flight, in terms of:

Kilometres per hour, expressed as K followed by 4 figures (*e.g.*, K0830), or
Knots, expressed as N followed by 4 figures (*e.g.*, N0485), or
True Mach number, when so prescribed by the appropriate ATS authority, to the nearest hundredth of unit Mach, expressed as M followed by 3 figures (*e.g.,* M082).

Cruising level (maximum 5 characters)

Insert the planned cruising level for the first or the whole portion of the route to be flown, in terms of:

Flight level, expressed as "F" followed by 3 figures (*e.g.*, F085; F330), or
* Standard metric level in tens of metres, expressed as "S" followed by 4 figures (*e.g.*, S1130), or
Altitude in hundreds of feet, expressed as "A" followed by 3 figures (*e.g.,* A045; A100), or
Altitude in tens of metres, expressed as "M" followed by 4 figures (*e.g.*, M0840), or
For uncontrolled VFR flights, the letters "VFR"
* When so prescribed by the appropriate ATS authorities.

c) Route (including changes of speed, level and/or flight rules)

Flights along designated ATS routes

Insert, if the departure aerodrome is located on, or connected to, the ATS route, the designator of the first ATS route,
Or, if the departure aerodrome is not on, or connected to, the ATS route, insert the letters "DCT" followed by the point of joining the first ATS route, followed by the designator of the ATS route.

THEN

Insert each point at which either a change of speed and/or level is planned to commence, or a change of ATS route, and/or a change of flight rules is planned,

Note. — When a transition is planned between a lower and upper ATS route and the routes are oriented in the same direction, the point of transition need not be inserted.

FOLLOWED, IN EACH CASE,

by the designator of the next ATS route segment, even if the same as the previous one, Or, by DCT, if the flight to the next point will be outside a designated route, unless both points are defined by geographical coordinates.

Flights outside designated ATS routes

Insert points normally not more than 30 minutes flying time or 200 NM apart, including each point at which a change of speed or level, a change of track, or a change of flight rules is planned.

Or when required by the appropriate ATS authorities

Define the track of flights operating predominantly in an east-west direction between 70°N and 70°S by reference to significant points formed by the intersections of half or whole degrees of latitude with meridians spaced at intervals of 10 degrees of longitude. For flights operating in areas outside those latitudes the tracks shall be defined by significant points formed by the intersection of parallels of latitude with meridians normally spaced at 20 degrees of longitude.

The distance between significant points shall, as far as possible, not exceed one hour's flight time.

Additional significant points shall be established as deemed necessary. For flights operating predominantly in a north-south direction, define the tracks by reference to significant points formed by the intersection of whole degrees of longitude with specified parallels of latitude that are spaced at 5 degrees.

Insert DCT between successive points unless both points are defined by geographical coordinates or by bearing and distance.

Use ONLY the conventions in 1) to 5) below, and SEPARATE each sub-item by a space.

(1) ATS route (2 to 7 characters)

The coded designator assigned to the route or route segment (*e.g.*, W5, Gl2, UA570) including, where appropriate, the coded designator assigned to the standard departure or arrival route, as SIDs or STARs are published.

(2) Significant point (2 to 11 characters)

1) The coded designator (2 to 5 characters) assigned to the point (*e.g.*, LN, MAY, PADEX, SOLER).

NOTE: In airspaces under national jurisdiction, five (5) letters will be used for reporting points not defined by radio aids in ATS routes, as established in ENR 4.3.

If no coded designator has been assigned, use one of the following ways:

- Degrees only (7 characters): 2 figures describing latitude in degrees, followed by "N" (North) or "S" (South), then followed by 3 figures describing longitude in degrees, followed by "E" (East) or "W" (West). Make up the correct number of figures, where necessary, by insertion of zeros, for example, 36S063W.
- Degrees and minutes (11 characters): 4 figures describing latitude in degrees, and tens and units of minutes followed by "N" (North) or "S" (South), followed by 5 figures describing longitude in degrees and tens and units of minutes, followed by "E" (East) or "W" (West). Make up the correct number of figures, where necessary, by insertion of zeros, for example, 4620S07504W.
- Bearing and distance from a reference point: The identification of a navaid (normally a VOR) in the form of 2 or 3 characters; NEXT the bearing from the navaid, in the form of 3 figures, giving degrees magnetic; NEXT the distance from the navaid in the form of 3 figures expressing nautical miles. Make up the correct number of figures, where necessary, by insertion of zeros – *e.g.*, a point 180 magnetic at a distance of 40 nautical miles from VOR "UEN" should be expressed as UEN180040.
- Bearing and distance from a significant point: The identification of a reference point, followed by the bearing from the point in the form of 3 figures, giving degrees magnetic; then the distance

from the point in the form of 3 figures expressing nautical miles. In high-latitude areas where the appropriate authority determines that it is not practical to make reference to degrees magnetic, degrees true may be used. Make up the correct number of figures, where necessary, by insertion of zeros, for example, a point 180º magnetic at a distance of 40 NM from VOR "DUB" should be expressed as DUB180040.

(3) Change of speed or level (maximum 21 characters)
The point at which a change of speed (5% TAS or 0.01 Mach or more) or a change of level is planned to commence, expressed exactly as in 2) above, followed by an oblique stroke and both the cruising speed and the cruising level, expressed exactly as in a) and b) above, without a space between them, even when only one of these quantities will be changed.

Examples: LN/N0284A045
MAY/N0305F180
HADDY/N0420F330
4602N07805W/N0500F350
46N078W/M082F330
DUB180040/N0350M0840

(4) Change of flight rules (maximum 3 characters)
The point at which the change of flight rules is planned, expressed exactly as in 2) or 3) above, followed by a space and one of the following:
VFR if from IFR to VFR
IFR if from VFR to IFR
Examples: PADEX VFR
PADEX/N0280F050 IFR

(5) Cruise climb (maximum 28 characters)
The letter "C" followed by an oblique stroke, THEN the point at which cruise climb is planned to start, expressed as in 2) above, followed by an oblique stroke; THEN the speed to be maintained during cruise climb, expressed exactly as in a) above, followed by the two levels defining the layer to be occupied during cruise climb, each level expressed exactly as in b) above, or the level above which cruise climb is planned, followed by the letters "PLUS", without a space between them:
Examples: C/48S050W/N0300F290F350
C/48S050W/N0300F290PLUS

ITEM 16: Destination aerodrome and total estimated elapsed time, destination alternate

Destination aerodrome and total estimated elapsed time (8 characters):
Insert the ICAO 4-letter location indicator of the destination aerodrome, as specified in ICAO Doc 7910, Location indicators,
Or, if no location indicator has been assigned,
Insert ZZZZ and SPECIFY in Item 18 the name and location of the aerodrome, preceded by DEST/.
THEN WITHOUT A SPACE
INSERT the total estimated elapsed time.

Note. — For a flight plan received from an aircraft in flight, the total estimated elapsed time is the estimated time from the first point of the route to which the flight plan applies to the termination point of the flight plan.

Destination alternate

Insert the ICAO four-letter location indicators of no more than two alternate aerodromes, as specified in ICAO Doc 7910, Location indicators, separated by a space,
Or, if no location indicator has been assigned to the alternate aerodromes,
Insert ZZZZ and SPECIFY in Item 18 the name and location of the alternate aerodromes, preceded by ALTN/.

ITEM 18: Other information

Note. — Use of indicators not included under this item may result in data being rejected, processed incorrectly or lost.
Hyphens or oblique strokes must only be used as prescribed below.
Insert 0 (zero) if no other information,
Or, any other necessary information in the sequence shown hereunder, in the form of the appropriate indicator selected from those defined hereunder, followed by an oblique stroke and the information to be recorded:
STS/ Reason for special handling by ATS, for example, a search and rescue mission, as follows:

- ALTRV: for a flight operated in accordance with an altitude reservation;
- ATFMX: for a flight approved for exemption from ATFM measures by the appropriate ATS authority;
- FFR: fire-fighting;
- FLTCK: flight check for calibration of navaids;
- HAZMAT: for a flight carrying hazardous material;
- HEAD: for a flight with Head of State status;
- HOSP: for a medical flight declared by medical authorities;
- HUM: for a flight operating on a humanitarian mission;
- MARSA: for a flight for which a military entity assumes responsibility for separation of military aircraft;
- MEDEVAC: for a life critical medical emergency evacuation;
- NONRVSM: for a non-RVSM capable flight intending to operate in RVSM airspace;
- SAR: for a flight engaged in a search and rescue mission; and
- STATE: for a flight engaged in military, customs or police services.

Other reasons for special handling by ATS will be denoted under the designator RMK/.

PBN/ Indication of RNAV and/or RNP capabilities. Include as many of the descriptors below, as apply to the flight, up to a maximum of 8 entries, *i.e.*, a total o not more than 16 characters.

RNAV SPECIFICATIONS

- A1 RNAV 10 (RNP 10)
- B1 RNAV 5, all permitted sensors
- B2 RNAV 5 GNSS
- B3 RNAV 5 DME/DME
- B4 RNAV 5 VOR/DME
- B5 RNAV 5 INS or IRS
- B6 RNAV 5 LORANC
- C1 RNAV 2, all permitted sensors
- C2 RNAV 2 GNSS
- C3 RNAV 2 DME/DME
- C4 RNAV 2 DME/DME/IRU
- D1 RNAV 1, all permitted sensors

D2 RNAV 1 GNSS
D3 RNAV 1 DME/DME
D4 RNAV 1 DME/DME/IRU

RNP SPECIFICATIONS
L1 RNP 4
O1 Basic RNP 1, all permitted sensors
O2 Basic RNP 1 GNSS
O3 Basic RNP 1 DME/DME
O4 Basic RNP 1 DME/DME/IRU
S1 RNP APCH
S2 RNP APCH with BARO-VNAV
T1 RNP AR APCH with RF (special authorisation required)
T2 RNP AR APCH without RF (special authorisation required)

Combinations of alphanumeric characters not listed above are reserved.

NAV/ Significant data related to navigation equipment, other than specified in PBN/, as required by the appropriate ATS authority. Indicate GNSS augmentation under this indicator, with a space between two or more methods of augmentation, *e.g.,* NAV/GBAS SBAS.
COM/ Indicate communications applications or capabilities not specified in Item 10a.
DAT/ Indicate data applications or capabilities not specified in Item 10a.
SUR/ Include surveillance applications or capabilities not specified in Item 10b.
DEP/ Name and location of departure aerodrome, if ZZZZ is inserted in Item 13, or the ATS unit for which supplementary flight plan data can be obtained, if AFIL is inserted in Item 13. For aerodromes not listed in the relevant aeronautical information publication, indicate location as follows:

With 4 figures describing latitude in degrees and tens and units of minutes followed by the letter “N” (North) or “S” (South), followed by 5 digits describing longitude in degrees and tens and units of minutes, followed by “E” (East) or “W” (West). Make up the correct number of figures, where necessary, by insertion of zeros, for example, 4620N07805W (11 characters).

Or, with the bearing and distance from the nearest significant point, as follows:

The identification of the significant point, followed by the bearing from the point in the form of 3 figures giving degrees magnetic, followed by the distance from the point in the form of 3 figures expressing nautical miles. In areas of high altitude where it is determined by the appropriate authority that reference to degrees magnetic is impractical, degrees true may be used.

Make up the correct number of figures, where necessary, by insertion of zeros, for example, a point 180º magnetic at a distance of 40 nautical miles from VOR “DUB” should be expressed as DUB180040.

Or, the first point of the route (name or LAT/LONG) or marker radio beacon, if the aircraft has not taken off from an aerodrome.

DEST/ Name and location of destination aerodrome, if ZZZZ is inserted in Item 16. For aerodromes not listed in the aeronautical information publication, insert location in LAT/LONG or bearing and distance from the nearest significant point, as described under DEP/ above.

DOF/ The date of flight departure in a six-figure format (YYMMDD), where YY equals the year, MM equals the month, and DD equals the day).

REG/ The nationality or common mark and registration mark of the aircraft, if different from the aircraft identification in Item 7.

EET/ Significant point or FIR boundary designators and total estimated elapsed time from take-off to such points or FIR boundaries, when so prescribed on the basis of regional air navigation agreements, or by the appropriate ATS authority.

Examples: EET/CAP0745 XYZ0830
EET/EINN0204

SEL/ SELCAL code, for aircraft so equipped.

TYP/ Types of aircraft, preceded if necessary without a space by number of aircraft and separated by one space, if ZZZZ is inserted in Item 9.

Example: TYP/2F15 5F5 3B2

CODE/ Aircraft address (expressed in the form of an alphanumerical code of six hexadecimal characters) when required by the appropriate ATS authority. Example: "F00001" is the lowest aircraft address contained in the specific block administered by ICAO.

DLE/ En-route delay or holding: insert the significant points on the route where a delay is planned to occur, followed by the length of delay using four figure time in hours and minutes (hhmm).

Example: DLE/MDG0030

OPR/ ICAO designator or name of the operator, if different from the aircraft identification in Item 7.

ORGN/ The originator's 8-letter AFTN address or other appropriate contact details, in cases where the originator of the flight plan may not be readily identified, as required by the appropriate ATS authority.

Note. — In some areas, fight plan reception centres may insert the ORGN/ identifier and originator's AFTN address automatically.

PER/ Aircraft performance data, indicated by a single letter, as specified in the Procedures for air navigation services – Aircraft operations (PANS-OPS, ICAO Doc 8168), Volume I — Flight procedures, if so prescribed by the appropriate ATS authority.

ALTN/ Name of destination alternate aerodromes, if ZZZZ is inserted in Item 16. For aerodromes not listed in the relevant aeronautical information publication, indicate location in LAT/LONG or the bearing and distance from the nearest significant point, as described in DEP/ above.

RALT/ ICAO four-letter indicators for en-route alternates, as specified in ICAO Doc 7910, Location indicators, or name of en-route alternates, if no indicator is allocated. For aerodromes not listed in the relevant aeronautical information publication, insert location in LAT/LONG or bearing and distance from the nearest significant point, as described in DEP/ above.

TALT/ ICAO four-letter indicators for take-off alternates, as specified in ICAO Doc 7910, Location indicators, or name of take-off alternates, if no indicator is allocated. For aerodromes not listed in the relevant aeronautical information publication, indicate location in LAT/LONG or bearing and distance from the nearest significant point, as described in DEP/ above.

RIF/ The route details to the revised destination aerodrome, followed by the ICAO four-letter location indicator of said aerodrome. The revised route is subject to reclearance in flight.

Examples: RIF/DTA HEC KLAX
RIF/ESP G94 CLA YPPH

RMK/ Any other plain language remarks when required by the appropriate ATS authority or deemed necessary.

ITEM 19: Supplementary information

Endurance: Insert a 4-figure group after E/ to indicate the fuel endurance in hours and minutes.
People on board: After P/, insert the total number of people (passengers and crew) on board, if prescribed by the appropriate ATS authority. Insert TBN (to be notified) if the total number of people is not known during flight plan filing.

Emergency and survival equipment:

R(RADIO)

Cross out U if UHF on frequency 243.0 Mhz is not available
Cross out V if VHF on frequency 121.5 Mhz is not available
Cross out E if an emergency location transmitter (ELT) is not available

S/(SURVIVAL EQUIPMENT)

Cross out all indicators if survival equipment is not carried
Cross out P if polar survival equipment is not carried. Cross out D if desert survival equipment is not carried. Cross out M if maritime survival equipment is not carried. Cross out J if jungle survival equipment is not carried.

J/(JACKETS)

Cross out all indicators if life jackets are not carried
Cross out L if life jackets are not equipped with lights. Cross out F if life jackets are not equipped with fluorescein. Cross out U or V or both, as in R/ above, to indicate radio capability of jackets, if any.

D/ (DINGHIES)

(NUMBER)

(CAPACITY)

Cross out indicators D and C if no dinghies are carried, and insert total capacity, number of persons, of all dinghies carried; and

(COVER)

Cross out indicator C if dinghies are not covered; and

(COLOUR)

Insert colour of dinghies if carried.

A/(COLOUR AND MARKINGS OF AIRCRAFT)

Insert the colour and significant markings of aircraft.

N/(REMARKS)

Cross out indicator N if no remarks, or indicate any other survival equipment carried and any other remarks regarding survival equipment.

C/(PILOT)
Insert the name of the pilot-in-command of the aircraft.

Submitted by: Insert the name of the unit, agency and/or person submitting the flight plan.

NOTE. — The aircraft commander or, in the case of commercial airlines, their designated representative, shall sign the PLN in the space reserved for additional requirements.

REFERENCES

AFIL: Flight plan filed in the air.
DCT: Direct (in relation to flight plan clearances and type of approach).
EET: Estimated elapsed time (for IFR flights, the estimated time required from take-off to arrive over that designated point, defined by reference to navigation aids, from which it is intended that an instrument approach procedure will be commenced, or, if no navigation aid is associated with the destination aerodrome, to arrive over the destination aerodrome. For VFR flights, the estimated time required from take-off to arrive over the destination aerodrome).
ELT: Emergency locator transmitter.
EOBT: Estimated off-block time (the estimated time at which the aircraft will commence movement associated with departure).
HF RTF: High frequency in radiotelephony.
PER: Aircraft performance data.
RIF: Reclearance in flight (renewal of clearance in flight)
RTF: Radiotelephony.
STS: Reason for special handling by ATS.
TBN: To be notified.
TYP: Type of aircraft.
UHF RTF: Ultra high frequency in radiotelephony.
VHF RTF: Very high frequency in radiotelephony.

3.3 The ARO-AIS/COM office will not accept the FPL if it contains inconsistencies.

3.4 It shall receive and review ATS messages (FPL, CNL, CHG, DLA) sent by the operators.

3.5 It shall prepare and transmit ATS messages in the standard format and text, and in accordance with the conventional representation of data in those cases and conditions prescribed in Doc 4444 ATM/501, Appendix 3.

4 AERONAUTICAL INFORMATION MANAGEMENT (AIM) PERSONNEL FLIGHT DATA DISPLAY (FDD) OPERATORS

4.1 The personnel responsible for modifying ATS messages received with errors shall proceed as follows:

1) Verify the ATS message is not duplicated. If duplicated, it shall be deleted.
2) Verify that the content of the message is in accordance with 2.2 of this document or with Doc 4444 ATM/501, Appendix 3, as appropriate. Once the error in the content has been corrected, the message shall be entered into the system.

Note. — If errors are found in Item 15 (Route) of an FPL, corrections will be made “only to the portion of the route that corresponds to its FIR", leaving intact the data of other FIRs, except when absolutely necessary to ensure route continuity in the adjacent FIR(s).

5 CONTROL TOWER ATCO PERSONNEL

5.1 It is expected that the AIDC will send ABI and EST messages based on the actual take-off time of the aircraft. However, when a flight is delayed, the ABI message will be sent based on the FPL EOBT, and then when the time comes for delivery of EST message, the system will send a PAC message.

5.2 This may result in undesired situations in which the receiving ACC receives automatic aircraft transfers that have not departed yet nor will depart in the next few minutes, thus creating confusion in the receiving FIR.

5.3 In order to avoid these situations, the EOBT must be updated based on the estimated time of departure, which shall be calculated by tower control personnel, based on tow or taxi estimates provided by the pilot, and the estimated departure calculated by the ATCO.

6 CONTROL CENTRE ATCO PERSONNEL

6.1 An automation environment is aimed at reducing human intervention in the processes that take place to fulfil a specific task. In this regard, air traffic controllers shall take into account that data handling operations on ATC automated systems could disrupt some automatic processes or cause undesired results.

6.2 For this reason, while AIDC coordination is taking place, ATCOs shall avoid activating and/or manually assuming flights, unless strictly necessary, thus allowing automatic coordination to proceed.

6.3 There are 2 (two) possible configurations for the establishment of AIDC coordination between control centres:

1) using EST messages, or
2) using CPL messages

6.4 Using EST messages

1º An FPL in "notified" status will be in a PRE-NOTIFYING coordination phase.
2º The system will send an ABI message and the coordination phase will change to NOTIFYING. (The system will send an ABI message whenever a change is made to EOBT, FL, ROUTE or DESTINATION data in the FPL.)
3º The system will send an EST message (if the duration of the flight from take-off to the COP is greater than the time specified in the database) or a PAC message (if the duration of the flight from take-off to the COP is less than that specified in the database) and the coordination phase will change to COORDINATING.
4º Acceptance can be automatic or manual, depending on system capacity and/or the decision of the ATSU. If manual, the ATCO of the adjacent ACC shall send an ACP message, and the coordination phase will change to COORDINATED.
5º The ATCO of the originating ACC or the ATCO of the receiving ACC may send a CDN message notifying or requesting a change in the FL and the coordination phase will change to RE-NEGOTIATING.

6º The ATCO that receives a CDN may send an ACP message or a CDN message with a different proposal. If the answer is an ACP message, coordination will return to the COORDINATED phase. If the answer is a CDN message, coordination will continue in the RE-NEGOTIATING phase until one of the ATCOs responds with an ACP message.

7º Under the circumstances defined in the Letter of Operational Agreement, the ATCO of the originating ACC shall make the transfer effective by sending a TOC message and coordination will change to TRANSFERRING.

8º The ATCO of the adjacent ACC shall send an AOC message accepting the transfer and the coordination status will change to TRANSFERRED.

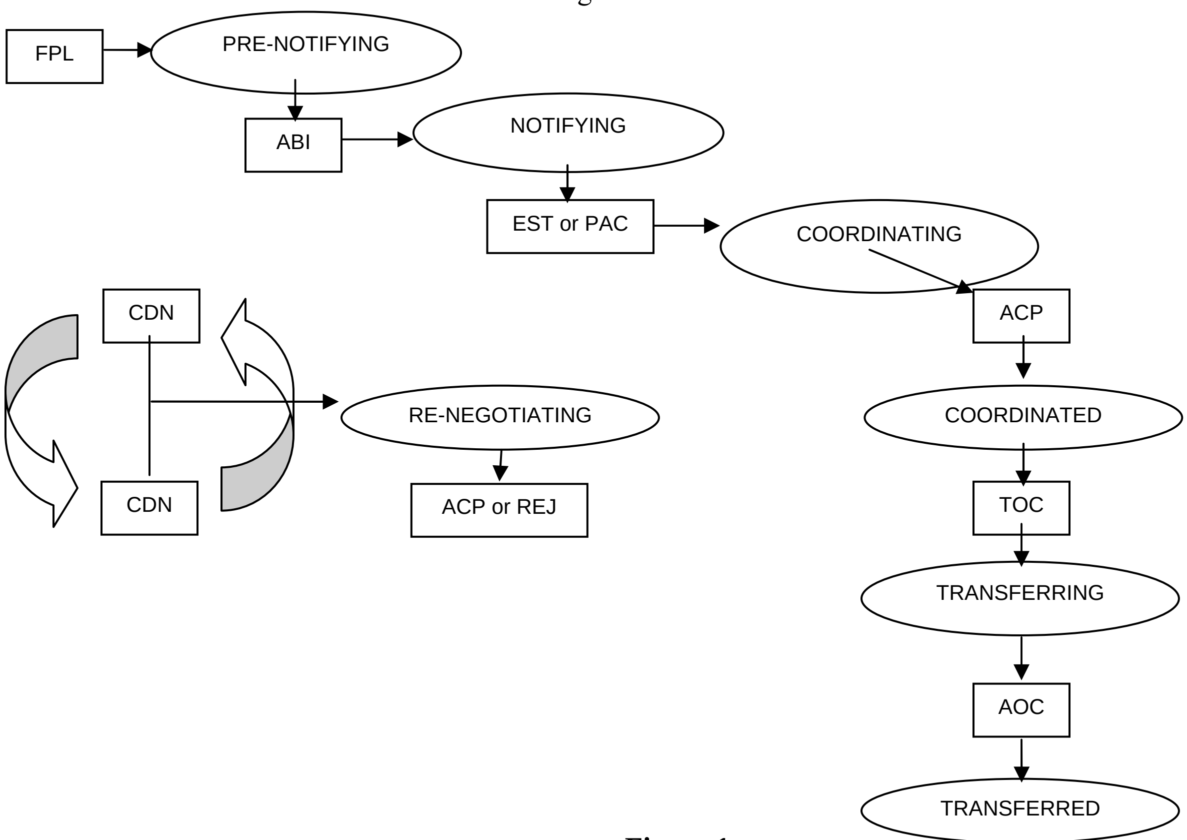


Figure 1

6.5 Using CPL messages

1º An FPL in "notified" status will be in the PRE-NOTIFYING coordination phase.

2º The system will send an ABI message and the coordination phase will change to NOTIFYING. (The system will send an ABI message whenever a change is made to EOBT, FL, ROUTE or DESTINATION data in the FPL.)

3º The system will send a CPL message and the coordination phase will change to NEGOTIATING.

4º The ATCO of the adjacent ACC shall send an ACP message or a CDN message with a different proposal. If the answer is an ACP message, coordination will change to the CORDINATED phase. If the answer is a CDN message, coordination will change to the RE-NEGOTIATING phase until one of the ATCOs responds with an ACP message, and the coordination phase will change to COORDINATED.

5º The ATCO of the originating ACC or the ATCO of the receiving ACC may send a CDN message notifying or requesting a change in the FL and the coordination phase will change to RE-NEGOTIATING.

6º The ATCO that receives a CDN may send an ACP message or a CDN message with a different proposal. If the answer is an ACP message, coordination will return to the CORDINATED phase. If the answer is a CDN message, coordination will continue in the RE-NEGOTIATING phase until one of the ATCOs responds with an ACP message.
7º Under the circumstances defined in the Letter of Operational Agreement, the ATCO of the originating ACC shall make the transfer effective by sending a TOC message and coordination will change to TRANSFERRING.
8º The ATCO of the adjacent ACC shall send an AOC message accepting the transfer and the coordination status will change to TRANSFERRED.

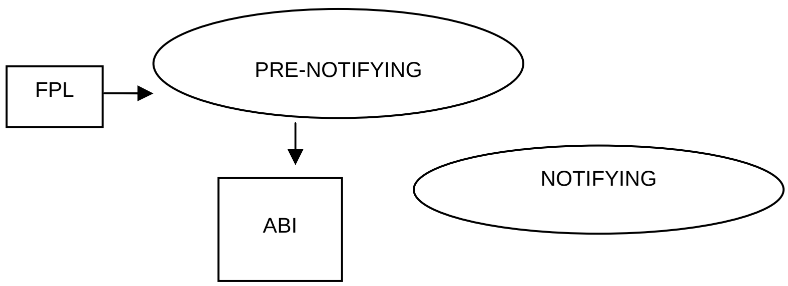


Figure 2

APPENDIX E

COMPOSITION OF AIDC MESSAGES OF THE MINIMUM SET

ATS message fields

Field	Element (a)	Element (b)	Element (c)	Element (d)	Element (e)
03	Message type designator	Message number	Reference data		
07	Aircraft identifier	SSR mode	SSR code		
09	Number of aircraft	Aircraft type	Wake turbulence category		
10	Radio communication and navigation and approach aid equipment and capabilities	Surveillance equipment and capabilities			
13	Aerodrome of departure	Time			
14	Control point	Time at control point	Cleared level	Supplementary data	Conditions
15	Cruising speed	Cruising level	Route		
16	Destination aerodrome	Total estimated elapsed time	Destination alternates		
18	Other data				
22	Field indicator	Modified data			
31	Facility designator	Sector designator			
32	Time	Position	Trace ground speed	Trace heading	Reported altitude

FPL (filed flight plan)

FPL field	Required elements	Optional elements	Comments
03	a. b.		
07	a.	b. c.	The SSR code is sent only if one has (already) been assigned and the aircraft is equipped for it.
08	a.	b.	Element (b) is included if so required by the boundary agreement.
09	b. c.	a.	
10	a. b.		
13	a. b.		
15	a. b. c.		
16	a. b.	c.	
18		a. Other information	Element (a) is included only if no other information is provided. Any element (a) or other information (but not both) must be included.

ABI (reporting message)

ABI field	Required elements	Optional elements	Comments
03	a.		Element (c) shall contain the reference number of the first message sent for this flight.
07	a.	b. c.	If an SSR code has been assigned, it must be included.
13	a.		
14	a. b. c. d. e.		
16	a.		
22			

CPL (current flight plan)

CPL field	Required elements	Optional elements	Comments
03	a. b.		
07	a.	b. c.	The SSR code is only sent if one has (already) been assigned and the aircraft is equipped for it.

08	a. b.		Element (b) is included if so required by the boundary agreement.
09	b. c.	a.	
10	a. b.		
13	a.		
14	a. b. c.	d. e.	
15	a. b. c.		
16	a.		
18		a. Other information	Element (a) is included only if no other information is included. Any element (a) or other information (but not both) must be included.

PAC (pre-activation)

PAC field	Required elements	Optional elements	Comments
03	a. b. c.		Element (c) shall contain the reference number of the last message sent for this flight.
07	a.	b. c.	The SSR code is only sent if one has already been assigned and the aircraft is equipped for it.
13	a.		The departure aerodrome must match the value previously sent in the FPL or the last CHG that modified the FPL.
14	a. b. c.	d. e.	Estimation data
16	a.		The destination aerodrome must match the value previously sent in the FPL or the last CHG that modified the FPL.
22			

MAC (coordination cancellation)

MAC field	Required elements	Optional elements	Comments
03	a. b. c.		Element (c) shall contain the reference number of the last message sent for this flight.
07	a.	b. c.	The SSR code is sent only if one has already been assigned and the aircraft is equipped for it.
13	a.		The departure aerodrome must match the value previously sent in the FPL or the last CHG that modified the FPL.
16	a.		The destination aerodrome must match the value previously sent in the FPL or the last CHG that modified the FPL.
22			

EST (estimates)

EST field	Required elements	Optional elements	Comments
03	a. b. c.		Element (c) shall contain the reference number of the last message sent for this flight.
07	a.	b. c.	The SSR code is sent only if one has already been assigned and the aircraft is equipped for it.
13	a.		The departure aerodrome must match the value previously sent in the FPL or the last CHG that modified the FPL.
14	a. b. c.	d. e.	
16	a.		The destination aerodrome must match the value previously sent in the FPL or the

			last CHG that modified the FPL.

CDN (coordination message)

CDN field	Required elements	Optional elements	Comments
03	a. b. c.		
07	a.	b. c.	
13	a. b.		
14	a. b. c.	d.	
16	a.		

ACP (acceptance message)

ACP field	Required elements	Optional elements	Comments
03	a. b. c.		
07	a.	b. c.	
13	a. b.		
16	a.		

RJC (rejection message)

RJC field	Required elements	Optional elements	Comments
03	a. b. c.		
07	a.	b. c.	
13	a. b.		
16	a.		

TOC (transfer of control message)

TOC field	Required elements	Optional elements	Comments
03	a. b. c.		
07	a.	b. c.	
13	a. b.		
16	a.		

AOC (assumption of control)

AOC field	Required elements	Optional elements	Comments
03	a. b. c.		
07	a.	b. c.	
13	a. b.		
16	a.		

LAM (logical acknowledgment message)

LAM field	Required elements	Optional elements	Comments
03	a. b. c.		

LRM (logical rejection message)

LRM field	Required elements	Optional elements	Comments
03	a. b. c.		
18	Text as shown in Comments		Describes the error code: after RMK /, includes two digits for the error code.

APPENDIX F

LIST OF ACRONYMS

ABI	Advance Boundary Information (AIDC message)
ACC	Area Control Centre
ACP	Acceptance (AIDC message)
ADS	Surveillance ADS-C (AIDC message)
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
AFTN	Aeronautical Fixed Telecommunications Network
AFTN	Aeronautical Fixed Telecommunications Network
AIDC	ATS Interfacility Data Communications
AMHS	Aeronautical Message Handling System
AMHS	ATS Message Handling System
AOC	Airline Operational Control; or Assumption of Control (AIDC message)
APP	Approach Control Office
ASCII	**A**merican **S**tandard **C**ode for **I**nformation **I**nterchange
ASIA/PAC	Asia/Pacific
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Service
ATSU	Air Traffic Service Unit
CAAS	Common AMHS Addressing Scheme
CARSAM	Caribbean – South America
CCAM	*Centro de Conmutación Automática de Mensajes* (automatic message switching centre)
CDN	Coordination (AIDC message)
CH	AFTN Channel
CHG	ICAO Modification Message
CNS	Communications, Navigation, Surveillance
CPDLC	Controller Pilot Data Link Communications
CPL	Current Flight Plan (AIDC message)
DS	Directory server that communicates using X.500 protocols
DS	Directory Service
EST	Coordination Estimate (AIDC message)
FPL	Filed Flight Plan
IA-5	International Alphabet 5
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IP	Internet Protocol
IPM	Inter Personal Message
IPv4	Internet Protocol version 4
IPv4 REDDIG SAM:	IP addressing plan, version 4. Uses the REDDIG and corresponds to the SAM Region
ITA-2	International Telegraph Alphabet No. 2
LAM	Logical Acknowledgment Message (AIDC message)
LRM	Logical Rejection Message (AIDC message)
MS	Message storage for handling message delivery and retrieval
MTA	Agent responsible for routing messages between MTAs, MSs, and UAs - Message Transfer Agent

MTCU	Message Transfer and Conversion Unit
NAT	Network Address Translation
NAT	IP address translation protocol
OSI	Open System Interconnection
P1	Protocol for communicating and routing messages between MTAs (ITU-T X.411)
P3	Delivery protocol ("pull" type)
P7	Protocol for the UA to withdraw from MS (ITU-T X.413) ("push" type)
REDDIG	South American Digital Network
REDDIG LAN	Environment associated to the regional IP addressing plan for each State
REDDIG WAN	Environment associated to the regional IP addressing plan for interconnection between States
REJ	Rejection (AIDC message)
Speech ATS	Speech circuit for ATS communications
TCP	Transfer of Control Point
TOC	Transfer of Control (AIDC message)
TWR	Aerodrome control tower
UA	User Agent
UTC	Universal Coordinated Time

APPENDIX B

(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 trials - March 2016 As a result of the trials, the transmission speed has to be incremented from 2400 to 9600 bit/seg AIDC foreseen to be operational on the second semester of 2017
	LA PAZ	XI			X	AIDC foreseen for period 2017-2019
	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 by the first semester of 2017
	RESISTENCIA	XI			X	AIDC pre-operational by the first semester of 2017
RESISTENCIA (AUT. INDRA AIRCON2100) (June 2016)	ASUNCION	XI			X	Positive AIDC trials were conducted in 2015 between Ezeiza and Asunción. Trials between Resistencia and Asunción will be conducted on mid-2016 AIDC foreseen to be operational by the second semester of 2017
	CORDOBA	XI			X	AIDC pre-operational by the first semester of 2017
	CURITIBA	XI			X	AIDC foreseen by the second semester of 2017
	EZEIZA	XI			X	AIDC pre-operational by the first semester of 2017
	MONTEVIDEO	XI			X	AIDC foreseen by the second semester of 2017
EZEIZA (AUT. INDRA AIRCON2100) (2007)	COMODORO RIVADAVIA	XI			X	AIDC pre- by the first semester of 2017
	MENDOZA	XI			X	AIDC pre-operational by the first semester of 2017

	PUERTO MONTT	XI			X	AIDC by the second semester of 2017
	CORDOBA	XI			XI	AIDC in pre-operational phase since December 2015. Operational phase foreseen by the first semester of 2017
	RESISTENCIA	XI			X	AIDC pre-operational by the first semester of 2017
	JOHANNESBURG	XI			X	AIDC tests foreseen by the end of October 2016
	MONTEVIDEO	XI			X	AIDC foreseen by the second semester of 2017
MENDOZA (AUT INDRA AIRCON2100) (June 2016)	EZEIZA	XI			X	AIDC pre-operational by the first semester of 2017
	SANTIAGO	XI			X	AIDC foreseen for period 2017-2019
	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 second semester of 2017
	PUERTO MONTT	XI			X	AIDC by 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 December 2016
	CURITIBA	XI			XI	AIDC implemented July 2016
	GEORGETOWN	XI			X	AIDC foreseen for period 2017-2019
	LA PAZ	XI			X	AIDC foreseen for period 2017-2019
	LIMA	XI			X	AIDC foreseen for December 2016
	MAIQUETIA	XI	X		X	AIDC foreseen for period 2017-2019
	PARAMARIBO	XI			X	AIDC foreseen for period 2017-2019
	RECIFE	XI			X	AIDC implemented since 2 May 2016

	CAYENNE	XI			X	AIDC foreseen for period 2017-2019
	ATLÂNTICO	XI			X	May 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 by December 2016
	BRASÍLIA	XI			Xi	AIDC implemented July 2016
	LA PAZ	XI			X	AIDC foreseen for period 2017-2019
	MONTEVIDEO	XI			X	AIDC foreseen for the first semester of 2017
	RECIFE	XI			XI	AIDC implemented July 2016
	RESISTÊNCIA	XI			X	AIDC foreseen for the first semester of 2017
	ATLÂNTICO	XI			X	May 2017
RECIFE AUTO. SAGITARIO ATECH	AMAZÔNICO	XI			X	AIDC Implemented on 2 May 2016
	BRASÍLIA	XI			XI	AIDC implemented June 2016
	CURITIBA	XI			XI	AIDC implemented July 2016
	ATLÂNTICO	XI			X	May 2017
ATLÁNTICO AUTO. SAGITARIO ATECH	AMAZÔNICO	XI			X	May 2017
	CURITIBA	XI			X	May 2017
	DAKAR	XI			X	AIDC TBD
	JOHANNESBURG	XI			X	AIDC TBD
	LUANDA	XI			X	AIDC TBD
	MONTEVIDEO	XI			X	AIDC foreseen for period 2017-2019
	RECIFE	XI			X	May 2017
	CAYENNE	XI			X	AIDC foreseen for period 2017-2019

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 2017-2019
	ASUNCION	XI			X	AIDC foreseen for period 2017-2019
	CURITIBA	XI			X	AIDC foreseen for period 2017-2019
	CORDOBA	XI			X	AIDC foreseen for period 2017-2019
	LIMA	XI			X	AIDC foreseen for period 2017-2019
	IQUIQUE	XI			X	AIDC foreseen for period 2017-2019

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 2017-2019
	LIMA	XI			X	AIDC foreseen for period 2017-2019
	MENDOZA	XI			X	AIDC foreseen for period 2017-2019
	PUERTO MONTT	XI			X	AIDC foreseen for period 2017-2019
IQUIQUE (AUTO INDRA AIRCON 2100)	CORDOBA	XI			X	Positive AIDC trials - March 2016 Trial results indicate the necessity of increase transmission speed from 2400 to 9600 bit/sec. AIDC operational foreseen by the first semester of 2017
	LA PAZ	XI			X	AIDC foreseen for period 2017-2019
	LIMA	XI			X	Positive AIDC trials conducted in February 2016 AIDC foreseen to be operational by the first semester of 2017

PUERTO MONTT (INDRA AUTOMATED)	SANTIAGO	XI			X	AIDC foreseen for period 2017-2019
	PUNTA ARENAS	XI			X	AIDC foreseen by the first semester of 2017
	EZEIZA	XI			X	AIDC by the second semester of 2017
	COMODORO RIVADAVIA	XI			X	AIDC by the second semester of 2017
PUNTA ARENAS (MANUAL)	PUERTO MONTT	XI			X	AIDC by the end of 2016
	COMODORO RIVADAVIA	XI			X	AIDC by the first semester of 2017

COLOMBIA						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
BOGOTÁ (AUTO INDRA AIRCON 2100)	AMAZÔNICO	XI			X	AIDC foreseen to be operational on second half of 2016
	CENAMER	XI			X	AIDC foreseen for period 2017-2019
	GUAYAQUIL	XI			XI	Positive AIDC trials conducted AIDC in pre-operational phase (August 2015) Operational foreseen by the end of 2016
	LIMA	XI			XI	Positive AIDC trials conducted AIDC pre-operational (August 2015) Pending signature of letter of operational agreement pending. Operational foreseen by end 2016
	MAIQUETIA	XI			X	AIDC foreseen for period 2017-2019
	PANAMA	XI			X	Positive AIDC trials conducted AIDC foreseen to be operational by first semester 17

	BARRANQUILLA	XI			XI	AIDC pre-operational (March 2016) Operation foreseen by the end of 2016
BARRANQUILLA (AUTO INDRA AIRCON 2100)	MAIQUETIA	XI			X	AIDC foreseen for period 2017-2019
	PANAMA	XI			X	Positive AIDC trials conducted AIDC foreseen to be operational by first semester 2017
	BOGOTA	XI			XI	AIDC pre-operational (March 2016) Operation foreseen by the end of 2016
	KINGSTON	XI			X	AIDC TBD
	CURAÇAO	XI			X	AIDC TBD

ECUADOR						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
GUAYAQUIL AUTO INDRA AIRCON 2100	BOGOTA	XI			XI	Positive AIDC trials conducted AIDC pre-operational (August 2015) Foreseen operational by the end of 2016
	LIMA				XI	AIDC operational implementation (31 March 2016)
	CENAMER	XI			X	Positive AIDC trials conducted AIDC foreseen for period 2017-2019

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 by first semester 2017
	PARAMARIBO	XI			X	AIDC foreseen for period 2017-2019
	PIARCO	XI			X	AIDC foreseen for period 2017-2019
	DAKAR	XI			X	AIDC foreseen by end 2016
	ATLANTICO	XI			X	AIDC foreseen by first semester 2017

GUYANA						
ACC	ACC ADJ	Flight plan				Comments
		Interconnection levels				
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
GEORGETOWN AUTO INTELCAN AIDC not installed	AMAZONICO	XI			X	AIDC foreseen for period 2017-2019
	PIARCO	XI			X	AIDC foreseen for period 2017-2019
	MAIQUETIA	XI			X	AIDC foreseen for period 2017-2019
	PARAMARIBO	XI			X	AIDC foreseen for period 2017-2019

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 trials conducted AIDC foreseen to be operational by first semester 2017
	BARRANQUILLA	XI			X	Positive AIDC trials conducted AIDC foreseen to be operational by first semester 2017
	CENAMER	XI			X	Positive AIDC trials conducted AIDC foreseen to be operational by the end of the first semester 2017

PARAGUAY						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
ASUNCION AUTO AIRCON 2100 INDRA	CURITIBA	XI			X	AIDC foreseen by December 2016
	LA PAZ	XI			X	AIDC foreseen for period 2017-2019
	RESISTÊNCIA	XI			X	Positive AIDC trials conducted in 2015 between Ezeiza and Asunción. Trials between Resistencia and Asunción will be conducted on mid 2016 AIDC foreseen to be operational by second semester 2017

PERU						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
LIMA AUTO AIRCON 2100 INDRA	AMAZONICO	XI			X	AIDC foreseen to be operational by December 2016
	BOGOTA	XI			XI	Positive AIDC trials conducted AIDC pre-operational phase (August 2015) Letter of operational agreement pending signature. Foreseen operational by the end of 2016.
	SANTIAGO	XI			X	AIDC foreseen for period 2017-2019
	IQUIQUE	XI			X	Positive AIDC trials conducted in February 2016 AIDC foreseen to be operational by first semester 2017
	GUAYAQUIL	XI			XI	AIDC operational (31 March 2016)
	LA PAZ	XI			X	AIDC foreseen for period 2017-2019

SURINAME						
ACC	ACC ADJ	Flight plan Interconnection levels				Comments
		1 4444 Manual	2 4444 Auto	3 (OLDI)	4 (AIDC)	
PARAMARIBO (AUTO INTELCAN) AIDC not installed	AMAZÓNICO	XI			X	AIDC foreseen for period 2017-2019
	GEORGETOWN	XI			X	AIDC foreseen for period 2017-2019
	PIARCO	XI			X	AIDC foreseen for period 2017-2019
	CAYENNE	XI			X	AIDC foreseen for period 2017-2019

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 2017
	EZEIZA	XI			X	AIDC foresee by second semester 2017
	RESISTENCIA	XI			X	AIDC foreseen by second semester 2017
	ATLANTICO	XI			X	AIDC foreseen for period 2017-2019
	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 2017-2019
	BOGOTA	XI			X	AIDC foreseen for period 2017-2019
	BARRANQUILLA	XI			X	AIDC foreseen for period 2017-2019
	PIARCO	XI			X	AIDC TBD
	CAYENNE	XI			X	AIDC foreseen for period 2017-2019
	CURAZAO	XI			X	AIDC TBD
	SAN JUAN	XI			X	AIDC TBD

*** X PLANNED**
***XI IMPLEMENTED AND IN PRE-OPERATIONAL OR OPERATIONAL PHASE**

APPENDIX C

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	Jefe Departamento CNS EANA	(549 11) 5848 6936	Jschenk@eana.com.ar
		Rubén Silva	Especialista ATM sistemas automatizados		rubengsilva@hotmail.com
		Mario Correa	Jefe sistemas automatizados ATS	(54 11) 4317-6015	mario_correa@yahoo.com.ar
		Javier Vittor	Especialista CNS	(54 11) 4480-2362 (54 911) 6894-0692	javiervittor@gmail.com
	ANAC	Diego Agüero	Técnico automatización	(54911) 2258-7836 (5411) 5941-3000 Ext.69-128	daguero@anac.gob.ar
BOLIVIA					
BRAZIL/ BRASIL	DECEA	Alessander Santoro	Especialista CNS	(55 21) 2101-6105	santoroaas@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
CHILE	DGAC	Pedro Pastrian	Especialista radar y sistemas automatizados	(56 2) 836-4005 (56 2) 644-8345	ppastrian@dgac.gob.cl

STATE/ ESTADO	ADMINISTRATION/ ADMINISTRACIÓN	NAME/ NOMBRE	POST/ CARGO	TELEPHONE/ TELEFONO	E-MAIL
		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
		Gilda Aracelly Espinosa Perez	Supervisora de area y aproximación radar	(507) 3929899	gespinosa@aeronautica.gob.pa
PARAGUAY	DINAC	Digno Nelson Cardozo González	Técnico Especialista en Radar y Sistemas Automatizados	(595) 9217585016 Celular: (595) 961779106	nechicar@gmail.com
		Diego Ramón Aldana Fernández	Supervisor ACC/APP	(595) 21 645-707	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 Mobile: 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
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	Alfredo A. Dávila Alfonzo	Coordinador Área de Trabajo ATS	(58 212) 2774-439	a.davila@inac.gob.ve
		Francisco Antonio Ortiz	Gestión Operacional ATM		f.ortiz@inac.gob.ve
		Jean Carlos Lozano Garcia	Controlador tránsito aéreo ACC Maiquetía	(58 416) 7226428	jclozgar@hotmail.com

APPENDIX D

PLAN OF ACTIVITIES FOR THE IMPLEMENTATION OF THE AIDC INTERCONNECTION BETWEEN ADJACENTS ACCs

	Start	End	Responsible party	Status
1. **Establishment of initial activities for completing the technical implementation of AIDC**	**10/10/2014**	**16/10/2014**	**ICAO**	**Completed** The initial plan of activities for AIDC implementation is scheduled for 2015. The plan of activities contemplates the conduction of AIDC courses for air traffic controllers working at ACCs and the operational implementation of AIDC between adjacent ACCs. These activities will be conducted in Chile, Colombia, Ecuador and Peru. Interconnection tests between the Lima and Bogota ACCs were added to the list shown in paragraph 1.1.1.
1.1 Based on the results of AIDC tests conducted from February 2014 to June 2014, the technical documentation of the automated systems installed in the Region, and the SAM AIDC implementation guide, develop: 1.1.1 Plan of activities to complete technical feasibility tests for AIDC interconnection between: Santiago ACC - Lima ACC Guayaquil ACC - Lima ACC Bogota ACC - Guayaquil ACC 1.1.2 Contents of AIDC course for ATS controllers and programmers of AIDC automated system databases, to be conducted in Chile, Colombia, Ecuador and Peru.	10/10	16/10	ICAO	
2. **Review of activities at the SAM/IG/14 meeting**	**09/10**	**13/11**	**ICAO and SAM/IG group**	**Completed** The SAM/14 reviewed and approved the plan of activities for AIDC implementation
2.1 Submission of the plan of activities and contents of the AIDC course at the SAM/IG/14 meeting	09/10	13/11	ICAO	
2.2 Review and approval for submission at the Eighth Coordination Meeting of Project RLA/06/901	09/10	13/11	SAM/IG	

	Start	End	Responsible party	Status
3. Approval of activities by the RCC/8 meeting	**25/02/15**	**27/02/15**	**RLA/06/901 member States**	**Completed** The RCC/8 meeting held in Lima on 25-27 February 2015 approved the activities for initial implementation of AIDC interconnection in Chile, Colombia, Ecuador and Peru.
3.1 Submission of activities, with their respective cost, for approval.	25/02/15	27/02/15	RLA/06/901 member States	
4. Search and selection of experts	**24/11/14**	**28/01/15**	**ICAO**	**Completed** For the performance of the initial activities, three SAM experts with experience in database programming and operation of ACC automated systems were selected: **Rubén Silva of Argentina, Mauricio Ferrer of Colombia, and Jorge Merino of Peru**.
4.1 Search and selection of 4 experts from SAM States participating in Project RLA/06/901, with experience in the installation, operation and programming of AIDC databases, to perform the activities listed in item 1.	24/11/14	28/01/15	ICAO	
5. Missions to complete AIDC interconnection between States that started tests during the first semester of 2014	**06/04/15**	**01/05/15**	**3 automation experts ICAO**	**Completed** Missions were conducted for training purposes and to complete tests for AIDC interconnection and operation **Chile 6/4 to 10/4/2015** **Peru 13/4 to 17/4/2015** **Ecuador 20/4 to 24/4/2015** **Colombia 27/4 to 1/5/2015**

	Start	End	Responsible party	Status
5.1 Mission to Santiago de Chile	13/04/15	17/04/15	3 automation experts ICAO	**Completed** Implementation of AIDC activities at the Santiago ACC • AIDC practical course • AIDC interconnection tests between: *Santiago ACC and Lima ACC*
5.1.1 Complete AIDC technical implementation between the Santiago and Lima ACCs	13/04/15	17/04/15	3 automation experts ICAO	Two-way communication was established in the AIDC interconnection tests between the Thales Top sky system of the Santiago ACC and the INDRA Aircon 2100 of the Lima ACC. The operational tests did not have positive results due to the AIDC limitations in the Santiago ACC. The practical course on AIDC and database programming was conducted, providing training to 16 controllers of the Santiago ACC and 2 aeronautical technicians.
5.1.2 Conduct AIDC course for ATS personnel of the Santiago ACC	13/04/15	17/04/15		
5.2 Mission to Lima:	13/04/15	17/04/15	3 automation experts	**Completed** Implementation of AIDC activities in the Lima ACC • AIDC practical course • AIDC interconnection tests between:

	Start	End	Responsible party	Status
				Lima ACC - Santiago ACC *Lima ACC - Guayaquil ACC* *Lima ACC - Bogota ACC*
5.2.1 Conduct AIDC course for ATS personnel of the Lima ACC	13/04/15	17/04/15	3 Automation experts ICAO	The practical course on AIDC and database programming was conducted, providing training to 44 controllers of the Lima ACC.
5.2.2 Complete AIDC tests between the Lima ACC and the Guayaquil ACC	13/04/15	17/04/15		AIDC tests between the Lima and Guayaquil ACCs were successfully conducted.
5.2.3 Complete AIDC tests between the Lima ACC and the Bogota ACC	13/04/15	17/04/15		AIDC tests between the Lima and Bogota ACCs were successfully conducted.
5.3 Mission to Guayaquil	20/04/15	24/04/15	3 Automation experts of the SAM Region	**Completed** Implementation of AIDC activities at the Guayaquil ACC • Practical course on AIDC • AIDC interconnection tests and pre-operational implementation: Guayaquil ACC - Lima ACC Guayaquil ACC- Bogota ACC
5.3.1 Complete AIDC technical implementation between the Guayaquil ACC and the Lima ACC	20/04/15	24/04/15	3 automation experts of the SAM Region	AIDC technical interconnection was completed, currently in the pre-operational phase.

	Start	End	Responsible party	Status
5.3.2 Complete AIDC technical implementation between the Guayaquil ACC and the Bogota ACC	20/04/15	24/04/15		AIDC technical interconnection was completed, currently in the pre-operational phase
5.3.2 Conduct AIDC course for ATS personnel of the Guayaquil ACC	20/04/15	24/04/15		The practical course on AIDC and database programming was conducted, providing training to 31 controllers of the Guayaquil ACC.
5.4 ***Mission to Bogota***	**27/04/15**	**01/05/15**	**3 automation experts**	**Completed** Implementation of AIDC activities in the Bogota ACC • Practical course on AIDC • AIDC interconnection tests and pre-operational implementation: *Guayaquil ACC - Lima ACC* *Guayaquil ACC - Bogota ACC*
5.4.1 Complete AIDC technical implementation between the Bogota ACC and the Guayaquil ACC	27/04/15	01/05/15	3 automation experts of the SAM Region	The AIDC technical interconnection was completed, currently in pre-operational phase
5.4.2 Complete AIDC technical implementation between the Bogota ACC and the Lima ACC	27/04/15	01/05/15		The AIDC technical interconnection was completed, currently in pre-operational phase

	Start	End	Responsible party	Status
6. First meeting of the AIDC operational implementation working group during the SAMIG/15 meeting	**11/05/15**	**15/05/15**	**RLA/06/901 member States**	**Completed.** As a result of AIDC technical implementation, the SAM/IG/15 established a group of activities to migrate from the pre-operational phase to the operational between the ACC Bogota, Guayaquil and Lima. Additionally the AIDC messages to be used were defined.
6.1 It is proposed that, as a matter of priority, the SAM/IG/15 meeting do the follow-up of AIDC implementation. Accordingly, the AIDC operational implementation working group will hold its first meeting.	11/05/15	15/05/15	RLA/06/901 member States	
7. AIDC operational implementation	**18/05/15**	**31/12/15**	Involved States	
7.1 Definition of the parameters of the AIDC database for the to AID operational interconnection between Colombia, Ecuador and Peru	25/05/15	29/05/15	Involved States	**Completed.**
7.2 Amend letter of operational agreement to include the AIDC for the coordination between the ACC Lima with AAC Bogota, ACC Bogota with ACC Guayaquil and ACC Lima with ACC Guayaquil	15/06/15	31/03/16	Involved States	**Valid.** Only letter of operational agreement between the ACC Guayaquil and ACC Lima was amendent and signed. (October 2015). Pending final review and sign letter of operational agreement between ACC Lima and ACC Bogota, ACC Bogota and ACC Guayaquil.
7.3 Teleconferences to coordinate and follow-up the migration from the AIDC pre-operational phase to the operational for Colombia, Ecuador and Peru	June 2014	Monthly Tele-conferences at the	Involved States ICAO	**Valid.** Teleconferences are been carried out on monthly basis since June 2014.

	Start	End	Responsible party	Status
		beginning of each month until end 2016		On 2016 teleconferences were conducted on: 19 January 23 May 19 February 3 June 18 March 6 September
7.4 Complete courses for the ACC Lima and Guayaquil, Bogotá ATS staff as well as staff ARO/AIS	18/05/15	29/02/16	Involved States	**Completed.**
7.5 Preoperational and operational Implementation of AIDC Guayaquil ACC - Lima ACC Bogota ACC - Guayaquil ACC Lima ACC - Bogota ACC Lima ACC – Santiago ACC*	18/05/15	31/07/16	States involved	**Valid.** Letter of operational agreement with corrections on AIDC between ACC Colombia, Ecuador, Panama and Peru were amended (October 2015). Letter of operational agreement between AAC Lima and Guayaquil with the inclusion of AIDC was signed on 23 October 2015. Establishing of a pre-operational period completing the ATS staff training. Operational implementation. AIDC between ACC Lima - ACC Guayaquil in operational phase from August 3, 2015, became operative on 31 March 2016.

	Start	End	Responsible party	Status
				The AIDC between the ACC Bogota and the ACC Lima and ACC Guayaquil is in pre-operational phase since May, 2015. * The AIDC operational implementation between the ACC Lima and ACC Santiago has postponed in view of the delay in the modernization of the ACC Santiago automated Center (2017).
8. Other AIDC implementations **Bogota ACC - Panama ACC** **Ezeiza ACC - Montevideo ACC** **Resistencia ACC - Asunción ACC** **Curitiba ACC – Resistencia ACC** **Iquique ACC – Lima ACC** **Cordoba ACC – Iquique ACC** **Amazonico ACC – Bogota ACC** **Amazonico ACC – Lima ACC** **Asuncion ACC – Curitiba ACC**	18/05/15	31/12/16	States involved	
8.1 Definition of parameters of the AIDC database for the operational interconnection of the AIDC		29/07/16	States involved	**Valid** Defined for AIDC between: Bogota ACC-Panama ACC and Iquique ACC-Cordoba ACC.

	Start	End	Responsible party	Status
8.2 Amendment of letter of operational agreement to include the AIDC for coordination between ACCs.		31/10/16	States involved	**Valid**
8.3 Carry out teleconferences for coordination and follow-up to the migration from the AIDC pre-operational to operational fase		Monthly tele-conferences at the begining of each month until the end of 2016	States involved ICAO	**Valid** Teleconferences conducted 19 January 23 May 19 February 3 June 18 March 6 September
8.4 Practical courses addressed to the ATS AIS CNS personnel of the ACC involved, interconnection AIDC		30/11/16	States involved OACI	**Valid** AIDC Course (Panamá 22 -26 June) 2015 AIDC Course (Paraguay 28 November to 2 December 2016).
8.5 Conduction of AIDC interconnection test between adjacents ACCs		30/11/16	States involved	**Valid** Successful AIDC interconnection tests between Bogota and Panama. (June 2015). AIDC tests Iquique ACC and Lima ACC were successfully conducted on December 2015 and continued until October 2016 AIDC tests Iquique ACC and Cordoba ACC were made in February 2016 with positive results but the ABI message.

	Start	End	Responsible party	Status
				AIDC tests Brazil Peru were conducted in March 2016 with problems with ABI messages at the beginning which were overcome by Atech. AIDC tests Ezeiza ACC and Montevideo ACC (first semester 2017). AIDC tests Asuncion ACC and Resistencia ACC (first semester 2017). AIDC tests Curitiba ACC and Resistencia ACC (first semester 2017). AIDC tests Curitiba ACC and Resistencia ACC (first semester 2017). AIDC tests Curitiba ACC and Resistencia ACC (November 2016). AIDC tests Bogota AAC and Amazonico ACC (November 2016).

8.6 Implantation of pre-operational and operational AIDC		31/12/16	States involved	**Valid** AIDC between Bogota ACC and Panama ACC is in pre-operational phase since October 2015. Operational phase foreseen by the second-half of 2016. AIDC between Ezeiza ACC and Montevideo ACC in pre-operational phase foreseen by first semester 2017. AIDC between Asuncion ACC and Resistencia ACC in pre-operational phase foreseen by the first semester 2017 and operational by second semester 2017. AIDC between Iquique ACC and Lima ACC will be in pre-operational and operational phases on the second semester 2017. AIDC between Iquique ACC and Cordoba ACC will be in pre-operational and operational phases by the second semester. AIDC between Curitiba ACC and Resistencia ACC in pre-operational and operational

				phases by the second semester 2017. AIDC between Amazonico ACC and Lima ACC will be in pre-operational phase by October 2016 and operational by December 2016. AIDC between Amazonico ACC and Bogota ACC foreseen operational by December 2016. Remaining interconnections foreseen pre-operational by first semester 2017 and operational by the second semester 2017.
9. Workshop on implementation of ATM automation, ADS B, and multilateration	**22/09/15**	**25/09/15**	ICAO	**Concluded** NAN/CAR/SAM workshop held in Panama (22-25 September 2015). The implementation of inter-regional AIDC interconnections was analysed at the workshop.
10. Second meeting of the AIDC operational implementation working group during SAMIG/16	**19/10/15**	**23/10/15**	ICAO	**Concluded**
10.1 It is proposed, as a matter of priority, the SAM/IG/16 meeting do the follow-up of AIDC implementation. Accordingly, the second meeting of the AIDC operational implementation working group will be held.	**19/10/15**	**23/10/15**	ICAO	**Concluded** Follow-up was made on the operational implementation and programming of activities for operational implementation in 2016.

11. **AIDC Implementation meetings**	01/01/2017	31/12/2019	Involved States ICAO	**Valid**
11.1 Implementation of 12 AIDC interconnections at inter-regional level and 9 interconnections distributed as follows: Colombia (3), Ecuador (1), Panama (1) and Venezuela (4).	01/01/2017	31/12/2019	Involved States ICAO	**Valid**
11.2 Inter-regional AIDC interconnections between SAM and AFI Regions: Argentina (1), Brazil (2), French Guiana (1) and Uruguay (1)	01/01/2017	31/12/2019	Involved States ICAO	**Valid**
12. **Monitoring to the AIDC interconnection implementation**	**2015**	**2019**	ICAO	
12.1 **AIDC Implementation Meeting** ✓ First AIDC Implementation Meeting ✓ Second AIDC Implementation Meeting ✓ Third AIDC Implementation Meeting ✓ Fourth AIDC Implementation Meeting ✓ Fifth AIDC Implementation Meeting	**March 2016**	**September 2019**	ICAO	**Valid** AIDC/1 (Lima, Peru, 28-30 March 2016) AIDC/2 (Lima, Peru, 21-23 September 2016) AIDC/3 (Lima, Peru, June 2017) Approved by RCC/10 AIDC/4 (Lima, Peru, June 2018) AIDC/5 (Lima, Peru, September 2019)

APPENDIX E / APÉNDICE E

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

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

STATE/ ESTADO	ACC	AFTN/AMHS	FDP
Argentina	Comodoro Rivadavia	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated/Automatización Implemented June 2016/Implementado Junio 2016
	Cordoba	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated / Automatizado
	Ezeiza	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated / Automatizado
	Mendoza	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated/Automatización Implemented June 2016/Implementado Junio 2016
	Resistencia	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated/Automatización Implemented June 2016/Implementado Junio 2016
Bolivia	La Paz	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Manual It is foreseen by third quarter 2016 an ATM automated system with AIDC in the La Paz ACC/ Se tiene previsto para finales del tercer trimestre de 2016 un sistema automatizado ATM en el ACC de La Paz con AIDC.

STATE/ ESTADO	ACC	AFTN/AMHS	FDP
Brazil / Brasil	Amazónico	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado (use of converter) / (uso de convertidor centralizado) An update in Sagitario ATM automated system (from ATECH Brazil) which includes the new FPL/12 flight plan format to deactivate the centralized inverter is scheduled for the first semester of 2017 in the AAC Amazonico, Atlantico, Brasilia, Curitiba and Recife./ Para el primer semestre del 2017 está prevista una actualización en Sagitario (sistema automatizado ATM de Brasil de la empresa ATECH) que incluye el nuevo formato de plan de vuelo FPL/12 y desactivar el convertidor centralizado.
	Atlántico	Implemented (AMHS terminal) / Implantado (terminal AMHS)	
	Brasilia	Implemented (AMHS terminal) / Implantado (terminal AMHS)	
	Curitiba	Implemented (AMHS terminal) / Implantado (terminal AMHS)	
	Recife	Implemented (AMHS terminal) / Implantado (terminal AMHS)	
Chile	Iquique	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado
	Punta Arena	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automatizado / May 2016 Automated May 2016
	Puerto Montt	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado
	Santiago	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated/Automatizado
Colombia	Barranquilla	Not implemented (AMHS terminal) No implantado (terminal AMHS)	Automated /Automatizado
	Bogotá	Not implemented (AMHS terminal) No implantado (terminal AMHS)	Automated /Automatizado
Ecuador	Guayaquil	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado

STATE/ ESTADO	ACC	AFTN/AMHS	FDP
French Guiana (France) Guyana Francesa (Francia)	Rochambeau	No Implemented (AMHS terminal) / No Implantado (terminal AMHS)	Automated / Automatizado
Guyana	Timehri	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated / Automatizado
Panama	Panama	Implemented / implantado (AMHS terminal)	Automated /Automatizado
Paraguay	Asunción	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Manual
Peru	Lima	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado It fails since in box 10 only 20 characters are allowed. / No cumple en su totalidad en vista que en la casilla 10 acepta solamente 20 caracteres. /
Surinam/Suriname	Paramaribo	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated (out of service, working manually) / Automatizado (fuera de servicio, trabajando manualmente)
Uruguay	Montevideo	Not implemented / No implantado	Automated / Automatizado
Venezuela	Maiquetia	Implemented (AMHS terminal) / Implantado (terminal AMHS)	Automated /Automatizado (use of converter) / (uso de convertidor)

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APPENDIX F

GUIDE TO AVOID ERRORS IN FPLs AND ASSOCIATED ATS MESSAGES

1. EFFECTIVE FILING OF FPLs

1.1 An effective and homogeneous air traffic flow through FIR boundaries is achieved, in part, by securing the flight plans, and transmitting, processing, and transferring the associated messages between FIRs in a homogeneous, efficient, and consistent manner.

1.2 The methods and procedures used for filing and/or originating flight plans have a residual effect on the quality of the air traffic services provided. The introduction of duplicated or multiple flight plans, or of flight plans containing erroneous information has a direct impact on flight safety and efficiency within the global airspace system.

1.3 The sources of flight plan errors that have been identified include:

- Lack of quality and consistency in the filing of flight plans
- Inappropriate management in the use of repetitive flight plans (RPLs)
- Utilization of converters to comply with the ICAO 2012 flight plan format due to non-permanent conversion process availability
- Manual entry and processing of FPLs and associated messages

2. DIRECT DELIVERY OF FLIGHT PLAN MESSAGES

2.1. In order to reduce the risk of manual errors, the ANSP, pursuant to Doc 4444, paragraph 11.2.1.1.1, can implement local arrangements to delegate to the operators the responsibility for direct transmission of movement messages *via* the Aeronautical fixed telecommunication network (AFTN) or the air traffic service message handling system (ATS AMHS). Movement messages include FPLs, modification (CHG), delay (DLA), and cancellation of the flight plan.

2.2. If ANSPs have delegated to the airlines the responsibility of originating flight plan messages, then, in accordance with Doc 4444 Appendix 2, page A2-3, part 2.1, airlines will have the responsibility of correctly transmitting the initial FPL, as well as the associated messages to all the ATS units involved, in accordance with Doc 4444, 11.2.1.1.3.

2.3. Before delegating the responsibility for direct filing of flight plan messages, ANSPs must consider conducting a test with new operators, using a central AFTN/AMHS address to receive the messages for an initial manual validation.

2.4. The ANSPs must also specify in local arrangements or in the AIP the deadlines for completing the delivery of movement messages (DLA and CHG) for individual flights, for example, using a time parameter before the estimated off-block time (EOBT).

2.5. It is better to use a CNL and file the FPL again as an alternative to the delivery of multiple modification messages concerning the same FPL or several modifications within the same message.

3. SIMILAR AND MULTIPLE FLIGHT PLAN ERRORS

Similar errors

3.1 Inadequate completion procedures, sending the modified plan to the originator instead of using CHG or DLA, generate similar flight plans for the same flight. This creates confusion among the different ATS units, which will have to select the flight plan (not necessarily the last one considered valid by the airline) to update it with the surveillance information and/or in flight transfer processes.

Multiple errors

3.2 Multiple FPLs are a cause of error when there are 2 different originators of the FPL (whether airlines or ANSPs).

3.3 In order to avoid multiple FPLs in the AFTN/AMHS, airlines will only originate and transmit the FPL if the ANSP has delegated this responsibility in accordance with chapter 2 of this guide.

4. DELAY MESSAGES (DLA)

4.1. The originator will only consider sending the DLA message if the flight is expected to be delayed by more than 30 minutes after the EOBT contained in the previous FPL (refer to Doc 4444, 11.4.2.2.3).

4.2. If the originator does not send a DLA message 30 minutes after the EOBT specified in the FPL, then the FPL will be automatically cancelled.

5. MODIFICTION MESSAGES (CHG)

5.1. If the originator is an airline and needs to send a CHG in less time than that specified in item 2.3 of this guide, then it shall first contact the TWR or the designated ATS unit that will coordinate the proposed changes with the TWR involved.

5.2. Modifications concerning aircraft type and wake turbulence category, cruising speed and/or level shall be notified for each individual flight as soon as possible and no later than 30 minutes after take-off to:

a) the air traffic services reporting office of the departure aerodrome, and

b) only if the responsibility for originating the FPL has been delegated as mentioned in paragraph 2.1, the originator of the FPL shall also send the CHG message to the other ATS units considered in the initial FPL.

5.3. If the originator of the FPL wishes to modify the ATS route or the flight level en route, then the CHG message shall contain the whole portion of the route and the different FLs.

5.4. CHG messages shall include a completed field 15, containing the information of the FPL that changes to avoid an incorrect modification.

5.5. If the CHG message has a new ATS route with FIRs that were not considered in the original FPL, then the FPL shall be cancelled with a CNL message and a new FPL sent.

6. AFTN ADDRESSES

6.1 In order to reduce FPL filing discrepancies resulting from incorrect addressing of aeronautical messages, ANSPs must list their AFTN addressing requirements in their aeronautical information publication (AIP). Guidance on the addressing of AFTN messages can also be found in ICAO Annex 10, Volume II, chapter 4, in ICAO Docs 7910 and 8585, and in ICAO regional AFTN routing directories.

7. CENTRAL FLIGHT PLAN PROCESSING UNIT

7.1 ANSPs with multiple ATS centres may consider the installation of a central flight-planning unit for the processing and initial distribution of FPLs. An example of central flight planning is provided in the specifications of the Initial Flight Plan of EUROCONTROL.

7.2 Studies conducted by EUROCONTROL and the European Commission determined that inconsistencies in flight data content in hands of different parties for the processing of the same flight have a negative impact on the efficiency of operations within the European air traffic management system.

7.3 According to the EUROCONTROL website (see the References section), the IFPL specification defines the procedures and requirements for the provision, processing, and distribution of flight plans in the pre-flight phase. Improved consistency in flight plan data has enabled more homogeneous operations, enhanced safety, and has also permitted the definition of the new operational concepts for air traffic flow management (AFTM).

8. PROCEDURES FOR MITIGATING ERRORS

8.1 Appropriate procedures are required for resolving issues derived from messages that are not received. Part of the solution involves ensuring that duplicated or erroneous messages are not fed into the system. For example, if a movement message is received for an unknown FPL, the receiving unit must use the flight plan request message (RQP) to request the FPL from the sending unit instead of creating its own FPL.

8.2 Where the ANSPs provide the possibility of filing FPLs through the Internet, a validation process should be established to prevent the introduction of wrong data from movement messages. NAV CANADA is an example of web-based flight plan filing, using its Collaborative Flight Planning System (CFPA). The application permits direct filing of the flight plan by pilots and/or flight plan filing agencies, and is in full compliance with Flight Plan 2012, verifying errors in full as required by FPL filers in order to correct discrepancies before the flight plan is accepted for processing.

9. REVISION OF STATE REGULATIONS

9.1 The ANSPs are encouraged to cooperate with State regulators in the revision and alignment of existing regulations with emerging technologies. In those cases in which State regulations require that the FPL be delivered personally, together with the electronic FPL, the modification of such regulations may reduce man-induced discrepancies in the filing process.

9.2 If after a revision, State regulations still require operators to personally deliver the filed flight plans, the ANSPs must introduce appropriate quality control measures to reduce the possibility of disparity between electronic and personally delivered FLPs.

10. REPETITIVE FLIGHT PLANS (RPLs)

10.1 The use of the RPL is known to be an important contributor to duplicated flight plans and may result in the provision of less-than-optimal services and erroneous separation by the ANSP.

10.2 The flight plan information contained in the RPL may differ from the actual details considered by the operator for a given day, for example, the type of aircraft to be flown. This type of changes may have an impact on the services provided and on the integrity of the separation or wake turbulence standards applied.

10.3 Consequently, the direct filing of flight plan messages through the AFTN/AMHS must be the method of choice of the operators for filing the flight plan.

11. ALTERNATE AERODROMES

11.1 Some automated ground systems will reject flight plans that do not contain an alternate aerodrome as destination, even if an alternate does not need to be filed for the specific destination. Consequently, some operators file alternate aerodromes where an alternate is not required in order to avoid the rejection of the flight plan, which results in a financial burden, since additional and unnecessary fuel must be carried on board.

11.2 *ICAO Annex 6, Operation of aircraft, Part 2* establishes exceptions to the requirement of filing an alternate aerodrome. The ANSP should make sure that the alternate field is not a mandatory field for automated flight plan processing, especially for flights in transit to a destination in another FIR.

12. DESIGNATION OF DEPARTURE/ARRIVAL PROCEDURES

12.1 The ANSPs should make sure that the name of any published standard instrument departure (SID) or standard instrument arrival (STAR) procedure filed in the flight plan meets the designation requirements of *ICAO Annex 11, Air Traffic Services, Appendix 3*, in order to reduce the number of rejected flight plans.

12.2 The ANSPs should make sure that ATM systems are capable of duly processing filed flight plans that include SIDs and STARs as part of the route.

13. SUPPLEMENTARY FLIGHT PLAN INFORMATION (FPL ITEM 19)

13.1. Supplementary flight plan information should not be considered for transmission for each FPL.

13.2. If, for SAR reasons, this information is required by any ANSP (in accordance with Annex 11, part 5.2.2.1), the sequence for acquiring the information would be as follows:

a) *via VHF*, requested from the flight crew, if the event is considered by ATC as an appropriate action; or
b) *by telephone*, contacting the designated 24/7 flight operation/dispatch unit of the airline (specified in the FLP delegation agreement); or
c) *via the AFTN/AMHS*, from the designated 24/7 flight operation/dispatch unit of the airline (specified in the FLP delegation agreement)

14. CONVERSIONS OF THE ICAO FPL 2012 FORMAT

14.1 During the transition to the ICAO FPL 2012 format, some ANSPs used converters to convert the existing flight plans to the new format.

14.2 The following issues were associated to the continuous use of converters:

a) The benefits of Amendment 1 are not fully realised; especially, it reduces separation standards associated to performance-based navigation (PBN), and the provision of ADS-B services;

b) Interoperability in the delivery of AIDC messages would be restricted when using the converter solution.

14.3 Other known issues related to the ICAO FPL 2012 include:

a) The RVR/ indicator in FPL Item 18. This indicator must be either accepted without processing, or eliminated without rejection by ATM systems;

b) FPL rejects occur when RMK/unexpected information is entered in Item 18.

14.4 In order to reduce the origin of erroneous messages and maximise the benefits of the new flight plan format, the ANSPs must fully comply with the provisions of ICAO FPL 2012 concerning automation and support systems.

15. FEEDBACK TO THE OPERATOR

15.1 The ANSPs shall consider establishing a reporting mechanism to provide constant feedback to the operators as to the number and causes of rejects and flight plan errors.

15.2 Furthermore, the ANSPs must consider holding periodic user/operator forums to discuss recurrent discrepancies.

16. REFERENCES

- ICAO Annex 6, Operation of aircraft, Part 2 (paragraph 2.2.2.3.5)
- ICAO Annex 10, Aeronautical telecommunications, Volume II, Chapter 4
- ICAO Annex 11, Air traffic services, Chapter 2, Appendix 3 and Appendix 4
- ICAO location indicators (Doc 7910)
- Designators for aircraft operating agencies (Doc 8585)
- ICAO AFTN routing guide, Asia/Pacific Regions, 27th Edition, August 2007
- ICAO PANS ATM (Doc 4444) (paragraph 11.2.1.1.1)

EUROCONTROL IFPL specification:

- https://www.eurocontrol.int/articles/initial-flight-plan-ifpl-specification
- http://www.acac.org.ma/ar/Workshop%20Presentation/IFPS%20in%20Flight%20PlanningV4.pdf

17. List of acronyms

Abbreviations

ACI	Airports Council International
ADS	Automatic dependent surveillance
ADS-B	Automatic dependent surveillance – Broadcast
ADS-C	Automatic dependent surveillance – Contract
AFTN	Aeronautical fixed telecommunication network
AIDC	ATS interfacility data communication
AIP	Aeronautical information publication
ANSP	Air navigation service provider
AMHS	Air traffic services (ATS) message handling system
APAC	Asia/Pacific
APANPIRG	Asia/Pacific air navigation planning and implementation regional group
ASBU	Aviation system block upgrades
ASIOACG	Arabian Sea/Indian Ocean ATS coordination group
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic service(s)
AUSEP	Australian air navigation operations
CHG	Modification
CNL	Flight plan cancellation message
CPDLC	Controller-pilot data link communications
CPL	Current flight plan
DARP	Dynamic air route planning
DLA	Delay message
EOBT	Estimated off-block time
FAA	Unites States Federal Aviation Administration
FIR	Flight information region
FIRBX	FIR boundary crossing
FPL	Filed flight plan
GANP	Global air navigation plan
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFPL	Specification for the initial flight plan (EUROCONTROL)
ISPACG	Informal South Pacific Air Traffic Services Co-ordinating Group
LOA	Letter of agreement
RPL	Repetitive flight plan
RQP	Request flight plan
SID	Standard instrument departure
SMS	Safety management system
STAR	Standard instrument arrival
UPR	User preferred route

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APPENDIX G

FLIGHT PLAN FILING PROCEDURES IN THE SAM REGION

ARGENTINA

Regarding the processing of FPLs in accordance with national regulations, paper forms can be initially filed at an ARO-AIS office and transmitted *via* AMHS to the units involved, or by phone or in flight through the A/G frequency.

The filing of RPLs is also regulated, as published in the AIP of Argentina. It should be noted that the filing of RPLs is not being used.

Additionally, the ACCs of Argentina have a flight data position, where an air traffic controller receives and controls FPLs through an AMHS channel.

In 2015, coordination started between the service provider and the operators LATAM Argentina and Aerolíneas Argentinas to study the possibility of using the information digitally produced by the flight planning systems hired by said operators, in the communication systems of the service provider, which produced the FPLs of all planned flights, which were then submitted by the operators in hard copy to the ARO/AIS offices involved.

To this end, coordination meetings were held between the aeronautical authority, ANAC, and the aforementioned actors. Personnel of the service provider and the operator conducted tests in early 2016 using the AMHS channel, with the inclusion of the ARO/AIS units of Aeroparque, Ezeiza and the INDRA automated centre at the EZE ACC.

These tests were successful, and use was extended to all ARO/AIS units in charge of planning the flights of the aforementioned companies.

This procedure permits reception of flight plans by the LIDO or JEPPESEN systems up to 4 hours before, with the advantage that they contain the data of the flight that will be actually conducted, significantly reducing errors in the data contained therein.

It should be noted that the aforementioned provision on FPL processing continues to be applied, and the control function of the ARO/AIS operator is not replaced by the systems hired by the operators.

BRAZIL

At present, Brazil accepts flight plans through the Internet all over the national territory, as established in AIC -. 9N of 15 May 2016 - ENTREGA DE PLANO DE VOO POR MEIO DA INTERNET. In this process, the plan goes through an automated system called SIGMA, which validates the syntax, based on the analysis of the content of each field of the flight plan form (FPL) and in accordance with MCA 100-11- *Preenchimento dos Formulários de Plano de Voo*. It also validates the semantics, which refers to the consistency among FPL boxes, based on the specifications of each flight, such as preferred routes, restricted aerodromes, enabled and activated airspaces, and others.

All this automated process starts with the completion of the flight plan and ends when clicking on the VALIDATE button. If there is any inconsistency, the user will be informed in order to make corrections as needed. Accordingly, Brazil uses an automated system to create the FPLs instead of using the FPL completion form at the AMHS terminals, which are used only as backup in case of communication failure between the application and the SIGMA system.

Under Brazilian regulations, flight plans can also be received by phone, by fax, or in person, at the AIS offices. The AIS operator uses the PLNA module, connected to the SIGMA system, which does the automatic validation of the plans filed through the Internet.

In this process adopted by Brazil, the validated plans are analysed from a flow management perspective (demand *vs.* capacity) and, if approved, are directly transmitted to the ACCs, which relay them to the TWRs and APPs involved.

Regarding the repetitive flight plan (RPL), Brazil applies this type of procedure for scheduled, charter, and postal flights authorised by ANAC, and is reproduced with the same basic characteristics for at least 10 (ten) flights, for a minimum period of 2 (two) months. RPLs are standardised through ICA 100-11 – Plano de Voo.

A basic requirement for using RPLs is that data must be highly stable, so any changes can be easily made.

The RPL is filed using electronic media, the Internet, and, alternatively, by fax, or in person at the repetitive flight plan centre. Non-repetitive flight data, such as an alternate, range, and number of people on board, shall be sent prior to take-off, by radiotelephone, to the control tower, aerodrome of departure, or aeronautical telecommunication station.

Airlines must request the repetitive flight plan at least ten (10) days before the beginning of each of the periods described below:

a) from the first to the tenth day of the month;

b) from the eleventh to the twentieth day of the month; and

c) from the twenty-first to the last day of each month.

Changes, delays, and temporary cancellations can be made to a flight in a planned RPL series. Permanent modifications that involve the addition of new flights, the deletion or modification of flights, in the RPL lists will be presented in the form of a new flight plan with the same advance notice.

ECUADOR

Based on the implementation of Amendment 1 to the Procedures for air navigation services – Air traffic management (PANS ATM - Doc 4444, 15th edition) of the International Civil Aviation Organization (ICAO), the implementation of new procedures and the content of the flight plan and its associated messages in Ecuador are defined as follows:

Procedures for filing a flight plan

- Flight plans will be physically filed at the AIS-AD room of the air navigation services at the aerodrome of departure.

- Filing of flight plans within Ecuadorian territory through the Internet flight information system (IFIS), whether by the pilot-in-command or his/her authorised representative, based on national technical aeronautical regulations on the filing of flight plans within Ecuadorian territory.

- When the operations office of the aircraft operator at the aerodrome of departure uses e-mail as the means to communicate with the AIS-AD room, the filing of the referential flight plan using this medium will be permitted, after which the original forms shall be filed on the same day, no later than 2300 UTC.

- The filing of the flight plan by telephone will not be accepted, nor its submission by individuals other than the pilot-in-command or his/her duly accredited and authorised representative.

PANAMA

Panama has the THALES ANAIS system for flight plan processing.

In accordance with the AIP of Panama (ENR1.10-1), all users must file a flight plan in accordance with the flight plan format contained in Doc 4444, at least one hour before departure.

The user must notify ATN units of any changes (amendments) to the FPL, on a timely basis.

Users that have dispatch offices with a service capable of linking to the AMHS network shall transmit the FPL to the appropriate ATM units once approved by the authority.

Every AIS-AD unit that receives an FPL will immediately transmit it to the ATM services, addressed to MPZLZQZX and the airports and ACCs involved.

PARAGUAY

The operator files the flight plan in writing to the AIS unit.

The AIS unit transcribes the flight plan, which is addressed and transmitted *via* AMHS.

The flight plan is entered in the AMHS and, in turn, addressed to the automated system through a point-to-point connection to the FDP.

The FDP does the processing and sends the flight plan to the flight plan generation and correction position.

Obs: All flight plans entered in the automated system are sent *via* the AMHS.

PERU

The AIS expert in charge receives the FPL, whether in hard copy, *via* AMHS, mail, fax, or telephone, and analyses and verifies its content.

The AIS expert determines if it is authorised (permit from the DGAC).

The authorisation number is recorded in the FPL.

He/she verifies if aeronautical services have been paid for.

He/she stamps the original and the copies to indicate the office, day, and time when the FPL was received.

He/she transmits the FPL to the ATS units involved, using an FDP station. A user agent (AMHS) will send the FPLs in case of failure of the FDP.

The FDP workstation is part of the INDRA AIRCON 2100 system.

VENEZUELA

Every aircraft that files a domestic or international flight plan, whether civilian, commercial, or military, must complete the physical flight plan format established to that end.

This flight plan must be presented to the appropriate AIS authority or unit, which will validate and authorise the flight plan.

Once the flight plan is authorised, the communications office will arrange for the entry of the flight plan into the AMHS or AFTN system so that it will reach the FDP.

Repetitive flight plans also exist in the automated system of the ACC. These flight plans are the commercial itineraries. However, these flight plans are also received by the AIS office (although not obligatory) and, when processed, generate duplication in the FDP system. Venezuela has incorporated Amendment 1 to Edition 15 of Doc 4444 into its flight plan.

APPENDIX H

FLIGHT PLAN ERRORS IDENTIFIED IN THE PLANNING OF FLIGHT PLANS AND RECOMMENDATIONS TO MITIGATE FLIGHT PLAN GENERATION ERRORS

FLIGHT PLAN ERRORS IDENTIFIED IN THE PLANNING OF FLIGHT PLANS:

- Lack of quality and consistency in flight plans
- Inappropriate use of repetitive flight plans (RPLs)
- Conversion due to non-compliance with the ICAO 2012 flight plan format
- Lack of verification of flight plan data by the aircraft operator prior to flight plan filing
- Manual entry and processing of FPLs and associated messages
- Similar errors and multiplicity of flight plans
- Omission of standard ATS messages associated to the flight plan (CHG, CNL….)
- Incorrect addressing of flight plan and associated messages
- Lack of agreement between the user and the flight information service provider regarding the direct delivery to the FDP of flight plans and associated messages by the operators.

RECOMMENDATIONS TO MITIGATE FLIGHT PLAN GENERATION ERRORS

- Train and inform all ARO/AIS personnel on the importance of the flight plan in the AIDC coordination process and ATS systems.

- Review the databases of automated systems, which should be in accordance with the amendments published in each AIP.

- Perform the proper addressing of the flight plans to automated control centres, listing AFTN addressing requirements in the aeronautical information publication (AIP).

- Conduct a complete analysis to determine if the existing automated ATM systems comply with flight plan 2012, especially with regards to the correlation between Items 10 and 18.

- Establish letters of agreement with the operators for the filing of repetitive flight plans (RPLs) for their proper processing and transmission.

- Establish a reporting mechanism to give feedback to operators on the number and cause of flight plan rejects and errors, prior to the establishment of agreements or direct delivery of FPLs to the ARO/AIS office.

- Use as a reference the procedures applied in Brazil and Lima for repetitive flight plans (RPLs) that are properly processed and transmitted, avoiding errors in the distribution to automated systems. These procedures are based on letters of agreement with the airlines, which must strictly follow the established procedures.

- Conduct an analysis in each unit to see the feasibility of concentrating flight data in flight plan distribution centres, based on available systems.

- If air navigation service providers offer the capability of filing FPLs *via* Internet, a validation process shall be implemented to prevent the introduction of inaccurate movement message data.

- Before delegating the responsibility for direct filing of flight plan messages, air navigation service providers must consider conducting a trial with the new operators, the ARO/AIS office, using a central AFTN/AMHS address for receiving messages for initial manual validation.

- Report to the representatives of aircraft operators and IATA at the next SAMI/IG meeting (SAM/IG/18) those aspects involved in the filing of an erroneous flight plan, which disrupt the AIDC coordination process.

APPENDIX I

SURVEILLANCE STRATEGY FOR THE CAR/SAM REGIONS

First Edition
Rev 2.0

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1. Introduction

1.1 General Considerations

Within the context of the GREPECAS/14, the Surveillance Regional Plan was updated and it was recognized that further analysis on that matter should take place by CNS Committee. The CNS Surveillance Task Force (CNS/SUR/TF) was then created and tasked, among other activities, to define a unified Air Surveillance Strategy for CAR/SAM Regions.

Subsequently, this initial document is the result of the task assigned to CNS Committee - CNS/SUR/TF, in which the preliminary elements for a Regional CAR/SAM Strategy in short, medium and long term for ADS-C and ADS-B use have been integrated into an Unified Regional Strategy for the Implementation of Surveillance Systems.

This surveillance strategy is derived from the "Global Air Navigation Plan for CNS/ATM Systems" (Doc. 9750) and the "CAR/SAM Regional Air Navigation Plan" (Doc. 8733) and NAM/CAR performance based regional plans (Regional Performance Based Air Navigation Implementation Plan RPBANIP) and SAM (Performance Based Air Navigation Implementation Plan for the SAM Region SAM PBIP), since technology is not an end in itself and should be based on clearly established operational requirements for ATM evolution.

The main objective of this strategy is to propose the surveillance systems that are suitable to be applied in short and medium terms within CAR/SAM Region and to define an evolutionary path that will promote safety, interoperability and cost effectiveness of the required infrastructure to meet the future ATM needs.

The surveillance strategy should be seen as a guidance document to all stakeholders, without any regulatory or mandatory requirements. Appropriate regulations should be published by Air Navigation Authorities when the use of new surveillance techniques is to be introduced in the States.

This strategy is a live document and should be reviewed and updated every two years.

Noted the existence of new technology ADS-B based with transmission via satellite which beginning is foreseen by early 2018.

1.2 Scope of the Surveillance Strategy

The surveillance strategy should be seen as a link between the Global Air Navigation Plan (GANP Doc. 9750) and the stakeholders' strategy for the air surveillance applications. The Global Air Navigation Plan (Fifth Edition 2016) is conceived to provide complementary guide to the entire sector in the air transport progress during period 2013-2028.

The GANP (Fourth Edition) explores the need for aviation planning to be more integrated at regional and State levels and discusses solutions that are required to introduce the consensus-based strategy for the modernization of the systems engineering of aviation system block upgrades (ASBU) and enter a roadmap for surveillance systems on ground, air-air and avionics.

Implementation of surveillance systems should be based on a harmonized strategy for the CAR/SAM Regions that would take into account the operational requirements and relevant cost-benefit analyses. It should also be based on Action Plans to ensure that CAR/SAM States, Territories and International Organizations implement the necessary systems in accordance with consistent timescales.

The surveillance technologies considered in this strategy to meet present and future ATM expectations are listed bellow and briefly explained in Annex C:

- Primary Radar (SMR/ASDE);
- Secondary Surveillance Radar (SSR);
- Automatic Dependent Surveillance-Broadcast (ADS-B); ground and/or satellite;
- Automatic Dependent Surveillance-Contract (ADS-C); and

- Multilateration.

In order to provide a global view of the surveillance strategy, the operational drivers, the required surveillance infrastructure and the regional studies and trials proposed in this document have been displayed in each chapter in a chronological presentation.

The timeframes illustrated in this document define the tentative dates when surveillance systems are estimated to become regionally operational. Nevertheless, some of the surveillance systems described in this strategy will be used to solve local issues prior to the timescales in this document, and thereby will migrate from pioneer areas into bigger regional areas.

In other words, new surveillance technologies implementation policy for CAR/SAM Region should be first based on a voluntary initiatives in pocket areas, using certified existing equipage which is to be followed by an implementation in wider areas supported by the Implementing Rule related to the upgraded equipage.

1.3 **Structure of the Document**

This document is structured as follows:

- Section 1 (this section) presents the general considerations, explains its scope and structure and describes its intended readers.
- Section 2 describes the Surveillance Operational Scenario Evolution, i.e. the envisaged operational drivers for short (2016-2018), medium (2019-2024) and long terms (2025-2030) in the Air Surveillance field, for En-Route and TMA Airspace, Aerodrome Operations and Aircraft Systems.
- Section 3 specifies the Surveillance Infrastructure Evolution required to cope with the foreseen operational environment and specifies a tentative action plan that needs to be accomplished in a timely manner, in order to promote the operational use of the new surveillance technologies.
- **Annex A** provides the meaning of the Acronyms used in this document.
- **Annex B** provides the definitions of the different terms used in this document.
- **Annex C** describes the principles of known surveillance techniques.

1.4 **Intended Readers**

This strategy was developed to the following stakeholders group within CAR/SAM Region:

- The departments of the National Supervisory Authorities of CAR/SAM countries who are responsible for verifying ATM Surveillance Systems;
- The departments of the civil and military ANSP of CAR/SAM states who are responsible for procuring/designing, accepting, and maintaining ATM Surveillance Systems;
- The Airport Operators, who are responsible for procuring/designing, accepting, and maintaining Surveillance Systems at airports level; and
- The Airspace Users, who are the final client of the ATM Surveillance Systems chain.

2. **Surveillance Operational Scenario Evolution**

2.1 **En-Route and TMA Airspace**

The surveillance operational scenario evolution for En-Route and TMA airspace is based on two fundamental principles for ground users in such airspace. These principles are dominant throughout the complete surveillance strategy and are:

- An independent surveillance system to track cooperative targets in TMA and en-route airspace; and
- Dependent cooperative surveillance.

2.1.1 **Short term (until 2018)**

Until 2018, independent surveillance systems will be predominant in CAR/SAM Regions. Until then, target position will be determined by the ground sensors (eg. SSR, MSSR radars), the ADS-C and the ADD initial provision to the ground stations supporting TMA and En Route operations is envisaged, following the increasing rate of Mode S equipped aircraft (new and overhauled) that will be able to transmit ADS-B messages (ADS-B out). The first set of new applications that are envisaged to be supported in CAR/SAM Region are the ground Surveillance (ADS-B out) in a non-radar environment (ADS-B-NRA), in a radar environment (ADS-B-RAD) and Airborne Derived Data (ADS-B-ADD) and multilateration.

2.1.2 **Medium term (2019-2024)**

Independent operation (MSSR, SSR – S Mode), ADS-C continues as well as a wide ADS-B out. It is foreseen that ADS-B-*out* will reach its whole operational capacity in 2025.

Another set of possible new applications is related to Airborne Surveillance (ADS-B-in, possibly supplemented by TIS-B) including: Airborne situational awareness (ATSA-AIRB), visual separation on approach (ATSA-VSA) and In-trail Procedure in oceanic airspace (ATSA-ITP). ADS-B-in for air traffic situational awareness is expected to be launched after 2020.

It is expected that an integration of airport and airspace surveillance will become more widespread in long term. This requires an increased integration of surveillance information at the SDPD level, which will require updating to process and deliver the new information to surveillance users as the new systems become operational.

A new ADS-B satellite option is foreseen to be available by early 2018 to cover oceanic and ground air spaces.

2.1.3 **Long term (until 2025-2030)**

Until 2024, the ground service provider will remain responsible for the separation service and for maintaining separation. However, from 2015 onwards, there will be a number of ATM concepts which will begin to drive the evolution of the surveillance environment, these are:

- Enhanced planning with the tasks of the controllers operating in En-Route and TMA sectors becoming increasingly supported by more automation. The controller will make use of more ADD to provide a more accurate view of the situation and improvements in safety nets;
- Surveillance derived information will be made available to support Airborne Traffic Situational Awareness;
- Flight data processing systems will be upgraded to provide full 4D trajectory prediction aligned with the capabilities of 4D FMS;
- The limited delegation of separation tasks to aircrews in low and medium density airspace. This will require additional avionics infrastructure and additional tools for the controller and aircrew; and
- Introduction of preferred routing will require flight information to be displayed in real time to the controller.

2.2 **Aerodrome Operations**

2.2.1 **Short term (until 2018)**

For selected airports, detection of all mobiles within the aerodrome area is permanent throughout the whole strategy timeframe. The use of ADDs to support aerodrome operations is envisaged; and the implementation of A-SMGCS level I (which may include ADS-B-APT application) and A-SMGCS level II will be enabled by systems such as Multilateration.

2.2.2 **Medium term (2018-2024)**

Implementation of A-SMGCS level I continue (which may include ADS-N-ATP application) and A-SMGCS level II.

2.2.3 **Long term (until 2025-2030)**

Where airport operators foresee a benefit, a long term implementation of A-SMGCS level III (which may include the ATSA SURF application) and A-SMGCS IV may start. This may require an ADS-B-in infrastructure and an equipage of selected, appropriate airport vehicles with transponders.

2.3 **Aircraft Systems**

2.3.1 **Short term (until 2018)**

In short term, the use of SSR or SSR Mode S transponders for ground based surveillance radar or Multilateration systems will continue. The implementation of new applications for ground surveillance (ADS-Bout). The implementation of new ground Surveillance Applications (ADS-B out), which will require integration between the aircraft navigation system and mode S transponders, in order to transmit intent information to other aircraft and ground users. This is enabled by ADS-B, using 1090 MHz Extended Squitter.

2.3.2 **Medium term (2019-2024)**

Implementation of ADFS-B out and ADS-B capacity will continue. (ICAO Ver.2) Surveillance integration (via ATN B2).

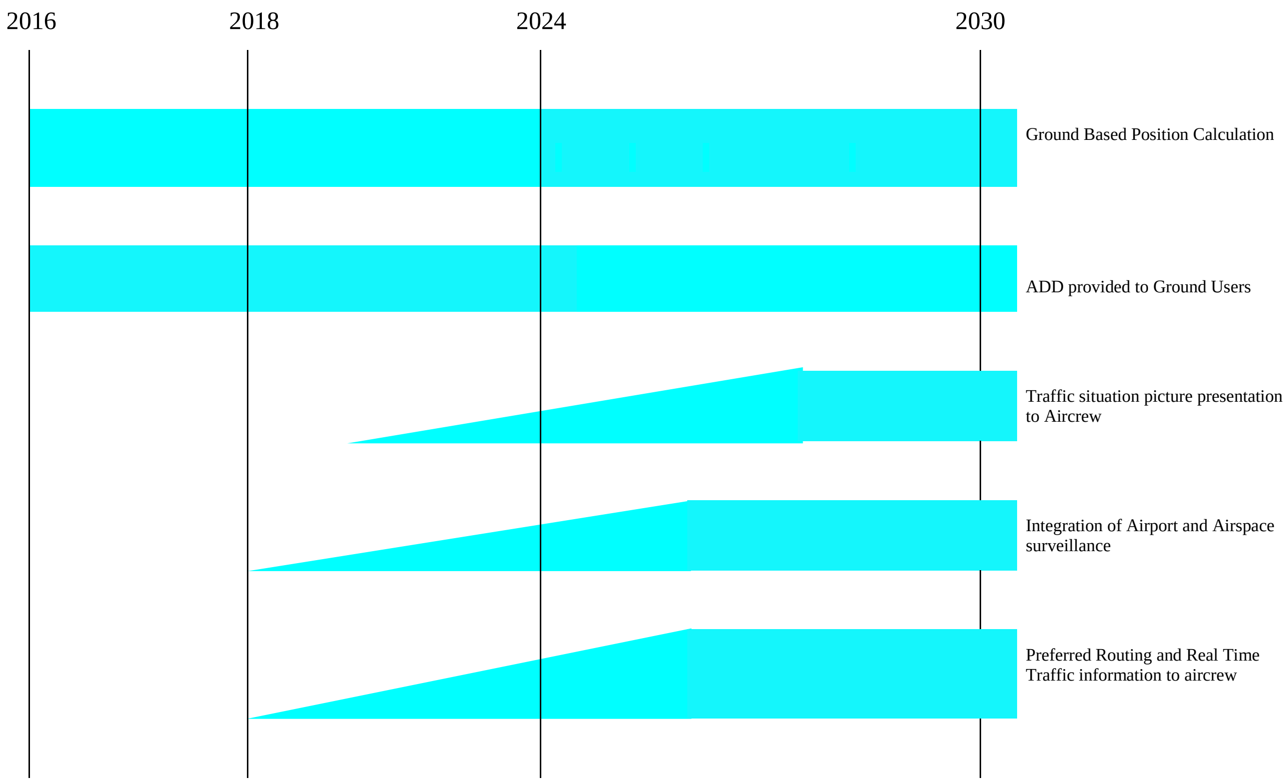
The implementation of ADS-B ASAS situational awareness applications will require an additional airborne SDPS and display system.

2.3.3 **Long term (until 2025-2030)**

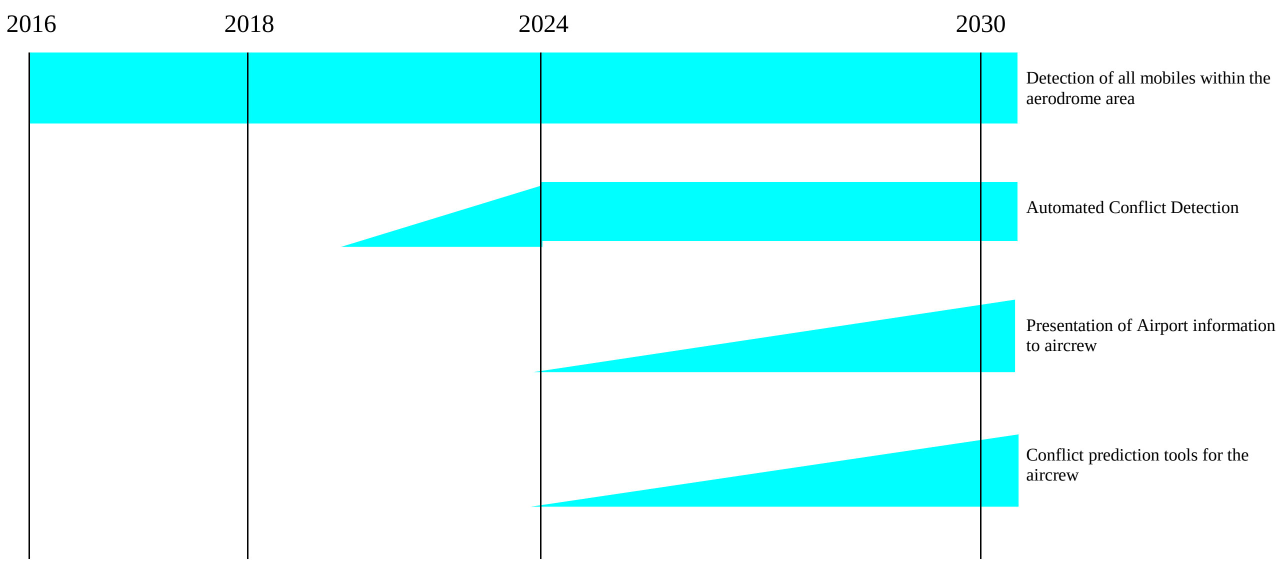
Future ADS-B IN/OUT systems and continuance of airborne systems considered a short and medium terms.

2.4 **Operational Drivers Timeframe**

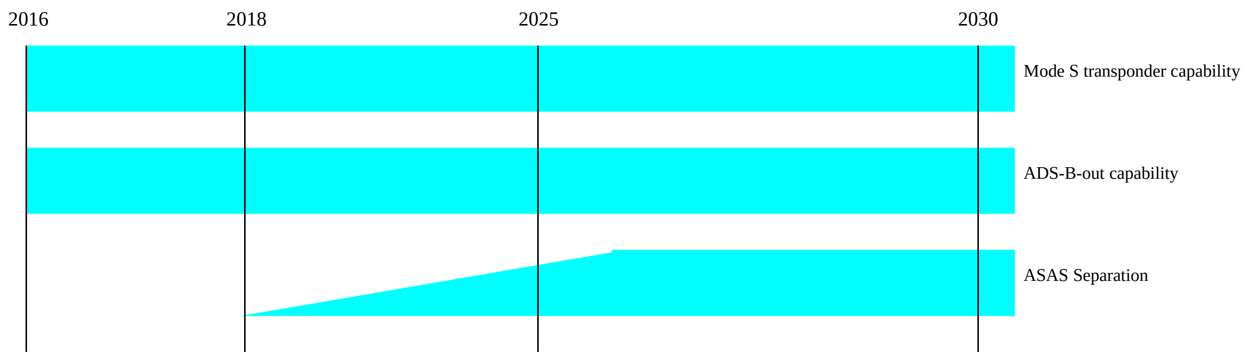
En Route and TMA Airspace



Aerodrome Operations



Aircraft Systems



3. **Surveillance Infrastructure Evolution**

3.1 **En-Route and TMA Airspace**

3.1.1 **Short term (until 2018)**

Co-operative surveillance, in the form of SSR, MSSR radars, will still be the main means of surveillance and will be extensively used for air traffic surveillance by civil agencies for TMA and En-Route services within coverage of (ground based) interrogator station(s).

Implementation of monopulse SSR, Mode S SSR, in medium- and high-traffic en route and terminal areas will continue.

ADS-C surveillance will be operationally used in all oceanic and remote airspace associated with FANS 1/A capacities.

Use of ADS-B (ES Mode S receivers) will begin to provide surveillance for en-route and terminal areas not covered with radar, and to strengthen surveillance in areas covered with SSR Modes A/C and S.

Depending on the percentage of ADS-B equipped aircrafts, wide area multilateration (WAM) implementation should be considered as a possible transition path to ADS-B environment in a shorter timeframe.

3.1.2 **Medium term (2019-2024)**

SSR Mode S surveillance implementation in high density will continue. State-selected TMAs in order to improve secondary radar performances. Since there will still exist legacy aircrafts that won’t be able to reply on mode S, a mixed mode interrogation will be required up to 2024.

Ground implementation for ADS-B (based on ES Mode S receivers) will increase to fill en route and terminal areas not covered with radar and to strengthen surveillance in areas covered with SSR Modes A/C and S.

Additionally the implementation of the ADS-B satellite to cover en rute and terminal areas not covered under radar is expected.

Surveillance Data Processing and Distribution systems based on surveillance server technology will have to be progressively upgraded, in order to merge legacy radar data and information contained in the ADD and/or from Multilateration position calculations and promote data sharing between States using TCP/IP patterns.

3.1.3 **Long term (until 2025-2030)**

It is predicted that by 2030 the majority of the SSR and SSR Mode S systems currently installed are at the end of their operational life. Therefore, SSR Mode A/C radars that have completed their life cycle by that time won’t be replaced anymore. ADS-B will fully replace those decommissioned SSRs.

3.2 Aerodrome Operations

3.2.1 Short term (until 2018)

The main technology for calculating the position of mobiles (both aircraft and vehicles) will be Surface Movement (primary) Radar.

Implementation of multilateration will gradually increase, where aircraft respond to SSR Mode A/C or SSR Mode S queries.

3.2.2 Medium term (2019-2024)

A-SMGCS Level I/II will provide the benefits at the aerodrome and additional information may be required by the ground systems. The most effective means of achieving this would be via ADS-B, since aircraft will already be equipped and there will be a cost-effective upgrade path for the Multilateration ground stations, although there may be an impact on the avionics.

Although many Multilateration systems are configured with their own data fusion trackers as standard, a possible upgrade to existing SDPDs to support Aerodrome operations will be required.

3.2.3 Long term (until 2025-2030)

The introduction of A-SMGCS Levels III/IV at selected aerodromes will require aircrew to be presented, with an airport map and other mobiles for situational awareness and possible conflict prediction tools in the aircraft. Where airports foresee a benefit from these kinds of applications then a TIS-B service may be required to ensure a complete and consistent airport situation picture.

3.3 Aircraft Systems

3.3.1 Short term (until 2018)

In accordance with ICAO requirements, all aircraft flying within CAR/SAM controlled airspace are required to be equipped with a pressure altitude reporting device. It is not foreseen that there will be significant changes for aircraft systems prior to 2010 on that matter.

Until 2018 the implementation of ACAS II systems throughout commercial and general aviation will be almost completed, using Mode S transponder.

Mode S transponder starts updating to operate in ADS-B environments (ADS-B out).

If aircrafts are operating in airspace where the ground-based ADS-B applications are being used, then the avionic configuration will require changes to deliver the additional aircraft derived data required.

3.3.2 Medium term (2019-2025)

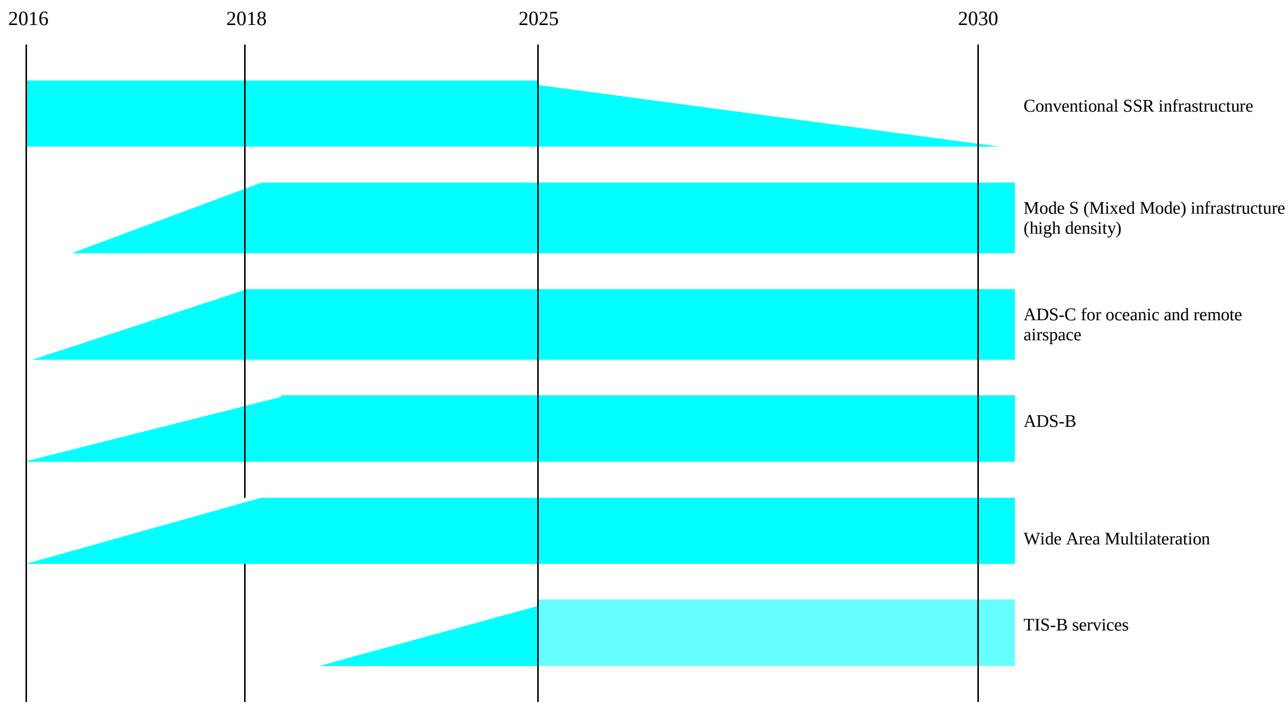
Aircraft operating in airspace where the ADS-B ground based surveillance applications are in use, with avionics configuration to deliver the additional aircraft derived data required.

3.3.3 Long term (until 2025-2030)

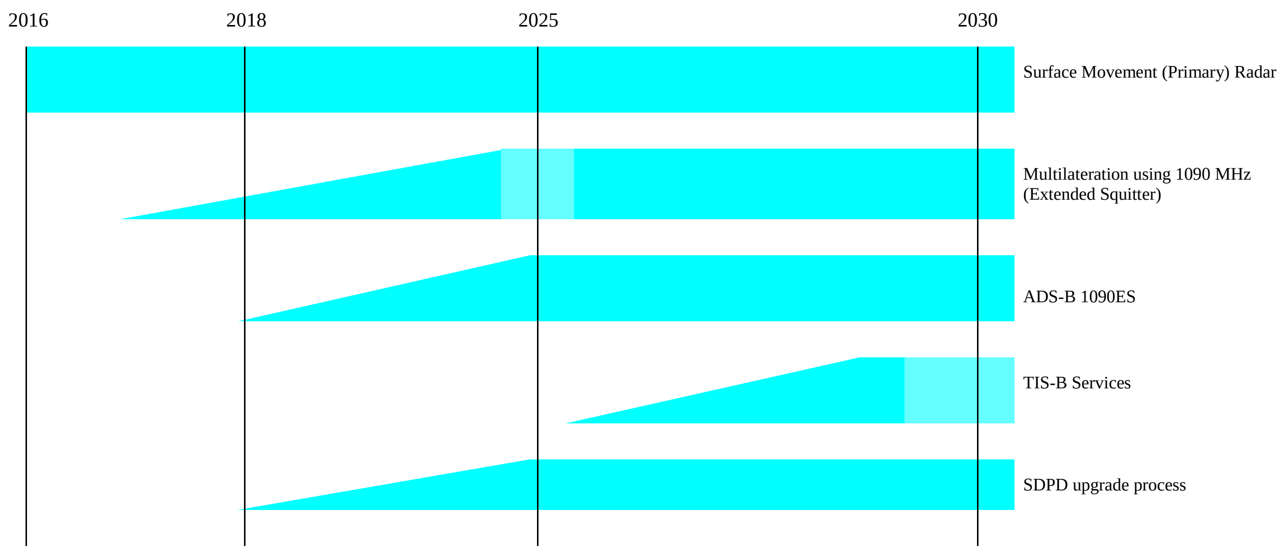
The move from ASAS spacing to ASAS separation and preferred routing may require a high integrity traffic situation picture, therefore the use of TIS-B may be required as well as the implementation of an airborne Surveillance Data Processing System (SDPS) to integrate ADS-B in and TIS-B for presentation of the air situation picture on a graphical display.

3.4 **Surveillance Infrastructure Timeframe**

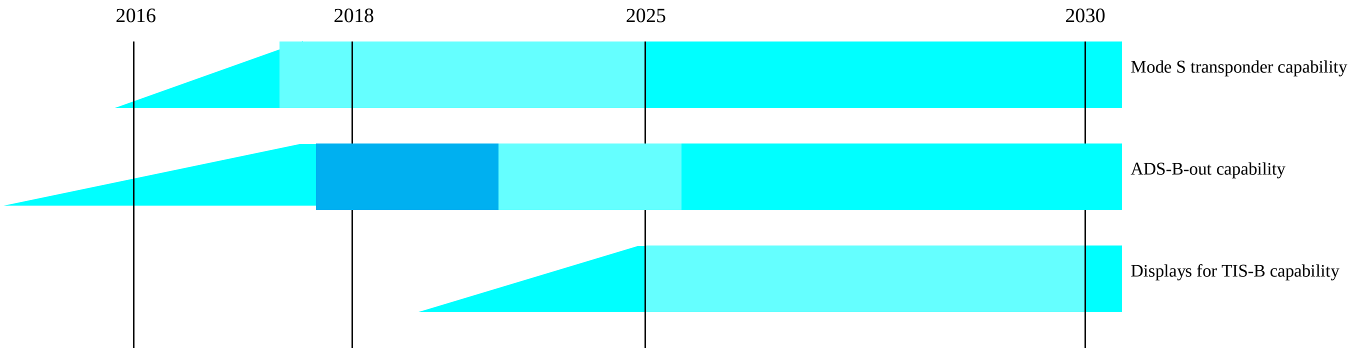
En Route and TMA Airspace



Aerodrome Operations



Aircraft Systems



3.5 **Tentative Action Plan**

3.5.1 **Short term (until 2018)**

Regional trials will have to be conducted in order to support the operational introduction of new techniques such as ADS-B and WAM. Such assessments would include Cost Benefit Analysis, safety assessments and detailing operational requirements.

In order to validate the timeframe forecasted by this surveillance strategy and assess the proportions of equipped aircrafts, each State/Territory/International Organization should evaluate the:

- useful life of their radars and the potentiality for their replacement with ADS-B;
- locations of potential ADS-C or ADS-B ground station sites;
- possibility of the ADS-B satellite deployment;
- capabilities of existing and planned ATC automation systems to support ADS-C or ADS-B applications;
- maximum density traffic nowadays and expected for the year 2025;
- number of equipped aircrafts operating in the concern airspace;
- number, name and type of equipped aircraft of the airlines that have equipped aircrafts for mode S, ADS-C and ADS-B;
- rate of faulty Mode S airborne equipment and its behavior; and
- categorization of the accuracy/integrity data available in the aircrafts.

The ADS-B deployment should be associated at early stages in coordination with the States/Territory/International Organizations responsible for the control of adjacent areas, and the correspondent ICAO Regional Office. Therefore, a plan for data sharing should be established, based on bilateral agreements, aiming at a coordinated, harmonious and interoperable implementation of ADS-B.

As the increased dependence on ADS-B (1090 MHz Extended Squitter) is expected to grow, there is concern that the band will become saturated as more information is loaded onto the restricted band. Therefore it is required to study whether the use of 1090MHz continues to support the surveillance requirements.

3.5.2 **Medium term (2019-2024)**

In medium term, the capabilities of current Multi Sensor Trackers are to be assessed in light of the more stringent requirements need to support and process increasing amount of ADD.

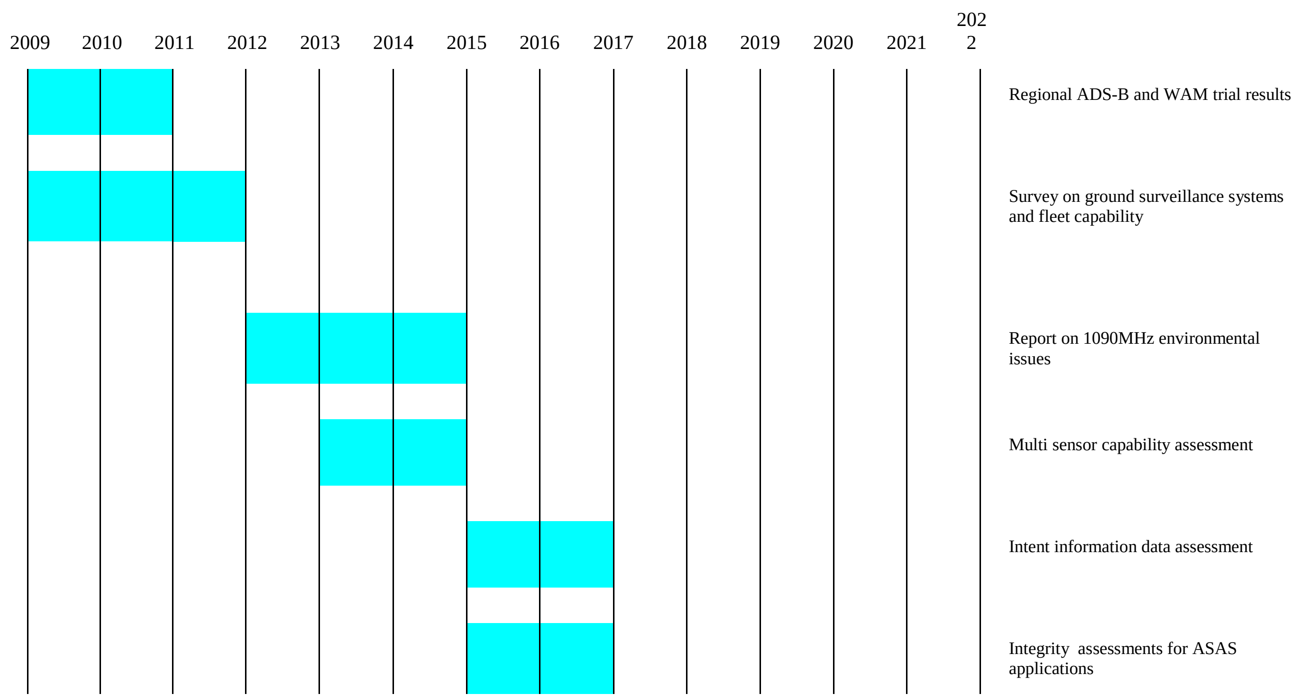
3.5.3 **Long term (until 2025-2030)**

In long term, it is required to identify the impact of the new procedures that are predicted to require 'intent' information from the aircraft. The precise definition of intent requires clarification to ensure avionics equipment and ground processing products can be developed in time to deliver the required information.

It is also required to identify whether the integrity requirements of the information presented to the aircrew while performing ADS-B Package I airborne surveillance applications may require the need for the uplink of traffic information to the aircraft to validate the integrity of the navigation data transmitted by ADS-B.

3.5.4 **Studies and Trials Timeframe**

Timeframe of the regional action plan



ANNEX A – ACRONYMS

ACAS	Aircraft Collision Avoidance System
ADD	Aircraft Derived Data
ADS	Automatic Dependent Surveillance
ADS-B	ADS-Broadcast
ADS-C	ADS-Contract
ANC	Air Navigation Commission
ANSP	Air Navigation Service Provider
APP	Approach (Centre or Control)
ASAS	Airborne Separation Assistance System
ASDE	Airport Surveillance Detection Equipment
A-SMGCS	Advanced Surface Movement and Guidance Control System
ATC	Air Traffic Control
ATM	Air Traffic Management
CDTI	Cockpit Display of Traffic Information
CNS	Communications Navigation and Surveillance
CPDLC	Controller Pilot Data link Communications
FDPS	Flight Data Processing System
FMS	Flight Management System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ICAO	International Civil Aviation Organization
M-SSR	Mono-pulse Secondary Surveillance Radar
PSR	Primary Surveillance Radar
RSP	Required Surveillance Performance
SARPs	Standards and Recommended Practices
SDPD	Surveillance Data Processing and Distribution System
SMGCS	Surface Movement Guidance and Control System
SSR	Secondary Surveillance Radar
TCAS	Traffic Collision Avoidance System
TIS-B	Traffic Information Service – Broadcast

ANNEX B – DEFINITIONS

Surveillance is defined as the technique for the timely detection of targets and the determination of their position (and if required, the acquisition of supplementary information relating to targets) and the timely delivery of this information to users in support of the safe control and separation of targets within a defined area of interest.

Ground Based Surveillance is defined as 'ground based techniques for the timely detection of targets and the determination of their position (and if required, the acquisition of supplementary information relating to targets) and the timely delivery of this information to users in support of the safe control and separation of targets within a defined areas of interest'. The 'defined area of interest'' relates to the ability of the User to select which information is deemed necessary to ensure the safe implementation of the surveillance application within the physical airspace for which they are responsible.

Independent surveillance is a technique where the position of the aircraft is calculated by the ground and is not dependent on position data transmitted by the aircraft.

Dependent surveillance like ADS-B is based on the principle of the target informing the ground system and other targets of its own position. The target may also provide aircraft derived data. Dependent surveillance delivers Aircraft Derived Data (ADD). ADD may contain navigation position, identification and other data from the aircraft.

Dependent surveillance, as ADS-B, can be transmitted through ground or satellite.

Cooperative surveillance is a technique that requires the mobile to equip with a dedicated surveillance systems which responds to transmissions from the ground system.

Non Cooperative surveillance is a technique where the position of the aircraft is calculated by the ground and is not dependent on position data transmitted by the aircraft or upon any deliberate interaction in the aircraft with active components e.g SSR transponders.

Basic surveillance delivers to the surveillance user:

- Aircraft position (latitude, longitude and altitude)
- Mode A

Elementary surveillance includes basic surveillance and also delivers to the surveillance user:

- Aircraft identity **-** Flight Identity or tail registration and 24 bit address,
- Flight Status,
- Aircraft pressure altitude in 100 ft or 25 ft units, if the aircraft is appropriately equipped.

Enhanced Surveillance delivers to the surveillance user a set of Aircraft Derived Data (ADD) to provide additional information to ground or air based ATM systems and safety nets. Enhanced surveillance may be delivered to ground system through Mode S SSR, ADS-B or Multilateration system (through active interrogations).

Aircraft Derived Data Different cooperative surveillance technologies extract different information from the aircraft. In its simplest form, the Mode A and Mode C information provided by the aircrafts SSR transponder can be classified as aircraft derived data or down linked aircraft parameters. When implemented using SSR Mode S, the following current or short term Aircraft Parameters are automatically extracted from the aircraft:

- Air Speed (Indicated Air Speed and Mach Number)

- Ground Speed

- Magnetic Heading Roll Angle
- Selected Altitude Track Angle Rate (or, if not available, True Air Speed)
- True Track Angle Vertical Rate

The enhanced surveillance parameters delivered by ADS-B include the position and longer term intent parameters e.g. 4D trajectory, trajectory change points etc.

Surveillance users are:

- Oceanic ATM Centers
- En-Route ATM Centers
- TMA/Approach ATM Units
- Airports/Tower ATM & Ground Traffic Management Units
- Military Centers
- Airline Aircraft Operations Centre
- Enhanced Tactical Flow Management System
- Data processing systems, such as Flight Data Processing Systems
- ATM Tools, such as Short Term Conflict Alert
- The target
- Adjacent Surveillance Functions
- Non ATM functions (e.g. Search and Rescue).

Surveillance Data Processing and Distribution systems accept information from surveillance sensors, process the information to develop the 'best' estimate of the position of a target and supply this information to users. In addition the SDPD may receive ADD and distribute this to surveillance users attached to the position information.

A-SMGCS is an airport system which provides surveillance to a ground controller. It has four implementation levels that provide different levels of functionality:

Level I A-SMGCS provides:

- Position; the presentation to a controller of the location of an aircraft or vehicle;
- Identification; the presentation to the controller the identity (flight identification or call sign) of the aircraft or vehicle.

Level II A-SMGCS provides a conflict prediction function to alert the controller of:

- Potential collisions (between aircraft/vehicle or aircraft/aircraft) on the runway surface or protected areas
- Potential entry of aircraft or vehicles into restricted areas.

Level III A-SMGCS includes functions that are being defined by the Airports and Environments Business Division to share traffic situation awareness amongst pilots and drivers and the introduction of the automated routing function. The guidance function may be enhanced by:

- Display of the airport map showing taxiways, runways, obstacles and the mobile position to aircrew and drivers;
- Providing dynamic map with updates of the runway status
- Triggering automatically the dynamic ground signs (stop bars, centerline lights, etc.) according to the route issued by the controller.

Level IV A-SMGCS corresponds to the improvement of the functions implemented at the level III. Of particular note to the surveillance strategy, the control function will be complemented by a conflict resolution function in the cockpit or vehicle.

ADS-B Satellite is a system of surveillance that receives the transmission of the message ADS-B, via frequency 1090 MHz of aircraft, towards a constellation of satellites of low orbit (LEO), and said message is transmitted through a network land, towards air traffic controllers around the world, achieving the coverage of surveillance of aircraft in time real, in ground, oceanic and remote areas.

ADS-B Package I is a set of Ground Based Surveillance, Airborne Traffic Situational Awareness and Airborne Spacing applications (reference 6). Note that since reference 6 was published, the application descriptions have been refined, although they remain largely in accordance with the referenced document. The text below summarizes the applications as of November 2005.

ADS-B Package I Ground Based Surveillance Applications are aimed at improving ATC surveillance on the ground for En-Route and TMA airspace and on the airport surface and at enhancing ATC tools through the provision of aircraft derived data enabled by ADS-B. These applications are:

- ADS-B-RAD ATC surveillance for TMA and En-Route airspace in areas that are already covered by radar systems
- ADS-B-NRA ATC surveillance in non-radar areas
- ADS-B-APT Airport surface surveillance
- ADS-B-ADD Aircraft derived data for ATC tools

ADS-B Package I Airborne Surveillance Applications are aimed at improving airborne (cockpit) surveillance in En-Route and TMA airspace as well as on the airport surface. These applications are:

- ATSA-SURF Enhanced traffic situational awareness on the airport surface
- ATSA-VSA Enhanced visual separation on approach
- ATSA-ITP In-trail procedure in oceanic airspace
- ATSA-AIRB Enhanced traffic situational awareness during flight operations

ADS-B Package I Airborne Spacing Applications are aimed at using airborne (cockpit) surveillance capabilities to carry out applications where the flight crew is able to maintain a time or distance from designated aircraft. These applications are:

- ASPA-S&M Enhanced sequencing and merging operations
- ASPA-C&P Enhanced crossing and passing operations

ASAS Applications are a set of operational procedures for controllers and flight crews that make use of the capabilities of Airborne Separation Assistance Systems to meet a clearly defined operational goal.

Airborne Spacing (ASPA) is an ASAS application category where the flight crew is able to maintain a time or distance from designated aircraft. The controller can use new spacing instructions to expedite and maintain an orderly and safe flow of traffic and is still responsible for providing separation in accordance with the applicable ATC separation minima. New procedures and responsibilities are expected with the introduction of Airborne Spacing applications.

Airborne Separation is an ASAS application category where the flight crew is able to provide separation from designated aircraft in accordance with the applicable airborne separation minima. In this application the controller can delegate separation relative to a designated aircraft to the flight crew through a new clearance however the controller is responsible for providing separation in accordance with the applicable ATC separation minima from other aircraft. New procedures and responsibilities are expected with the introduction of Airborne Separation applications.

Airborne Self Separation is an ASAS application where the flight crew is able to provide separation from all known aircraft in accordance with the applicable airborne separation minima. Airborne self separation is not considered within the timescales of this strategy.

ANNEX C – SURVEILLANCE TECHNIQUES

Primary Radar (PSR, SMR/ASDE)

Primary Radar operates by radiating high levels of electromagnetic energy and detecting the presence and characteristics of echoes returned from reflected objects.

Target detection is totally based on the reception of reflected energy, it does not depend on any energy radiated from the target itself, i.e. no carriage of airborne equipment is required.

Secondary Surveillance Radar (SSR)

Secondary Surveillance Radar (SSR) operates by transmitting coded interrogations in order to receive coded information from all SSR transponder equipped aircraft, providing a two way "data link" on separate interrogation (1030 MHz) and reply (1090 MHz) frequencies.

Replies contain positive identification, as requested by the interrogation, either one of 4096 codes (Mode A) or aircraft pressure altitude reports (Mode C). The co-operative concept ensures stable received signal strength and considerably lower transmitted power levels than Primary Radar. SSR enables Basic Surveillance.

SSR Mode S is a development of SSR using the same interrogation and reply frequencies as the SSR but the selective interrogations contain a unique 24 bit address that ensures all transmissions are only decoded by one aircraft's Mode S Transponder having that 24 bit address.

A Mode S station also transmits conventional SSR formats in order to detect SSR only aircraft (Mode A/C) in order to be downward compatible with SSR.

The SSR Mode S transponder is also a fundamental part of the ACAS airborne installation and the ADS-Broadcast when using the 1090 MHz Extended Squitter transmission. SSR Mode S enables elementary and enhanced surveillance.

Automatic Dependent Surveillance-Broadcast (ADS-B)

Automatic Dependent Surveillance - Broadcast (ADS-B) is a surveillance technique that allows the transmission of aircraft derived parameters, such as position and identification, via a broadcast mode data link for use by any air and/or ground users.

Each ADS-B emitter periodically broadcasts its position and other data provided by the onboard aircraft avionics systems. Any user, either airborne or ground based, within range of the emitter may choose to receive and process the information. Three technology options are available, these are ADS-B 1090ES [which has been selected as the initial link for CAR/SAM Region], VDL Mode 4 (Very High Frequency Data Link) and UAT (Universal Access Time). ADS-B enables elementary and enhanced surveillance.

Automatic Dependent Surveillance-Contract (ADS-C)

Automatic Dependent Surveillance - Contract (ADS-C) is a surveillance technique in which aircraft provide, via a data link, data such as position and identification, derived from the onboard aircraft avionics systems. A "contract" is established between the aircraft and the ground to transmit data at a particular event. An event could be time based, position based or as specified in the contract.

Currently ADS-C is usually implemented via SATCOM but any data link having the range capability would suffice. Whilst originally envisaged to be an ATN compliant data link, current implementations exploit a large part of the functionality through the FANS 1/equipment currently carried by many aircraft.

Traffic Information Service – Broadcast (TIS-B)

An air traffic situation picture derived by a ground based Surveillance Data Processing System may be broadcast from the ground to all aircraft within range and equipped with correct receivers. There are three roles of TIS-B, these are:

- TIS-B fundamental service: This ‘gap filler service broadcasts information about aircraft that cannot be adequately obtained directly by ADS-B and is used to enhance the availability of surveillance information to users that are not normally able to receive ADS-B transmissions from other aircraft. This service will normally exclude from transmission those aircraft broadcasting ADS-B messages
- ADS-B validation service: This optional service compares aircraft ADS-B state vector data with surveillance data from ground-based sensors and broadcasts validation data
- ADS-B rebroadcast service: The automatic rebroadcast of ADS-B messages received over one data link, translated directly onto other data links for the purpose of extending ADS-B connectivity to users of incompatible data links.

Multilateration

Multilateration is a surveillance technique where aircraft replies from other SSR or SSR Mode S interrogations or spontaneous squitter message from Mode S transponder are passively received by 3 or more ground receiver stations. Using time of arrival techniques the position and altitude of the target can be determined. In some Multilateration systems, active Mode S selective interrogations are used to extract data from the aircraft.

The surveillance strategy distinguishes three levels of functionality, which are:

- Basic operation in which Multilateration uses time of arrival of signals to determine the position of aircraft.
- Elementary operation, which includes basic operation and the addition of active integrations to extract aircraft identification information from the flight systems
- Enhanced operations, which includes basic operations and the addition of active interrogations to extract any information (including aircraft identification) from the aircraft systems.

APPENDIX J

ACTION PLAN FOR THE CONDUCTION OF ADS-B TRIALS IN THE SAM REGION

IMPLEMENTATION PHASE	TASK	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	STATUS
PHASE I **Conduction of ADS-B trials, collection and processing of data, submission of results**	1	Define trial objectives, aiming at studying the possibility for States to benefit from ADS-B as surveillance system in the Region.	CNS Task Force	Trial objectives	**Finalised**
	2	Review and describe in detail the activities to be considered for ADS-B trials designed by the GREPECAS mechanism.	Secretariat	Revised regional plan of activities for ADS-B trials	**Finalised**
	3	Define the equipment and configuration needed to begin trials. Define trial costs.	Rapporteur Project C2	Definition of equipment and its configuration for the trial	**Finalised** A Thales ADS-B station was used for the trial at no cost.
	4	Define the geographical area where trials will be conducted	Rapporteur Project C2	Geographical area defined (operational concept)	**Finalised** The terminal area of the Jorge Chavez international airport of Lima, Peru, was selected
	5	Consult States and users about their participation in the trials	Secretariat	Confirmation of participation by States	**Finalised**
	6	Select the entity, organisation or State in charge of conducting the trials	States	Selection of the entity, organisation or State	**Finalised** CORPAC, the air navigation service provider of Peru, was selected
	7	Installation of the ADS-B equipment required for the	Selected entity, organisation or State	Equipment installed	**Finalised** It was installed at the Jorge Chavez

IMPLEMENTATION PHASE	TASK	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	STATUS
		trial in the defined geographical area			international airport of Lima, Peru.
	8	Conduction of trials (data collection).	State (Peru), manufacturer (Thales), Secretariat	Start-up of trials	**Finalised** Trials were conducted for a period of six months
	9	Processing of collected data	State (Peru), manufacturer /Thales), Secretariat	Processing of data	**Finalised** Processing of the data collected was done by the air navigation service provider (CORPAC)
	10	Presentation of results obtained	State (Peru), Secretariat	Presentation of results	**Finalised** Results were presented at the ADS-B workshop (Lima, Peru) and SAM/IG meeting.
PHASE II OPERATIONAL IMPLEMENTATION OF ADS-B	11	Define operational use of ADS-B, based on the airspace concept defined at national level	States	Presentation of results	**Valid**
	12	Safety assessment based on the defined operational use(s)	States	Presentation of results	**Valid** In this task, it is important to analyse the behaviour of global positioning satellites in these latitudes.
	13	Drafting of model documents for operational implementation of ADS-B • Drafting of model advisory circulars for	Regional projects RLA/99/901 RLA/06/901 States	Publications in support of ADS-B implementation	**Valid** December 2016 All model publications on operational use of ADS-B

IMPLEMENTATION PHASE	TASK	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	STATUS
		airworthiness approval and operation with ADS-B • Drafting of model AIC to report ADS-B implementation plans • Develop model AIP supplement containing standards and procedures applicable to ADS-B, in accordance with the operational use defined • Review the procedural handbooks of ATS units, in accordance with the operational use defined for ADS-B			
	14	Publication of documents in support of ADS-B operational implementation	States	Publication of documents	**Valid** December 2017
	15	Training programme: • Establishment of a training programme for ATS personnel on the operational implementation of ADS-B, in accordance with the operational use defined	Regional projects RLA/99/901 RLA706/901 States	Training programme	**Valid** December 2016

IMPLEMENTATION PHASE	TASK	ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	STATUS
		• Establishment of a training programme for airworthiness and operation inspectors on the operational implementation of ADS-B, in accordance with the operational use defined • Establishment of a training programme for pilots on the operational implementation of ADS-B, in accordance with the operational use defined			
	16	ADS-B implementation	States	ADS-B implementation operational	**Valid** 2024 ADS B systems installed in Brazil (6), Colombia (13), Guayana (2), Peru (1) and Paraguay (6)
PHASE III **ADS-B IMPLEMENTATION MONITORING**	17	ADS-B implementation Monitoring	SAM/IG Secretariat	ADS-B implementation Monitoring	**Valid** 2024

Agenda Item 6: Other business

6.1 Under this agenda item the Meeting analysed the following paper:

a) IP/12 – *New Edition of the Global Air Navigation Plan (GANP Fifth Edition)* (presented by the Secretariat).

6.1 The meeting was informed that on May 30, 2016, the Council (208/8) approved the fifth edition of the GANP and the 39th Session of the ICAO Assembly (Montreal, Canada, 27 September to 7 October 2016) supported it.

6.2 The fifth edition of the GANP (Doc 9750) and the edition 2016 of the aviation system block upgrades (ASBU) Document, are available at the website associated to the 39th Session of the ICAO Assembly http://www.icao.int/Meetings/a39/Pages/documentation-reference-documents.aspx.

6.3 The fifth edition of the GANP is focused on improving the coherence of the submission, incorporate already planned additions and update modules of Blocks 0 and 1 of the ASBU document. At the same time, the fifth edition of the GANP made a major change in the periodicity of the ASBU modules. It was considered necessary to correlate the three-year cycle of the ICAO Assembly and the two-year cycle of ICAO amendments with a six-year cycle for the modules. In consequence it is proposed that the Block 0 embraces the period 2013-2018, the Block 1 embraces 2019-2024, the Block 2 embraces 2025-2030 and the Block 3 begin on 2031.

6.4 The Meeting took note that by the second semester of 2017, it is foreseen to carry out in Lima a seminar/workshop on ASBU implementation, considering the new edition and the Regional plan on implementation of the Performance Based Air navigation System (PBIP) for the SAM Region. The event is supported by the RLA/06/901 Project and the Tenth Coordination Meeting of the RLA/06/901 Project (Lima, Peru, 25 – 26 August 2016) approved 11 fellowships for the member States of the project.