



SAM/IG/27

**INTERNATIONAL CIVIL AVIATION ORGANIZATION
South American Office**

Regional Project RLA/06/901

**TWENTY SEVENTH WORKSHOP/MEETING OF THE SAM
IMPLEMENTATION GROUP**

(SAM/IG/27)

FINAL REPORT

Virtual, 31 May to 3 June 2022

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of ICAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

INDEX

i -	Index	i-1
ii -	History of the Meeting	ii-1
	Place and duration of the Meeting	ii-1
	Opening ceremony and other matters	ii-1
	Schedule, organization, working methods, officers and Secretariat	ii-1
	Working languages	ii-1
	Agenda	ii-1
	Attendance	ii-2
	List of Conclusions	ii-2
iii -	List of Participants	iii-1
	Report on Agenda Item 1	1-1
	ANS context (ATM/CNS) Global and Regional level.	
	a) Elaboration of Vol. III of the ANP CAR/SAM	
	b) Review of the status of conclusions.	
	Report on Agenda Item 2	2-1
	Report of activities of the GESEA and Subgroups	
	a) Review of air navigation priorities in the ATM field	
	b) ATM implementation. Progress of the Subgroups.	
	c) Proposed Conclusions	
	d) Review of the 2022 Work Plan	
	Report on Agenda Item 3	3-1
	Report of activities and deliverables of the GT - Interop and Subgroups	
	a) Review of air navigation priorities in the CNS field.	
	b) CNS Implementation. Progress of the Subgroups.	
	c) Proposed Conclusions	
	d) Review of the 2022 Work Plan	
	Report on Agenda Item 4	4-1
	SAM/IG Conclusions and next actions - Plenary	
	a) Summary of Sessions	
	b) Review and approval of Conclusions	
	Report on Agenda Item 5	5-1
	Other Business	

ii-1 PLACE AND DURATION OF THE MEETING

The Twenty-Seventh Workshop/Meeting of the SAM Implementation Group (SAM/IG/27) was held by virtual means (Zoom), Peru, from 31 May to 3 June 2022, under the auspices of Regional Project RLA/06/901.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Jorge Armoa, Regional Officer, ANS Implementation (AIM/MET), on behalf of the Regional Director of the ICAO South American Regional Office (SAM), welcomed the civil aviation authorities and representatives of organizations and industry. Likewise, he reiterated his gratitude for the continuous support given to the activities undertaken by the Regional Office, particularly, to those of the SAM Implementation Group (SAM/IG).

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

The Workshop/Meeting agreed to hold its sessions from 08:00 to 13:30 hours, with appropriate breaks.

The sessions from the first to the third day were dedicated to the analysis of the activities and deliverables of the GESEA and GT Interop Groups, as well as the current priorities of air navigation. At the fourth day session, a Plenary meeting was held to validate and/or endorse the deliverables of the above-mentioned Technical Groups, as well as to approve the conclusions of the Meeting.

Mr. Fernando Hermoza, ATM/SAR Regional Officer and Mr. Francisco Almeida, ICAO Regional Officer CNS, served as the Secretariat, and were assisted by Mr. Jorge Armoa, Regional Officer MET/AIM, and Mr. Roberto Sosa, Regional Officer ANS/SAFETY.

Likewise, Support was provided by the coordinators and rapporteurs of the GESEA and GT Interop groups and subgroups for the preparation and analysis of documentation.

ii-4 WORKING LANGUAGES

The working languages of the Meeting were English and Spanish.

ii-5 AGENDA

The following agenda was adopted:

Agenda

Item 1: ANS context (ATM/CNS) Global and Regional level.

- a) Elaboration of Vol. III of the ANP CAR/SAM
- b) Review of the status of conclusions.

Agenda

Item 2: Report of activities of the GESEA and Subgroups

- a) Review of air navigation priorities in the ATM field
- b) ATM implementation. Progress of the Subgroups.

- c) Proposed Conclusions
- d) Review of the 2022 Work Plan

Agenda

Item 3: Report of activities and deliverables of the GT - Interop and Subgroups

- a) Review of air navigation priorities in the CNS field.
- b) CNS Implementation. Progress of the Subgroups.
- c) Proposed Conclusions
- d) Review of the 2022 Work Plan

Agenda

Item 4: SAM/IG Conclusions and next actions - Plenary

- a) Summary of Sessions
- b) Review and approval of Conclusions

Agenda

Item 5: Other Business

ii-6 **ATTENDANCE**

The virtual Meeting was attended by 165 participants of 13 States of the SAM Region (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Panama, Paraguay, Peru, Suriname, Uruguay and Venezuela); a State from the North American and Caribbean Region (United States), an agency from the EUR/NAT Region (EASA), an International Organization (IATA), an organization from the industry (CANSO) and one company (TRANSOFT). The list of participants is shown in page iii-1.

ii-7

LIST OF CONCLUSIONS ¹

No.	Title of the Conclusion	Page
Conclusion SAM/IG/27-01	ADOPTION OF THE SAM AIRSPACE OPERATIONAL CONCEPT 2022-2026 (EC/SAM CONOPS)	4-1
Conclusion SAM/IG/27-02	ADOPTION OF THE ROADMAP 2022–2026: PERFORMANCE-BASED OPTIMIZATION OF SAM AIRSPACE	4-2
Conclusion SAM/IG/27-03	ADOPTION OF AMENDMENT 1 OF THE ATS CONTINGENCIES FRAMEWORK PLAN OF THE SAM REGION (MCATS / SAM) AND ALIGNMENT OF NATIONAL PLANS.	4-2
Conclusion SAM/IG/27-04	MANUAL FOR THE CALCULATION OF RUNWAY CAPACITY AND ATC SECTOR	4-3

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

LISTA DE PARTICIPANTES / LIST OF PARTICIPANTS**ARGENTINA***ANAC*

1. Manuel Álvarez
2. Andrés Espina
3. Darío Aquino
4. Débora Kuc
5. Diego Frigerio
6. Leandro Bauza
7. Leonardo Gonzalez
8. Magalí Haufler
9. Marcos Lemos
10. Mauricio Nogara
11. Moira Callegare
12. Raúl Dandrich
13. Silvia Ruiz
14. Verónica Villarruel

EANA

15. Adrián Malizia
16. Andrés Ant
17. Antonio E. González
18. Diego Gamboa
19. Diego Ortiz
20. Franco Velona
21. Gustavo Flores
22. Hernán Aguirre
23. Hernán Ibarra
24. Jorge Cornelio
25. Jorge Maldonado
26. Julián Ahumada
27. Karina Lebán
28. Leonardo Costa
29. Lilian Velazquez
30. Malena Reinoso
31. Mario Correa
32. Natalia Rodríguez
33. Nicolás Medrano
34. Paola López
35. Patricia Urbano
36. Rodrigo Devesa
37. Silvia García
38. Yessica Stoffel

SMN

39. Claudia Ribero
40. Roxana Vasques

FAA

41. José Marcos Penchi

BOLIVIA

42. Andrés Quintana

43. Arturo Griffiths
44. Luis Rojas
45. Reynaldo Cusi

BRASIL / BRAZIL

46. Adriano Silva
47. André Rocha
48. Antonio Fernández
49. Clóvis Fernandes Junior
50. Diego De Brito
51. Hebert Dos Santos
52. Jorge Bezerra
53. José Izidro Apolinário
54. Kleiffer Cunha
55. Joaquim Tavares Lobo
56. Luis Felipe Fartura
57. Vahe Yaghdjian

CHILE

58. Alfonso De la Vega
59. Christian Vergara
60. Francisco Uzieda
61. Héctor Ibarra
62. José Morales
63. Patricio Zelada
64. Rodrigo Fajardo

COLOMBIA

65. Andrés Colmenares
66. Alexander Huertas
67. Carlos Mayorga
68. Douglas Villamarín
69. Edwar Cepeda
70. Germán Vélez
71. Giovannny Cruz
72. Gladys Roa
73. Harlen Mejía
74. Henry Córdoba
75. Jaime Burbano
76. Joaquin Penagos
77. José Luis Avendaño
78. Juan Hernández
79. Juan Pulido
80. Juan Vásquez
81. Martha Ceballos
82. Medardo Figueroa
83. Myyey Cruz

84. Nelson Celeita
85. Oscar García
86. Robinson Quintero
87. Samuel Roiter
88. Sebastián Cano
89. Mauricio Corredor
90. Viviana Obando
91. Wiston Caro

ECUADOR

92. Alejandro Coronado
93. Alis Villavicencio
94. Arturo Lomas
95. Jorge Zúñiga
96. José Paredes
97. Marcelo Valencia

ESTADOS UNIDOS / UNITED STATES

98. Raúl Chong

GUYANA

99. Rickford Samaroo

PANAMÁ

100. Ana Montenegro
101. Arsenio Bethancourt
102. Carlos Aparicio
103. Cristino Vargas
104. Daniel De Ávila
105. Ivette Iturrado
106. Javier Faeth
107. Xenia Guardia

PARAGUAY

108. Christian Baumann
109. Eleno Centurión
110. José Filártiga
111. Juan Felix Estigarribia
112. Margarita Cabrera
113. Víctor Morán

PERÚ

DGAC

114. Brenda Céspedes
115. José Mondragón
116. Diana Montoya

117. Eloy Tafur
118. Giuliano Guzmán
119. Hugo Rosado
120. Joel Cordero
121. Karla Albañil
122. Libio Benites
123. Luis Luna
124. Sara Siles

CORPAC

125. Ángel Carrera
126. Dante Samaniego
127. Erick Fernández
128. Henry Loza
129. John Camacho
130. Johnny Ávila
131. Juan Pablo Portilla
132. Moisés Valera
133. Pamela Martell
134. Raúl Anastacio Granda
135. Rocío Ávila
136. Sarita Alcántara

SURINAM / SURINAME

137. Alrick Blokland
138. Apinsa Andreas
139. Radha Atwaroe Kalawatie
140. Radjan Phalai

URUGUAY

141. Andrés Braidá
142. Daniel Burgos
143. Gabriel Falco
144. Gabriel Fernández
145. Laura Díaz
146. Marcos Vignolo
147. Mario Dávila
148. Rosanna Barú

VENEZUELA

149. Carlos Castañeda
150. Carlos Mata
151. Jarumy Castillo
152. Jean Carlos Lozano
153. Maricel Berroterán
154. Orlando Sánchez
155. Patricia Castillo

CANSO

156. Javier Vanegas

EASA

157. Eleonora Italia
158. Germán Meyer
159. José Quevedo

IATA

160. Julio de Souza Pereira
161. Andrés Guilhem (Aerolíneas Argentinas)
162. Eduardo Ravera (Aerolíneas Argentinas)

TRANSOFT

163. James Renner
164. Mark Rodrigues
165. Pier Carlo Ferraris

OACI / ICAO

166. Jorge Armoa
167. Fernando Hermoza
168. Francisco Almeida
169. Roberto Sosa

**Agenda
Item 1:**

ANS context (ATM/CNS) Global and Regional level

- a) Elaboration of Vol. III of the ANP CAR/SAM**
- b) Review of the status of conclusions.**

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

- a) WP/1.1 – *Status review of conclusions adopted by SAM/IG meetings* (presented by the Secretariat)
- b) WP/1.2 – *Coordination between GREPECAS and the Regional Group on Aviation Safety-PAN AMERICA (RASG-PA)* (presented by the Secretariat)
- c) WP/1.4 - *Uruguay’s work for the preparation of Vol. III of the CAR/SAM ANP (Spanish only)* (presented by Uruguay)
- d) IP/1.1 – *Status of implementation of SAM/IG/26 Conclusions by Peruvian State* (presented by Peru)
- e) IP/1.2 – *Brazil – Status of Conclusions* (presented by Brazil)
- f) IP/1.3 – *Status of implementation of SAM/IG/26 Conclusions by Guyana* (presented by Guyana)
- g) IP/1.4 – *Progress report of the state of Argentina in the activities of GESEA and Interop TF* (presented by Argentina)
- h) IP/1.5 – *Implementation of routes preferred by users (UPR) in Argentina’s FIRs* (presented by Argentina)
- i) IP/1.6 – *Runway Capacity Calculation Plan and ATC sector 2022* (presented by Argentina)
- j) IP/1.7 – *Implementation of the ATS surveillance control service in the Córdoba FIR north sector, and in the Comodoro Rivadavia FIR* (presented by Argentina)
- k) IP/1.8 – *Update of the SAM/IG/26 Conclusions and Report of the GESEA and Subgroups activities* (presented by Uruguay)
- l) IP/1.9 – *Review of status of conclusions* (presented by Venezuela)
- m) IP/1.10 – *Review of status of conclusions* (presented by Panama)
- n) IP/1.11 – *Review of status of conclusions* (presented by Bolivia)
- o) IP/1.12 – *Review of status of conclusions* (presented by Chile)

Note.- The sequential number WP/1.3 was not assigned.

Conclusions and Decisions adopted by the SAM/IG meetings

1.2 The Meeting proceeded to review the conclusions and valid decisions, as well as the pending activities of the workshops/meetings of the SAM Implementation Group (SAM/IG), which is presented in an updated manner as **Appendix A** to this agenda item. The list of conclusions and activities is made up of:

- a) the tasks to be developed and/or the corresponding conclusion in the areas under analysis;
- b) the specific tasks that will lead to the fulfillment of the main task;
- c) expected results in each task;
- d) completion dates;
- e) those responsible for its execution;
- f) support members for the task; and

- g) when necessary for a better understanding, any explanatory comment on the execution status be included.

1.3 In the same way, the information papers presented by Argentina, Bolivia, Brazil, Chile, Guyana, Panama, Peru, Uruguay and Venezuela were summarized in order to update the Tables that appear in **Appendix B** of this Agenda Item (see note below), where the progress of the tasks in charge of the States is indicated, in order to follow up on the implementation of the Conclusions.

Note.- The Meeting considered that the Table presented by Argentina allows the information to be adequately organized and agreed to adopt the said model.

1.4 The five States that were unable to present information on their progress can send it to the Secretariat by e-mail from 30 June, 2022, so that the follow-up is maintained until SAM/IG/28. The aforementioned Table is made available in Word format (Spanish and English versions), at the following link;

<https://oaci.sharepoint.com/:f/r/sites/SAM-CAR-ANS-SAMIG/Shared%20Documents/SAMIG/SAMIG27?csf=1&web=1&e=Fpr36i>

Coordination between GREPECAS and RASG-PA in the sphere of global plans (GANP-GASP)

1.5 The Meeting emphasised that both the GASP and the GANP represent the regional strategic orientation for safety and air navigation, respectively, and close cooperation and coordination with all stakeholders should be strengthened.

1.6 It was noted that the GREPECAS/19 Meeting was held virtually from 27 to 29 October, 2021. As part of the agenda, the Agreements and Coordination for the Implementation of GREPECAS/RASG-PA Safety Objectives were discussed.

1.7 In this context, it was noted that in June 2021 the implementation of PBN procedures was carried out in Guapi, Colombia, an aerodrome with a runway for visual flight with the participation of Aerocivil and the operator SATENA. Since its implementation, flight data has been collected to allow comparison with data from a period prior to implementation, so that conclusions about potential benefits can be drawn.

1.8 Unstable approaches and landing after unstable approaches are precursors to at least 24% of all fatal runway excursions. The results of the Guapi implementation metrics are shown in following Tables:

TABLE 1

	Before	After	Change
Unstable approach	12/year (2.5% of all approaches)	0/year (0% of all approximations)	-100%
Hard landings	2/year (0.42% of all landings)	0/year (0% of all landings)	-100%

TABLE 2

	Before	After	Change
Cancellation due to weather	28/year (5.83% of all operations)	14/year (2.92% of all trades)	-50%
Fuel consumption	241 Tn/year	204 Tn/year	-15.3%
CO2 emissions	747 Tn CO2/year	642.6 Tn/year	-15%
Flight time savings	24 flight hours/year		

1.9 It was highlighted that the project was carried out in a coordinated manner through the Secretariat, with the contribution of the Colombian PANS OPS specialists, strengthening the interaction of the GANP implementation objectives and the GASP safety aspects.

1.10 The results make it possible to visualize the positive impact of the “PBN to visual flight runway” initiative developed by SAMIG through its Study Group, in terms of benefits for safety and the environment.

1.11 Note was taken of these metrics for reference and analysis by the GESEA specialists involved. See progress on the “PBN to visual flight runway” initiative in the report on Agenda Item 2.

1.12 The Secretariat distributed to the participants the “GANP-GASP” survey aimed at evaluating the level of understanding of the SAM/IG ATM/CNS community on the interaction of the aforementioned global plans, as well as the harmonization initiatives carried out the GREPECAS and RASG-PA. The information from the survey will allow enriching the preparation of a working paper to be presented to the 41st ICAO Assembly. It was indicated that the responses to the survey be sent to the Secretariat via e-mail.

1.13 Other safety matters concerning Flight procedure design units (IFPD) are set out in the report on Agenda Item 2.

Preparation of Vol. III of the CAR/SAM ANP

1.14 The execution of the CAR/SAM Workshop for the elaboration of Vol. III, held from May 9 to 12, 2022, was reviewed. The States continued to advance in the understanding of the 6-step methodology, the draft proposal for several Tables, including the Table on FIR/UIR/CTA, the SWOT analysis, the definition of the KPAs, and the feasibility of managing various KPIs. The use of the instructional material approved by GREPECAS for the States’ activities was emphasized. Presentations from Brazil and Chile during the Workshop were highlighted.

1.15 Uruguay reported its working on the development of Vol. III of the National Air Navigation Plan within the framework for the preparation of the CAR/SAM Regional Air Navigation Plan, based on an analysis process and applying the six-step methodology.

1.16 The States were urged to continue their tasks for the analysis and completion of the Tables of the Template of Vol. III, based on multidisciplinary groups of specialists, remaining the Secretariat at disposal for the assistance that may be required.

1.17 The Secretariat explained the steps to follow to access the electronic CAR/SAM ANP Plan with updated data, within the ICAO portal that contains the iSTARS tool and its “ANP” application with the world's regional plans. The link is indicated for access instructions:

<https://portallogin.icao.int/instructions.htm>

1.18 The summary of paper IP/1.7 — Implementation of the ATS surveillance control service in Córdoba FIR and Comodoro Rivadavia FIR, presented by Argentina (*Spanish only*), is included in the report on Agenda Item 5.

APPENDIX A

STATUS OF IMPLEMENTATION OF CONCLUSIONS AND/OR TASKS EMANATING FROM SAM/IG MEETINGS
(Updated SAM/IG/27, June 2022)

No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
1. Implementation of performance-based navigation (PBN) in the SAM Region							
1-1	<p>Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs</p> <p>That SAM States:</p> <p>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;</p> <p>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.</p>	Determination of the selected air spaces to be optimized with the implementation of PBN	<p>Indicate the selected airspace for redesign or optimisation</p> <p>Report updates</p>	SAM/IG/25	STATES	RO/ATM	VALID
1-2	<p>Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level</p> <p>That SAM States, organisations, users, and stakeholders double efforts to meet regional and interregional performance-based air navigation implementation goals, based on GREPECAS projects, and contemplating the strengthening of national PBN implementation plans so that they include performance indicators and the use of recognised project management tools and methods.</p>	<p>Updating of regional PBN action plans and State action plans.</p> <p>Follow-up to PBN implementation and specific assistance to States.</p>	PBN implementation plans implemented	SAM/IG/26	STATES	RO/ATM	VALID

No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
1-3	<p>Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures</p> <p>SAM States adopt the Regional guide on the implementation of PBN visual runway procedures developed by GESEA and, on this basis, approve national regulations on the implementation of these procedures.</p>	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway	As soon as possible	STATES	RO/ATM	VALID
1-4	<p>Conclusion SAM/IG/25-05 Studies on RNAV visual flight procedures RVFP</p> <p>The GESEA SG2 conduct studies on the implementation of RNAV visual flight procedures (RVFP), in order to have available a harmonised regional guide aligned with ICAO provisions</p>	Deliver studies	Studies on RNAV Visual flight procedures RVFP	No later than October 2022	GESEA	RO/ATM	<p>VALID</p> <p>CANCELLED</p> <p>TASKS HAVE BEEN ASSIGNED TO THE WG PBN TO GESEA VISUAL TRACK THAT DEVELOPS CONCLUSION SAM/IG/25-04</p>
1-4	<p>Conclusion SAM/IG/27-01 Adoption of the SAM Airspace Operational Concept 2022-2026 (EC/SAM CONOPS)</p> <p>The States adopt the document SAM Airspace Operational Concept 2022-2026 (EC/SAM CONOPS), prepared with the purpose of supporting the studies of the specialists and ATM planners involved in the formulation of Volume III of the CAR/SAM ANP, facilitating the understanding of the methodology of Doc. 9883 assumed in the GANP.</p>	Adopt CONOPS EC/SAM	Take technical references and orientations to ATM and ANS regional planning	No later than October 2023	STATES	RO/ATM	APPROVED BY SAM/IG/27
1-5	<p>Conclusion SAM/IG/27-02 Adoption of the Roadmap 2022–2026: Performance-based optimisation of SAM airspace</p> <p>The States adopt the Roadmap 2022–2026: Performance-based optimisation of SAM airspace, and taking into account the metrics and deadlines stipulated in the document, review their national plan and further PBN implementation activities.</p>	Adopt the Roadmap 2022–2026: Performance-based optimisation	Apply technical references and orientations to PBN regional implementation. Aligned to implementation metrics.	No later than October 2023	STATES	RO/ATM	APPROVED BY SAM/IG/27

No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
2. Contingency plans and air space efficiency							
2-1	<p>Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material</p> <p>That the civil aviation authority and/or ATS authorities, in coordination with meteorological authorities and/or meteorological watch offices, implement procedures related to the production of SIGMETs in order to:</p> <ul style="list-style-type: none"> a) Ensure that their ATS/MET cooperation agreements include the exchange of information on radioactive material in messages exchanged between ATS and MET units; b) Foresee training for ATS staff on procedures related to receiving information from the London VAAC concerning radioactive material; c) Coordinate the inclusion of the accidental release of radioactive material or the presence of radioactive clouds in their contingency plans. 	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed.	SAM/IG/26	STATES	RO/ATM RO/MET	VALID
2-2	<p>Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation</p> <p>That SAM States take action and apply procedures in the ACCs to consolidate the implementation of 40NM longitudinal separation minima and give priority to the execution of the action plan for the implementation of standard 20NM separation minima between adjacent FIRs in SAM continental airspace.</p>	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States.	Implementation of 20NM longitudinal separation minima in continental airspace.	SAM/IG/25	STATES	RO/ATM	VALID

No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
2-3	CONCLUSION SAM/IG/25-01 Implementation of strategic direct routing - EDE SAM States analyse the guidance material prepared by the GESEA SG1 on the strategic direct routing (EDE) concept, which has been made available to the administrations, and coordinate with IATA and international airlines, as well as with adjacent States, for its implementation.	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE	As soon as possible	STATES AIRLINES IATA	RO/ATM GESEA	VALID
2-4	CONCLUSION SAM/IG/25-02 Adoption of the guidelines of the SAM-ATS contingency framework plan (MCATS/SAM) and alignment of national plans States adopt the guidelines of the SAM-ATS Contingency Framework Plan developed by GESEA and start harmonising their national ATS contingency plans, so that the documentation required for regional activities on contingency plans and letters of ATS agreement, tentatively scheduled for 2021, may be available on a timely manner.	Follow up ATS contingency planning harmonization	Delivery of National ATS-Contingency Plans harmonized to MCATS	No later than 15 April 2021	STATES	RO/ATM GESEA	VALID SUPERSEDED BY CONCLUSION SAM/IG/27-03
2-4	Conclusion SAM/IG/27-03 Adoption of amendment 1 of the Framework Plan for Contingencies ATS of the SAM Region (MCATS / SAM) and alignment of National Plans States adopt the guidelines of the ATS Contingency Framework Plan of the SAM Region, incorporating Amendment 1 covering Appendix E and Appendix I, aimed at completing and publishing their national ATS Contingency Plans, in order to having such documentation for the regional events on optimization of ATS coordination and Contingency Plans (SOUTH SAM and NORTH SAM), scheduled for the second half of 2022.	Follow up to the harmonization of ATS contingency plans	Issuance of National ATS contingency plans by States, aligned with MCATS.	No later than 31 July 2022	STATES	RO/ATM GESEA	APPROVED BY SAM/IG/27

No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
2-5	<p>Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework</p> <p>States support GESEA activities towards a second stage of the MCATS, with a view to developing guidance material for a “SAM ATM/CNS Contingency Framework Plan”.</p>	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR States.	ATM/CNS contingency Plan Framework Plan for SAM	No later than October 2023	GESEA	RO/ATM	VALID
3. ATFM implementation							
3-1	<p>Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences</p> <p>ATFM services implemented in the SAM States provide for the development of the Daily Plan - PDA and coordinated the means and procedures for distribution or publication in repositories or websites on a regular basis, designating its focal points responsible for implementing this initiative. In addition, an agile procedure for developing ATFM Regional Teleconferences is studied and defined, with the goal of progressively achieving a daily periodicity.</p>	<p>Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable.</p> <p>Sign or update ATFM agreement letters to formalize the exchange and its processes.</p> <p>Study media for ATFM teleconferences</p>	PDA exchanged between SAM region dependencies and CAR if applicable	SAM/IG/26	STATES / ATFM FOCAL POINTS	RO/ATM	VALID
3-2	<p>Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies</p> <p>That, SAM States prioritise the provision of the following for their ATS and ATFM services:</p> <p>a) Strengthen the functions of the flow management positions (FMPs) or units (FMUs), providing them with the prerogatives for coordinating and supporting ATS services;</p>	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	Support to ATFM and ATC	SAM/IG/25	STATES	RO/ATM	VALID

No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
	<ul style="list-style-type: none"> b) Define the profile and skills of the ATFM staff, and provide programmes for initial and recurrent training for the Staff; c) Mandate that ATFM measures are strictly based on the Doc. 9971 to face situations generating capacity/demand imbalance, especially in cases of ATS capacity degradation caused by unforeseen events; d) Establish instructions and supervision H24, ensuring that ATFM measures has the less impact for international flights, and all ATFM measures are agreed with adjacent ATFM or ACC dependencies; e) Mandate the correct application of the ATFM process, from the ATM planning phase to the phase of operations analysis and performance control; and f) Exclude the use of NOTAM of Flow Control to deal with situations of demand/capacity unbalance, with the only exception of the initial response that an ACC may require in the first 12 hours of ATS contingency. 						
3-3	<p>Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)</p> <p>States adopt the ATFM Operations Plan (OPSAM) and provide for the ongoing participation of their ATFM services in the sharing of data for the Regional Dashboard of indicators and BRISA operational teleconferences. At the same time, each State should encourage the participation of airlines, airports and users in OPSAM.</p>	<p>Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.</p>	<p>OPSAM plan implemented and generating KPIs.</p>	SAM/IG/29	STATES	RO/ATM	VALID
3-4	<p>Conclusion SAM/IG/26-02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026</p> <p>The States adopt the Guide for the implementation of ATFM in the SAM Region 2022-2026, harmonised with the objectives of regional integration of this service and taking into account</p>	<p>SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the</p>	<p>State following guidance of the document and reaching Phase IV of implementation.</p>	December 2025	STATES	RO/ATM	VALID

No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
	the implementation phases and deadlines foreseen.	solution of demand/capacity imbalances in the Region.					
3-5	<p>Conclusion SAM/IG/27-04 Manual for the Calculation of Runway Capacity and ATC Sector (OPSAM)</p> <p>States adopt the Manual for the Calculation of Runway Capacity and ATC Sector, and carry out calculation activities in their airport headquarters and ATS units, recognizing that it is essential to have updated data to provide the ATFM service efficiently.</p>	Implementation of a common methodology for runway capacity and ATC sector calculation	Calculation of runway capacity and ATC sector updated	December 2026	STATES	RO/ATM	APPROVED BY SAM/IG/27
5. Operational implementation of new ATM automated systems and integration of the existing systems							
5-1	<p>Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages</p> <p>That States:</p> <p>a) Approve the ATM/FPL Roadmap and the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages; and</p> <p>b) Adopt the guidelines and procedures of the ATM/FPL Roadmap.</p>	Adoption of the ATM/FPL roadmap by states	<p>- Roadmap implemented</p> <p>- Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages.</p>	SAM/IG/27	STATES	RO/CNS RO/ATM GT Interop	VALID



No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
5-2	<p>Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase</p> <p>That SAM States currently in the AIDC pre operational phase, in order to reduce time in this phase and migrate to the operational phase:</p> <ul style="list-style-type: none"> a) operate AIDC for a period of time to obtain the skills required for use thereof; b) monitor AIDC operation, recording errors made during the reporting, coordination and transfer stages; c) conduct statistical measurements based on the results of b), in order to identify the most frequent errors; d) based on the results of c), take the necessary action to mitigate errors; and e) report the results obtained in c) and d) and disseminate the lessons learned at events, teleconferences and AIDC implementation meetings of the SAM Region, so that they may serve as a reference for other AIDC implementations. 	Follow-up and coordination via teleconferences and meetings	AIDC operational connection completed	December 2019	STATES	RO/CNS and RO/ATM	VALID
5-3	<p>Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users</p> <p>That, pursuant to the standard requiring the implementation of the exchange of OPMET messages in IWXXM GML format by 5 November, States should:</p> <ul style="list-style-type: none"> a. Adjust AMHS terminals of aeronautical meteorology users so that they may transmit and receive OPMET messages in IWXXM GML format b. Implement the necessary AMHS interconnections in order to facilitate the transmission and reception of OPMET messages in IWXXM GML format c. States in a position to do so should conduct OPMET message exchange trials in IWXXM GML format 	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results	SAM/IG/26	SAM REGION STATES	ICAO SAM Office	<p>VALID</p> <p>SAM/IG/27 – until May 2022, the following States have implemented AIDC connections:</p> <ul style="list-style-type: none"> Brazil (9 out of 25); Chile (2 out of 11); Colombia (4 out of 13); Ecuador (3 out of 3); Panama (2 out of 6) and Peru (3 out of 6).

No.	Task to be developed	Specific tasks	Deliverables	Completion date	Responsible party	Members supporting the task	Status of implementation
5-4	<p>Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project</p> <p>That the Secretariat:</p> <p>a) Consult Trinidad and Tobago on their interest in participating in a potential regional implementation of Space-based ADS-B, together with Chile and Panama, initially;</p> <p>b) Initiate the procedures, together with the Technical Cooperation Bureau (TCB), to enable the contracting of the service through Regional Project RLA/03/901; and</p> <p>c) Organise an ad-hoc group under Regional Project RLA/03/901, with those States interested in participating in the regional implementation of Space-based ADS-B, for the drafting of the necessary documents for a potential contracting of the service.</p>	<p>Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service.</p>	<p>Support concerned states and coordination with TCB ICAO</p>	<p>No later than SAM/IG/26</p>	<p>RO/CNS</p>	<p>Panama, Chile, Trinidad and Tobago and other interested states.</p>	<p>VALID</p> <p>SAM/IG/27 – Chile, Panama, Trinidad & Tobago intend to resume, after recovery of normal flights post pandemic</p>
5-5	<p>Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics</p> <p>a) The CNS/ANP Subgroup, activated at the SAM/IG/26 Meeting, will carry out the revision of the CNS tables contained in Vol. II of the CAR/SAM Air Navigation Plan, referring to the information of the SAM States and provide support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics;</p> <p>b) The Secretariat circulates a letter to SAM States nominating participants in the CNS/ANP Subgroup; and</p> <p>c) SAM States nominate representatives in sufficient numbers to perform the tasks assigned to the CNS/ANP Subgroup.</p>	<p>Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.</p>	<p>ANP CAR /SAM; Vol. II Update and Vol. III elaborated</p>	<p>SAM/IG/29</p>	<p>STATES</p>	<p>RO/ATM</p>	<p>VALID</p> <p>SAM/IG/27 – First Subgroup Teleconference: 26 May 2022</p>

APPENDIX B

FOLLOW-UP TO THE CONCLUSIONS AND TASKS ESTABLISHED IN THE SAM/IG MEETINGS

(As reported by states in SAM/IG/27, May-June 2022)

ARGENTINA		Specific tasks	Deliverables (Expected completion period)	Status of implementation
No.	Conclusion			
B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28
B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	TO BE REVIEWED AT SAM/IG/28
B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	AIDC implementation temporarily suspended. Consideration will be given to the letter of operational agreement for implementation of AIDC between two centres as part of the activities prior to restart.
B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	Progress under SG2 was reported through TABLE sent to SAM RO on 22-April 2022.
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	Progress under SG2 was reported through TABLE sent to SAM RO on 4 April 2022.

1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	Argentina reported at SAM/IG/25 that work was in progress.
1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	The regional material is under review as opportunities for improvement have been identified and will be addressed by GESEA SG2.
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	Argentina is reviewing the letters of agreement between the ANSP and the NWS.
2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	Argentina reported at SAM/IG/25 that work was in progress. A survey is being carried out to measure progress.

2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	State experts are collaborating within the context of GESEA SG1 for the development of guidance material for the Region, as an opportunity for improving its contents had been identified. A new proposal from the Region to adapt the scenario to UPR is under study. An IP on EDE/UPR was presented at SAM/IG/27.
2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	APPROVED AT SAM/IG/27 Comment on the superseded SAM/IG/25-02: The ATS contingency plan is published in ENR 1.15, in Spanish. A SUPP will be published in English. Although it had been published in both languages, when introduced into the first amendment to the AIP, the English text--already available--was omitted. This will be remedied by means of a supplement as soon as possible and, as such, will not subject to the AIRAC publication cycle. This was reinforced through a national regulatory framework (RAAC Part 211) for the development of ATS contingency plans, which includes provisions set forth in the MCATS/SAM. Contingency plans are currently being drawn for use in each ATS unit.
2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS

3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	<p>Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable.</p> <p>Sign or update ATFM agreement letters to formalize the exchange and its processes.</p> <p>Study media for ATFM teleconferences</p>	<p>PDA exchanged between SAM region dependencies and CAR if applicable</p> <p>(SAMIG26)</p>	TO BE REVIEWED AT SAM/IG/28
3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	<p>Support to ATFM and ATC</p> <p>(SAMIG25)</p>	ATFM measures are being applied since May 2018 in accordance with Doc 9971 and other ICAO standards.
3-3	Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)	Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.	<p>OPSAM plan implemented and generating KPIs.</p> <p>(SAMIG29)</p>	<p>Argentina (EZE FMU - EANA) has adopted the OPSAM Plan since its approval at SAMIG/26 (2021), and participates in BRISA briefings at the pre-tactical (weekly: every Tuesday) and strategic and post-operational (monthly: last Thursday of each month) level.</p> <p>In this sense, data is shared with other SAM States to generate regional indicators (KPIs).</p>
3-4	Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026	SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.	<p>State following guidance of the document and reaching Phase IV of implementation.</p> <p>(DECEMBER 2026)</p>	<p>Status of ATFM development in Argentina:</p> <p>Phase ATFM II A (basic national)</p> <p>Still pending to reach Phase III (cross-border):</p> <ul style="list-style-type: none"> · ATFM slots · Ground delay programme · Dynamic capacity/demand update · FPLs automatically updated when there is a delay due to ATFM measures, so that they are not removed from the ATM system · Integration of AMAN, DMAN, ACDM and ATFM · Capacity building

3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM	Updated runway and ATC sector capacity calculations. (DECEMBER 2026)	APPROVED AT SAM/IG/27
5-1	Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages	Adoption of the ATM/FPL roadmap by states	- Roadmap implemented - Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages. (SAMIG27)	NOT in the short term. Regulations under development: Envisaged for inclusion in the General Procedures Regulations that apply to ARO units, a document still in the process of approval.
5-2	Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase	Follow-up and coordination via teleconferences and meetings	AIDC operational connection completed. (DECEMBER 2019)	AIDC implementation temporarily suspended.
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results. (SAMIG26)	The AMHS system was fully replaced and became operational in May 2022. (The current system allows operation in XML format.)
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	Support concerned states and coordination with TCB ICAO (SAMIG26)	NOT APPLICABLE
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	Teams of experts were created to review the tables in Volume II and also for cxVolume III.

BOLIVIA		Specific tasks	Deliverables (Expected completion period)	Status of implementation
No.	Conclusion			
B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28
B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	TO BE REVIEWED AT SAM/IG/28
B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	TO BE REVIEWED AT SAM/IG/28
B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	TO BE REVIEWED AT SAM/IG/28
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	In March this year, the redesigned TMA of La Paz became operational through AIRACs published in due course with the corresponding STARs, SIDs and IAPs. Its implementation was delayed due to the global sanitary crisis and the transition to a new air navigation service provider. The design phase of the Cochabamba TMA has concluded, and flight validation is expected to be completed soon.

1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	
1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	In this regard, since 2010, Bolivia has been developing PBN procedures for aerodromes where nav aids are not available for conventional procedures. Although these aerodromes are not declared as international, they have benefited from improved accessibility, overcoming weather conditions that prevented VFR operations. The CAA is currently reviewing the procedures at these aerodromes to align them with the Regional Guide on Implementation of PBN Procedures for Visual Runways.
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27

2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	Bolivia had completed the implementation, as reported in IP/5.1 of SAM/IG/25, but due to the change of air navigation provider (AASANA to NAABOL), operational agreements are in the process of adoption, and the contingency plan on radioactive clouds and accidental release of radioactive material is being drafted.
2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	
2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	Bolivia has participated in GESEA meetings to address the issue, as well as in the development of guidelines. EDE has not yet been implemented, in the understanding that it is not necessary, but Bolivia is ready to meet the requirements made by aircraft operators through IATA.

2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	APPROVED AT SAM/IG/27 Comment on the superseded SAM/IG/25-02: In this regard, in coordination with the air navigation service provider, it was decided that the guidelines of the SAM ATS Contingency Framework Plan would be applied, starting with the inclusion of the creation of an operational group on the subject in both the provider and the Bolivian civil aviation authority. Although an ATS contingency plan had been published in the AIP, a new ATS contingency plan was agreed for the La Paz FIR, following the publication processes defined by the State. Likewise, the Guide on the implementation of the contingency plan will be followed, in accordance with ICAO guidelines.
2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS
3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable. Sign or update ATFM agreement letters to formalize the exchange and its processes. Study media for ATFM teleconferences	PDA exchanged between SAM region dependencies and CAR if applicable (SAMIG26)	TO BE REVIEWED AT SAM/IG/28

3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	Support to ATFM and ATC (SAMIG25)	
3-3	Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)	Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.	OPSAM plan implemented and generating KPIs. (SAMIG29)	Bolivia, through ANSP and DGCA officials, participates in the SAM-BRISA ATFM operational teleconferences, sharing tactical and pre-tactical information with the participating States on a weekly and monthly basis. Likewise, Bolivia served as HOST in April this year, a satisfactory experience for the members of the Bolivian team. Likewise, data is generated for the regional indicator dashboard in accordance with a pre-established format and then sent to GESEA.
3-4	Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026	SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.	State following guidance of the document and reaching Phase IV of implementation. (DECEMBER 2026)	
3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM	Updated runway and ATC sector capacity calculations. (DECEMBER 2026)	APPROVED AT SAM/IG/27
5-1	Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages	Adoption of the ATM/FPL roadmap by states	- Roadmap implemented - Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages.	

			(SAMIG27)	
5-2	Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase	Follow-up and coordination via teleconferences and meetings	AIDC operational connection completed. (DECEMBER 2019)	
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results. (SAMIG26)	Aeronautical meteorology users in the air navigation provider have AMHS terminals for sending meteorological information. However, in order to improve the ability to transmit and receive OPMET messages in IWXXM format, there is a procurement plan envisaged for 2023.
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	Support concerned states and coordination with TCB ICAO (SAMIG26)	NOT APPLICABLE
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	Bolivia participates in the Interop TF workshops. In this regard, the CNS/ANP Subgroup has held coordination meetings and the standard table profile is available for updating purposes. Bolivia is prepared to participate in the new ANP Subgroup, in the CNS area, to further the development of VOL III.

<<<<

BRAZIL		Specific tasks	Deliverables (Expected completion period)	Status of implementation
No.	Conclusion			

B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28
B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	TO BE REVIEWED AT SAM/IG/28
B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	TO BE REVIEWED AT SAM/IG/28
B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	Brazil acknowledges and continues to implement PANS-OPS recommendations of ICAO regional groups.
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	FINALISED
1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	Brazil established the Procedure and Airspace Study Group (GEPEA), which, among other objectives, seeks to identify PANS-OPS best practices and implement these practices in a harmonised manner at the national level.

1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	Brazil has been actively involved in the development of criteria for the implementation of PBN procedures for visual RWI and has been applying these criteria at national level. Procedures were developed for 4 aerodromes and 8 more will be published by 2024.
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	FINALISED
2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	FINALISED

2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	Brazil implemented strategic direct routing (EDE) in four FIRs. A working paper will be presented in this regard.
2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	APPROVED AT SAM/IG/27 Comment on the superseded SAM/IG/25-02:
2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS
3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable. Sign or update ATFM agreement letters to formalize the exchange and its processes. Study media for ATFM teleconferences	PDA exchanged between SAM region dependencies and CAR if applicable (SAMIG26)	TO BE REVIEWED AT SAM/IG/28
3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	Support to ATFM and ATC (SAMIG25)	FINALISED

3-3	Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)	Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.	OPSAM plan implemented and generating KPIs. (SAMIG29)	OPSAM is being used in international operational meetings (BRISA) at the pre-tactical (weekly) and strategic (monthly) level, and States send the data to CGNA to update the dashboard.
3-4	Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026	SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.	State following guidance of the document and reaching Phase IV of implementation. (DECEMBER 2026)	Brazil has fully implemented ATFM in airspace under the jurisdiction of DECEA.
3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM	Updated runway and ATC sector capacity calculations. (DECEMBER 2026)	APPROVED AT SAM/IG/27
5-1	Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages	Adoption of the ATM/FPL roadmap by states	- Roadmap implemented - Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages. (SAMIG27)	In 2021, Brazil implemented an automated system for centralised flight plan management that provides feedback messages to FPL originators, sending acknowledgment (ACK) or rejection (REJ) messages related to the flight plans submitted. The Secretariat has stressed that the format adopted in Brazil is not fully consistent with the format set forth in the document prepared by the ATM/FPL Subgroup, because the Brazilian system was developed before the ATM/FPL Roadmap was published. Brazil was urged to analyse the possibility of adjusting the system to match the format proposed in the ATM/FPL Roadmap.

<p>5-2</p>	<p>Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase</p>	<p>Follow-up and coordination via teleconferences and meetings</p>	<p>AIDC operational connection completed. (DECEMBER 2019)</p>	<p>Amazonico ACC – Maiquetia ACC Pre-operational tests were carried out in the first half of February 2022. The transfers of control between the two centres were, for the most part, successful. The AMAZON ACC, based on a report generated by SAGITARIO (Brazilian ATC system), is in the process of analysing the failures that occurred. The report will serve as a basis for adjusting the system configuration and the operating procedures in accordance with Maiquetia and software correction requests.</p> <p>Curitiba ACC – Asunción ACC DECEA's Operations Sub-department is negotiating the memorandum of understanding between the centres, which will contain the parameters and standards for pre-operational testing.</p> <p>Atlantico ACC –Dakar ACC Atlantico ACC received the visit of representatives of the Dakar centre to discuss the implementation of AIDC with AO ACC. Representatives of DECEA also participated in the meeting. The centres agreed to draft documents specifying testing parameters and schedule, as well as the future operation of the AIDC.</p> <p>Amazónico ACC – Lima ACC The last tests were conducted in June and July 2021, noting a high level of rejection of ABI messages sent from AZ ACC to Lima. 94% of ABI messages generated by the AZ ACC received a logical rejection message (LRM) in response. The SDOP (Operations Sub-Department) analysed the errors reported in the LRMs produced by the Lima system and</p>
------------	------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------	------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

				found no inconsistencies in the content of the cited FPL fields. The result of the analysis was presented to the responsible parties in Lima, confirming a misinterpretation of field contents by the Lima system. In August 2021, Lima reported the problem for analysis by the system provider, Indra. DECEA expects that the errors in the Indra system will be corrected for this point onwards in order to schedule new tests between the Manaus and Lima centres.
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results. (SAMIG26)	FINALISED
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	Support concerned states and coordination with TCB ICAO (SAMIG26)	NOT APPLICABLE
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	The participants of the CNS/ANP Subgroup should determine which tables must be included in the Plan, and propose changes to table formats, if necessary, in order to have a document that reflects State plans, taking into account that the document describes the plans of the States of two Regions (CAR and SAM). The strategy to be adopted entails approving the review and update of the information contained in Volume II, as it relates to SAM States, at a meeting of the SAM Regional Implementation Group (SAM/IG). In this regard, the Secretariat noted that the SAM/IG/27 meeting was scheduled to be held virtually, on 30 May to 3 June 2022.

				<p>The Secretariat suggested that, once the task of reviewing Volume II had been completed, the CNS/ANP Subgroup could work on updating the COM lists for the allocation of frequencies (navaids, VHF, etc.), using the Frequency Finder application as a tool. In this regard, coordination with the Secretariat of the Frequency Spectrum Management Panel (FSMP) will be resumed in order to provide training to all SAM States on the use of this application.</p>
--	--	--	--	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<<<<

CHILE		Specific tasks	Deliverables (Expected completion period)	Status of implementation
No.	Conclusion			
B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28
B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	In process
B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	TO BE REVIEWED AT SAM/IG/28

B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	Currently in the final phase of the updating and certification of the 10,000ft transition altitude for terminal areas. Arrival flows to the Santiago TMA have been optimised and training is being provided to ATCOs as part of the implementation of parallel STARs.
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	FINALISED
1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	FINALISED
1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	The current Chilean regulation DAP 11 137, "Criteria and requirements for implementing and executing RNAV (GNSS) approaches on visual runways at aerodromes outside controlled airspace", in force since 2017, is in the process of being updated, based on the Regional Guide on departures from visual runways. The aforementioned document will continue to be applicable to general aviation and CAT A-B aircraft. No RNAV visual flight procedure (RVFP) studies are foreseen in the short term.
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27

1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	The civil aviation authority (DGAC) and the meteorological authority (DMC) have signed a letter of agreement with the Chilean Nuclear Energy Commission (CCHEN) to address cases of accidental release of radioactive material, in force since 2018. This letter is linked to the arrangements established for the issuance by meteorological watch offices of SIGMETs on radioactive material, other meteorological phenomena and volcanic ash clouds.
2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	There are locations with poor communications that have prevented a reduction of longitudinal separation. Plans are being developed to improve VHF coverage. No estimated completion date yet.
2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	In October 2020, AIC N°19 was published informing about the implementation of strategic direct routing in the upper airspace of the Antofagasta and Santiago FIRs. Based on Chile's route network structure and considering that airspace optimisation has been completed, it is estimated that the benefits of implementing strategic direct routing in jurisdictional airspace will be minimal.

2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	APPROVED AT SAM/IG/27 Comments on the superseded SAM/IG/25-02: Bolivia: Awaiting confirmation of its focal point. Peru: Harmonised. Argentina: Harmonised National contingency plan current and published. Pending publication of the English version.
2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS
3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable. Sign or update ATFM agreement letters to formalize the exchange and its processes. Study media for ATFM teleconferences	PDA exchanged between SAM region dependencies and CAR if applicable (SAMIG26)	Chile is sending an ADP to ATFM addressees in the Region, as agreed by Subgroup 3 - ATFM of GESEA. Likewise, Chile participates in the pre-tactical and the post-operational BRISA briefings every Tuesday and last Thursday of each month, in which all ATFM units of the Region participate with a standard format, using the OPSAM Dashboard. Chile is in charge of the BRISA GADHOC of GESEA/SG3.
3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	Support to ATFM and ATC (SAMIG25)	Conclusion a): As of 27 April 2020, Chile activated a national FMU that oversees FMPs at the Iquique, Santiago, Puerto Montt and Punta Arenas ACCs (SCFZ-SCEZ-SCTZ-SCCZ-SCCZ FIRs), and FMPs at the Temuco and Concepción APPs; supporting ATS flow management at those airports that have experienced capacity reductions due to airport

				<p>infrastructure and other restrictions published in Chile's AIP.</p> <p>It should be noted that Chile is currently in ATFM phase 2A and planning to transition to ATFM phase 2B in 2023.</p> <p>Conclusion b): In the aforementioned ACCs, FMPs were filled by ATC personnel from the unit who had received ATFM training. In those units that did not have ATFM-trained personnel, capacity-building programmes were carried out to level up the ATC supervisors or personnel designated for FMP tasks in the ACCs of Iquique, Santiago and Puerto Montt (SCFZ-SCEZ-SCTZ FIRs); and in APPs and TWRs of interest, so as to use a common language for DCB coordination purposes.</p> <p>In October 2021, ATFM experts from Chile received international training from COCESNA.</p> <p>Conclusion c): ATFM in Chile is strictly based on measures set out in Doc 9971/2018. Notwithstanding the above, the DGCA of Chile formulated regulation DAP 11 136 (https://www.dgac.gob.cl/normativa/reglamentacion-aeronautica/normativa-para-opinion/) currently under consultation prior to publication.</p> <p>Conclusion d): Instructions have been developed for use at national level and TMIs have been used only for domestic cabotage. International flights are not subject to restrictions. Depending on the availability of staff in the FMU and in each FMP, after operating hours in each position, DCB monitoring falls upon the ATC supervisors of each ACC, supported by the ADP prepared by the FMU (Chile AIP / Vol. I / ENR. 1.9).</p> <p>Conclusion e): Chile is working on the implementation of the service with all its stages and stakeholders.</p> <p>Conclusion f): Chile has excluded the use of flow control NOTAMs.</p>
--	--	--	--	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

3-3	Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)	Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.	OPSAM plan implemented and generating KPIs. (SAMIG29)	FINALISED
3-4	Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026	SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.	State following guidance of the document and reaching Phase IV of implementation. (DECEMBER 2026)	Adopted and gave rise to DAP 11 136. The composition of the ATFM structure (FMPs, FMUs) was formalised through the respective institutional administrative procedures for its implementation in ACC, APP and TWR units of the country, as described in 2.10.1.
3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM	Updated runway and ATC sector capacity calculations. (DECEMBER 2026)	APPROVED AT SAM/IG/27
5-1	Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages	Adoption of the ATM/FPL roadmap by states	- Roadmap implemented - Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages. (SAMIG27)	ATM/FPL Roadmap approved and in the process of adoption of the guidelines and procedures. FPL errors have been minimised through reporting and suggestions to users, with very good results. Frequentis was asked about the possibility of implementing ACK and REJ functionality in AMHS terminals; awaiting response.
5-2	Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase	Follow-up and coordination via teleconferences and meetings	AIDC operational connection completed. (DECEMBER 2019)	AIDC between Iquique ACC and Lima ACC implemented in the operational phase.

				For the Santiago and Oceanic ACCs, implementation is scheduled to start in June 2022 and the measures contained in conclusion SAM/IG/21-03 will be adopted during the pre-operational phase.
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results. (SAMIG26)	To date, only 20% of the meteorological units have AMHS terminals, so it is not possible to receive or transmit information in IWXXM format. MET message exchange trials were carried out, with the exchange of attachments between the automatic message switching centres of Chile and Peru, with good results. AMHS terminals are being implemented throughout the MET network.
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	Support concerned states and coordination with TCB ICAO (SAMIG26)	The initiative to implement space-based ADS-B under project RLA 03/901 is contemplated in the draft budget for 2023. Initially, and depending on governmental confirmation of the required funds, implementation will be carried out in limited airspaces of the Antofagasta FIR that are of interest for flight safety and efficiency.
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	Chile is represented in the CNS/ANP subgroup by electronic engineering professionals and, with the support of the States gathered at the Third Workshop/Meeting of the Interop TF Subgroups (Interop TF/3), Chile assumed the rapporteurship of the subgroup. The first teleconference of the CNS/ANP subgroup was held on 26 May 2022.

<<<<

GUYANA	Specific tasks	Deliverables	Status of implementation
--------	----------------	--------------	--------------------------

No.	Conclusion		(Expected completion period)	
B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28
B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	In process
B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	TO BE REVIEWED AT SAM/IG/28
B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	Currently, in the final phase of updating and certification of the 10,000ft transitional altitude for terminal areas. Arrival flows to the Santiago TMA have been optimised and the implementation of parallel STARs is in the ATCO training stage.
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	FINALISED
1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	FINALISED

1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	The current Chilean regulation DAP 11 137, "Criteria and requirements for implementing and executing RNAV (GNSS) approaches on visual runways at aerodromes outside controlled airspace", in force since 2017, is in the process of being updated, based on the Regional Guide on departures from visual runways. The aforementioned document will continue to be applicable to general aviation and CAT A-B aircraft. No RNAV visual flight procedure (RVFP) studies are foreseen in the short term.
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	The civil aviation authority (DGAC) and the meteorological authority (DMC) have signed a letter of agreement with the Chilean Nuclear Energy Commission (CCHEN) to address cases of accidental release of radioactive material, in force since 2018. This letter is linked to the arrangements established for the issuance by meteorological watch offices of SIGMETs on radioactive material, other meteorological phenomena and volcanic ash clouds.

2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	There are locations with poor communications that have prevented a reduction of longitudinal separation. Plans are being developed to improve VHF coverage. No estimated completion date yet.
2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	In October 2020, AIC N°19 was published informing about the implementation of strategic direct routing in the upper airspace of the Antofagasta and Santiago FIRs. Based on Chile's route network structure and considering that airspace optimisation has been completed, it is estimated that the benefits of implementing strategic direct routing in jurisdictional airspace will be minimal.
2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	APPROVED AT SAM/IG/27 Comments on the superseded SAM/IG/25-02: Bolivia: Awaiting confirmation of its focal point. Peru: Harmonised. Argentina: Harmonised National contingency plan current and published. Pending publication of the English version
2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS

3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	<p>Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable.</p> <p>Sign or update ATFM agreement letters to formalize the exchange and its processes.</p> <p>Study media for ATFM teleconferences</p>	<p>PDA exchanged between SAM region dependencies and CAR if applicable</p> <p>(SAMIG26)</p>	<p>Chile is sending an ADP to ATFM addressees in the Region, as agreed by Subgroup 3 - ATFM of GESEA. Likewise, Chile participates in the pre-tactical and the post-operational BRISA briefings every Tuesday and last Thursday of each month, in which all ATFM units of the Region participate with a standard format, using the OPSAM Dashboard.</p> <p>Chile is in charge of the BRISA GADHOC of GESEA/SG3.</p>
3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	Support to ATFM and ATC (SAMIG25)	<p>Conclusion a): As of 27 April 2020, Chile activated a national FMU that oversees FMPs at the Iquique, Santiago, Puerto Montt and Punta Arenas ACCs (SCFZ-SCEZ-SCTZ-SCCZ-SCCZ FIRs), and FMPs at the Temuco and Concepción APPs; supporting ATS flow management at those airports that have experienced capacity reductions due to airport infrastructure and other restrictions published in Chile's AIP.</p> <p>It should be noted that Chile is currently in ATFM phase 2A and planning to transition to ATFM phase 2B in 2023.</p> <p>Conclusion b): In the aforementioned ACCs, FMPs were filled by ATC personnel from the unit who had received ATFM training. In those units that did not have ATFM trained personnel, capacity-building programmes were carried out to level up the ATC supervisors or personnel designated for FMP tasks in the ACCs of Iquique, Santiago and Puerto Montt (SCFZ-SCEZ-SCTZ FIRs); and in APPs and TWRs of interest, so as to use a common language for DCB coordination purposes.</p> <p>In October 2021, ATFM experts from Chile received international training from COCESNA.</p> <p>Conclusion c): ATFM in Chile is strictly based on measures set out in Doc 9971/2018. Notwithstanding the above, the DGCA of Chile formulated regulation DAP 11 136 (https://www.dgac.gob.cl/normativa/reglamentacion-</p>

				<p>aeronautica/normativa-para-opinion/) currently under consultation prior to publication.</p> <p>Conclusion d): Instructions have been developed for use at national level and TMIs have been used only for domestic cabotage. International flights are not subject to restrictions. Depending on the availability of staff in the FMU and in each FMP, after operating hours in each position, DCB monitoring falls upon the ATC supervisors of each ACC, supported by the ADP prepared by the FMU (Chile AIP / Vol. I / ENR. 1.9).</p> <p>Conclusion e): Chile is working on the implementation of the service with all its stages and stakeholders.</p> <p>Conclusion f): Chile has excluded the use of flow control NOTAMs.</p>
3-3	Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)	Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.	OPSAM plan implemented and generating KPIs. (SAMIG29)	FINALISED
3-4	Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026	SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.	State following guidance of the document and reaching Phase IV of implementation. (DECEMBER 2026)	Adopted and gave rise to DAP 11 136. The composition of the ATFM structure (FMPs, FMUs) was formalised through the respective institutional administrative procedures for its implementation in ACC, APP and TWR units of the country, as described in 2.10.1.

3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM	Updated runway and ATC sector capacity calculations. (DECEMBER 2026)	APPROVED AT SAM/IG/27
5-1	Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages	Adoption of the ATM/FPL roadmap by states	- Roadmap implemented - Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages. (SAMIG27)	ATM/FPL Roadmap approved and in the process of adoption of the guidelines and procedures. FPL errors have been minimised through reporting and suggestions to users, with very good results. Frequentis was asked about the possibility of implementing ACK and REJ functionality in AMHS terminals; awaiting response.
5-2	Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase	Follow-up and coordination via teleconferences and meetings	AIDC operational connection completed. (DECEMBER 2019)	AIDC between Iquique ACC and Lima ACC implemented in the operational phase. For the Santiago and Oceanic ACCs, implementation is scheduled to start in June 2022 and the measures contained in conclusion SAM/IG/21-03 will be adopted during the pre-operational phase.
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results. (SAMIG26)	To date, only 20% of the meteorological units have AMHS terminals, so it is not possible to receive or transmit information in IWXXM format. MET message exchange trials were carried out, with the exchange of attachments between the automatic message switching centres of Chile and Peru, with good results. AMHS terminals are being implemented throughout the MET network.
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	Support concerned states and coordination with TCB ICAO (SAMIG26)	The initiative to implement space-based ADS-B under project RLA 03/901 is contemplated in the draft budget for 2023.

				Initially, and depending on governmental confirmation of the required funds, implementation will be carried out in limited airspaces of the Antofagasta FIR that are of interest for flight safety and efficiency.
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	Chile is represented in the CNS/ANP subgroup by electronic engineering professionals and, with the support of the States gathered at the Third Workshop/Meeting of the Interop TF Subgroups (Interop TF/3), Chile assumed the rapporteurship of the subgroup. The first teleconference of the CNS/ANP subgroup was held on 26 May 2022.

<<<<

PANAMA		Specific tasks	Deliverables (Expected completion period)	Status of implementation
No.	Conclusion			
B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28
B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	TO BE REVIEWED AT SAM/IG/28
B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	TO BE REVIEWED AT SAM/IG/28

B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	TO BE REVIEWED AT SAM/IG/28
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	After two attempts to redesign the Panama TMA, which failed for bureaucratic reasons, the decision was made to proceed with personnel of the same TMA. Accordingly, the staff first received training to build their competencies, to be followed by the creation of a multidisciplinary group to plan and carry out this task. A new PBN design of the Panama TMA is expected to be available by 2025.
1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	Pursuant to the national PBN plan, Panama has already developed PBN procedures for the runways of the Tocumen and Pacifico airports, which are already published in the AIP. With regard to PBN routes, Panama has an RNAV5 route network implemented in 85% of its upper airspace.
1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	Panama has not yet developed any PBN design with these characteristics and therefore has not had the opportunity to adopt the Regional Guide on the implementation of PBN procedures for visual runways.
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27

1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	Coordination took place with the ATM/MET/AIS units to approve the procedures for cases of radioactive clouds or accidental release of radioactive material. Since ships with radioactive waste sporadically pass through the Panama Canal, the Panama Canal Authority (ACP) was included in the procedure. It is expected that these procedures will have been published in the AIP and ATM/MET/AIS and ACP personnel will have been trained by AIRAC date of 11 August.
2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	Barranquilla, Bogota, Kingston 40 NM. CENAMER 20 NM.

2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	The Panama FIR airspace is declared as a general control area. Accordingly, users can fill their flight plans direct to points on a route or coordinates. They must only meet two requirements: be PBN-approved and obtain ATC clearance. The use of direct flight is published in AIP ENR 1.8 in general terms, so the need was felt to align the text with the current terminology, in a clear format, for use by aviation in general.
2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	APPROVED AT SAM/IG/27 Comment on the superseded SAM/IG/25-02: The air navigation service provider took advantage of the fact that the national contingency plan has not yet been published and adopted the guidelines of MCATS/SAM. The AIRAC date set for publication of the national contingency plan based on the regional framework plan is 1 December 2022.
2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS

3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	<p>Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable.</p> <p>Sign or update ATFM agreement letters to formalize the exchange and its processes.</p> <p>Study media for ATFM teleconferences</p>	<p>PDA exchanged between SAM region dependencies and CAR if applicable</p> <p>(SAMIG26)</p>	<p>Air navigation services are planning to develop and disseminate an ADP and use it in teleconferences once staff is available for such functions.</p>
3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	<p>To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11</p>	<p>Support to ATFM and ATC</p> <p>(SAMIG25)</p>	<p>The implementation of ATFM measures is contemplated in our ATFM procedures manual.</p>
3-3	Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)	<p>Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.</p>	<p>OPSAM plan implemented and generating KPIs.</p> <p>(SAMIG29)</p>	<p>Air navigation services are reviewing the OPSAM to align it with the national plan.</p>
3-4	Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026	<p>SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.</p>	<p>State following guidance of the document and reaching Phase IV of implementation.</p> <p>(DECEMBER 2026)</p>	<p>Air navigation services envisage the use of the Guide on the implementation of ATFM, as it facilitates the establishment of a roadmap for effective implementation of ATFM.</p>
3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	<p>Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM</p>	<p>Updated runway and ATC sector capacity calculations.</p> <p>(DECEMBER 2026)</p>	<p>APPROVED AT SAM/IG/27</p>

5-1	Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages	Adoption of the ATM/FPL roadmap by states	<p>- Roadmap implemented</p> <p>- Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages.</p> <p>(SAMIG27)</p>	<p>Panama implemented a procedure for receiving flight plans via AMHS, involving manual delivery of acknowledgement of receipt (ACK) and reject (REJ) messages. It was tested with COPA for several months, but failed because COPA did not verify if messages had been accepted or not.</p> <p>The AIS office at the Tocumen aerodrome is responsible for reviewing and processing 93% of international flight plans. Since the beginning of the recovery from the COVID-19 pandemic, it started to receive and acknowledge receipt of flight plans via internet, then entering them into the system.</p> <p>Discussions were held with COPA to reinstate a procedure for acknowledgement of flight plans, which is due to become effective on 1 July 2022, until such time as the system is upgraded to automatically acknowledge flight plans.</p>
5-2	Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase	Follow-up and coordination via teleconferences and meetings	<p>AIDC operational connection completed.</p> <p>(DECEMBER 2019)</p>	<p>Given that Panama is in the operational phase in the CENAMER, BARRANQUILLA and BOGOTA FIRs and is waiting for KINGSTON to start pre-operational trials, it is considered that this pre-operational phase will definitely be much shorter.</p>
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results.	<p>Although users of meteorological information have AMHS terminals, we do not have the capacity to meet the IWXXM format requirement.</p>

			(SAMIG26)	
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	Support concerned states and coordination with TCB ICAO (SAMIG26)	Panama took the first step to connect to REDDIG II, and it is estimated that Panama will have this link available by August, enabling the reception of the satellite signal. Panama has expressed to AIREON its interest in receiving the space-based ADSB service through a regional contract. We expect to soon have a date by which space-based ADSB surveillance will be provided.
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	Panama has yet to review the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan.

<<<<

PERU		Specific tasks	Deliverables (Expected completion period)	Status of implementation
No.	Conclusion			
B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28

B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	TO BE REVIEWED AT SAM/IG/28
B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	TO BE REVIEWED AT SAM/IG/28
B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	TO BE REVIEWED AT SAM/IG/28
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	In accordance with the Jorge Chávez International Airport expansion project, which includes the commissioning of a second runway parallel to the existing one and a new passenger terminal, the Lima terminal area (Lima TMA) will be redesigned as of 2023. Likewise, the construction of the new Chinchero-Cusco International Airport contemplates the redesign of the Cusco terminal area (Cusco TMA) from 2025 onwards.

1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	As foreseen in the national air navigation plan (PNNA), RNP-AR procedures are to be implemented at all national airports in Peru. By 2022, SID, STAR and RNP-AR IAP procedures will be published for the following airports: Arequipa Cajamarca Pisco Tacna Tarapoto It should also be noted that Peru has reached 100% implementation of version 05 of the ATS SAM route network; that is, all ATS routes in Peru's upper airspace meet the RNAV5 navigation specification.
1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	At present, Peru has PBN procedures for visual runways in different airports in the country, which are in compliance with the Regional Guide prepared by GESEA. See IP.1.1 SAMIG27.
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27

2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	The ATS MET letter of agreement was drawn up and signed in 2013 and then updated in 2019, in which the three items mentioned in the conclusion are fulfilled.
2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	Peru has letters of ATS agreement with two States of the Region, which include the 40NM longitudinal separation according to the following detail. See IP.1.1 SAMIG27.
2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	Through SUP 01/21: Implementation of strategic direct routing (EDE) in the upper oceanic airspace of the Lima FIR, dated 1 June 2021, Peru informed users of the implementation of direct routing in the oceanic area of the Lima FIR.
2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	<p>APPROVED AT SAM/IG/27</p> <p>Comment on the superseded SAM/IG/25-02: The guidelines of the SAM ATS Contingency Framework Plan (MCATS/SAM) are being followed, starting with the creation of the operational decision-making group by the provider.</p> <p>The ATS contingency plan for Peru is published in AIP Supplement 6/21 of 18 December 2021. It contemplates the establishment of the ATS contingency operational group (AOCG), responsible for coordination as needed in case of contingencies, according to the guidelines of the SAM ATS Contingency Framework Plan (MCATS/SAM).</p> <p>Peru is also developing the Guide for the Implementation of the National Contingency Plan, which follows ICAO guidelines.</p>

2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS
3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable. Sign or update ATFM agreement letters to formalize the exchange and its processes. Study media for ATFM teleconferences	PDA exchanged between SAM region dependencies and CAR if applicable (SAMIG26)	On 2 April 2020, Peru started producing the ADP, using as a reference the template contained in Appendix D to the 2020-2025 Guide for the implementation of ATFM in the SAM Region, which is posted on the CORPAC (ANSP) website (https://portal2.corpac.gob.pe/Main.asp?T=5719) and disseminated via e-mail to SAM ATFM units. In order to address various issues related to the provision of the ATFM service, scheduled and <i>ad hoc</i> teleconferences are being held since 2020, in which the collaborative decision-making (CDM) methodology is applied. The teleconferences cover various topics and are attended by the provider (ATS, ATFM), the airlines, the airport operator, as well as the authority (navigation and itineraries). Among the issues covered are: the daily delivery of the coordinated flight scheduling (out of itinerary) by the airport operator to the flow management unit (Lima FMU); meteorological information (SIGMETs, TAFs, etc.) for the development of the ATFM daily plan; coordination for the declaration of temporary capacities; production of data to feed BRISA and the regional dashboard, among others.
3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	Support to ATFM and ATC (SAMIG25)	Regarding items a) and b) of the conclusion, the ATFCM concept of operations (ATFCM CONOPS) for Peru is being developed, which describes the duties of flow management positions (FMPs) and units (FMUs), as well as the profile and competencies of ATFM personnel and the guide for the ATFM training programme for

				<p>all those involved.</p> <p>The implementation of ATFM measures listed in item c) is strictly based on Doc 9971 regarding management of capacity/demand imbalances, which have only been identified at the Jorge Chavez International Airport (AIJC). In this regard, AIJC is the only airport with an FMP, and the ATFM service is provided from 7 a.m. to 7 p.m. and only for domestic flights from the provinces to AIJC (Lima). The need to extend the operation of the FMP is under study.</p> <p>Item d) is met, since ATFM measures are not applied to international flights.</p> <p>Regarding item e), the ATFM process is properly applied, with all its phases: strategic, pre-tactical, tactical, post-operational analysis and performance monitoring.</p>
<p>3-3</p>	<p>Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)</p>	<p>Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.</p>	<p>OPSAM plan implemented and generating KPIs.</p> <p>(SAMIG29)</p>	<p>Through the provider (CORPAC) and the authority (DGAC), Peru participates in the "SAM ATFM Operational Teleconference - BRISA", in which essential strategic, pre-tactical and post-operational information is shared among the States of the SAM Region. Participation involves both weekly and monthly BRISA meetings. Also, according to regional planning, Peru is ready to host them when so required.</p> <p>Regarding the implementation of the "regional indicator dashboard", the State generates the requested data on a monthly basis, using the agreed format, which is sent to GESEA by the established deadline for the purpose of updating the dashboard.</p>

<p>3-4</p>	<p>Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026</p>	<p>SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.</p>	<p>State following guidance of the document and reaching Phase IV of implementation.</p> <p>(DECEMBER 2026)</p>	<p>Regarding the implementation of the different phases defined in the Guide for the implementation of ATFM in the SAM Region 2022-2026, Peru is in the process of implementing the first three phases, as follows:</p> <ul style="list-style-type: none"> ➤ Phase I In accordance with national regulations, Peru has implemented runway and ATC sector capacity measurements at aerodromes where demand exceeds or is expected to exceed ATS system capacity. In this sense, it has implemented such measurements at the Lima and Cusco aerodromes. At present, it does not envisage conducting such study in other aerodromes at national level. Regarding the expected growth of demand for air operations, an analysis of the growth of demand has been carried out, with a focus on post-COVID recovery. ➤ Phase II A There are means available for generating and distributing ATFM information to ATS units through AMHS. Likewise, the ADP and the post-operations daily report are prepared in accordance with ICAO guidelines, and are disseminated through the ANSP website and via e-mail, respectively. Furthermore, the CDM methodology has been implemented through <i>ad hoc</i> teleconferences among stakeholders. Regarding what still needs to be done to complete this phase, it should be noted that, although we have RAP 311, which provides general guidelines, the NTC ATFCM has not yet been published, and is currently being developed. ➤ Phase II B The State does not have a dedicated software for ATFM applications to integrate AMAN/DMAN and ACDM. Dynamic capacity/demand updating is being analysed and implemented at the Jorge Chavez International Airport, currently in the first phase. Likewise, CDM coordination with support areas (especially with the MET service)
------------	------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

				for the conduction of daily scheduled teleconferences is still pending.
3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM	Updated runway and ATC sector capacity calculations. (DECEMBER 2026)	APPROVED AT SAM/IG/27
5-1	Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages	Adoption of the ATM/FPL roadmap by states	- Roadmap implemented - Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages. . (SAMIG27)	Peru receives flight plans via AMHS from 95% of the airlines with scheduled international flights, issuing acknowledgement of receipt (ACK) and reject messages (REJ). Regarding airlines with domestic flights, such as LATAM, VIVA AIR and SKY AIRLINES, they submit their flight plans via AMHS throughout the different controlled aerodromes in Peru.
5-2	Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase	Follow-up and coordination via teleconferences and meetings	AIDC operational connection completed. (DECEMBER 2019)	Peru has been one of the first to carry out activities and apply solutions to solve the problems encountered in the pre-operational phase of AIDC interconnection between adjacent centres of the States. In this sense, this conclusion is fully implemented.
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results. (SAMIG26)	All users of the AMHS messaging network use AMHS terminals to send MET information in the traditional format (TAC). These terminals can send attachments, in accordance with the requirements. Meteorological information in GML or XML format is delivered by manually attaching the message using this extension. The new requirement states that AMHS terminals must produce the attachment containing OPMET information in IWXXM format and send it

				(interconnections) in an AMHS message or have an application installed that encodes the OPMET information in IWXXM format and automatically generates an XML file to be sent by the AMHS system. This requirement has not been met yet, because the current AMHS system does not support this functionality, which is why the provider CORPAC S.A. is in the process of acquiring a new system.
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	Support concerned states and coordination with TCB ICAO (SAMIG26)	NOT APPLICABLE
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	During the last Interop TF workshop organised by the SAM Regional Office, Peru provided the updated tables of VOL II of the CAR/SAM Air Navigation Plan. During that same workshop, Peru presented its experts designated to participate in the new ANP subgroup in the CNS speciality, to support in the development of VOL III, as well as the updated list of participants of the other subgroups.

<<<<

URUGUAY		Specific tasks	Deliverables (Expected completion period)	Status of implementation
No.	Conclusion			
B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28
B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	TO BE REVIEWED AT SAM/IG/28

B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	TO BE REVIEWED AT SAM/IG/28
B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	TO BE REVIEWED AT SAM/IG/28
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	
1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	
1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27

1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	
2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	
2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	Uruguay is participating in GESEA SG1 on the direct routing concept and is in the process of defining EDE for the upper airspace of the Montevideo FIR.
2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	APPROVED AT SAM/IG/27 Comment on the superseded SAM/IG/25-02: The guidelines of the SAM ATS Contingency Framework Plan (MCATS/SAM), aligned with the national plan, are being applied. It is in the process of approval and subsequent publication in the AIP ENR 1.5, in Spanish and English.

2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS
3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable. Sign or update ATFM agreement letters to formalize the exchange and its processes. Study media for ATFM teleconferences	PDA exchanged between SAM region dependencies and CAR if applicable (SAMIG26)	The ATSP of Uruguay will prepare the daily plan (ADP) using as a reference the template contained in Appendix D to the Guide for the implementation of ATFM. In order to address various issues related to the provision of the ATFM service, scheduled teleconferences are being held since 2020, in which the collaborative decision-making (CDM) methodology is applied. The teleconferences cover various topics and are attended by the provider (ATS, ATFM), the airlines, the airport operator, as well as the authority (navigation and itineraries). In 2021, Brazil was included in coordination and collaborative decision-making activities, thus facilitating the analysis and dynamic demand/capacity implementation at the Carrasco international airport and adjacent units to respond specifically to the demand generated during Conmebol soccer games. This experience provided added value in relation to best practices and lessons learned.
3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	Support to ATFM and ATC (SAMIG25)	

3-3	Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)	Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.	OPSAM plan implemented and generating KPIs. (SAMIG29)	The ATSP participates virtually in the meetings of the SAM airspace study and implementation groups, where work is carried out on the basis of a Guide for the implementation of ATFM with the purpose of providing a common regional framework, and for the development of documents on how to draw up ADPs, post-operation reports and ATFM unit manuals. Coordination will take place for the declaration of temporary capacities, and the production of data to feed BRISA and the regional dashboard.
3-4	Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026	SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.	State following guidance of the document and reaching Phase IV of implementation. (DECEMBER 2026)	The ATSP participates virtually in the meetings of the SAM airspace study and implementation groups, where work is carried out on the basis of a Guide for the implementation of ATFM with the purpose of providing a common regional framework, and for the development of documents on how to draw up ADPs, post-operation reports and ATFM unit manuals. Coordination will take place for the declaration of temporary capacities, and the production of data to feed BRISA and the regional dashboard.
3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM	Updated runway and ATC sector capacity calculations. (DECEMBER 2026)	APPROVED AT SAM/IG/27
5-1	Conclusion SAM/IG/25-06 Approval of the ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight	Adoption of the ATM/FPL roadmap by states	- Roadmap implemented - Mitigate the occurrence of errors	

	plans and associated messages		and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages. (SAMIG27)	
5-2	Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase	Follow-up and coordination via teleconferences and meetings	AIDC operational connection completed. (DECEMBER 2019)	
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	Perform the tests and submit results. (SAMIG26)	
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	Support concerned states and coordination with TCB ICAO (SAMIG26)	NOT APPLICABLE
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	

<<<<

VENEZUELA		Specific tasks	Deliverables (Expected completion period)	Status of implementation
No.	Conclusion			
B-1	Conclusion SAM/IG/13-9 - IATA Safety Event Indicators for SAM States	Activities of states with operators for the analysis of operational safety events	SMS analysis and mitigating measures (REPORT IN EACH SAM/IG)	TO BE REVIEWED AT SAM/IG/28

B-2	Conclusion SAM IG/14-18 - Exception for filling alternative destination aerodromes	Application of exception for filling of alternative aerodrome in the format of the FPL by the airline Inclusion of the procedure in the AIP by the States	Procedure included in the AIP (DECEMBER 2015)	TO BE REVIEWED AT SAM/IG/28
B-3	Conclusion SAM/IG/16-1 Model amendment of letter of operational agreement for the operation of the AIDC between two centres	Use of the letter of operational agreement between the ACC of Lima and the ACC of Guayaquil for the operation of the AIDC (Appendix A Question 5 of the Agenda SAM/IG/16)	Model letter of operational agreement (DECEMBER 2016)	TO BE REVIEWED AT SAM/IG/28
B-4	Conclusion SAM/IG/18-01 - PANS-OPS Recommendations for Harmonization of Instrumental Procedures in the SAM Region	Implementation of recommendations developed by the PANS-OPS Group (Appendix B Agenda Item 2 Report SAM/IG/18)	Recommendations developed by the PANS-OPS Group applied (SAMIG21)	Venezuela recognises and continues to implement PANS-OPS recommendations of ICAO regional groups.
1-1	Conclusion SAM/IG/14-6: Projects and/or action plans for PBN redesign of the main South American TMAs	Determination of the selected air spaces to be optimized with the implementation of PBN	Indicate the selected airspace for redesign or optimisation Report updates (SAMIG25)	As foreseen in the national air navigation plan (PNNA) of Venezuela, we have planned the implementation of RNP-AR procedures initially at the "El Gran Roque" national airport. SID, STAR and IAC RNP-AR procedures for this airport are planned to be published by 2022. It should also be noted that Venezuela has reached 75% implementation of version 5 of the SAM ATS RNAV5 route network.
1-2	Conclusion SAM/IG/21-01: Objectives of PBN implementation harmonized at regional and interregional level	Updating of regional PBN action plans and State action plans. Follow-up to PBN implementation and specific assistance to States	PBN implementation plans implemented (SAMIG26)	

1-3	Conclusion SAM/IG/25-04 Adoption of the Regional guide on the implementation of PBN visual runway procedures	Adopt the Regional Guidance on PBN procedures for visual runway implementation	Deliver the national regulation on implementation of PBN procedures for visual runway (AT THE SHORTEST TIME)	
1-4	Conclusion SAM/IG/27-01 Adoption of the operational concept document for SAM airspace 2022-2026 (CONOPS EC/SAM)	CONOPS EC/SAM adopted	Take technical references and guidelines for ATM and Regional ANS planning (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
1-5	Conclusion SAM/IG/27-01 Adoption of Roadmap 2022 – 2026: Performance-Based Optimization of SAM Airspace	Roadmap optimization based on performance, adopted.	Apply technical references and guidelines for the implementation of Regional PBN. Alignment to implementation metrics (NO LATER THAN OCTOBER 2023)	APPROVED AT SAM/IG/27
2-1	Conclusion SAM/IG/23-04: Procedure to be applied in case of radioactive clouds or accidental release of radioactive material	Develop and sign ATS MET cooperation agreements, including information related to radioactive material in exchange messages	ATS MET cooperation agreements signed. (SAMIG26)	<p>The letters of operational agreement between the ATS/MET and SAR/MET services are at the INAC legal advisory office awaiting approval and will subsequently be signed by the parties concerned.</p> <p>The draft contingency plan for cases of volcanic ash and accidental release of radioactive material or presence of radioactive clouds was prepared and is awaiting the respective review by ATS experts at INAC's air navigation services and by the MET authorities of the national Armed Forces.</p>

2-2	Conclusion SAM/IG/21-02: Consolidation of the implementation of 40NM longitudinal separation minima between adjacent FIRs in the SAM Region and promotion of the Action Plan for the implementation of a 20NM separation	Follow-up to the implementation of the 40NM separation, follow-up to the Action Plan for the implementation of 40 NM separation, follow-up to the Action Plan for the implementation of 20NM minima, and specific assistance to States	Implementation of 20NM longitudinal separation minima in continental airspace (SAMIG25)	At present, Venezuela has letters of ATS agreement that include 40NM longitudinal separation with two States of the Region, in accordance with the following table: See IP1.9 SAMIG27.
2-3	Conclusion SAM/IG/25-01 Implementation of strategic direct routing - EDE	Follow up EDE implementation Fuel savings analysis, supported by airlines.	Delivery of AIC and/or SUP AIP by the states, on EDE (AT THE SHORTEST TIME)	Through AIP Supplement C03-A03/21, Venezuela implemented strategic direct routing (EDE) in the airspace between FL290 and FL410 in the Maiquetia FIR, on 20 May 2021, advising users of the implementation of direct routing in the Maiquetia FIR.
2-4	Conclusion SAM/IG/27-03 Adoption of Amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS/SAM) and alignment of National Plans.	Follow up ATS contingency planning harmonization	Delivery of National ATS Contingency Plans harmonized to MCATS. (NO LATER THAN 31 JULY 2022)	<p>APPROVED AT SAM/IG/27</p> <p>Comment on the superseded SAM/IG/25-02: The guidelines of the SAM ATS Contingency Framework Plan (MCATS /SAM) are being applied. We are in the final phase of adaptation and updating in the Maiquetia FIR, based on the decisions adopted by the multidisciplinary operational team of INAC's air navigation services.</p> <p>The ATS contingency plan for the Maiquetia FIR was published in AIP Supplement C02-A02/20 dated 16 July 2020, which included the creation of the ATS operational contingency committee tasked with coordinating as needed in the event of a contingency.</p>

2-5	Conclusion SAM/IG/25-03 Activities for the development of the SAM ATM/CNS contingency framework	Prepare document for a harmonized implementation of ATM/CNS National Contingency Plans, with interfaces to AIM, MET, Airports, etc. services duly in line with neighbouring States, even if applicable, with CAR states	ATM/CNS contingency Plan Framework Plan for SAM (NO LATER THAN OCTOBER 2023)	GESEA: IN PROCESS
3-1	Conclusion SAM/IG/24-01: Procedures for developing and disseminating PDAs and development of ATFM Teleconferences	Develop PDA, coordinating its dissemination with SAM regional ATFM dependencies and CAR if applicable. Sign or update ATFM agreement letters to formalize the exchange and its processes. Study media for ATFM teleconferences	PDA exchanged between SAM region dependencies and CAR if applicable (SAMIG26)	Since 2020, ATFM programmed and <i>ad hoc</i> teleconferences, in which the collaborative decision-making (CDM) methodology is applied, are being held to work on various issues related to the delivery of ATFM services. These teleconferences cover various topics and are attended by air navigation services (ATS, ATFM). Discussions include relevant information that may affect airport capacity and aircraft flow, such as significant weather, NOTAMs, programmed ATFM measures, as well as traffic behaviour, based on demand forecasts and post-operational data; as well as the contribution of capabilities declared by the States to the production of data to feed BRISA and the regional dashboard, among others.
3-2	Conclusion SAM/IG/23-01: Implementation of ATFM measures in accordance with Doc 9971, and coordination in case of ATS contingencies	To meet the provisions of ICAO Doc 9971 and the SARPs contained in Annex 11	Support to ATFM and ATC (SAMIG25)	

3-3	Conclusion SAM/IG/26-01 Adoption of the ATFM Operations Plan (OPSAM)	Adjust ATC and airport capacity to the gradual increase in demand, and contribute to the recovery and sustainability of the air transport system at regional and global level in the new projected scenario. Also, to reinforce the use of KPIs in ATFM and ATM in general.	OPSAM plan implemented and generating KPIs. (SAMIG29)	Venezuela, through its air navigation services, participates in the "SAM ATFM operational teleconferences (BRISA)", sharing essential strategic, pre-tactical and post-operational information with SAM States. Participation takes place in both the weekly and monthly BRISA teleconferences in accordance with regional planning. Regarding the implementation of the "regional indicator dashboard", Venezuela started providing data in May 2022 for the strategic and post-operational briefings that take place on the last Thursday of every month.
3-4	Conclusion SAM/IG/26- 02 Adoption of the Guide on the implementation of ATFM in the SAM Region 2022- 2026	SAM States to implement national or crossborder ATFM services that are suited to the air traffic flow managed by their ATS services and that duly contribute to the solution of demand/capacity imbalances in the Region.	State following guidance of the document and reaching Phase IV of implementation. (DECEMBER 2026)	Regarding the implementation of the different phases set forth in the Guide for the implementation of ATFM in the SAM Region 2021-2025, Venezuela is in phase ATFM I (capacity/demand and baseline), which contemplates the adoption of capacity/demand analyses. To this end, Venezuela has the declaration of runway and ATC sector capacity for the main airport of Maiquetía, the "Simón Bolívar" international airport, and has developed various sources of information that can generate air operations growth forecasts.
3-5	Conclusion SAM/IG/27-04 Adoption of the Manual for calculating Track Capacity and ATC Sector	Implementation of a common methodology for the calculation of track capacity and ATC sectors in SAM	Updated runway and ATC sector capacity calculations. (DECEMBER 2026)	APPROVED AT SAM/IG/27
5-1	Conclusion SAM/IG/25-06 Approval of the		- Roadmap implemented	Venezuela does not have an automated

	<p>ATM/FPL Roadmap and of the format for acknowledgment (ACK) and rejection (REJ) of flight plans and associated messages</p>	<p>Adoption of the ATM/FPL roadmap by states</p>	<p>- Mitigate the occurrence of errors and duplication /multiplicity of flight plans, also providing feedback to the originators of FPLs and associated messages.</p> <p>(SAMIG27)</p>	<p>system for centralised management of flight plans that provides feedback messages to FPL originators through the delivery of acknowledgment (ACK) or reject (REJ) messages in relation to filed flight plans. However, we have adopted the ATM/FPL Roadmap and are expecting to acquire the software soon in order to automatically perform these operations.</p>
<p>5-2</p>	<p>Conclusion SAM/IG/21-03: Activities required in the AIDC pre-operational phase to reduce migration times to the operational phase</p>	<p>Follow-up and coordination via teleconferences and meetings</p>	<p>AIDC operational connection completed.</p> <p>(DECEMBER 2019)</p>	<p>In 2019, Venezuela started conducting activities and implementing solutions to solve problems encountered in the pre-operational phase during AIDC interconnection processes between some adjacent area control centres in Brazil and Barranquilla.</p> <p>The AIDC project is currently halted because ATECH has not updated the air traffic management system software (SAGITARIO) of the Maiquetía ACC for lack of payment. However, trials are still being carried out and AIDC and voice coordination are working in parallel. Pre-operational trials were carried out in the first half of February 2022 with the Amazonico ACC (most of them have been successful), but the aforementioned software requires updating (to correct some errors or failures). In addition, according to a report by SAGITARIO, they are in the process of analysing the failures occurred. This report will serve as a basis to reconfigure the system operating procedures in agreement</p>

				<p>with Maiquetía and software correction requests in order to have a reliable connection to operate.</p> <p>It should be noted that connection trials with the Barranquilla ACC have been successful and are 85% operational.</p>
5-3	Conclusion SAM/IG/23-03: Adaptation of AMHS terminals of aeronautical meteorology users	To meet the provisions of amendment 78 to ICAO Annex 3	<p>Perform the tests and submit results.</p> <p>(SAMIG26)</p>	<p>Trials were carried out with the OPMET data bank of Brazil. Transmission through the AMHS was satisfactory. The second phase of AMHS system implementation is still pending, requiring a software update by INAC's information and communication technology department (OTIC).</p> <p>The new requirement specifies that AMHS terminals either prepare the attachment with OPMET information in IWXXM format and send it (interconnection) in an AMHS message or have an application installed that encodes the OPMET information in IWXXM format and automatically generates a file in XML format to be sent through the AMHS system. This requirement has not been met yet, since the current AMHS system does not support such functionality.</p>
5-4	Conclusion SAM/IG/25-07 Implementation of Space-based ADS-B under a regional technical cooperation project	Provide States that expressed interest in the implementation of ADS-B Satellite support necessary for the procurement of the service	<p>Support concerned states and coordination with TCB ICAO</p> <p>(SAMIG26)</p>	<p>Venezuela is reviewing the technical proposals submitted by ground ADS-B, ADS-C/CPDLC service providers. With regard to space-based ADS-B, the 2019-2023 Air Navigation Plan of Venezuela contemplated its implementation as an ASBU element for the medium term, to which end technical studies shall be carried out</p>

				based on operational requirements, cost-benefit analyses and other relevant studies.
5-5	Conclusion SAM/IG/26-03 Revision of the CNS tables of Vol. II of the CAR/SAM Air Navigation Plan and support in the elaboration of Vol. III of the ANP CAR/SAM, on the CNS topics	Update the information of Vol. II of the CAR/SAM Air Navigation Plan and support the elaboration of ANP CAR/SAM Vol. III, concerning CNS Planning aspects.	ANP CAR /SAM; Vol. II Update and Vol. III elaborated (SAMIG29)	

Agenda Item 2: Report of activities of the GESEA and Subgroups

- a) Review of air navigation priorities in the ATM field**
- b) ATM implementation. Progress of the Subgroups.**
- c) Proposed Conclusions**
- d) Review of the 2022 Work Plan**

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

- a) WP/2.1 – *Report of activities of GESEA Subgroup* (presented by the Secretariat)
- b) WP/2.2 – *Concept of operations for efficiency and capacity in SAM airspace 2022-2026 (CONOPS)* (presented by the Secretariat)
- c) WP/2.3 – *Roadmap 2022 – 2026: Performance-based optimization of SAM airspace* (presented by the Secretariat)
- d) WP/2.4 – *Opportunity to improve the SAM Region ATS contingency framework plan (MCATS/SAM)* (presented by the Secretariat)
- e) WP/2.5 - *Activities of the SG2 /PANS OPS* (presented by the Secretariat)
- f) WP/2.7 – *Runway and ATC sector capacity calculation Manual (draft 2.0)* (presented by the Secretariat)
- g) WP/2.8 – *Progress made in the implementation of the ATFM system in Peru* (presented by Peru)
- h) WP/2.9 – *Airspace optimization in Brazil* (presented by Brazil)
- i) WP/2.10 – *Update on the implementation process of the EDE concept in Brazilian airspace* (presented by Brazil)
- j) WP/2.11 – *SISCEAB five-year demand forecast* (presented by Brazil)
- k) WP/2.12 – *Use of radar synthesis data in SISCEAB performance monitoring* (presented by Brazil)

Note.- Number WP/2.6 was not assigned

2.2 The coordinators and members of SG1 Airspace Planning, SG2 PANS OPS, and SG3 ATFM presented the progress of their work and new deliverables, and formulated draft conclusions to support their next actions for airspace optimisation and implementation of improvement elements linked to GANP operational threads. processes and reported on their progress.

Activities of SG1- Airspace Planning***Implementation of strategic direct routing (EDE)***

2.3 The status of implementation of EDE in the SAM Region is shown in **Appendix A** to this part of the Report. There was progress in many States, but in others the initiative has been suspended, due to the quick growth of air traffic since the end of 2021, especially on domestic flights. It is important to highlight that the world scenario presents high costs for the price of fuels, and the importance of promoting the initiatives linked to the FRTO module of the GANP was emphasized.

2.4 The feasibility of promoting the User preferred routes - UPR initiative was analyzed without affecting the process of implementation of the EDE, additionally in the case of some States that cannot extend the application EDE throughout the scope of their FIRs. It was stressed that the UPRs can produce early benefits as long as the EDE is not implemented in all South American FIRs. A number of UPRs have been implemented and have undergone successful trials and coordinated within the CIIFRAS initiative developed by IATA-CANSO and ICAO.

2.5 Argentina presented information on its studies on the implementation of UPR. Brazil presented the improvements of EDE application in large areas of its airspace, generating efficiency benefits to users and reduction in CO2 emissions.

2.6 Thus, it was decided to promote a second stage of studies by the GT EDE to formulate a Regional Guide Manual on the aspects of the FRTO (EDE, UPR, etc.), as well as to facilitate tests and feasibility analysis.

Concept for the Efficiency and Capacity of SAM Airspace (CONOPS EC/SAM)

2.7 The Concept for the Efficiency and Capacity of SAM Airspace (hereinafter CONOPS EC/SAM) was presented to the SAM/IG/26 Meeting (Virtual, 20-23 September 2021), which agreed that the document should be circulated to States for additional feedback. After this process, comments were received from Chile (contributions for editing and writing) and Argentina.

2.8 These comments were analyzed at the GESEA/SG2/3 Meeting (Virtual, 6-8 April 2022), where ANAC Argentina specialists widened the comments on the aforementioned document. The concern that CONOPS generates divergent or overlapping lines of analysis with the Vol III development activities of the ANP CAR SAM was discussed in detail, and the lack of clarity in the scope of CONOPS and its use by States or users was noted.

2.9 As a result of the amendments, the revised version is presented as **Appendix B** to this part of the report. It was acknowledged that GREPECAS is the competent body to promote regional priorities, as well as to develop and maintain the ANP CAR/SAM Regional Plan in its three volumes.

2.10 In this sense, the CONOPS EC/SAM has the purpose of supporting the studies of the ATM specialists of SAM/IG and GESEA involved in the formulation of Volume III of the aforementioned Plan, facilitating the understanding of the methodology of Doc. 9883 assumed in the GANP.

2.11 Considering the above, the proposal for **Conclusion SAM/IG/27-01: Adoption of the document Concept of Operations for efficiency and capacity in SAM Airspace 2022-2026 (CONOPS EC/SAM)** was formulated and approved in plenary, as detailed in the Report on Agenda Item 4.

Roadmap 2022–2026: Performance-based optimisation of SAM airspace

2.12 The GESEA/SG1/2 meeting (27-29 April 2021) received the draft developed by the designated working group for its comments to the EC/SAM CONOPS. Based on the comments received, the development of a Roadmap 2022-2026: Performance-based optimisation of SAM airspace, derived from the studies for the aforementioned CONOPS, was discussed.

2.13 The Roadmap was presented during the SAM/IG/26 Meeting (Virtual, 20-23 September 2022) which agreed that the document should be circulated among States for additional feedback.

2.14 After this process, contributions were received from Chile regarding improvements in the drafting, and from Brazil, which observed the tables used to show the progress in the implementation of the PBN in the States, based on data from the ICAO iSTARS platform. These comments were discussed at the GESEA/SG2/3 Meeting (Virtual, 6-8 April 2022) and changes were incorporated into the version presented as **Appendix C** to this part of the Report.

2.15 The abovementioned Roadmap replaces the PBN CONOPS, originally developed in 2016. The Meeting agreed on the implementation dates for the PBN components presented in the document, as well as the supporting metrics to monitor such implementation.

2.16 In view of the above, Conclusion **SAM/IG/27-02 Adoption of the Roadmap 2022–2026: Performance-based optimization of SAM airspace** was formulated and approved in Plenary.

ATS contingency plans

2.17 The need to resume the alignment activities of the MCATS with respect to the national Contingency Plans was highlighted and the dates of the events organized for the harmonization between Adjacent States/FIR, that is, SAM SOUTH (September 5 to 9) and SAM NORTH (October 24 to 28, 2022) was highlighted.

2.18 An ad-hoc group has been formed to provide support to this part of the implementation to SAM States, through a sequence of 3 meetings with the teams that allow to observe the progress, identify difficulties or delays in the deliveries and provide support if necessary. The meetings referred to will be via TEAMS at 13 30 UTC on the following dates;

- 5 June 2022
- 9 June 2022
- 25 July 2022

2.19 On the other hand, following the consensus of SAM/IG/26, the ad-hoc group presented the results of its work, aimed at optimizing the ATS Contingency Framework Plan, as follows:

- a) review the Terms of Reference for the Coordination and Support Team (ECA), after identifying the need to proceed with the actions concerning the notification of a contingency situation of a SAM State and, consequently, those related to the roles to be adopted by each intervening party of said Team, which led to the updating of Appendix E of the MCATS/SAM (see **Appendix D** to this part of the Report – *Spanish only*); and
- b) develop standardized mechanisms to support actions related to the preparation, coordination and updating of contingency measures to be included in the ATS LEVEL 2 Contingency Plans, which led to the introduction of a new Appendix to the MCATS/SAM: Appendix I (see **Appendix D** to this part of the Report - *only Spanish*).

2.20 The Meeting agreed that the proposal for improvement to MCATS enable the following:

- a) Mechanisms for change management in ANS and CNS/ATM systems, that impact on the contingency measures included in the ATS Level 2 Contingency Plans;

- b) Mechanisms for amending and/or updating International Letters of Agreement that include contingency measures, also providing for the procedure for approving them; and
- c) Criteria on the aspects or contents of contingency measures agreed between two (2) or more adjacent States to be published in the corresponding IPAs.

2.21 Recognizing the work of the ad-hoc group, it was requested to continue the task of integrating the appendices into Amendment No. 1 of the MCATS, as well as the editorial adjustment required elsewhere in the Plan. The Secretariat was then instructed to provide the amended text to SAM States, **no later than July 11, 2022.**

2.22 In view of the above, Conclusion **SAM/IG/27-03, Adoption of amendment 1 of the SAM Region ATS Contingency framework plan (MCATS / SAM) and alignment of National Plans** was formulated and approved by the Plenary, superseding Conclusion **SAM/IG/25-02.**

2.23 Venezuela stressed the importance of also promoting the harmonization of ATS Contingency Plans with the boundary States of the CAR Region. At the same time, the update of the LOA ATS. The Secretariat was commissioned for coordinating, in the short term, interregional activities with the ICAO Office in Mexico.

2.24 It was highlighted that the MCTAS contains in one of its Appendixes the SAM Contingency Plan for volcanic ash, recommending that the States emphasize the attention of response issues in cases of volcanic events.

2.25 IATA stressed that the Contingency Plans take into account the least impact on international area navigation, and apply the maximum flexibility criteria for operations. The harmonization work being carried out in SAM was also supported.

2022-2023 Regional route optimisation. Implementation of RNAV-5

2.26 After activities carried out in 2021 by Argentina, Brazil, Chile, Paraguay and Uruguay, in direct coordination via teleconference, as well as the participation of Brazil in the respective AIP publication, the airspace routes of the FIR Resistencia, FIR Asunción, TMA FOZ, and other sectors on the south side of Chile and Argentina have been optimized. To date, there are only 23 conventional Upper Space Regional routes (from the SAM catalog).

2.27 It seemed appropriate to commission this year a set of tasks of implementation RNAV 5 or optimization of routes to GESEA/SG2 - PANS OPS, given that SG1 will have a lot of load of activities. In the FIR Maiquetia is already in progress a joint optimization with FIR Piarco.

Airspace Planning: Regional Documentation and Training

2.28 The Meeting informed on the revised dates for the activities that will have the support of the RLA/06/901. The participation of specialists from Brazil and a member of the ICAO PANS OSP Panel, for the elaboration of regional guidance material on airspace planning regulations, was confirmed in a Mission in Lima, in the second week of August 2022. The JOB CARD related to this activity is enclosed as **Appendix E** to part of the Report (in Spanish only).

2.29 With the material prepared and approved in SAM/IG/28, the Workshop for Airspace Planners will be held in **Lima, from November 7 to 11, 2022.**

Activities of SG2- PANS OPS

2.30 It was reported that the GESEA/SG2/3 – PANS PAHO Meeting was held in virtual mode, from April 6 to 8, 2022. The Summary of that Meeting is displayed on the website. The analysis of the PANS OPS matters follows.

Follow-up to PBN implementation in the SAM Region (Resolution A-37/11) and optimization of TMA spaces. RNAV routes

2.31 The Meeting agreed that, in the operational context, there are different criteria for the implementation of procedures, noting that, in the Region, the standardized departure routes are complemented by specific operational options of the PANS OPS document, such as omnidirectional exits, PBN arrival sections, as well as merge-point procedures.

2.32 It was highlighted that the conditions of the orography, in States in the Andean area, leads to the implementation of PBN procedures for domestic airports, which are not included in the percentages of the ICAO iSTARS application.

2.33 Consensus was reached to resume Table XLS that was used until 2018 in the SAM/IG to monitor the implementation, with some improvements to simplify its use, in which the summary of the implementation for SAM international airports is presented. It was stressed that the above Table will be for internal use of SAMIG/GESEA bodies, and that it is not intended to replace iSTARS.

2.34 It was agreed that this Table would be prepared to follow up on the Region's PBN Roadmap that has been developed in the SG1 working groups, as explained in paragraph 2.10 above. This XLS Table can be customized as required by each State, for which you can download from the GESEA TEAMS channel, in the link.

<https://oaci.sharepoint.com/:x:/r/sites/SAM-CAR-ANS-GESEA/Shared%20Documents/GESEA/SG2%20PANS%20OPS/SEGUIMIENTO%20implant.%20PBN/GESEA%20SG2%20PBN%20progress.xlsx?d=w910ce628a6874dc49e52ae9f47cd4673&csf=1&web=1&e=N89mEn>

Redesign of selected TMA Airspaces based on PBN Planning

2.35 Included in **Appendix F** to this part of the Report, Table "Redesign of TMA Airspaces Selected based on PBN Planning" of the "Roadmap 2022-2024; Performance-based optimization of SAM airspace".

Implementation of PBN procedures to visual flight runways. Studies on Visual RNAV procedures – RVFP. Analysis of VPT RNAV initiative

2.36 Updated the PBN Procedures to Visual runways Planning Table, originally developed in SAM/IG/26, which is presented in **Appendix G** to this part of the report.

2.37 The Rapporteur of SG2, Diego Gamboa, presented the activities on the proposal of a Circular (in draft) of the ICAO to guide the implementation of procedures with Visual Manouver with prescribed track (VPT), which according to the proposed criteria is an application similar to the PBN procedures to visual runways developed by SG2.

2.38 The work of the FLTOPSP panel was analyzed and the objectives of the aforementioned Circular were indicated, as follows;

- Possibility to standardize criteria in the construction of Visual RNAVs
- Publication of Visual RNAVs for;
 - i. Create a new trajectory for efficiency, noise or environmental issues
 - ii. To increase utilization of a prescribed path or replace a PPP

2.39 SG2 has organized a list of volunteer specialists to support and feedback the studies on the aforementioned Circular, within a single GT PBN to visual runway, as well as monitor the implementation in our Region. In addition to the States, delegates from IATA, LATAM, AVIANCA, SATENA, and the consultancy FLYGHT7 joined the WG. Special attention will be paid to the operational safety metrics and emission savings generated in the implementation of these procedures, highlighting the information presented on the results of PBN implementation in Guapi, Colombia (See report on Agenda Item 1).

2.40 This WG should act as an advisor to States and ANSPs that have consultations on specific cases of implementation, and at the same time monitor the preparation and issuance of the ICAO Circular.

2.41 Thus, it is appropriate to deactivate the task force - GT that was in charge of studying guides for the flight procedures RNAV Visual - RVFP (FAA concept) and, therefore, to **withdrawn the conclusion SAMIG/25-05** that organized said GT in November 2020.

Optimization of flight procedures with application of RF segments.

2.42 The Meeting stressed the importance of the application of RF segments to RNP APCH procedures. Brazil reported that it has ongoing projects to improve the procedures of Fortaleza (SBFZ), Zumbi (SBMO) and Vitoria (SBVT).

Implementation of SATDIS tool Version 2

2.43 A second version of the 'SATDIS – SAM RAIM prediction availability service' tool has been purchased through RLA/06/901. It was stressed that SG2 PANS PAHO should collaborate with activities for the dissemination of the use of the web tool in their States. The tool will be delivered in June 2022 to RLA/06/901 and Member States after the testing phase (SAT) and adjustments to the user manual.

Other PANS-OPS matters

2.44 Brazil presented the progress made on airspace optimization and design of flight procedures. 100% progress was observed in the implementation of the NBP. The efforts to improve the productivity of the IFPD units affected in the pandemic period were highlighted.

2.45 At the proposal of Uruguay, the Meeting emphasized the need for the bodies of SAM/IG and SRVSOP – LAR to act jointly to improve the guidelines and regulations on the operational safety surveillance of the IFPD units, in addition to promoting the quality requirements within these units. It was identified that, in the last triennium, there may have been a lack of human and material resources in the

IFPDs of the Region. The Secretariat was commissioned for coordinating these matters and reporting to States.

Activities of SG3 - ATFM

2.46 The GESEA/SG3/4 Meeting was held virtually from 25 to 27 April 2022. The summary of this event can be found on the meeting's website. Here's the analysis of the ATFM topics:

Manual for calculating Runway Capacity and ATC Sector

2.47 The draft of the Manual for calculating Runway Capacity and SECTOR ATC was developed between August 19 and August 29, 2019, at the SAM Regional Office and was presented to the States, in SAM/IG/24.

2.48 Based on the comments and recommendation to re-circulate the text to obtain opinions, and given the importance of clearly presenting the methodology and the objective of arranging the capacity values, WG 2 - Doc. ATFM SAM was commissioned to review and update the manual.

2.49 The objective was to maintain the robust mathematical model and, at the same time, that the users of the document not only had mathematical aspects, but also explain concepts of capacity and guidelines for the improvement of capacity, both of the runways, and for the efficiency in the provision of ATCs in the work sectors.

2.50 Consequently, version 2.0 of the draft of the Manual was obtained, including:

- General Capacity Considerations
- Capacity Measurement and Calculation Process Preparation Activities
- Runway Capacity Calculation Methodology
- Guidelines for runway Capacity Improvements
- Methodology for Calculating ATC Sectors
 - Workload Fatigue
 - Management in the ATC
 - Definitions for the calculation of ATC Sector Capacity
 - Factors for the determination of Sector Capacity
 - Mathematical model for the Calculation of Sector Capacity
 - Steps for the collection and calculation of ATC sector capacity
 - Optimization of the capacity of the ATC sectors
 - Estimated capacity of the ATC sectors Measurement
 - Parameters for CTR or ATZ
- Guidelines for improvements in sector capacity
- Improvement through the use of data for analysis and indicators
- A new Appendix F was included, in response to the proposal of several States, which indicates criteria for classifying demand levels.

2.51 The Meeting agreed that the Manual for the Calculation of Runway Capacity and ATC Sector is a key document for the States of the SAM Region to implement a common methodology for the calculation of runway capacity and ATC sectors. (See **Appendix H** to this part of the Report).

2.52 In view of the above, Conclusion **SAM/IG/27-04 Adoption of Manual for the Calculation of Runway Capacity and ATC Sector (OPSAM)** was approved by the Plenary.

2.53 Argentina presented its national plan for the calculation of runway capacity and atc sector for the current year, in charge of the supplier EANA. To date, there is a 35% advance in the calculation tasks for the programmed runways.

Improvements to the BRISA sessions for OPSAM

2.54 BRISA sessions are deliverables included in the ATFM Operations Plan (OPSAM). The progress made by the GADHOC – ATFM briefing, with the Office of the Rapporteur of Chile, was presented, aimed at identifying improvements for the BRISA, as commissioned by SG3. Options are being analyzed to obtain the following Benefits;

- Uniformity in the delivery of information.
- facilitates the host State to properly organize pre-tactical and strategic/post- operational teleconference.
- facilitates traceability and availability of the data delivered/reported.
- ensures the transmission of data in the event of Internet failures.
 - resource that can be printed by the states or ATFM teams of the states that consider it pertinent.
 - reduces teleconferencing times and makes the exposure of information more efficient.
 - facilitates industry participation in these teleconferences.

2.55 The implementation of these improvements is important to strengthen the CDM, expand the quality of the BRISA sessions, extend the participation of airlines and users, and disseminate pre-tactical, strategic and post-operations information.

Other ATFM matters

2.56 Peru presented the status of the ATFM service and progress in data and indicator management. To date, eight KPIs included within the GANP concepts are being managed. Likewise, the provider CORPAC has implemented a dashboard on air traffic demands and operations management.

2.57 Brazil presented its progress in the studies on five-year demand forecasts, in charge of its SISCEAB unit. The first forecast results, even in periods of pandemic, have been satisfactory, which represents an important element of planning for the State. Initiatives were presented to use synthetic radar data for the development of GANP KPIs 08 and 05 as part of a BIG DATA development.

GESEA work plan

2.58 The GESEA Work Plan 2022 was reviewed, highlighting the revised dates for the events that have been scheduled with the support of RLA/06/901, as set out in the report on Agenda Item 4.

EDE implementation in the SAM Region

- **Argentina**. - The EDE has not yet been implemented. The TMA Baires is in the process of being implemented, which is expected to affect the airspace of several FIRs neighboring Ezeiza, therefore, the issue of EDE implementation has not yet been defined.
- **Bolivia**. - The EDE has not yet been implemented. Progress in the implementation of the ATS surveillance service in the FIR La Paz was reviewed, and it is hoped that the coverage of pilot-controller VHF communications will also be extended, and it is foreseen that with the fulfillment of these technical conditions the EDE can be implemented.
- **Brazil**. - The EDE is implemented in all the FIRs of Recife and Amazonia and in most of the RIS Brasilia and Curitiba, as published in the AIP Brazil (ENR 1.9 AIR TRAFFIC FLOW MANAGEMENT AND AIRSPACE MANAGEMENT).
- **Chile**. – EDE implemented in a portion of the ocean space, according to AIC NR 19 - 28 OCT 2020.
- **Colombia**. – The EDE is not implemented. Sup AIP A64/C86, 04 NOV 2020, has been cancelled, taking into account the increase in the volume of air traffic in the Barranquilla and Bogotá FIR.
- **Ecuador**. – EDE implemented in the entirety of the Guayaquil FIR, as published in AIP as part of ENR 1.10.
- **Panama**. – The EDE has not yet been implemented. However, it was indicated that there is a tactical application for direct flight for a long time. The applicable conditions have been published in AIP ENR 1.8-1.
- **Peru**. – EDE implemented in the upper oceanic airspace of the FIR Lima, through Supplement AIP 01/21, as of June 1, 2021 In a first stage, the entry and / or exit to / from the EDE space of the FIR Lima must be done through travel points published in the AIP Peru.
- **Uruguay**. - The EDE is not implemented. It was stated that all SID/STAR procedures and ATS routes within FIR Montevideo have a direct and very efficient configuration. The option of publishing specific information in AIP was analyzed, in a way that facilitates the knowledge of the airlines for the presentation of flight plans with origin in Montevideo, which could access the application of EDE in the neighboring FIR spaces. In addition, there will possibly be more information that will be subject to the implementation process of the Baires TMA, which is expected to affect the airspace of the MONTEVIDEO FIR.
- **Venezuela**. –The EDE was implemented in most of the Maiquetia FIR through sup AIP C03-A03/21 on the AIRAC date of May 2021.

APPENDIX B

**CONCEPT OF OPERATIONS FOR EFFICIENCY AND CAPACITY
IN SAM AIRSPACE**

(CONOPS EC/SAM)

2022 - 2026

APPENDIX



INTERNATIONAL CIVIL AVIATION ORGANIZATION SOUTH AMERICAN REGIONAL OFFICE

CONCEPT OF OPERATIONS FOR EFFICIENCY AND CAPACITY IN SAM AIRSPACE

(CONOPS EC/SAM)

2022 - 2026

Draft elaborated by the TF – CONOPS Task Force of
Sub-Group 1 of GESEA.

Draft 2.1 dated 1 April 2022

CONCEPT OF OPERATIONS FOR EFFICIENCY AND CAPACITY IN SAM AIRSPACE

(CONOPS EC/SAM)

2021 - 2025

CHANGE CONTROL

Version	Date	Change	Pages
DRAFT 0.1 presented at the GESEA plenary	18 March 2021	Drafting of document	
DRAFT V0.2.0	6 July 2021	Review by the TF. Incorporates inputs by Uruguay, Brazil and IATA	
DRAFT V0.3.0	12 July 2021	Review by the TF. Incorporates inputs by Uruguay, Argentina, Brazil and IATA	
DRAFT V0.3.1	19 July 2021	Consolidation of CONOPS EC/SAM and separation from the PBN part, new roadmap. Secretariat.	
DRAFT 1.0	20 July 2021	Draft to submit at SAMIG/26	
DRAFT 2.0	1 March 2022	Re-Circulated at the request of SAMIG26. Letter SA5499. Contributions from Argentina, Brazil and Chile	
DRAFT 2.1	1 April 2022	Improvements according to analysis of GESEA Meeting SG1/3. Rapporteur and Secretariat.	

CONTENT

1.	PURPOSE	4
2.	INTRODUCTION	4
2.1	ICAO strategic objectives	4
2.2	New aviation scenario	5
2.3	Global and regional trend and status	5
2.4	ICAO-driven planning	5
2.5	Alignment to GANP and Doc 9883	6
2.6	Safety	7
2.7	Resilience and the environment	8
2.8	Capacity and efficiency	9
3.	THEORETICAL ASSUMPTIONS	10
4.	CONOPS EC/SAM ENABLING ELEMENTS	10
4.1	Air navigation plans	10
4.2	Airspace optimisation plans	11
4.3	Communications	11
4.4	ATS surveillance	11
4.5	Flexible use of airspace	11
4.6	KPI application and data management	12
4.7	PBN and PBCS certification of air operators	13
4.8	Human factors	13
4.9	Training	14
4.10	Other factors to be considered in the implementation	14
5.	CHALLENGES FOR THE SAM REGION	15
6.	PLANNING PRINCIPLES	15
	Appendix A. Performance based planning according 6 steps method	16
	Appendix B. ASBU Modules/Elements	17
	Appendix C. Acronyms y Abbreviations	18
	Apéndice D. References	19

1. PURPOSE

GREPECAS is the competent body to promote regional priorities, as well as to develop and maintain the ANP CAR/SAM Regional Plan in its three volumes. In this sense, the Operational Concept for the efficiency and capacity of SAM airspace (hereinafter CONOPS EC/SAM) aims to support the studies of the ATM specialists of SAMIG and GESEA involved in the formulation of Volume III of the aforementioned Plan, facilitating the understanding of the methodology of Doc. 9883 assumed in the GANP.

The **Concept of Operations for Efficiency and Capacity in SAM Airspace (hereafter CONOPS EC/SAM)** is a collaboratively developed document ~~that considers the needs of all stakeholders of the ATM community in order to provide a reference~~ for improving the airspace of the SAM Region, highlighting the solutions put forth through the ASBU elements of the Global Air Navigation Plan - GANP, as well as PBN planning and implementation underway in South America, in this case, focusing on the "operational" threads that can generate the agreed performance in two specific areas: **Efficiency and Capacity**.

All ICAO Regions have been impacted by the sanitary measures imposed for the control of COVID-19. The contraction of the industry was significant worldwide. **It is vital** for the industry to normalise its activities as soon as possible, so as to restore air connectivity, which promotes the growth of trade, business and tourism in the SAM Region, and contributes a significant part of GDP, generating numerous jobs. Furthermore, it is crucial that the collaborative decision-making process be strengthened, with a view to finding immediate and short-term solutions that can support the recovery of South American aviation.

~~The GANP, 6th edition, essentially seeks to develop the six-step methodology of Doc 9883 "Manual on global performance of the air navigation system", which allows for a consistent process of analysis, identification and quantification of air navigation solutions, recognising a limiting scarcity of resources (public and private), while considering the efficiency and capacity requirements of airlines and industry.~~

The CONOPS EC/SAM will continue to receive inputs and updates as the regional and global aviation and industry scenarios are ~~not yet fully defined~~ **still in evolution** in front of the COVID-19. It is expected that the CONOPS EC/SAM may in the future extend its scope to other KPAs (predictability, safety, interoperability, etc.) and also include the technology and information threads of the GANP, as well as the aerodrome operational scenario.

2. INTRODUCTION

2.1 ICAO strategic objectives

This Concept of Operations for Increasing Efficiency and Capacity of SAM Airspace (hereinafter referred to as CONOPS EC/SAM) is directly linked to the strategic objectives of ICAO, as described below:

- a) Safety: Enhance global civil aviation safety.
- b) Air navigation capacity and efficiency: Increase the capacity and improve the efficiency of the global civil aviation system.
- c) Economic development of air transport: Foster the development of a sound and economically-viable civil aviation system.

- d) Environmental protection: Minimise the adverse environmental effects of civil aviation activities.

2.2 New aviation scenario

It is recognised that, due to the COVID-19 sanitary emergency, a new scenario has emerged in global aviation. It is estimated that in 2020 the number of passengers carried worldwide dropped by 60%. This entails a strong economic impact for the entire industry, and affected ANSPs due to the significant reduction in the number of air operations.

The ATM community is focused on supporting the revival of air transport in general, as well as restoring the connectivity of the SAM Region. At the same time, the aim is to return to the pre-pandemic trend of sustainable growth in regional air transport. To this end, it is necessary to have the support of a seamless, high-performance, safer, more robust and resilient regional air navigation system.

COVID-19 has revealed that the complex internal and external interfaces of States generate new challenges for collaborative decision-making. CAAs need to adopt a safety risk management approach to decision-making.

2.3 Global and regional trend and status

Due to the severe impact of COVID-19, the framework for projecting the five-year period is highly changing, since it depends on the duration and magnitude of the pandemic, the containment measures of States that are being deescalating, the degree of user confidence and the conditions of the global economy.

The ICAO Aviation Data and Analysis Panel (ADAP) approved in July 2021 a set of traffic forecasts for the 32-year horizon (2018-2050), considering different scenarios for the evolution of operations post COVID-19. According to this work, operations in the SAM region will grow, but at a lower rate than globally.

For example, for routes within the SAM Region, the cumulative annual passenger growth forecast is between 2.2 and 3.2%, depending on the scenario, while the world average would be between 2.9% and 4.2%. For cargo, the work indicates a growth for Latin America and the Caribbean between 0.8 and 1.5% per year, compared to 2.6% to 4.2% for the world average. See ADAP tables at:

<https://www.icao.int/sustainability/Documents/post%20covid%20forecasts%20scenarios%20tables.pdf>

At the beginning of 2022, a gradual recovery in the demand for operations in several States is identified, although more visible in domestic operations, which are close to reaching the levels of 2019. International operations are still in a slower recovery process, as measures for passenger entry/transit are being de-escalated and the recovery of tourism is strengthened.

2.4 ICAO-driven planning

The International Civil Aviation Organization (ICAO) has developed Doc 9854 "Global ATM Operational Concept", which describes ICAO's vision of an ATM applied worldwide.

It also developed the global "Aviation System Block Upgrade" (ASBU) framework as a programmatic framework to develop a set of air traffic management (ATM) solutions or upgrades that builds on existing equipment and establishes an implementation framework to achieve global interoperability within given timelines.

The Global Air Navigation Plan, 6th edition (GANP - Doc 9750) enables members of the aviation community to participate together to achieve an agile, safe, secure, sustainable, high performance and interoperable global air navigation system.

At the same time, new demands on the aviation system, emerging technologies, innovative ways of doing business and the changing human role pose challenges and also offer opportunities that call for an urgent transformation of the air navigation system in order for aviation to continue to drive social well-being in the South American Region.

The GANP emphasises performance-based air navigation planning, in accordance with the six-step approach of Doc 9883. For reference, Appendix A presents the "Instructions for the use of the template of Volume III of the Regional Air Navigation Plan – ANP CAR/SAM" (approved in October 2021 through the GREPECAS Conclusion 19/05) in which the application of the six-step method is exposed.

2.5 Alignment to GANP and Doc 9883

The CONOPS EC/SAM is aligned with the new four-layer GANP design, specifically, with the second "global technical" layer, recognising the set of threads set forth in the ASBU methodology, that is, the **Operational threads** that, in turn, are supported by the information and technology/CNS services threads. See **Appendix B** for a list of ASBU modules and elements.

Note. - This CONOPS EC/SAM basically addresses the operational threads of the GANP. The information and technology/CNS services threads are discussed and defined in the respective regional documentation and other action plans/roadmaps.

In this context, it is deemed essential to achieve, in the next five years, a South American airspace that is safe, efficient and with adequate capacity (see capacity assumptions in paragraph 2.8), supported by interoperable, resilient and cyber-secure CNS systems/facilities (see note below). At the same time, the objective is to reduce the impact of CO2 emissions and noise pollution on the environment.

Note. - ICAO is leading the development of the concept of cybersecurity for air navigation systems.

Consequently, this CONOPS EC/SAM will make available the desired operational scenario of regional airspace, which could be used in the studies and plans concerning the interoperability of CNS systems and services (focused on the intra-regional and inter-regional scenario), and those for the optimisation of MET/AIM information resources also proposed in the GANP.

The CONOPS EC/SAM focuses on the key performance areas (KPA) of **airspace efficiency and capacity** defined in the GANP and other related ICAO documents. These KPAs are associated with key performance indicators (KPIs) which are in turn linked to the development of ASBU elements.

For the purposes of this document, airspace segments have been defined as follows:

- ✓ En-route operation segment
 - continental airspace
 - oceanic airspace

- ✓ Terminal area operation segment

The CONOPS EC/SAM draws from Doc 9883 with respect to the performance-based approach to air navigation optimisation, as set forth in the GANP.

For the deployment of the CONOPS EC/SAM, performance management, as described in the aforementioned document, is implemented through the six-step method, with emphasis on the first 4 steps (see note), as follows:

- Step 1: Define/examine scope, context and general ambitions/expectations
- Step 2: Identify opportunities and issues, and set (new) objectives
- Step 3: Quantify objectives
- Step 4: Identify solutions to seize opportunities and solve issues
- Step 5: Deploy solutions
- Step 6: Assess the achievement of objectives.

Note. - The CONOPS EC/SAM does not elaborate on steps 5 and 6, on implementation of solutions and assessment of the achievement of objectives. These steps will be described theoretically in Appendix A.

Performance objectives

2.6 Safety

Resolution A40-1 "ICAO Global planning for safety and air navigation" endorses the third edition of the GASP and the sixth edition of the GANP as the global strategic directions for safety and air navigation, respectively.

It further resolves that the GASP and GANP plans be implemented and kept current in close cooperation and coordination with all concerned stakeholders, and that these plans provide the frameworks in which regional, sub-regional and national plans will be developed and implemented, thus ensuring consistency, harmonisation and coordination of efforts aimed at improving international civil aviation safety, capacity and efficiency. The full content of the Resolution and its appendices on GASP and GANP matters, can be found at:

https://www.icao.int/Meetings/a40/Documents/Resolutions/a40_res_prov_es.pdf

Appropriate infrastructure to support safe operations

The Global Aviation Safety Plan - GASP (Doc 10004) and the GANP are mutually supportive in recognising the need for appropriate infrastructure to support safe air operations. Coordination of RASG-PA and GREPECAS activities is considered essential for the successful implementation of both global plans, since **increasing air navigation capacity and improving efficiency** must be done in a safe manner and appropriate safety nets are required to prevent accidents.

The Basic Building Block (BBB) framework specified in the second layer of the GANP, independently of the ASBU framework, describes the core structure of any robust air navigation system by defining the essential air navigation services to be provided for international civil aviation in accordance with ICAO SARPs and the procedures for air navigation services (PANS). These are essential services for aerodrome operations, air traffic management, search and rescue, meteorology and aeronautical information.

BBBs do not represent an evolutionary step, but a benchmark defined by the basic services agreed by States under the Convention on International Civil Aviation to enable international civil aviation to develop in a safe and orderly manner.

The ASBU framework defines a set of operational improvements in certain areas of the air navigation system that the aviation community agreed to work on in order to maintain or improve system performance (ASBU threads). An ASBU element is a specific change in operations aimed at improving the performance of its air navigation system under specific operating conditions.

In planning improvements to air navigation systems, the following should be taken into account for the different stages of the pandemic:

- a) Risk assessment and prioritisation based on the data collected and analysed;
- b) The implementation of safety management principles for risk-based decision-making; and
- c) The management and oversight of approvals issued by the CAAs, taking into account the flexibility required throughout the aviation system to maintain safe operations.

Global Safety Plan indicators

Doc 10004 sets out its objectives, targets and indicators related to the aspirational safety goal of "zero fatalities by 2030."

In this regard, the GASP has identified Goal 6, related to the availability of the appropriate infrastructure to support safe operations, whose targets and indicators are shown in the table below:

<p>Goal 6: Ensure the appropriate infrastructure is available to support safe operations</p>	<p>6.1</p>	<p>By 2022, all States to implement the air navigation and airport core infrastructure</p>	<ul style="list-style-type: none"> • Number of States having implemented the air navigation and airport core infrastructure elements
---------------------------------------------------------------------------------------------------------	-------------------	--------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------

2.7 Resilience and the environment

Regarding operational resilience, the aim is to implement harmonised and optimally managed ATS contingency plans, which in the short term will evolve into consolidated ATM contingency plans (including ATFM and ASM), and will be gradually integrated into plans for all air navigation services.

The CONOPS EC/SAM, at the same time, recognises the contribution of ASBU modules/elements to environmental protection, especially in implementations that result in a reduction of flight distances, the optimisation of aircraft descent/climb speeds and the use of PBN to designate approach/departure paths that avoid impacts on populations near airports.

As shown in Appendix A, several KPIs have been defined in the Efficiency KPA that allow for the generation of **estimated data** on fuel burn reduction, for example, in aircraft taxiing and climb/descent maneuvers.

Furthermore, consideration should be given to the "Roadmap for PBN implementation in the SAM Region 2022-2026", to give continuity to regional activities for the implementation of the requirements set out in ICAO Assembly Resolution A37-11 entitled "Performance-based navigation global goals."

The initiatives of the SAM Region promote the use of performance-based navigation in the en-route, terminal area and approach segments, and must be consolidated mainly within the scope of the elements of the APTA (Airport Accessibility) module, referred to PBN approach and incorporating the elements related to CCO and CDO.

2.8 Capacity and efficiency

The CONOPS EC/SAM encompasses the challenges that regional and global air navigation will face in the period 2022-2026 and formulates the proposed functionalities and implementations to improve efficiency and keep airspace capacity/demand in balance, contributing to the prompt recovery of civil aviation and restoration of connectivity.

During the period 2020-2022, the hubs of the Region have experienced a reduction in airport capacity (runways and aprons) induced by sanitary measures (social distancing, disinfection of facilities and aircraft, boarding lounge restrictions, etc.) that require increased separation between departure/arrival of aircraft and extended airline turnaround times.

Atypically, there are capacity/demand imbalances in a period marked by a severe reduction in air operations. This capacity/demand imbalance would seem to be of a temporary nature in view of global developments in vaccine availability, which has allowed ~~leads to the assumption~~ that airport measures would be phased out.

Thus, by the period 2022-2023, an airport and ATC capacity scenario in balance with the number of air operations is anticipated. See below for theoretical capacity assumptions. In addition, the temporary scenario of reduced air traffic demand, compared to 2019 values, will favour the gradual implementation of new GANP-based airspace concepts, such as "free route airspace."

To respond to future recovery and growth, the capacity/demand balance in the Region must be maintained, together with increases in efficiency, flexibility and predictability, while ensuring that there are no adverse effects on safety, with due consideration of environmental aspects. The air navigation system must be resilient to service disruptions and the resulting temporary loss of capacity.

Efficiency refers to the operational effectiveness and cost-effectiveness of gate-to-gate flight operations from the perspective of a single flight. In all phases of flight, airspace users want to depart and arrive at their selected time and fly along a path they consider optimal.

For the five-year period, efficiency is considered crucial for the thematic axis Financial Sustainability, set out in the Strategic Framework for the Recovery of International Air Transport in the SAM Region in response to COVID-19. See link below:

<https://www.icao.int/SAM/SECURITY-FACILITATION/COVID-19/Pages/COVID19-StrategicFramework.aspx>

*Note.- The **predictability** KPA made up by the concepts "punctuality" and "variability" is not addressed in depth in this document. However, its link to the **efficiency** KPA is recognised. The GANP 6ed. lists KPIs linked to this area, which can be associated to ASBU elements for their development within the Aerodromes operational scenario.*

3. THEORETICAL ASSUMPTIONS

Based on a generic operational scenario for the airspace of the SAM Region, and pointing to the ambitions of improvement for capacity and efficiency, this CONOPS proposes below a list of theoretical assumptions, without prejudice to other analyses that can be carried out in the specific scope of each Flight Information Region – FIR and / or State.

- a) The primary navigation element of the CONOPS EC/SAM is performance-based navigation (PBN), supported mainly by GNSS.
- b) Hub airports and the surrounding TMA airspace will, towards the second half of the five-year period, present capacity/demand imbalances at levels close to those of 2019. ATFM will need to be strengthened in the region to be prepared to manage these imbalances, with a strong emphasis on minimising the impact of flow measures on operators.
- c) As a communications element, oral VHF is assumed as the main means of communications, in continental airspace. For oceanic/remote airspace, the use of applications that meet the specific requirements of the PBCS in each case is foreseen, such as CPDLC or SATVOICE, which will be the primary means of communication. HF communications will be used as backup or by users not equipped with the aforementioned systems.
- d) It is assumed that the capacity of the ATM system will be expanded to accommodate the growth of IFR traffic.
- e) Due to the contraction of air operations and the new economic scenario, older and/or less efficient fleets would be withdrawn. There will remain a small number of commercial and general aviation operators lacking modern (advanced) navigation and communications equipment. However, airspace planning will be carried out on the basis of PBN and PBCS. The concept of “*best equipped, best served*” will be applied.
- f) Ground-based navigation aids will continue to be used in support of navigation reversal and contingency procedures. Temporary deviations from the SARPs that have been implemented in States in response to COVID-19 will be considered, taking into account safety and mitigations related to maintenance and in-flight inspection of radio aids.
- g) RPAS operations are expected to grow significantly in the coming years, covering various activities and business sectors, and should be considered in airspace planning.
- h) States in the region, depending on the economic situation, will continue to make efforts to modernise their air navigation systems in accordance with their operational needs and new developments in the industry.
- i) States in the region will continue to take the necessary measures to reduce environmental impacts that could result from civil aviation activities.

4. CONOPS EC/SAM ENABLING ELEMENTS

4.1 Air navigation plans

The five-year period will be marked by difficulties in accessing financial resources for ANSPs, making it more relevant for States to manage their national plans, seeking to identify performance improvement needs and priorities, so that investments are clearly based on cost-benefit aspects.

National air navigation plans (NANPs) are considered as the fourth layer of the GANP, 6th edition, and it is foreseen that templates will be developed in the short term to facilitate and standardise the drafting of these plans.

Only one third of SAM States have updated their NANP, and it is felt that the drafting and implementation of Volume III of the CAR/SAM ANP, using the template and process set forth in the GANP, will facilitate the formulation of these national plans.

4.2 Airspace optimisation plans

SAM States have been developing airspace optimisation plans based on the GANP ASBUs, Doc 9613 and Doc 9992, which clearly set out the strategies to be applied in airspace optimisation. These plans are in line with the regional PBN implementation objectives, which in turn are developed in accordance with the guidance contained in the GANP. The "Roadmap for PBN implementation in the SAM Region 2021-2025" guides PBN implementation.

4.3 Communications

To date, almost all communication between the cockpit and the controller is mainly through VHF voice communications on continental airspace. However, with the increasing number of flights, it will be necessary to evolve the way pilots and controllers communicate to support improved and more robust information exchange, without affecting pilot or controller workload.

The concept of operations considers data link communications (CPDLC) or SATVOICE in oceanic airspace to support the implementation of optimised separations, with the application of RNP4/2 and PBCS. Some States in the Region have implemented ADS-C with CPDLC in their oceanic airspace, and it is expected that beyond 2024 an increasing number of digital data communication applications and services will be incorporated to become the primary means of communication, but circumstances will continue to exist where clearances and instructions are issued by voice.

In accordance with the global air traffic management (ATM) operational concept, communication specifications will be established in accordance with the required communication performance (RCP) and the airspace in which operations are conducted.

4.4 ATS surveillance

ATS surveillance plays an important role in air traffic. The ability to accurately determine, track and update the position of aircraft helps to optimise aircraft separations and positively impacts the degree of efficiency with which a given airspace can be used.

ATS surveillance will be implemented taking into account the operational requirements for the airspaces under consideration. States in the region, especially those with rugged terrain, are expected to consider the possibility of ATS surveillance coverage through ADS and/or MLAT systems.

In the same way as RCP, ATS surveillance specifications will be established in accordance with the required surveillance performance (RSP) and the airspace in which operations are conducted.

4.5 Flexible use of airspace

Aviation covers a wide range of users, from commercial aviation to military and recreational operations, each with its own mission or business objectives.

The Implementation Group (SAMIG) developed "GUIDELINES FOR IMPLEMENTATION OF THE FLEXIBLE USE OF AIRSPACE (FUA) CONCEPT IN THE SOUTH AMERICAN REGION, which, like the CONOPS EC/SAM, considers SAM airspace as a single resource shared by all airspace users, with diverse and sometimes conflicting interests and requirements, which should be taken into account and addressed to the extent possible.

Flexible use of airspace is a concept of airspace management based on the principle of accommodating all airspace users to the extent possible, considering effective communications, cooperation and necessary coordination to ensure safety, efficiency and environmental sustainability.

Where conditions permit, standard arrival and departure procedures and non-permanent or conditional routes (CDR) will be implemented for more efficient use of airspace.

4.6 KPI application and data management

The GANP 6th ed. details 19 key performance indicators, as shown in the following link:

<https://www4.icao.int/ganportal/ASBU/KPI>

In each of the 19 formats presented, the following KPI components are explained:

- Definition
- Measuring units
- Operations to be measured
- KPI variants
- Characterised objects
- Usefulness of the KPI
- Parameters
- Data requirements
- Data providers
- Formula/Algorithm

It is highlighted that the management of the KPIs and their use to measure the extent to which the expected performance was achieved as part of the improvement for the ASBU element requires the collaborative action of various actors in the system, such as airports, ATFM services, ANS providers, airlines, itinerary databases, ADS-B providers, etc. The present CONOPS EC/SAM does not elaborate on airport service improvements as its scope is the airspace of the Region. However, the associated KPIs are shown in Appendix A as a reference for future joint development with GANP initiatives in the airport scenario.

Note.- The present CONOPS EC/SAM does not delve into the improvements of airport services since its scope is the airspace of the Region, however, the related KPIs are shown in Appendix A, as a reference for a future joint development with the ganp initiatives in the airport scenario.

The tables in Appendix A show how the KPIs are associated with each selected KPA in order to determine the ASBU elements that, when implemented, will contribute to the performance improvement measured by the selected KPI.

FOQA data and big data

When FOQA (flight operations quality assurance) is available, this information will be used for the design of procedures, routes and mainly for the post-implementation assessment of an optimised airspace concept because it provides real data on the benefits derived from the implementation.

The information provided by the Big Data Project on air traffic movement represents a valuable input for airspace planning tasks. This information is derived from the analysis of data provided by aircraft ADS equipment and transmitted to a network of receivers on the ground and then analysed to produce safety or statistical indicators that can be used for airspace measurement and planning. The information can be updated every three hours, providing constant, accurate and low-cost information.

The indicators that have been defined for use in airspace planning within a PBN operational concept include, *inter alia*, the following:

- a) SID utilisation rate: it is possible to determine how many flights were performed for each SID within a given period of time, for example, one month.
- b) STAR utilisation rate: it is possible to determine how many operations were performed for each STAR within a given period of time.
- c) APCH utilisation rate: it is possible to determine how many operations were performed for each APCH within a given period of time.
- d) Average top of descents: the average of where aircraft begin descent at a STAR can be obtained, sorted by airway category, by time period, etc.
- e) Average deviations in PBN airspace: information on the percentage of STAR, SID or APCH deviations can be provided.
- f) Number of ACAS RAs: a measure of RAs can be obtained and filtered by altitude level or airspace segment.

In addition, the information captured by Big Data can be used to determine aircraft flows for input into airspace design, quite useful for noise segregation procedures or other uses.

These are just some of the indicators that will be available to users of the Big Data project, and that will directly support airspace planning tasks.

4.7 PBN and PBCS certification of air operators

It is expected that, given the post-COVID scenario, the older and more inefficient fleet will be decommissioned and users without PBN/PBCS certification will be significantly reduced. The benefits derived from the operational concept are based on the modern navigation capabilities of most of the commercial air fleet operating in the Region.

4.8 Human factors

As we move towards the global ATM operational concept, an increasing level of automation will be required. However, the human being will at all times continue to manage automation. In basic terms, this means that the human will decide what is to be done, will delegate the execution of tasks to automation, and will be able to intervene when necessary.

4.9 Training

People with the appropriate skills and competencies, properly certified and trained, will continue to be the backbone of ATM/CNS operation and support services. With the expected recovery and growth of aviation, it is critically important to have duly qualified and competent personnel to ensure a safe and efficient aviation system.

States should incorporate human performance into the planning and implementation phases of new systems and technologies within the framework of the GANP and the regional and national plans. Early involvement of operational staff is also essential.

In this regard, it is necessary to emphasise the importance of incorporating **Human Performance** in the programmes and content of the courses delivered in the aeronautical training centres in the States of the region. The training of aeronautical personnel is fundamental for the purposes of this document.

4.10 Other factors to be considered in the implementation

4.10.1 Cost-benefit analysis

The States of the region should conduct a cost/benefit analysis of airspace modifications and of planned infrastructure and modernisation investments. GANP/6, in the AN-SPA tool and in the fourth NANP layer, presents some basic considerations and a checklist (CBA Checklist) for this analysis.

4.10.2 Pre-operational analysis and accessibility

It should be noted that, in route optimisation, there are user factors such as: aeronautical charges, routes in case of depressurisation (escape routes), distance to alternate aerodromes, weather conditions, etc., which may determine that the shortest distance between two points is not necessarily the optimal path in a given circumstance.

The effect of publishing meteorological minima as an alternate airport that are higher than the published instrument approach procedure minima for the same aerodrome should also be considered to ensure accessibility.

4.10.3 Safety assessment

Safety must be guaranteed in any modification of airspace design or procedures contemplated in its optimisation. This includes compliance with ICAO SARPs and relevant State regulations.

Following changes in airspace, the system should be monitored and operational data collected to ensure that safety is preserved, to determine whether strategic objectives have been achieved, and to identify opportunities for improvement.

Appendix A. Performance based planning according 6 steps method

Available at the following link of the GESEA Channel:

https://oaci.sharepoint.com/:b:/r/sites/SAM-CAR-ANS-GESEA/Shared%20Documents/GESEA/SG1%20PLAN%20EA/3%20CONOPS%20Espacio%20Aereo/APn%20F%20eCRPP%203%20_%20Instructivo%20de%20plantilla%20VOLIII.pdf?csf=1&web=1&e=S5KLvO

Optionally, the instructions are incorporated in the Final Report of the eCRPP/03, available at the following link:

<https://www.icao.int/NACC/Documents/Meetings/2021/PPPRC3/eCRPP03-Minuta.pdf>

Appendix B. ASBU Modules/Elements

See ICAO GANP PORTAL, at the following link:

<https://www4.icao.int/ganportal/ASBU>

Appendix C. Acronyms y Abbreviations

A-CDM	Airport collaborative decision-making
AN-SPA	Air navigation system performance assessment
ASBU	Aviation system block upgrades
DCB	Demand-capacity balancing
FUA	Flexible use of airspace
GANP	Global air navigation plan (Doc 9750)
GASP	Global aviation safety plan (Doc 1004)
KPI	Key performance indicator
KPA	Key performance area
PBA	Performance-based approach
PBN	Performance-based navigation

APPENDIX C

**ROADMAP 2022–2026:
PERFORMANCE-BASED OPTIMISATION OF
SAM AIRSPACE**



**INTERNATIONAL CIVIL AVIATION ORGANIZATION
SOUTH AMERICAN REGIONAL OFFICE**

PERFORMANCE-BASED OPTIMISATION OF SAM AIRSPACE

2022 - 2026 ROADMAP

Elaborated by TF – CONOPS Task Force of Sub-Group 1 of
GESEA.

Draft 2.1- 8 April 2022

PERFORMANCE-BASED OPTIMISATION OF SAM AIRSPACE

2022 - 2026 ROADMAP

CHANGE CONTROL

Version	Date	Change	Pages
DRAFT 1.0	20 July 2021	Drafting and update based on the previous 2018 - 2020 PBN CONOPS	All
DRAFT 2.0	1 March 2022	Re-Circulated at the request of SAMIG26. Letter SA5499. Contributions from Brazil and Chile	
DRAFT 2.1	8 April 2022	Revised in GESEA SG2/3 PANS OPS 6-8 April 2022. Approved for submission to SAMIG 27.	Improvements to PBN Progress Tables

TABLE OF CONTENTS

1	BACKGROUND.....	5
2	CURRENT SITUATION.....	5
2.1	En-route PBN.....	5
2.2	Terminal airspace optimisation.....	6
2.3	Implementation of ICAO GANP modules/elements.....	9
3	PBN NAVIGATION SPECIFICATIONS.....	9
3.1	RNAV 10 (RNP 10).....	9
3.2	RNP 4.....	9
3.3	RNP 2.....	10
3.4	RNAV 5.....	10
3.5	RNAV 1 and RNAV 2.....	10
3.6	RNP 1.....	11
3.7	RNP APCH.....	11
3.8	A-RNP.....	11
3.9	RNP AR APCH.....	12
3.10	Performance-based communication and surveillance (PBCS).....	13
4	EN-ROUTE PBN OPERATIONS.....	14
4.1	Description of the concept.....	14
4.2	Specific objectives.....	15
4.3	Oceanic airspace.....	16
4.4	Continental airspace.....	17
5	PBN OPERATIONS IN TERMINAL AREAS.....	19
5.1	SID/STAR routes.....	19
5.2	Navigation specifications.....	20
5.3	Instrument approach procedures – IAP.....	21
5.4	Navigation specifications.....	21
6	SUPPORTING METRICS.....	22
	Annex 1. Example of operational scenario with PBN routes between States.....	30
	Annex 2. Example of A-RNP SIDs and RNP AR SIDs.....	32
	Annex 3. Example of an operational scenario with SIDs and STARs in one State.....	34
	Appendix A. Acronyms and Abbreviations.....	35
	Appendix B. Reference Documents.....	37

1 BACKGROUND

The SAM Region works in a coordinated manner, through the meetings of the SAM Implementation Group (SAM/IG) and its technical contributing body GESEA, in the development of tasks and actions that allow a sustained evolution towards the application of the global ATM operational concept.

In this regard, implementation programmes are developed, which have initially focused on the following:

- ATS optimisation in the SAM Region
- Implementation of performance-based navigation (PBN) for en-route, terminal area and approach operations
- Air traffic flow management (ATFM)
- CNS system enhancements; and
- ATM automation

The SAM/IG/10 meeting, held in October 2012, reviewed the SAM ATS Route Network Optimisation Action Plan and deemed it advisable to extend it to cover all phases of flight within SAM airspace, with a view to integrating ATS routes with terminal areas and instrument approaches.

Airspace optimisation with application of PBN, PBCS and ATM automation is a high priority in the ATM work programme of the South American Regional Office, and many of its activities, such as PBN workshops, and PANS-OPS courses and workshops have been promoted by Regional Project RLA/06/901 to support PBN planning and implementation in the Region.

This Roadmap replaces and supersedes the PBN CONOPS, originally developed in 2016, in view of the availability of the **SAM airspace efficiency and capacity CONOPS (SAM/EC CONOPS)** developed by the Airspace Study and Implementation Group - GESEA. Worth noting in this Roadmap is the consensus on the implementation dates of PBN components, and the supporting metrics to monitor such implementation.

This Roadmap will give continuity to, and harmonise, the efforts of the SAM Region to optimise SAM airspace through the implementation of PBN, and supplements the SAM/EC CONOPS.

2 CURRENT SITUATION

2.1 En-route PBN

En-route airspace optimisation is addressed by the GESEA SG1, based on the implementation of the corresponding ASBU elements, such as strategic direct routing and free route airspace.

Phase 1 of the Route optimisation programme was completed on 20 October 2011 with the implementation of RNAV 5, while RNP10 was maintained on some routes in the upper oceanic airspace, such as the EUR/SAM Corridor, the Lima-Santiago routes, and the South Atlantic Random Route System (AORRA).

Until March 2022, 138 ATS routes have been implemented in Region SAM under PBN criteria, leaving 23 conventional routes remaining, as shown in the following table:

Table 1

Total regional ATS routes in SAM upper airspace	Conventional routes	PBN routes	% routes implemented with RNAV 5 and/or RNP 10 PBN
161	23	138	85.7%

Source: Secretariat, april 2022

2.2 Terminal airspace optimisation

The training for, and monitoring of, PBN redesign of the main TMAs of the SAM Region is accomplished through GESEA SG1 and SG2, under the sponsorship of Regional Project RLA/06/901. It is important to note that STARs should only be published where there are specific operational requirements to overcome mountainous terrain or to reduce ATCO workload in high air traffic volume scenarios, by means of altitude restrictions between STARs - IAP and SIDs.

Regarding the state of PBN implementation in Terminal Area, for 62 TMA selected from the SAM Region, 35 TMA have been re-designed based on PBN criteria, that is, 56.5% progress is made until April 2022. See next Table:

Table 2

Redesign of selected TMA Airspaces based on PBN Planning *Updated during GESEA SG2/3 April 2022		
	STATE	Implementation
*Argentina	1. Comodoro Rivadavia	Implemented
	2. Bahia Blanca	
	3. Mendoza	
	4. Tucumán	
	5. Rosario	
	6. Bariloche	
	7. Resistencia Corrientes	
	8. Jujuy	
	9. Esquel	
	10. Córdoba	August 2022
	11. La Rioja	November 2022
	12. Termas de Río Hondo	November 2022
	13. Chapelco	November 2022
	14. Parana Sauce Viejo	November 2022

Redesign of selected TMA Airspaces based on PBN Planning

***Updated during GESEA SG2/3 April 2022**

STATE		Implementation	
	15. Posadas	November 2022 – To be coordinated	
	16. Ushuaia/Rio Grande	November 2022 – To be coordinated	
	17. BAIRES FUTURO	2023	
*Bolivia	18. Cochabamba	review of design Phase	
	19. La Paz	Implemented march 2022	
	20. Santa Cruz	design Phase	
*Brazil	21. Brasilia	Implemented	
	22. Belo Horizonte		
	23. São Paulo (Changes partials)		
	24. Salvador		
	25. Manaus		
	(PBN SUL)	26. Curitiba	Implemented
		27. Florianópolis	
		28. Joinville	
		29. Navegantes	
		30. Porto Alegre	
		31. São Paulo	
		32. (cambios partials)	
	33. Rede de rota FIR CW		
34. São Paulo (TMA-SP Neo)	Implemented (mayo 2021)		
35. Fortaleza, Natal, João Pessoa, Recife	Nov 2022		
36. Campo Grande	Fecha TBD		
*Chile	37. Santiago (Sur)	Implemented	
	38. Routes network FIR Santiago		
*Colombia	39. Bogota	Implemented	
	40. Medellin	Dec 2023 advance 40%	
	41. Pereira	Dec 2025 advance 50%	
	42. Cali	Dec 2025	
	43. Cucuta	Dec 2024	
	44. Bucaramanga	Dec 2024 advance 50%	
	45. Barranquilla	Estimado Jul 2026	
46. San Andrés	Estimado Jul 2026		
*Ecuador	47. Guayaquil	Implemented	
	48. Manta		
	49. Quito		
	50. Galapagos		
Guyana	51. Georgetown	February 2020	
*Panama	52. Panama	<i>Pending.</i>	

Redesign of selected TMA Airspaces based on PBN Planning *Updated during GESEA SG2/3 April 2022		
STATE		Implementati on
*Paraguay	53. Asunción	Implemented
Peru	54. Arequipa	First semester 2019
	55. Cusco	Implemented
	56. Juliaca	Second semester 2019
	57. Puerto Maldonado	Second semester 2019
*Surinam	58. Paramaribo	Implemented
Uruguay	59. Carrasco y Laguna del Sauce	Second semester 2020
*Venezuela	60. Maiquetia	Implemented
	61. Isla Margarita	Implemented
	62. Maracaibo	2 nd semester 2022

Prepared by: Secretariat April 2022

According to iSTARS application of ICAO, APV BARO VNAV/LNAV approach procedures have been implemented for 201 of 222 runway thresholds (baseline of Assembly Resolution A-37/11) at 100 international airports, reaching 90.5% progress (the global average is 74.2%). Regarding Standardized PBN routes, the iSTARS indicates that for 222 international runway thresholds an average advance of 68.9% was reached on SID routes and 51.8% on STAR routes.

However, the implementation of PBN approaches and SID/STAR PBN routes in SAM States is adequately reflected in terms of the specific operational needs of international airports, where not only SID/STAR PBN are being implemented, but also omnidirectional departures or specific PBN arrival legs. In this context, the PBN implementation of the SAM Region is presented in the Table "GESEA SG2 PBN progress Abril 2022.xlsx", Spanish only, available to be updated periodically by each State (according progress of implementation) in the SG1 folder called "4.Roadmap 2022 -2026, in the GESEA Channel link;

<https://oaci.sharepoint.com/f/r/sites/SAM-CAR-ANS-GESEA/Shared%20Documents/GESEA/SG1%20PLAN%20EA/4.%20Hoja%20de%20Ruta%202022%20-%202026?csf=1&web=1&e=QApx8p>

2.3 Implementation of ICAO GANP modules/elements

The following ASBU Block 0 and 1 modules, among other related applications, are considered for the short term:

APTA - Airport accessibility: Optimisation of PBN-based instrument approach procedures

APTA-B0/1	PBN approaches (with basic capabilities)
APTA-B0/2	PBN SID and STAR procedures (with basic capabilities)
APTA-B0/3	SBAS/GBAS CAT I precision approach procedures
APTA-B0/4	CDO (Basic)
APTA-B0/5	CCO (Basic)
APTA-B0/6	Point-in-space (PinS) PBN helicopter operations
APTA-B0/7	Performance-based aerodrome operating minima - Advanced aircraft
APTA-B0/8	Performance-based aerodrome operating minima – Basic aircraft

FRTO - En-route operations with enhanced trajectories: Capacity optimisation and flexible flights through enhanced en-route trajectories

FRTO-B0/1	Direct routing (DCT)
FRTO-B0/2	Airspace planning and flexible use of airspace (FUA)
FRTO-B0/3	Pre-validated and coordinated ATS routes to support flight and flow
FRTO-B0/4	Basic conflict detection and conformance monitoring
FRTO-B1/1	Free route airspace (FRA)

3 PBN NAVIGATION SPECIFICATIONS

The following is a summary of the navigation specifications set forth in ICAO Doc 9613. The appropriate specifications for the corresponding airspaces are defined further down, in accordance with the operational scenario identified.

Table 5 below presents a summary of the navigation specifications, divided by flight phase and NAVAID sensors required.

3.1 RNAV 10 (RNP 10)

The RNP 10 specification was developed to support reduced lateral and longitudinal separation minima for application in oceanic and remote areas where available NAVAIDs, communications and surveillance are limited.

The minimum spacing between routes when using RNP 10 is 50 NM.

RNP 10 operational requirements are defined in Part B, Volume II, Chapter 1, of ICAO Doc 9613.

3.2 RNP 4

The RNP 4 specification was developed for operations in oceanic and remote airspace, where no ground-based NAVAID infrastructure is available. GNSS is the primary navigation sensor to support RNP 4, either as a stand-alone navigation system or as part of a multi-sensor system. It supports the procedure-based separation defined in ICAO Doc 4444, PANS-ATM, with a minimum longitudinal separation of 30 NM and longitudinal separation of 30 NM. In order to use this spacing standard, RNP 4 must be combined with additional communication capabilities, specifically ADS-C.

RNP 4 operational requirements are defined in ICAO Doc 9613, Volume II, Part C, Chapter 1.

3.3 RNP 2

RNP 2 was developed for en-route applications, particularly in geographic areas with little or no ground NAVAID infrastructure, and no or limited ATS surveillance. The use of RNP 2 in continental applications has a less stringent continuity requirement than that for oceanic and remote applications.

The RNP 2 specification is GNSS-based and shall not be used in areas of known GNSS signal interference. Operators relying on GNSS must have the means to predict the availability of GNSS failure detection to support operations along the RNP 2 ATS route.

RNP 2 operational requirements are defined in ICAO Doc 9613, Volume II, Part C, Chapter 2.

3.4 RNAV 5

RNAV 5 operations are based on the use of RNAV equipment that automatically determines the position of the aircraft in the horizontal plane, using information from one or a combination of the following types of position sensors, together with means to establish and maintain a desired path:

- a) VOR/DME;
- b) DME/DME;
- c) INS or IRS; and
- d) GNSS.

In much of the airspace of the SAM region, RNAV 5 operations with VOR/DME and DME/DME sensors alone have limitations due to inadequate coverage and geometry of ground-based radio aids and insufficient number of stations to provide appropriate support infrastructure.

Direct pilot-controller speech communications are mandatory.

ATS surveillance may be used to mitigate the risk of gross navigational errors, provided that the route is within ATS surveillance and the volume of communication service and ATS resources are sufficient for the task.

3.5 RNAV 1 and RNAV 2

RNAV 1 and RNAV 2 specifications are applicable to all ATS routes, for both en-route and terminal area operations. It also applies to IAPs up to the FAF.

RNAV 1 and RNAV 2 specifications have been developed for RNAV operations in an ATS surveillance environment, but can be used in an environment without ATS surveillance if GNSS is required, and if the State of implementation ensures adequate system safety and responds for the lack of on-board performance monitoring and alerting.

RNAV 1 and RNAV 2 operations are based on the use of the same aircraft receivers that are required for RNAV 5. There are additional functional infrastructure and aircraft navigation aid requirements needed to meet the more demanding RNAV 1 and RNAV 2 performance.

RNAV 1 and RNAV 2 routes are intended for direct pilot-controller speech communications.

3.6 RNP 1

The RNP 1 specification provides a means to develop connectivity routes between the en-route structure and the terminal airspace with or without ATS surveillance.

RNP 1 can be associated to RF path termination and baro-VNAV.

The RNP 1 specification is GNSS-based and shall not be used in areas where navigation signal (GNSS) interference is known. While DME/DME-based RNAV systems may have RNP 1 precision capability, depending on a robust DME station infrastructure, this navigation specification is primarily intended for environments where such infrastructure cannot support DME/DME area navigation for the required performance.

3.7 RNP APCH

The RNP APCH specification relies on GNSS to support RNP APCH operations down to LNAV or LNAV/VNAV minima.

RNP APCH does not include specific requirements for ATS communications or surveillance. Adequate obstacle clearance is achieved through aircraft performance and operating procedures.

3.8 A-RNP

For en-route and terminal applications, this navigation specification has requirements that only address the lateral aspects of navigation.

A-RNP is based on GNSS. Ground infrastructure with multiple DME is not required, but can be provided based on State requirements, operational requirements and available services.

RF is an additional functional element required in A-RNP. The following additional functional elements are optional:

- a) RNP scalability
- b) Greater continuity
- c) Fixed radius transitions (FRT)
- d) Time of arrival control (TOAC)
- e) Baro-VNAV

Advanced RNP is the only navigation specification that allows operations under other associated navigation specifications. The aircraft navigation precision and the functional requirements of other navigation specifications that are met when A-RNP certified are:

- a) RNAV 5
- b) RNAV 1
- c) RNAV 2

- d) RNP 2
- e) RNP 1
- f) RNP APCH

The A-RNP specification has a very wide operational application: for operations in oceanic/remote airspace, in the en-route continental structure, in arrival and departure routes, and in approach procedures. Operations would depend solely on the integrity of the RNP system without the capability of reversal to conventional means of navigation, as conventional infrastructure may not be available. Notwithstanding the above, the corresponding contingency procedures need to be developed and implemented.

A-RNP is planned to be implemented in support of the ICAO aviation system block upgrades and the Global Air Navigation Plan.

3.9 RNP AR APCH

The RNP AR APCH specification represents ICAO's global standard for developing IAPs for airports where obstacles exist that impose limitations or where significant operational advantages can be gained.

The higher risks and complexities associated with these procedures are mitigated by more stringent RNP criteria, advanced aircraft capabilities and better flight crew training.

RNP AR APCH implementations do not require specific considerations regarding ATS communications and surveillance.

Table 3

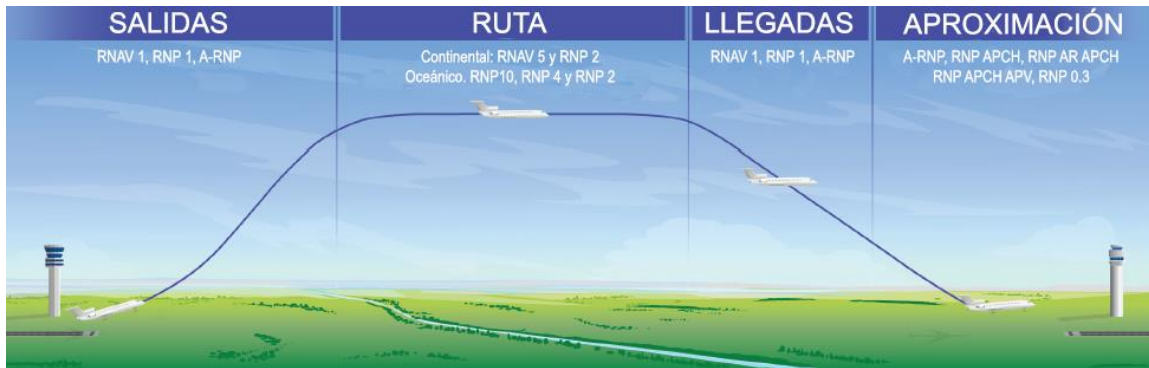
AIR NAVIGATION SPECIFICATIONS BY PHASES OF FLIGHT AND NAVAID REQUIRED SENSORS													
Air navigation Specifications	Phases of Flight								NAVAID sensors				
	Enroute Oceanic/remote	Enroute continental	Arrival	Approach				Departure	GNSS	IRU	DME/DME	DME/DME IRU	VOR/DME
				Initial	Intermediate	Final	Missed approach ¹						
RNAV 10	10	N/A		N/A				N/A	O	O	N/A		
RNAV 5 ²	N/A	5	5	N/A				N/A	O	O	O		O
RNAV 2		2	2	N/A				2	O	N/A	O	O	N/A
RNAV 1		1	1	1	1	N/A	1	1	O		O		
RNP 4	4	N/A		N/A				N/A	M				
RNP 2	2	2	N/A	N/A				N/A	M		SR	SR	
RNP 1 ³	N/A		1	1	1	N/A	1	1	M		SR	SR	
RNP avanzada ⁴ (A-RNP)	⁵ 2	2 o 1	1	1	1	0,3	1	1	M		SR	SR	
RNP APCH ⁶	N/A			1	1	⁷ 0,3	1	N/A	M		N/A		
RNP AR APCH				1-0,1	1-0,1	0,3-0,1	1-0,1	N/A	M				
RNP 0,3 ⁸	N/A		0,3	0,3	0,3	0,3	0,3	0,3	M				

O: Optional; **M:** Mandatory; **SR:** Subject to ANSP requirements

Notes:

1. Only applies once an obstacle clearance of 50 m (40 m, Cat H) has been reached after the start of climb.
2. RNAV 5 is a specification for en-route navigation that can be used for the initial part of a STAR outside 30 NM and above the MSA.
3. Use of the RNP 1 specification is limited to STARs, SIDs, initial and intermediate IAP segments and missed approach after the initial climb phase. Beyond 30 NM from the ARP, the alerting precision value becomes 2 NM.
4. A-RNP also allows for a range of scalable RNP lateral navigation decisions - see Part C, Chapter 4, 4.3.3.7.4. of Doc 9613.
5. Optional — requires higher continuity.
6. There are two sections in Doc 9613 for the RNP APCH specification: Section A is enabled by GNSS and baro-VNAV, Section B is enabled by SBAS.
7. RNP 0.3 applies to RNP APCH Section A. Different annular performance requirements apply only to RNP APCH Section B of Doc 9613.
8. The RNP 0.3 specification is primarily intended for helicopter operations.

Figure 1. Model navigation specifications by flight phase in SAM airspace



3.10 Performance-based communication and surveillance (PBCS)

The performance-based communication and surveillance (PBCS) concept provides objective operational criteria to evaluate emerging communication and surveillance technologies suited for the evolving needs of ATM functions. Once these criteria are established and accepted, the implementation of a specific ATM function, including its performance in technical and human terms, can be assessed against these operational criteria to determine its feasibility.

The PBCS concept is aligned with that of PBN. While the PBN concept applies required navigation performance (RNP) and area navigation (RNAV) specifications to the navigation element, the PBCS concept applies the required communication performance (RCP) and required surveillance performance (RSP) specifications to communication and surveillance elements, respectively. Each RCP/RSP specification includes criteria attributed to the components of the communication and surveillance systems involved.

Where beneficial, the RCP, RNP/RNAV and RSP specifications may be applied to the communication, navigation and surveillance elements to ensure the operational system and its components perform in accordance with the specifications. Figure 2 provides an overview of the performance-based communication, navigation and surveillance (CNS)/ATM model, which characterises the relationship of the performance-based specifications of the CNS elements supporting an ATM function.

Figure 2.- Performance-based CNS/ATM model



There are some differences between the PBCS concept and the PBN concept:

- a) The PBCS concept applies RCP and RSP specifications, which allocate criteria to ATS provision, including communication services, aircraft capability, and the aircraft operator; while the PBN concept applies RNP/RNAV specifications, which allocate criteria only to the aircraft capability and the aircraft operator; and
- b) The PBCS concept includes post-implementation local and regional monitoring programmes, with global exchange of information; while the PBN concept includes real-time aircraft capability monitoring and alerting functionality.

4 EN-ROUTE PBN OPERATIONS

4.1 Description of the concept

The implementation of strategic direct routing and free route airspace, in accordance with ASBU, will be the main feature of en-route airspace optimisation in the SAM Region, in order to take advantage of advanced aircraft navigation capabilities that, in combination with ATM tools, appropriate ATC sectorisation and traffic flow management, will support ATS routing that, as far as possible, meets the needs of airspace users, reduces controller and pilot workload and avoids concentrations of aircraft in portions of the airspace that could lead to system congestion.

The review and implementation of strategic direct routing and free route airspace will be carried out as a collaborative process among States, regardless of national borders, taking into account user requirements, airspace constraints and adapting to main traffic flows, with emphasis on the establishment of trunk routes.

It is expected that, by the end of the implementation period foreseen in this Roadmap, the upper continental airspace of the SAM Region, or part of it, will be PBN-exclusive with RNAV 5 navigation specification mainly, and RNP 2 or A-RNP specifications in those airspaces where it is necessary to increase airspace capacity by reducing spacing between main flows, close to TMAs.

RNAV-5 may be completely replaced by RNP 2 or A-RNP, but for this to happen the aircraft fleet must be equipped and the operators approved, and the cost-benefit analysis must offer a favourable equation.

This transition should be gradual, so it is expected that during this period routes may have more than one navigation specification. Under these conditions, aircraft meeting the more demanding specifications will derive greater operational benefits. See Annex 1 to this document.

Air operators increasingly require flexible routes that better suit their operational needs (EDTO; weather avoidance, airspace restrictions, etc.). The introduction of strategic direct routing and free route airspace and improvements in ATM systems would allow the implementation of these concepts.

Strategic direct routing and free route airspace can be defined by means of:

- Geographical coordinates that define them laterally,
- Entry/exit points to and from these airspaces; and/or
- Windows of specified levels.

In addition, strategic direct routing and free route airspace may be activated for certain periods of time.

In more complex airspaces, a fixed airspace structure will be maintained by means of a route network, combined with advanced on-board and ground capabilities, to ensure that system capacity and safety levels are maintained. The concept recognises that where traffic complexity is high, the required capacity can only be achieved at the cost of some limitation to individual optimal paths (for example, segregated paths may increase miles flown or affect optimal profiles).

In highly congested areas where upward and downward traffic flows prevail, it will be necessary to increase airspace capacity by implementing route structures that provide a higher degree of strategic segregation. The application of more advanced navigation specifications such as RNP 2 or A-RNP will allow for reduced route spacing.

Likewise, in congested areas, the flow of overflying aircraft must, as far as possible, not cross or interfere with the incoming and outgoing flow at the main TMAs, and the duration of eventual crossings must be minimised.

SAM airspace optimisation must also take into account ATC sectors, which must be adapted to the main traffic flows, to strategic direct routing/free route airspace and, where required and to a limited extent, to the route network. More ATC sectors shall be developed and put into operation where necessary (including vertical sectorisation). The design of ATC sectors must ensure that they are adaptable in shape and size (pre-defined) in response to variations in airspace demand and availability. It is expected that the need will arise to implement cross-border ATC sectors to support operations.

4.2 Specific objectives

Airspace optimisation in the South American Region is expected to contribute to ICAO's strategic objectives.

4.2.1 Principles

- i. The replacement of conventional ATS routes with RNAV routes in the upper airspace will continue, expecting to achieve 100% migration by 2023, considering the possibility that this PBN airspace, in the case of domestic and regional routes, will be exclusionary by virtue of regional agreement.
- ii. The implementation of strategic direct routing will start even with published RNAV routes. Gradually, starting in 2023, RNAV routes will start to be removed from airspaces with lower air traffic volumes and which have the necessary operational requirements (adequate VHF and ATS surveillance coverage as well as the required ATC systems).
- iii. Airspace optimisation will be based on operational requirements, regardless of national or FIR boundaries.
- iv. Airspace design will be a transparent process that takes into account the needs of all users, while negotiating safety, capacity, environmental protection, military and national security needs.
- v. The overall airspace structure will be developed establishing a close relationship among airspace design, airspace management and air traffic flow management.
- vi. Where required on oceanic routes, RNP 4/RNP 2 will be implemented with application of 23 NM lateral separation on parallel routes.
- vii. In continental airspace where operational advantages can be gained, RNP 2 or A-RNP routes will be implemented with the application of 15 NM spacing between parallel routes.
- viii. On unidirectional routes where the allocation of levels according to the semicircular table of headings is maintained, 10 NM separation may be applied with navigation specification RNP 2.
- ix. For dynamic airspace management, implementation of conditional routes will be considered, taking into account that no airspace should be restricted in a permanent or fixed manner, or restricted for an extended period of time. This will require effective civil-military coordination to achieve flexible use of airspace (FUA).
- x. Safety assessments will be conducted in the pre- and post-implementation phases.
- xi. Ensure connectivity of en-route airspace with terminal area SIDs and STARs. “Free Route Airspace” shall be obtained between the last point of the SID at the airport of origin to the first point of the STAR at the destination airport or, if no STAR exists, to the closest possible point of the initial approach fix (IAF).

4.3 Oceanic airspace

RNP10 (RNAV10) is applied in certain airspaces, such as the EUR/SAM Corridor, Lima-Santiago routes and the South Atlantic Random Routing Area and is expected to migrate to RNP4/RNP2, with the application of communication and surveillance performance, in order to allow separation reductions in accordance with Doc 4444, where safety enhancements and/or airspace capacity increases are required. Taking into account the low air traffic density in oceanic airspaces, significant changes to the current airspace structure are expected. The application of RNP 4/2 and PBCS will be required for the implementation of strategic direct routing and, subsequently, free route airspace in oceanic airspaces (see Annex 1).

Navigation in areas with random routes and /or User Preferred Routes (UPR) should consider PBCS and aircraft flying in these areas should be duly equipped with equipment that meets PBCS requirements.

Spacing between routes

In oceanic airspaces, the spacing between routes (parallel tracks) with PBN specification will be applied as described in the following table:

Table 4

Navigation specification	Minimum separation between routes	Performance requirements	
		Communication	Surveillance
RNAV 10 (RNP 10)	93 km 50 NM	Types of communication other than direct controller-pilot VHF voice communication	
RNP 4 RNP 2	42.6 km* 23 NM*	RCP 240	RSP 180
RNP 2	27.8 km** 15 NM**	Direct controller-pilot VHF voice communication	

* SLOPs will be applied up to 2NM

** SLOPs will be applied up to 0.5NM

Reference: Doc 4444, para 5.4.1.2.1.6

Note 1.— Guidelines for the implementation of the navigation capability supporting the lateral separation minima shown in the preceding table are contained in the Performance-based navigation (PBN) manual (Doc 9613). Information relative to the lateral separation minima shown in the preceding table is contained in Circular 349, Guidelines for the implementation of lateral separation minima.

Note 2.— Guidelines for implementation of communication and surveillance capability supporting the lateral separation minima shown in the preceding table are contained in the Performance-based communication and surveillance (PBCS) manual (Doc 9869) and the Global operational data link (GOLD) manual (Doc 10037).

4.4 Continental airspace

In the design, the main traffic flows will have higher priority over lower flows, applying the strategic direct routing/free route airspace concept and, where specific operational requirements exist, trunk PBN routes. Likewise, through an appropriate SID and STAR structure, main traffic flows will connect to major airports,

thus avoiding the proliferation of routes with low utilisation and/or that contribute to air navigation inefficiency.

In lower airspace, RNAV 5 will be implemented and, in selected airspaces, where necessary to reduce route spacing, RNP 2 or A-RNP, with mandatory application of GNSS, taking into account that the ground infrastructure does not support these navigation specifications. Lower and upper airspace PBN routes shall have as direct as possible paths and it is recommended that routes in both airspaces use the same reporting points. RNAV-5 may be completely replaced by RNP 2 or A-RNP, if the aircraft fleet is equipped and operators approved, within a favourable cost-benefit equation.

The Roadmap envisages that, in the lower airspace, the implementation of PBN routes aligned with the routes in the upper airspace will take a little longer depending on the equipage of the fleet flying in this airspace.

Spacing between routes

In continental airspaces, spacing between routes with PBN specification will be applied as described in the table below:

Table 5

Navigation specification	Minimum separation	Communication	Surveillance	Remarks
RNAV 5*	55.5 km 30 NM	Direct pilot-controller VHF (see Note 1)	Without surveillance	High traffic density
	33.3 km 18 NM		With surveillance	Opposite-direction traffic
	30.6 km 16.5 NM			Same-direction traffic
	19 km 10 NM			ATC intervention capacity permitting
RNP 2** or GNSS equipment	27.8 km 15 NM	Direct pilot-controller VHF	Without surveillance	Applied while an aircraft is climbing/descending through the level of another aircraft
	13 km 7 NM	Other than direct pilot-controller VHF		Applied while an aircraft is climbing/descending through the level of another aircraft
	37 km 20 NM			
<i>Note 1.- CPDLC is used in continental airspace in Brazil.</i>				

References:

**Doc 9613, Vol. II, Part B, Chapter 2, paragraph 2.2.3*

***Doc 4444, paragraph 5.4.1.2.1.6*

Also, taking into account the increasing importance of supporting the optimised application of PBN-based navigation specifications that are aimed at improving lateral separation, it is highly desirable to include in this roadmap the complementary optimisation of en-route longitudinal separation.

In this regard, it is proposed to consider the gradual reduction of conventional longitudinal separation from 80NM to 20NM, as well as of longitudinal separation based on ATS surveillance to 10 NM, in accordance with the commitments adopted by the States at the SAMIG meetings on this issue, and based on Doc 4444. It is also proposed to include this optimisation in the corresponding metrics and indicators.

5 PBN OPERATIONS IN TERMINAL AREAS

5.1 SID/STAR routes

PBN implementation will continue in the main TMAs of the Region, prioritising implementation based on the volume of traffic they support and considering proper integration with the route network. It is expected that non-PBN aircraft operations will still be allowed; the establishment of PBN-only TMAs will depend on the complexity and density of air traffic.

It is considered that SID and STAR design will be based mainly on RNAV 1 and RNP 1 navigation specifications, including environments without ATS surveillance, with mandatory application of GNSS, taking into account that almost all South American terminal areas do not have the necessary ground infrastructure to support these specifications, in order to allow the procedures to be used by a larger number of users.

The implementation of these navigation specifications will allow the development of segregated paths between PBN SIDs and STARs, with application of the lateral separation mentioned in Doc 4444.

In airspaces with low air traffic volume and low complexity or without significant terrain obstacles, the efficiency and safety justification of PBN STAR implementation should be assessed in order to avoid a result opposite of the one intended.

In environments of higher complexity due to obstacles or environmental constraints, where more advanced specifications are required, consideration will be given to applying the A-RNP specification in SID and STAR design, in order to take advantage of the functionality of RF legs and/or precision values of less than 1 NM and up to 0.3 NM. There are States that apply RNP AR criteria for SIDs, and other States may have the same need and could profit from available experiences (see Annex 2).

The implementation of fixed radius transitions (FRTs) in SIDs/STARs should also be pursued to reduce flying distances and fuel consumption.

Improved management of climb/descent flight profiles, together with the use of PBN, provides safer and more cost-effective operations in terminal areas. PBN procedures contribute to the increased use of CCO/CDO, which improves flight efficiency and reduces fuel consumption, CO₂ emissions and noise. States should take into account CCO/CDO operations in the design of SIDs/STARs, within the possibilities of each scenario considered. Work should be done in collaboration with operators to improve the prospects for successful validation and implementation of CCO/CDO.

At airports with a more complex operational environment, with a large number of SID and STAR procedures, the transition concept should be considered in the design and identification of charts to facilitate the pilot's access to the procedure authorised by the controller, as well as to avoid the ATCO having to memorise a significant number of SIDs/STARs. To this end, criteria should be established to standardise the application and nomenclature of transitions in the Region.

In adjacent or very close terminal areas, SIDs may be implemented that connect directly to a STAR in the next terminal area and *vice versa*, thus allowing the two-way traffic flow between two aerodromes to be channelled and strategically segregated (see Annex 3).

In the terminal area environment, in the vicinity of aerodromes, navigation precision often results in a concentration of perceived noise, due to more aircraft following the same approach profile. In some specific cases, mainly in the initial legs of SIDs, it may be necessary to allow for a greater dispersion of paths, despite the precision of RNAV systems, in order to mitigate the effects of aeronautical noise.

Consideration should be given to mitigating the environmental impact of noise on residential communities affected by the design of the procedures, which may have a cumulative effect of noise pollution over time, through noise mitigation measures, based on ICAO practices.

Omnidirectional SIDs will be applied where operational gains exist, mainly at airports with low air traffic volume and/or for use by non-PBN equipped users.

The treatment of VFR flights and the activities performed by these flights, as well as those airspaces that are intended to protect visual corridors for VFR aircraft operations, shall be included in planning and design.

5.2 Navigation specifications

The applicable navigation specifications in terminal areas are RNAV 1, RNP 1 or A-RNP.

Separations

In terminal areas, the separation between standard departure and arrival routes with PBN specification shall be applied as described in the following table:

Table 6

Navigation specification	Minimum separation	Communication	Surveillance	Remarks
RNAV 1	13 km 7 NM	Direct pilot-controller VHF	Without surveillance	Between any combination of RNAV 1 with RNAV 1, or RNP 1, RNP APCH or RNP AR APCH tracks
RNP 1	9.3 km 5 NM	Direct pilot-controller VHF	Without surveillance	Between any combination of RNP 1, RNP APCH or RNP AR APCH tracks

Navigation specification	Minimum separation	Communication	Surveillance	Remarks
Between conventional IFPs or between conventional IFPs and PBN	<i>See remarks*</i>	Direct pilot-controller VHF	Without surveillance	* Where the protected areas of tracks designed using obstacle clearance criteria do not overlap and provided operational error is considered.

References:

- *Doc 4444, paragraph 5.4.1.2.1.4*
- *ICAO Circular 324*

5.3 Instrument approach procedures – IAP

Within the considerations of this document it is not foreseen that SBAS or GBAS augmentation systems will be available in the Region for the development of approach procedures in the period considered herein.

Approach procedures with vertical guidance (APV) will continue to be developed for all IFR thresholds, with the purpose of increasing safety with stabilised approaches and reducing the possibility of CFIT. Priority will be given to their implementation at international airports and other controlled airports as determined by the competent authority of each State. The navigation specifications to be applied will be RNP APCH and A-RNP, with baro-VNAV for vertical guidance.

RNP approach procedures with authorisation required (RNP AR APCH) will continue to be developed at airports where there are clear operational benefits to be gained, and not only at airports with complex terrain. A solution has been found in the Region to interference between approach procedures at nearby aerodromes, through the application of RNP AR APCH procedures.

The design of RNP APCH procedures with RF leg will be encouraged, with a view to shortening approach paths, with the corresponding fuel and CO2 savings.

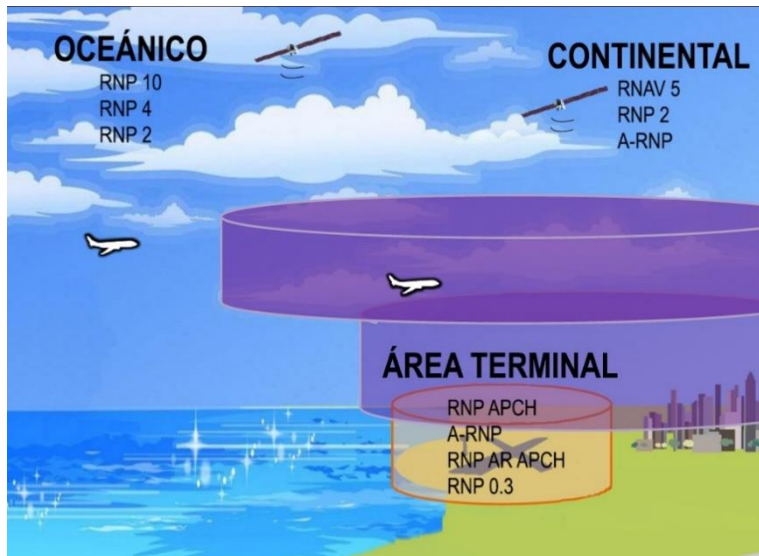
As RNAV 1 and RNP 1 specifications can be used up to the FAF, these specifications will be applied in the design of the initial and intermediate legs of ILS procedures.

This roadmap considers as a recommended alternative the implementation of PBN operations for visual runways at those airports that do not have instrument approaches, in order to reduce the probability of CFIT and loss of control in-flight, as well as non-stabilised approaches. CDM should be taken into account from the design phase. For this application, an implementation guide was developed for use by the States of the Region.

5.4 Navigation specifications

The applicable navigation specifications for instrument approach procedures are A-RNP, RNP APCH, RNP AR APCH, or RNP 0.3.

Figure 3. Model navigation specifications by airspace type



6 SUPPORTING METRICS

The following table 9 of **supporting metrics** is proposed to measure the degree of continuity of the implementation tasks planned for the period 2022-2026. These metrics do not replace and are not equivalent to key performance indicators (KPIs) defined in the GANP, 6th edition, which are used to assess the performance improvement in the implementation of certain ASBU elements.

Table 7

SUPPORTING METRICS FOR THE PERIOD 2022-2026				
ELEMENTS	SCOPE	METRICS	TARGET/DATES	STATUS AS AT JUNE 2021
1) Strategic direct routing in SAM FIRs	All FIRs (where communication and surveillance conditions are met)	Indicator: % of South American FIRs with EDE implemented. Supporting metrics: number of SAM FIRs with EDE implemented.	90% by 2022 100% by 2023	States started implementation in 2020.
2) Free route airspace in SAM FIRs	All FIRs (where communication and surveillance conditions are met)	Indicator: % de SAM FIRs with Free route airspace implemented. Supporting metrics: number of SAM FIRs with Free route airspace implemented.	10% by 2024 30% by 2025	N/A

SUPPORTING METRICS FOR THE PERIOD 2022-2026				
ELEMENTS	SCOPE	METRICS	TARGET/DATES	STATUS AS AT JUNE 2021
3) PBN SIDs SIDs at selected international airports with international operations. (alternatively, omnidirectional SIDs may be considered if air traffic volume is low)	International airports (where applicable)	Indicator: % of international airports with scheduled international operations with PBN SIDs	90% by 2022 100% by 2024	67.7% of 100 international airports with PBN SIDs implemented.
		Supporting metrics: number of international airports with scheduled international operations with PBN SIDs implemented.	Note: The new planning basis for the four-year period in reference to international airports is given in Table AOP-1 of the CAR/SAM ANP	

SUPPORTING METRICS FOR THE PERIOD 2022-2026				
ELEMENTS	SCOPE	METRICS	TARGET/DATES	STATUS AS AT JUNE 2021
<p>4) PBN STARs</p> <p>STARs at international airports with scheduled international operations considered in 2014: 1680</p>	<p>International airports (where applicable)</p>	<p>Indicator: % of international airports with scheduled international operations with PBN STARs, where the use of STARs is justified.</p>	<p>90% by 2022</p>	<p>52.5% of the 100 international airports with PBN STARs implemented.</p>
		<p>Supporting metrics: number of international airports with scheduled international operations with PBN STARs implemented, where such implementation is justified.</p>	<p>100% by 2024</p>	
<p>Note: The new planning basis for the five-year period in reference to international airports is given in Table AOP-1 of the CAR/SAM ANP</p>				

SUPPORTING METRICS FOR THE PERIOD 2022-2026				
ELEMENTS	SCOPE	METRICS	TARGET/DATES	STATUS AS AT JUNE 2021
5) Application of the CCO and CDO technique to departures and arrivals	All States	Indicator: % of international airports with arrivals and departures with CCO and CDO applications.	40% by 2022 60% by 2024 80% by 2026	20% of international airports with CCO/CDO implemented.
		Supporting metrics: Number of international airports with arrivals and departures with CCO and CDO applications.		
		<p>Note:1) CCOs/CDOs cannot always be implemented together, as they depend on the complexity of the terminal area under consideration.</p> <p>Note:2) CDOs are not necessarily related to the implementation of STARs. The State may create specific procedures to ensure the implementation of CDOs in airspace with low air traffic volume, without applying STARs.</p>		
6) PBN TMA design Baseline 2020: 54 TMAs selected	TMAs with INTL airports (where applicable)	Indicator: % of selected TMAs that apply the PBN airspace concept, serving international airports. Supporting metrics: Number of selected TMAs that apply the PBN airspace concept, serving international airports.	85% by 2022 90% by 2023 100% by 2024	(44/54) 81% of selected TMAs with PBN design according to the baseline considered.

SUPPORTING METRICS FOR THE PERIOD 2022-2026				
ELEMENTS	SCOPE	METRICS	TARGET/DATES	STATUS AS AT JUNE 2021
		Note: The baseline considered is 54 terminal areas (TMAs) of the most important international airports in the Region.		
<p>7) Reduction of the conventional longitudinal separation from 40 to 20 NM</p> <p>International FIR boundaries considered in the SAM Region: 50</p>	All States (where communication conditions are met)	<p>Indicator: % international FIR boundaries where the longitudinal separation reduction of 20 NM applies.</p> <p>Supporting metrics: Number of international FIR boundaries where 20 NM longitudinal separation applies.</p>	<p>50% by 2022</p> <p>70% by 2023</p> <p>100% by 2024</p>	<p>(45 of 50) 90% of international FIR boundaries applies the 40 NM longitudinal separation at FIR boundaries.</p> <p>4 continental FIR boundaries of Brazil apply 20 NM.</p> <p>9 SAM States have common boundaries with the Amazonica FIR or the Curitiba FIR. 20 NM is applied for aircraft inbound in Brazil.</p> <p>Panama–Barranquilla applies 20 NM</p> <p>Montevideo–Buenos Aires applies 20 NM</p> <p>Mendoza–Santiago applies 20 NM.</p>
		Note: Separations between internal FIRs within the same State are generally less than 40 NM.		

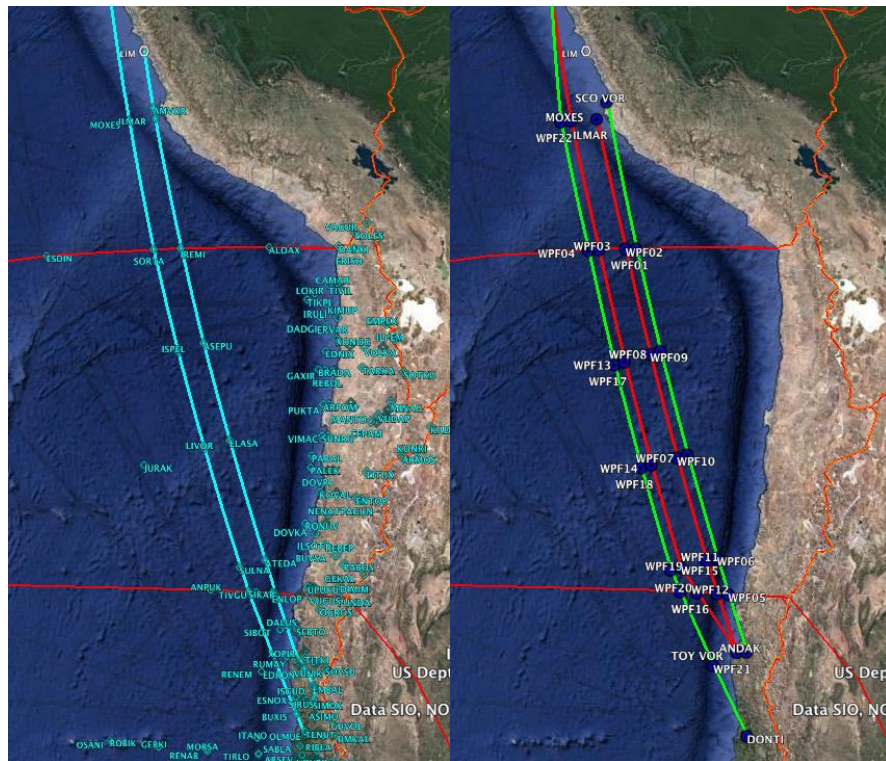
SUPPORTING METRICS FOR THE PERIOD 2022-2026				
ELEMENTS	SCOPE	METRICS	TARGET/DATES	STATUS AS AT JUNE 2021
<p>8) Reduction of the longitudinal separation with ATS surveillance to 10 NM</p> <p>International FIR boundaries considered: 50</p>	<p>All States (where communication and surveillance conditions are met)</p>	<p>Indicator: % international FIR boundaries where the reduction of longitudinal separation with ATS surveillance of 10 NM is applied.</p> <p>Supporting metrics: Number of international FIR boundaries where longitudinal separation with ATS surveillance of 10 NM is applied.</p>	<p>20% by 2024</p> <p>50% by 2026</p>	<p><i>Note. - Under ATC tactical coordination, 10 NM is applied on aircraft transfers between Montevideo-Curitiba and Montevideo-Buenos Aires.</i></p>
<p>9) Approaches with vertical guidance (APV) to international airport</p> <p>APV at international airports (ICAO Assembly Res. A37-11)</p>	<p>All States</p>	<p>Indicator: % of international airports with approach procedures with vertical guidance</p> <p>Supporting metrics: number of IFR runway thresholds at international airports with APV procedures in place</p>	<p>93% by 2022</p> <p>96% by 2023</p> <p>100% by 2024</p>	<p>(192 of 217) 88.5% of IFR thresholds at international airports with APV procedures in place.</p>

SUPPORTING METRICS FOR THE PERIOD 2022-2026				
ELEMENTS	SCOPE	METRICS	TARGET/DATES	STATUS AS AT JUNE 2021
<p>10) Approaches with vertical guidance (APV) to domestic airport</p> <p>APV at domestic IFR aerodromes, as well as aerodromes with selected visual flight runways.</p>	All States	<p>Indicator: % of domestic aerodromes with APV procedures</p> <p>Supporting metrics: number of controlled domestic aerodromes with APV procedures in place</p>	<p>40% by 2022</p> <p>60% by 2024</p> <p>80% by 2026</p>	<p>TBD</p> <p>By GESEA SG2</p>
<p>11) PBN routes (RNAV-5 or RNP2) in the upper airspace</p> <p>RNAV routes implemented in upper airspace where there is a need to channel large air traffic volume flows.</p>	All States	<p>Indicator: % of routes (RNAV-5 or RNP2) in upper airspace where there is a need to channel large air traffic volume flows.</p> <p>Supporting metrics: number of routes in upper airspace with some PBN navigation specification and a need to channel large air traffic volume flows.</p>	<p>90 % by 2022</p> <p>100 % by 2023</p>	<p>(136 of 165) 82.4% of routes (RNAV-5 or RNP2) of the upper airspace.</p>

Annex 1. Example of operational scenario with PBN routes between States

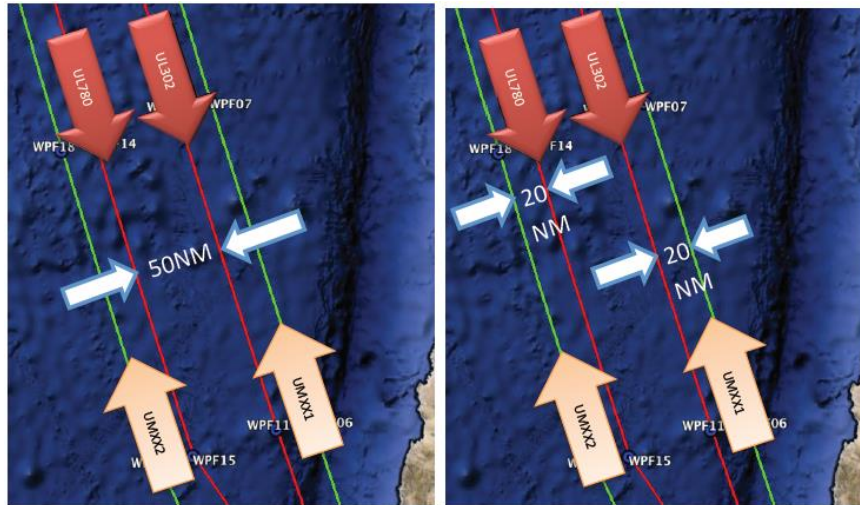
By way of example, Peru and Chile are countries that are actively working on improving their airspace using PBN, implementing segregated departure and arrival flows at their main TMAs: Peru through the PROESA project and Chile with the PAMPA project.

The flow linking the Lima and Santiago terminal areas has been structured since 2006 on the basis of a pair of airways, UL302 and UL780, declared RNP 10 (RNAV10) spaced 50 NM apart, and bidirectional. Some sectors have VHF voice communication deficiencies and no ATS surveillance due to being out of coverage, especially at the FIR boundary. (See figures.)



Considering the work in progress in both countries, the increase in traffic, traffic complexity in oceanic airspace and the need to increase the levels of safety at the transfer points between the FIRs involved, it is proposed to implement two new RNP 10 (RNAV 10) routes parallel to the existing ones. In this new scheme, the routes would be unidirectional. The current routes UL780 and UL302 would have a North-South direction and the two new routes would have a South-North direction. (See figure B2.)

These new routes will be spaced 20 NM apart from the current routes, which will maintain their 50 NM spacing. (See figure.)



Spacing between routes allows separation for "RNAV operations for which RNP is specified on parallel tracks or ATS routes", as described in Chapter 5 of Doc 4444. Thus, a minimum separation of 37 km (20 NM) between tracks may be applied while an aircraft is climbing/descending through the level of another aircraft when using a means of communication other than direct controller-pilot voice VHF, if RNP2 navigation performance **or GNSS equipment**, declared on the FPL by the letter G, is prescribed, considering that aircraft with RNP 10 approval meet the requirement for GNSS equipment and that the use of the letter G on the FPL implies that the GNSS receiver meets the requirements of Annex 10, Volume I.

In this situation, these airways will have dual navigation specification, RNAV 10 and RNP 2. The latter will have operational benefits in allowing level changes with respect to other RNP 2 aircraft flying on airways with only 20 NM separation and routes with 50 NM spacing, while those with only RNAV 10 certification will be able to do so only with respect to 50 NM routes.

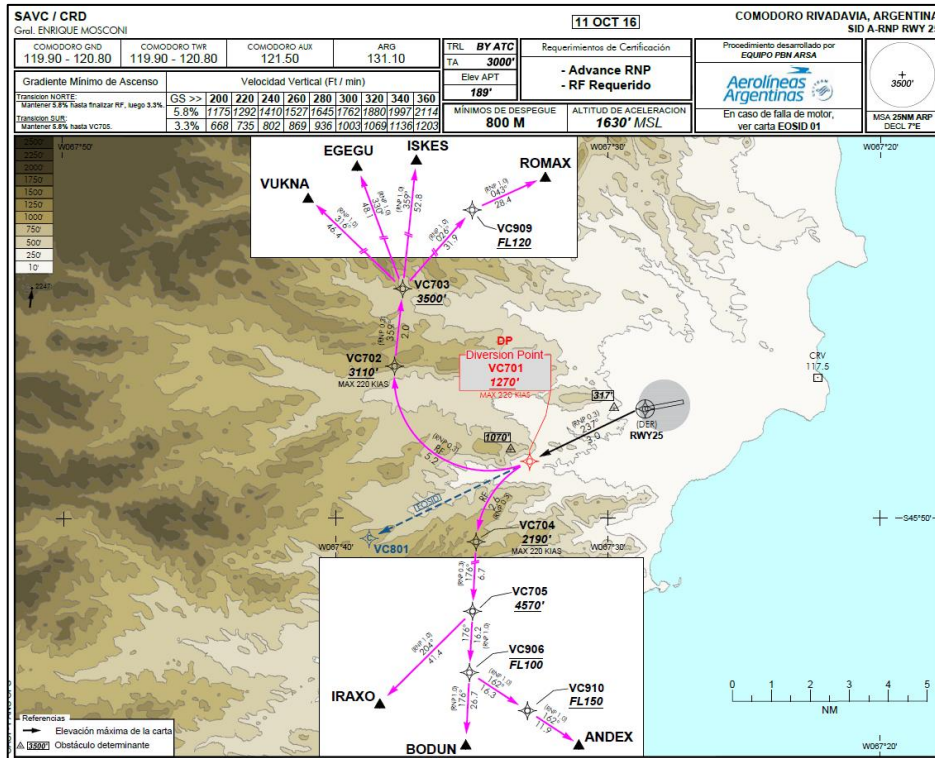
This airway configuration would mitigate potential operational coordination errors between ATS units, achieve short-term operational efficiencies by not restricting level changes by traffic in the opposite direction, if the aircraft involved have GNSS equipment, and support the estimated increase in traffic in the coming years.

When the need to increase airspace capacity warrants it and the fleet operating on these airways is ready, it will be possible to consider, using the same route structure, the implementation of a more advanced navigation specification such as RNP 2 on an exclusionary basis.

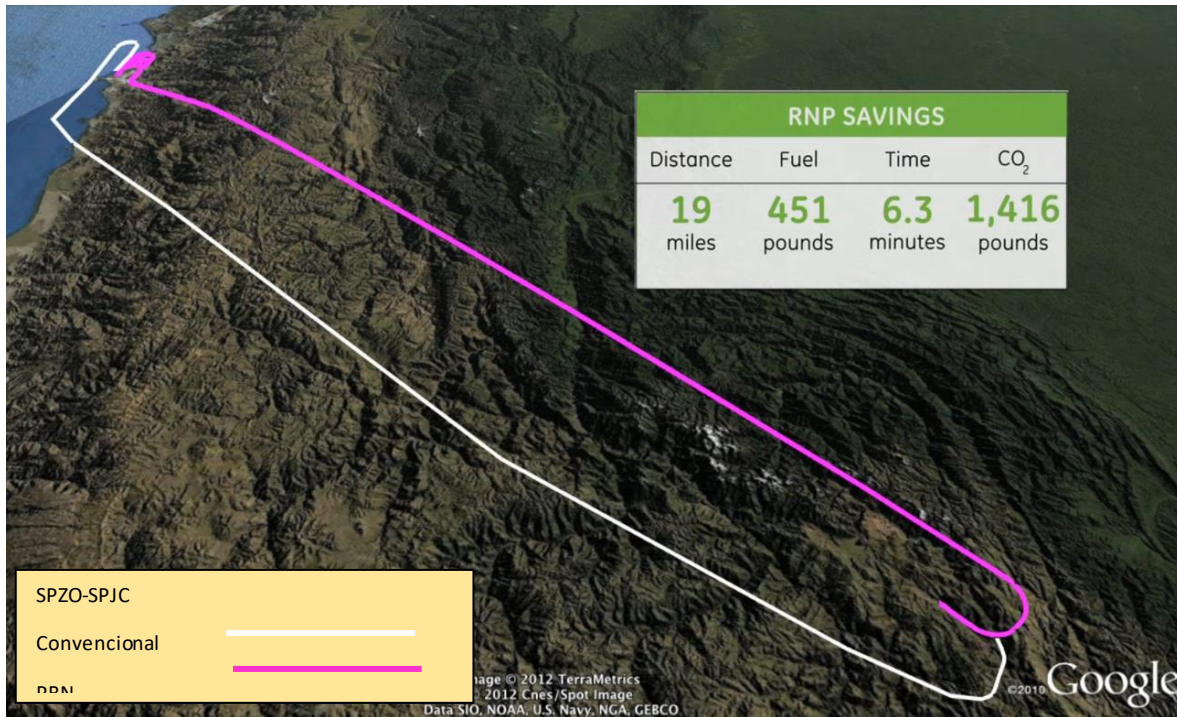
Annex 2. Example of A-RNP SIDs and RNP AR SIDs

As an example, SID charts developed with application of A-RNP and RNP AR are presented.

1. In Argentina, the company Aerolíneas Argentinas found a solution to develop instrument departures at two airports with complicated settings such as San Martín de los Andes (SAZY) and Comodoro Rivadavia (SAVC), through the application of the A-RNP specification with required RF. Initially, these SIDs will be for private use by Aerolíneas while coordination with the Argentinean authority to make them public is being completed.



2. Before the introduction of the A-RNP specification in Peru, there was a need to develop instrument departures from Cusco to connect with the new RNAV 5 route to Lima. Considering that the RNP 1 specification did not provide an adequate solution for the development of instrument departures, RNP AR SIDs were developed. In this way, it was possible to develop a completely PBN alternative from the departure in Cusco to the arrival in Lima: RNP AR SID - RNAV 5 Route - RNP 1 STAR - RNP AR APCH IAP.



Annex 3. Example of an operational scenario with SIDs and STARs in one State

As an example, the scenario of arrivals and departures between adjacent or very close terminal areas is shown below.

Ecuador, in its airspace optimisation process, has implemented PBN in the terminal areas of Quito and Guayaquil. In this process, it has developed standard departure and arrival routes connected to each other at a common point. This has strategically segregated two-way traffic flows between Quito and Guayaquil airports (which are separated by 149 NM).

This SID and STAR configuration reduces points of conflict and facilitates the application of CCO/CDO, reducing pilot and controller workload. See figure.

Figure



Appendix A. Acronyms and Abbreviations

A-RNP	Advanced RNP
ADS-B	Automatic dependent surveillance - Broadcast
ADS-C	Automatic dependent surveillance - Contract
AIP	Aeronautical information publication
ANSP	Air navigation service provider
AORRA	Atlantic Ocean Random Routing Area
APCH	Approach
APV	Approach procedure with vertical guidance
ASBU	Aviation system block upgrades
ATC	Air traffic control
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic service
CCO	Continuous climb operations
CDO	Continuous descent operations
CDM	Collaborative decision-making
CDR	Conditional route (non-permanent ATS route)
CNS	Communications, navigation and surveillance
CPDLC	Controller-pilot data link communications
DME	Distance-measuring equipment
e-ANP	Electronic Air navigation plan
EDTO	Extended diversion time operations
FAF	Final approach fix
FANS	Future air navigation systems
FPL	Flight plan
FUA	Flexible use of airspace
GA	General aviation
GANP	Global air navigation plan
GBAS	Ground-based augmentation system
GLS	GBAS landing system
GNSS	Global navigation satellite system
GPS	Global positioning system
IAP	Instrument approach procedure
IFP	Instrument flight procedure
ILS	Instrument landing system
INS	Inertial navigation system
IRS	Inertial reference system
IRU	Inertial reference unit
MLAT	Multilateration
NAVAID	Aid to air navigation
PBCS	Performance-based communication and surveillance
PBN	Performance-based navigation
PBS	Performance-based surveillance
RAAC	Meeting of Civil Aviation Authorities of the South American Region
RNAV	Area navigation
RCP	Required communication performance
RF	Fixed radius turn

RNP	Required navigation performance
RPAS	Remotely-piloted aircraft systems
RSP	Required surveillance performance
SAM/IG	South American Implementation Group
SAM-PBIP	Performance-based navigation system implementation plan for the South American Region
SARPs	Standards and recommended practices
SATVOICE	Satellite voice communications
SBAS	Satellite-based augmentation system
SID	Standard instrument departure
STAR	Standard instrument arrival
SUA	Special-use airspace
VFR	Visual flight rules
VHF	Very high frequency
VNAV	Vertical navigation

Appendix B. Reference Documents

The following ICAO documents are related to the Roadmap:

- Doc 9750 GANP, Sixth edition 2019
- Doc 9854 Global air traffic management operational concept
- Doc 9883 Manual on global performance of the air navigation system
- Doc 9882 Manual on air traffic management system requirements
- Doc 4444 Procedures for air navigation services - Air traffic management (PANS-ATM)
- Doc 8168 Aircraft operations, Volume II
- Doc 9613 Performance-based navigation (PBN) manual
- Doc 9905 Required navigation performance authorization required (RNP AR) procedure design manual, first edition
- Doc 9924 Aeronautical surveillance manual, first edition
- Doc 9931 Continuous descent operations (CDO) manual, first edition
- Doc 9992 Manual on the use of performance-based navigation (PBN) in airspace design, first edition
- Doc 9993 Continuous climb operations (CCO) manual, first edition
- Doc 9997 Performance-based navigation (PBN) operational approval manual, first edition
- ICAO Circular 324 Guidelines for lateral separation of arriving and departing aircraft on published adjacent instrument flight procedures

(AVAILABLE IN SPANISH ONLY)

**PLAN MARCO PARA CONTINGENCIAS
ATS DE LA REGIÓN SAM**

(MCATS /SAM)

Enmienda 1 sobre:

APÉNDICE E: TÉRMINOS DE REFERENCIA DEL EQUIPO DE
COORDINACIÓN DE CONTINGENCIA (CCT)

APÉNDICE I: PROCESOS DE ARMONIZACIÓN PARA LOS
PLANES DE CONTINGENCIA ATS NIVEL 2

APÉNDICE E - TÉRMINOS DE REFERENCIA DEL EQUIPO DE COORDINACIÓN DE CONTINGENCIA (CCT)

1. PREMISAS BÁSICAS.

- 1.1. El *Equipo de Coordinación de Contingencia (CCT)* estará constituido por el Estado SAM en situación de contingencia y por los Estados SAM a los cuales se requiera su participación.
- 1.2. Se adopta el nombre *Equipo de Coordinación de Contingencia (CCT)*, a fin de contribuir con la estandarización de la terminología utilizada por OACI y por IATA, y para facilitar la identificación del equipo que tendrá a su cargo la asistencia que los Estados de la Región SAM puedan brindar a uno o más Estados en situación de contingencia. Esta adopción tiene como base el Doc OACI 10084 – Manual de evaluación de riesgos para operaciones de aeronaves civiles sobre zonas de conflicto o cerca de estas zonas -, pero su uso estará limitado al cumplimiento de los objetivos del Plan Marco para Contingencias ATS de la Región SAM (MCATS/SAM).
- 1.3. La conformación de dicho Equipo reside en la necesidad de que la Región SAM disponga de un mecanismo de coordinación que optimice la implementación de las medidas de contingencia previstas en los citados Planes, sin perjuicio de las responsabilidades inherentes a los Estados en los que se desarrolla la situación de contingencia.
- 1.4. Al recibir información sobre el inicio de acciones para la preactivación o activación de un Plan de Contingencia ATS de un Estado, la Oficina Regional Sudamericana (RO SAM) de OACI asistirá en la organización del CCT. Este equipo tiene carácter temporal y será disuelto cuando se desactive el Plan de Contingencia ATS que lo motivó.
- 1.5. La asistencia del CCT no se limitará al Estado en situación de contingencia, también proveerá apoyo a los Estados adyacentes al mismo, teniendo en cuenta lo previsto en los Planes de Contingencia ATS de esos Estados y, cuando existan, las provisiones incluidas en los Planes de Contingencia Regionales.

2. OBJETIVOS.

- a) Apoyar la coordinación y el intercambio de información en casos de contingencias que afecten, o pudieran afectar, los espacios aéreos, aeropuertos, comunicaciones y/o la provisión de Servicios de Navegación Aérea en la Región SAM;
- b) Coordinar la contingencia con Estados colindantes de la región CAR (Ej.: Contingencias provocadas por huracanes y otros eventos que, puedan afectar a Estados, como Ecuador, Colombia, Venezuela, Guyana, Surinam),

- c) Servir como entidad de apoyo y coordinación y de intercambio de información confiable y actualizada. Monitorear e intercambiar información pertinente con los Estados directamente involucrados, como así también con aquellos que son potenciales participantes en los arreglos para casos de contingencia, y otras partes involucradas pertinentes;
- d) Servir de enlace con los Estados y organizaciones internacionales, los usuarios y las entidades involucradas, a fin de agilizar la respuesta individual y Regional ante contingencias o posibles contingencias que puedan afectar los ATS (ver en Apéndice F, el Listado regional de puntos de contacto (Árbol de llamadas/Phone tree);
- e) En caso de ser necesario, colaborar con acciones de mitigación o medidas complementarias o adicionales; y
- f) Asegurar el flujo de información hacia la OACI (Sede y puntos focales de las Oficinas Regionales) como así también hacia IATA (Sede y puntos focales de las Oficinas Regionales).
- g) Centralizar toda información fidedigna relativa a la situación de contingencia, que permitan coordinar con las partes involucradas y apoyar las medidas de contingencia que se establezcan, facilitando la circulación de las aeronaves y reforzando la seguridad operacional, además de aplicar la toma de decisiones en colaboración (CDM) como metodología de trabajo.

3. PERFIL DE LOS PARTICIPANTES.

El CCT deberá, preferentemente, tener la participación de los siguientes profesionales, a criterio de cada Estado y Organización Internacional:

- a) Funcionarios de la Alta Dirección (facultados para la toma de decisiones. Ej.: Director de Navegación Aérea o equivalente);

Nota: En cada Estado se debe considerar la denominación de la posición según la estructura de la organización.

- b) Directores/Gerentes de Alto Nivel (facultados para la toma de decisiones);
- c) Especialistas en el Servicio de Gestión del Flujo de Tránsito Aéreo (ATFM);
- d) Especialistas en el Servicio de Búsqueda y Salvamento (SAR);
- e) Especialistas en Comunicaciones, Navegación y Vigilancia (CNS);
- f) Especialistas en Meteorología Aeronáutica (MET);
- g) Especialistas en Gestión de Información Aeronáutica (AIM);
- h) Especialistas en Aeropuertos y Ayudas Terrestres (AGA);
- i) Especialistas en Sistema de Gestión de la Seguridad Operacional (SMS);
- j) Representantes de otros organismos/usuarios que puedan tener una implicancia directa en la situación de contingencia en desarrollo o a desarrollarse.

4. ESTRUCTURA.

Para el desarrollo de sus actividades, el Equipo de Coordinación de Contingencia (CCT) tendrá la siguiente estructura:

Nota 1.- Los Coordinadores Generales AAC/ANSP, serán los Puntos Focales designados por cada Estado y estarán en coordinación permanente con el Oficial ATM de la Regional SAM.

Nota 2.- La conformación de los coordinadores según especialidad, será establecida por el Coordinador General de cada Estado, en base a la categoría y campo de acción del evento que provocó la contingencia.

- a) Coordinadores Generales AAC/ANSP,
- b) Coordinadores OPS,
- c) Coordinadores CNS,
- d) Coordinadores ATFM,
- e) Coordinadores AIM,
- f) Coordinadores MET,
- g) Coordinadores SAR,
- h) Coordinadores AGA, y
- i) Miembros de otros organismos/usuarios.

5. RESPONSABILIDADES Y FUNCIONAMIENTO.

5.1. RESPONSABILIDADES.

5.1.1. COORDINADORES GENERALES Y COORDINADORES POR ESPECIALIDAD.

- a) Coordinadores Generales AAC/ANSP: responsables de la conducción de los Coordinadores de cada Especialidad designados en sus respectivos Estados. Será quien vele por la utilización de información confiable y actualizada. Deberá mantener un vínculo directo con el Oficial ATM/SAR de la RO SAM. Dichos Coordinadores, recibirán la información, a fin de ser procesada y presentada a los miembros de los Organismos afectados/alcanzados de su Estado.
- b) Coordinadores OPS: dedicados a las actividades relacionadas a la Planificación de Espacio Aéreo y desarrollo operativo de las medidas requeridas;
- c) Coordinadores CNS: dedicados a las actividades relacionadas a los sistemas de Comunicación, Navegación y Vigilancia que serán requeridos según el evento de contingencia que afecte a los ATS;
- d) Coordinadores ATFM: dedicados a las actividades relacionadas a la Gestión de Afluencia de Tránsito Aéreo. Serán quienes coordinen las unidades para mantener un balance de la capacidad/demanda aceptable para la contingencia;
- e) Coordinadores AIM: dedicados a las actividades relacionadas a la Gestión de la Información. Serán quienes mantengan un flujo de información dentro de los canales establecidos para atender la contingencia y asegurarán la calidad de la información transmitida;

- f) Coordinadores MET: dedicados a las actividades relacionadas a la gestión de información de datos y productos meteorológicos. Serán quienes mantengan informados a los distintos organismos afectados sobre cualquier evento meteorológico que se haya producido o afecte a la contingencia;
- g) Coordinadores SAR: dedicados a las actividades relacionadas a la prestación del Servicio de Búsqueda y Salvamento en la región/zona de la contingencia. Serán quienes mantengan la coordinación e información de los medios SAR requeridos para la contingencia;
- h) Coordinadores AGA: dedicados a las actividades relacionadas a la gestión de los aeródromos/aeropuertos involucrados. Serán quienes coordinen y mantengan informados a las unidades/servicios en los aeródromos/aeropuertos afectados por la contingencia.

5.1.2. MIEMBROS DE OTROS ORGANISMOS/USUARIOS.

Los puntos focales de otros organismos/usuarios serán quienes mantengan informado al CCT sobre toda novedad o medidas que se considere pertinente para ser transmitida en base al tipo de contingencia, reportando a través del Coordinador OPS o AGA, según corresponda.

5.2. FUNCIONAMIENTO DEL EQUIPO DE COORDINACIÓN DE CONTINGENCIA.

- 5.2.1. El Coordinador General del Estado en que se suscita o se podría suscitar una situación de contingencia notificará al respecto, al Oficial ATM/SAR de la RO SAM.
- 5.2.2. El Oficial Regional ATM/SAR, posterior a ser informado, notificará la preactivación o activación de un Plan de Contingencia ATS mediante correo electrónico institucional y una aplicación de mensajería instantánea (por ej., WhatsApp) a los Coordinadores Generales de cada Estado, de acuerdo al Árbol de llamadas incluido en el MCATS/SAM (Apéndice F -LISTA REGIONAL DE LOS PUNTOS DE CONTACTO).
- 5.2.3. El CCT conformado se desempeñará, durante las 24 horas, mientras prevalezca la situación de contingencia, excepto que se acuerde un esquema horario distinto.
- 5.2.4. Los Coordinadores Generales del CCT designarán a los Coordinadores de cada Especialidad y los puntos focales de otros organismo o usuarios, según corresponda en su Estado. El listado de dichos coordinadores será remitido por email a RO SAM para efectos del Informe indicado en Sección 7.

Nota: La lista de participantes del CCT estará disponible luego de cada evento para un control de la actuación y retroalimentación ante futuras activaciones del plan por eventos de contingencia de similares características. (Archivo/Registro de Contingencias y acciones adoptadas)

- 5.2.5. Los Coordinadores Generales de cada Estado ejecutarán el procedimiento establecido para el desarrollo de una situación de contingencia de un Estado de la Región SAM a ser aplicado a nivel nacional, tendiente a alcanzar los objetivos del CCT, en función de los

acuerdos realizados entre Estados ante una situación de contingencia.

- 5.2.6. Finalizada la situación de contingencia y producida la desactivación del Plan de Contingencia ATS, el Coordinador General pertinente informará al respecto al Oficial Regional ATM/SAR.
- 5.2.7. Consecuentemente, el Oficial Regional ATM/SAR notificará la desactivación del Plan de Contingencia ATS pertinente a los Coordinadores Generales de cada Estado, mediante los canales establecidos a tal efecto.
- 5.2.8. El CCT será disuelto vía e-mail cuando se desactive el Plan de Contingencia ATS que lo motivó.

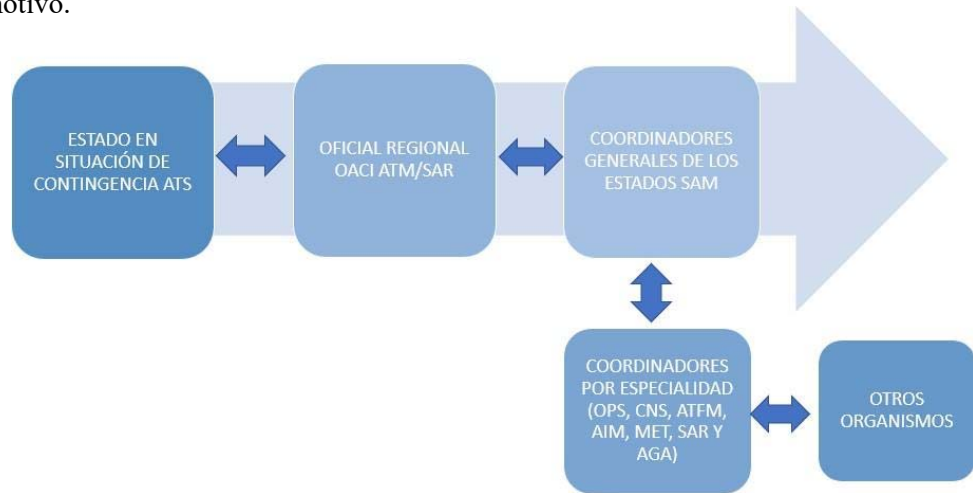


Figura 1-Diagrama de flujo de comunicaciones

6. ACTUALIZACIÓN DE LOS TÉRMINOS DE REFERENCIA DEL CCT.

Los términos de referencia del CCT serán actualizados cada DOS (2) años, para lo cual el Oficial Regional ATM deberá convocar un grupo de trabajo *Ad Hoc*, formado por los expertos de los Estados. No obstante, se podrán enmendar cada vez que se considere necesario, en virtud de los procesos de mejora continua o ante cambios significativos en las regulaciones.

7. INFORME.

- 7.1. Al finalizar las tareas y funciones asociadas a una contingencia, el Oficial ATM/SAR, elaborará el informe en el que se dejará constancia de lo actuado por el CCT.
- 7.2. Dicho Informe debería incluir los aspectos que se detallan a continuación, entre otros que se consideren pertinentes, a fin de ser tratados en carácter de caso de estudio y análisis en los procesos en la planificación e implementación de futuros Planes de Contingencia ATS:
 - a) Hora y fecha de inicio/finalización de las medidas de contingencia.
 - b) Información sobre la situación que desencadenó la preactivación y/o activación de las medidas de contingencia;
 - c) Medidas de contingencia efectivamente implementadas;
 - d) Repercusión de las medidas de contingencia sobre las operaciones;
 - e) Disponibilidad del espacio aéreo/aeropuerto para aterrizajes, despegues y sobrevuelos de tránsito;
 - f) Rutas de contingencia utilizadas;
 - g) Dependencias y servicios disponibles o no disponibles.
 - h) Dependencias y servicios disponibles o no disponibles en los Estados adyacentes;
 - i) Procedimientos aplicados por los explotadores y/o usuarios.
- 7.3. Este informe recibirá los aportes de cada Coordinador que haya actuado, de los miembros de otros organismos y de los puntos focales de los explotadores y/o usuarios, en la medida que hayan intervenido.

- 7.4. Asimismo, los Informes resultantes se archivarán en un repositorio confeccionado a tal efecto, de acceso a los responsables designados por cada Estado a tal fin, con el objeto de constituir una plataforma de aprendizaje de la cual se retroalimente el MCATS/SAM y, en consecuencia, los Planes de Contingencia ATS Nacionales.

8. MONITOREO Y CONTROL DEL DESEMPEÑO DEL CCT.

Toda la información monitoreada y recopilada, será utilizada para optimizar el funcionamiento del CCT en el formulario o instrumento similar que se establezca a tal efecto. A tal fin, se deberá observar y compilar, al menos, la siguiente información:

- a) Estado/país en el que se activan las medidas de contingencia.
- b) Hora de inicio de las medidas de contingencia;
- c) Hora de activación del CCT.
- d) Hora de desactivación del CCT a partir de la hora de finalización de la contingencia.
- e) Tiempo total de duración de la contingencia.
- f) Cantidad de Coordinadores Generales que participan.
- g) Cantidad de puntos focales de explotadores y/o usuarios que se comunican con el CCT.
- h) Cantidad de comunicaciones realizadas mediante la aplicación de mensajería instantánea.
- i) Cantidad de correos electrónicos institucionales enviados.
- j) Otros medios de comunicación que se requieran.

APÉNDICE I: PROCESOS DE ARMONIZACIÓN PARA LOS PLANES DE CONTINGENCIA ATS NIVEL 2

1. OBJETIVOS.

- 1.1. A fin de alcanzar la consecución de los objetivos de este Plan Marco - entre otros, aquellos vinculados a la armonización y a la capacidad de respuesta de dichos Estados ante el desarrollo de una situación de contingencia -, se establecen los siguientes objetivos específicos:
 - a) Dinamizar los procesos de armonización de los Planes de Contingencia ATS Nivel 2, con el propósito de incrementar la capacidad de respuesta de los Estados de la Región SAM ante la activación de dichos Planes, adoptando acciones que contribuyan a la rápida normalización de las operaciones aéreas y de la provisión regular de los Servicios de Navegación Aérea (ANS);
 - b) Acelerar y flexibilizar los procesos de actualización de las medidas de contingencia armonizadas entre dos o más Estados de la Región SAM, dado su carácter operacional y la necesidad de su inmediata implementación para la continuidad y la seguridad de las operaciones aéreas.

2. PROCEDIMIENTO PARA LA ACTUALIZACIÓN DE MEDIDAS DE CONTINGENCIA ESTABLECIDAS ENTRE DOS (2) O MÁS ESTADOS ADYACENTES.

- 2.1. Para el desarrollo del procedimiento que a continuación se detalla, se tomó como premisa básica la desvinculación de las medidas de contingencia acordadas entre países adyacentes respecto de las Cartas de Acuerdo Operacionales (LOA) ATS suscritas entre ambos.
- 2.2. Se pretende de este modo agilizar el proceso de actualización de dichas medidas, siendo que son intrínsecas a las mismas el tenor técnico operativo que las conforman; motivo por el cual resulta superfluo/ prescindible la presencia y/o rúbrica de las mismas por parte de los funcionarios de la alta Dirección de las AAC / ANSP de los Estados.
- 2.3. De este modo, se presenta a continuación los pasos que pretenden conllevar eficientemente al logro de la actualización de las medidas de contingencia ATS entre Estados adyacentes:
 - a) Las AAC de los Estados adyacentes que requieran la actualización de sus Planes de Contingencia Nivel 2, en coordinación con la Oficina Regional Sudamericana (RO SAM), convocarán a los ANSP respectivos a una reunión mediante plataforma virtual con el objeto de que se actualicen sus medidas de contingencia ATS. La convocatoria se lleva adelante mediante correo electrónico institucional.
 - b) Se planificarán las reuniones presenciales o virtuales necesarias entre los ANSP de los Estados respectivos, para el logro del debido consenso en relación a los aspectos de orden técnico-operativo referidos a las medidas de contingencia ATS. Cada una de las reuniones deberán acreditarse mediante la confección de una minuta, informe o acta de reunión, la cual será enviada tanto a los participantes de las mismas como al punto focal correspondiente de las AAC de los Estados involucrados, con el doble objetivo de informar respecto de lo actuado, como así también de dejar constancia de las acciones convenidas.

- c) Una vez armonizado el Plan de Contingencia ATS entre los Estados, se procederá a labrar un acta o informe de la reunión que quedará como instrumento de estandarización o armonización entre las Partes. Dichos documentos deben incluir los aspectos coordinados, como así también la fecha y el instrumento de publicación, es decir, sea por Suplemento (SUPP) o por Enmienda (AMDT) a la AIP.
- d) Finalmente, los Estados involucrados procederán a la publicación de las medidas de contingencia ATS en la sección 1.15 de la AIP.

Nota. - De ser acordado entre los Estados, las LOA ATS incluirán - respecto a materia de Contingencias ATS - una referencia documental que remita a las AIP de los Estados pertinentes.

- e) Se remitirán los instrumentos resultantes a la Oficina Regional OACI a fin de que sean incluidas en el repositorio que ésta administra al respecto.

3. CONTENIDO MÍNIMO A PUBLICAR EN LA AIP EN RELACIÓN A LAS MEDIDAS DE CONTINGENCIA ACORDADAS ENTRE DOS (2) O MÁS ESTADOS ADYACENTES.

3.1. Sin perjuicio de incluir los elementos básicos citados en el *Apéndice C - Elementos Básicos del Plan* -, en los respectivos Planes de Contingencias ATS de los Estados que hayan acordado medidas de contingencia ATS entre sí, se publicará en sus AIP, al menos, el contenido que a continuación se detalla:

- a) Espacios Aéreos alcanzados por las medidas de contingencia ATS acordadas;
- b) Procedimientos ATS, incluyendo medidas de coordinación y de transferencia de control;
- c) Procedimientos de Comunicaciones, incluyendo medidas TIBA;
- d) Otras medidas y/o procedimientos vinculados a los CNS;
- e) Medidas y/o Procedimientos MET;
- f) Medidas y/o Procedimientos vinculados a la difusión de la preactivación, activación y desactivación de los Planes de Contingencias ATS, incluyendo medidas NOTAM;
- g) Esquema de Rutas ATS de Contingencia;
- h) Esquema de Niveles de Vuelo;
- i) Separaciones de Tránsito;
- j) Delegación de ANS (de corresponder);
- k) Medidas ATFM;
- l) Roles y Responsabilidades en la preactivación, activación y desactivación del Plan de Contingencia ATS;
- m) Árbol de llamadas - LISTA REGIONAL DE LOS PUNTOS DE CONTACTO

*(AVAILABLE IN SPANISH ONLY)***JOB CARD**

PARTE I	
Objetivo(s) Estratégico(s)	Desarrollar propuesta de material guía Regional armonizado y capacitación sobre planificación de espacio aéreo. Referencia: SG1/PANSOPS/01/2020
Macroactividad	Regulación, Guías Técnicas y Capacitación
Actividad	Desarrollo de Normas y Capacitación de especialistas en Planificación de Espacio Aéreo en Sudamérica.
Propuesto por	SAMIG/25 noviembre 2020, reporte del GESEA y plan de trabajo
Definición del problema	<p>La Planificación del Espacio Aéreo requiere varias competencias y habilidades para que el nuevo escenario operacional y la nueva circulación en una TMA cumplan con los objetivos estratégicos establecidos para un determinado proyecto de implementación de Conceptos de Espacio Aéreo: recolección y análisis de datos de tránsito aéreo; comprensión de la distribución geográfica de los flujos, mix de tránsito aéreo y performance de las aeronaves; definición de nuevos flujos de llegadas y salidas para un aeródromo, definición de la estructura de rutas y procedimientos de navegación aérea, entre otros aspectos.</p> <p>Los Proyectos de Implantación del Conceptos de Espacio Aéreo se ven directamente afectados por las técnicas de organización del espacio aéreo y por la actuación del especialista responsable de la planificación del espacio aéreo, ya que el desarrollo de los escenarios operacionales, que describen la organización del espacio aéreo y la circulación aérea, están directamente relacionados con la actividad de Planificación del Espacio Aéreo. Esta es la principal tarea a desarrollar para la implantación de nuevos Conceptos de Espacio Aéreo y requiere una gran especialización y competencia de los profesionales que la realizan.</p>

	<p>Sin embargo, aún no existe una norma (o guía) Regional sobre Planificación de Espacio Aéreo, ni tampoco curso o formación adecuada para los especialistas que desarrollan esa actividad, lo que ha generado obstáculos a la implementación eficiente de Conceptos de Espacio Aéreo en Sudamérica:</p> <ul style="list-style-type: none"> ✓ Falta de alineación con las mejores prácticas internacionales; ✓ Dependencia del talento individual del especialista; ✓ Falta de estandarización en la aplicación de técnicas de organización y gestión del espacio aéreo; ✓ Retrasos y dificultades en la implementación de proyectos de Concepto de Espacio Aéreos; ✓ Insatisfacción e incredulidad de los usuarios en general (ATCO, pilotos, aerolíneas, etc.). <p>La formulación de Normas y Guías Regionales sobre Planificación de Espacio Aéreo, así como cursos y entrenamientos para los especialistas para el desarrollo de esta actividad, resolverán un importante vacío que existe actualmente respecto a la Planificación del Espacio Aéreo en Sudamérica.</p>
--	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<<<<<<<

	Detalle	Elaborar normas que contengan guías técnicas armonizadas sobre planificación de espacio aéreo y gestión de proyectos de concepción de espacio aéreo.		
PARTE II		Desarrollar entrenamiento y curso de capacitación de especialistas para la actividad de Planificación de Espacio Aéreo y gestión de proyectos de Conceptos de Espacio Aéreo.		
Prioridad	Alta	Media X	Baja	
Justificación para aceptación/rechazo	NA			
Encaminamiento del tema	SG1		Creación de GADHOC: <input checked="" type="checkbox"/> Sí <input type="checkbox"/> No	
Acciones en curso	NIL			
Referencias	Doc 9613 OACI, Doc 9992 OACI; Manual de Planificación de EA EUROCONTROL (ERNIP).			
Interrelaciones	Reuniones SAMIG, Talleres regionales de Planificación de Espacio Aéreo.			

<<<<<<<<

PARTE III

<<<<<<<<

Acción requerida	Responsables	Productos	Término
Elaborar un Manual de Planificación de Espacio Aéreo de la Región SAM que contenga las técnicas armonizadas de organización de la estructura del espacio aéreo (trayectorias, espacios aéreos, FUA, concepto PBN, etc).	Coordinador: Fernandes Jr (Brasil). Asistencia: IATA; LATAM. El grupo está abierto a Estados GESEA que deseen aportar.	Propuesta de Manual de Planificación de Espacio Aéreo de la Región SAM para ser presentada a SG1 / GESEA y posteriormente a consideración de SAMIG y/o Estados miembros.	Octubre 2022
Fecha de emisión: 31 de Agosto 2021	Fecha de aprobación de TF 31 de Agosto 2021	Fecha de aprobación de SG1: N/A	Próxima revisión:

Acción requerida	Responsables	Productos	Término
Desarrollar un Taller sobre Planificación de Espacio Aéreo para especialistas de los Estados de la Región SAM que presente las técnicas armonizadas de organización de la estructura del espacio aéreo (trayectorias, espacios aéreos, FUA, concepto PBN, etc).	Coordinador: Fernandes Jr (Brasil). Asistencia: IATA; LATAM. El grupo está abierto a Estados GESEA que deseen aportar.	Propuesta de Taller sobre Planificación de Espacio Aéreo para especialistas de los Estados de la Región SAM para ser presentada a SG1 / GESEA y posteriormente a consideración de SAMIG y/o Estados miembros.	Octubre 2022
Fecha de emisión: 31 de Agosto 2021	Fecha de aprobación de TF 31 de Agosto 2021	Fecha de aprobación de SG1: N/A	Próxima revisión:

Acción requerida	Responsables	Productos	Término
Desarrollar un Taller sobre Planificación de Espacio Aéreo para especialistas de los Estados de la Región SAM que presente las técnicas armonizadas de organización de la estructura del espacio aéreo (trayectorias, espacios aéreos, FUA, concepto PBN, etc).	Coordinador: Fernandes Jr (Brasil). Asistencia: IATA; LATAM. El grupo está abierto a Estados GESEA que deseen aportar.	Propuesta de Taller sobre Planificación de Espacio Aéreo para especialistas de los Estados de la Región SAM para ser presentada a SG1 / GESEA y posteriormente a consideración de SAMIG y/o Estados miembros.	Octubre 2022

Acción requerida	Responsables	Productos	Término
Aplicar un Taller sobre Planificación de Espacio Aéreo para especialistas de los Estados de la Región SAM que presente las técnicas armonizadas de organización de la estructura del espacio aéreo (trayectorias, espacios aéreos, FUA, concepto PBN, etc).	Coordinador: Fernandes Jr (Brasil). Asistencia: IATA; LATAM. El grupo está abierto a Estados GESEA que deseen aportar.	Taller sobre Planificación de Espacio Aéreo para especialistas de los Estados de la Región SAM para ser presentada a SG1 / GESEA y posteriormente a consideración de SAMIG y/o Estados miembros.	Noviembre 2022
Fecha de emisión: 31 de Agosto 2021	Fecha de aprobación de TF 31 de Agosto 2021	Fecha de aprobación de SG1: N/A	Próxima revisión:

>>>>>>>>>>

Acción requerida	Responsables	Productos	Término
Elaborar un Guía sobre Gestión de Proyectos de Conceptos de Espacio Aéreo de la Región SAM que contenga las guías armonizadas y buenas prácticas para la implementación de Conceptos de Espacio Aéreo.	Coordinador: Fernandes Jr (Brasil). Asistencia: IATA; LATAM. El grupo está abierto a Estados GESEA que deseen aportar.	Propuesta de Guía sobre Gestión de Proyectos de Conceptos de Espacio Aéreo de la Región SAM para ser presentada a SG1 / GESEA y posteriormente a consideración de SAMIG y/o Estados miembros.	Mayo 2023
Fecha de emisión: 31 de Agosto 2021	Fecha de aprobación de TF 31 de Agosto 2021	Fecha de aprobación de SG1: N/A	Próxima revisión:

Acción requerida	Responsables	Productos	Término
Desarrollar un curso para capacitación de especialistas de la Región SAM sobre Planificación de Espacio Aéreo y de Gestión de Proyectos de Conceptos de Espacio Aéreo.	Coordinador: Fernandes Jr (Brasil). Asistencia: IATA; LATAM. El grupo está abierto a Estados GESEA que deseen aportar.	Propuesta de curso para capacitación de especialistas de la Región SAM sobre Planificación de Espacio Aéreo y de Gestión de Proyectos de Conceptos de Espacio Aéreo para ser presentada a SG1 / GESEA y posteriormente a consideración de SAMIG y/o Estados miembros.	Mayo 2023
Fecha de emisión: 31 de Agosto 2021	Fecha de aprobación de TF 31 de Agosto 2021	Fecha de aprobación de SG1: N/A	Próxima revisión:

Acción requerida	Responsables	Productos	Término
Aplicar un curso para capacitación de especialistas de la Región SAM sobre Planificación de Espacio Aéreo y de Gestión de Proyectos de Conceptos de Espacio Aéreo.	Coordinador: Fernandes Jr (Brasil). Asistencia: IATA; LATAM. El grupo está abierto a Estados GESEA que deseen aportar.	Curso para capacitación de especialistas de la Región SAM sobre Planificación de Espacio Aéreo y de Gestión de Proyectos de Conceptos de Espacio Aéreo para ser presentada a SG1 / GESEA y posteriormente a consideración de SAMIG y/o Estados miembros.	Junio 2023
Fecha de emisión: 31 de Agosto 2021	Fecha de aprobación de TF 31 de Agosto 2020	Fecha de aprobación de SG1: N/A	Próxima revisión:

— FIN/END —

Redesign of selected TMA Airspaces based on PBN Planning				
*Updated during GESEA SG2/3 April 2022				
State	Implementation			
*Argentina	1. Comodoro Rivadavia			
	2. Bahía Blanca			
	3. Mendoza			
	4. Tucumán			
	5. Rosario			
	6. Bariloche			
	7. Resistencia Corrientes			
	8. Jujuy			
	9. Esquel			
	10. Córdoba		Implemented	
	11. La Rioja		August 2022	
	12. Termas de Río Hondo		November 2022	
	13. Chapelco		November 2022	
	14. Paraná Sauce Viejo		November 2022	
	15. Posadas		November 2022 – To be coordinated	
	16. Ushuaia/Río Grande		November 2022 – To be coordinated	
	17. BAIRES FUTURO		2023	
*Bolivia	18. Cochabamba		Review of design Phase	
	19. La Paz		Implemented March 2022	
	20. Santa Cruz		Design Phase	
*Brazil	21. Brasília		Implemented	
	22. Belo Horizonte			
	23. São Paulo (partial changes)			
	24. Salvador			
	25. Manaus			
	(PBN SUL)	26. Curitiba		Implemented
		27. Florianópolis		
		28. Joinville		
		29. Navegantes		
		30. Porto Alegre		
31. São Paulo				

Redesign of selected TMA Airspaces based on PBN Planning		
*Updated during GESEA SG2/3 April 2022		
State		Implementation
	32. (partial changes)	
	33. Rede de rota FIR CW	
	34. São Paulo (TMA-SP Neo)	Implemented (May 2021)
	35. Fortaleza, Natal, João Pessoa, Recife	Nov 2022
	36. Campo Grande	TBD
*Chile	37. Santiago (Sur)	Implemented
	38. Route network FIR Santiago	
*Colombia	39. Bogotá	Implemented
	40. Medellín	Dic 2023 advance 40%
	41. Pereira	Dic 2025 advance 50%
	42. Cali	Dic 2025
	43. Cúcuta	Dic 2024
	44. Bucaramanga	Dic 2024 advance 50%
	45. Barranquilla	Estimated Jul 2026
	46. San Andrés	Estimated Jul 2026
*Ecuador	47. Guayaquil	Implemented
	48. Manta	
	49. Quito	
	50. Galápagos	
Guyana	51. Georgetown	February 2020
*Panamá	52. Panamá	<i>Pending.</i>
*Paraguay	53. Asunción	Implemented
Perú	54. Arequipa	First semester 2019
	55. Cusco	Implemented
	56. Juliaca	Second semester 2019
	57. Puerto Maldonado	Second semester 2019
*Suriname	58. Paramaribo	Implemented
Uruguay	59. Carrasco y Laguna del Sauce	Second semester 2020
*Venezuela	60. Maiquetía	Implemented
	61. Isla Margarita	Implemented
	62. Maracaibo	Second semester 2022

State	Projects	Notes
Panama	MPMG – Marcos Gelabert	
Peru	<p>Arequipa - RWY 28 VISUAL RNP RWY28 (AR) – LATAM (tailored)</p> <p>Cajamarca – RWY 34 VISUAL RNP RWY34 (AR) – AIP PERÚ</p> <p>Chiclayo – RWY19L VISUAL (calle de rodaje empleada como pista) RNP RWY19L (AR) – SUP AIP PERÚ</p> <p>Jaen – RWY 12 VISUAL RNP RWY34 (AR) – LATAM (tailored)</p> <p>RNP RWY16 (AR) – LATAM (tailored)</p> <p>RNP RWY34 (LNAV/VNAV) – VIVA AIR (tailored)</p> <p>Jauja – RWY31 VISUAL RNP RWY31 (AR) – LATAM (tailored)</p> <p>Juliaca – RWY 12 VISUAL RNP RWY12 (AR) – LATAM (tailored)</p> <p>RNP RWY12 (AR) – VIVA AIR (tailored)</p> <p>RNP RWY12 (AR) – SKY AIRLINES (tailored)</p> <p>Piura – RWY01 VISUAL RNP RWY01 (LNAV/VNAV) – AIP PERÚ</p> <p>Pucallpa – RWY20 VISUAL RNP RWY20 (LNAV/VNAV) – LATAM (tailored)</p> <p>Tacna – RWY 20 VISUAL RNP RWY20 (AR) – LATAM (tailored)</p>	<p>Implemented 2014</p> <p>Implemented 2010</p> <p>Implemented 2021</p> <p>Implemented 2016</p> <p>Implemented 2016</p> <p>Implemented 2018</p> <p>Implemented 2017</p> <p>Implemented 2010</p> <p>Implemented 2019</p> <p>Implemented 2020</p> <p>Implemented 2012</p> <p>Implemented 2012</p> <p>Implemented 2013</p>

State	Projects	Notes
	Trujillo – RWY20 VISUAL RNP RWY20 (AR) – AIP PERÚ Tumbes – RWY 14 VISUAL RNP RWY14 (AR) – LATAM (tailored)	Implemented 2013 Implemented 2012
Uruguay	---	
Venezuela	SVRS – Los Roques	

APÉNDICE H / APPENDIX H

(AVAILABLE IN SPANISH ONLY)

**MANUAL DE CÁLCULO DE CAPACIDAD
DE PISTA Y SECTOR ATC**



GESEA

Grupo de Estudio
e Implantación del
Espacio Aéreo SAM



Manual de Cálculo de Capacidad de Pista y Sector ATC

Versión 2.0
Diciembre 2021

CONTROL DE CAMBIOS

Versión	Fecha	Descripción	Secciones afectadas	Aprobación
1.0	20/10/2019			SAM/IG/23
2.0	01/12/2021	Revisión	Todas	Presentado para la aprobación de SAM/IG/27

Tabla de Contenido

1	Acrónimos	8
2	Documentos de Referencia	9
3	Introducción General	10
4	Objetivo	10
5	Antecedentes	11
6	Consideraciones Generales	11
6.1	Conceptos de capacidad	11
6.2	Actividades de preparación	12
7	Metodología para el cálculo de Capacidad de Pista	12
8	Orientaciones para mejoras de la capacidad de Pista	31
9	Metodología para el cálculo de sector ATC	32
9.1	Carga de trabajo	32
9.2	Gestión de la Fatiga en el ATC	33
9.3	Definiciones para el cálculo de capacidad de Sector ATC	35
9.4	Factores para la determinación de capacidad de sector ATC	36
9.5	Modelo matemático para el cálculo de capacidad de sector ATC	37
9.6	Pasos para la recolección y el cálculo de capacidad de sector ATC	40
10	Orientaciones para mejoras de la capacidad de Sector	52
11	Mejora a través del uso de datos para análisis e indicadores	53
12	Apéndices	55

1 Acrónimos

Los acrónimos utilizados en este Manual tienen los siguientes significados:

AA	Secuencia Aterrizaje - Aterrizaje
AAR	Índice de Llegadas al aeropuerto
ADA	Secuencia Aterrizaje – Despegue - Aterrizaje
ADDA	Secuencia Aterrizaje – Despegue – Despegue -Aterrizaje
ADR	Índice de salidas aeroportuarias
ARR	Aterrizaje
ATC	Control del Tránsito Aéreo
ATCO	Controlador de Tránsito Aéreo
ATFM	Gestión de la Afluencia del Tránsito Aéreo
ATM	Gestión del Tránsito Aéreo
ATZ	Zona de Tránsito de Aeródromo
CFA	Capacidad Física de Aeródromo
CFCP	Capacidad Física del Conjunto de Pistas
CTCP	Capacidad Teórica del Conjunto de Pistas
CHS	Capacidad Horaria del Sector
CTP	Capacidad Teórica de Pista
CTR	Zona de Control
DD	Secuencia Despegue - Despegue
DEP	Despegue
FAA	Federal Aviation Administration
GANP	Plan Mundial de Navegación Aérea
IAC	Carta de Aproximación Instrumental
IMC	Condiciones Meteorológicas Instrumentales
MTOPA	Media Aritmética de Tiempo de Ocupación de Pista de Aterrizaje
MTOPD	Media Aritmética de Tiempo de Ocupación de Pista de Despegue
NM	Milla Náutica
Npico	Número Máximo
Nref	Número de Referencia
OACI	Organización de Aviación Civil Internacional
OM	Marcador Externo (Outer Marker de un sistema ILS)
PU	Porcentaje de Utilización
RWY	Pista
SAF	Segmento de Aproximación Final
SID	Salida Normalizada por Instrumentos
SM	Separación Mínima
SS	Separación de Seguridad

ST	Separación Total
STAR	Llegadas Normalizadas por Instrumentos
T	Tiempo de permanencia
Tcom	Tiempo de comunicación
THR	Umbral de pista
TMOP	Tiempo Medio de Ocupación de Pista
TMST	Tiempo Medio ponderado, entre dos aterrizajes Consecutivos, considerando la Separación Total
TOP	Tiempo de Ocupación de Pista
TOPA	Tiempo de Ocupación de Pista para el Aterrizaje
TOPD	Tiempo de Ocupación de Pista para el Despegue
TTS	Tiempo de Tareas Secundarias
VA	Velocidad de Aproximación
VHF	Muy Alta Frecuencia
VM	Velocidad Media
VMC	Condiciones Meteorológicas Visuales

2 Documentos de Referencia

- Airport Capacity Assessment Methodology (ACAM), Eurocontrol
- Manual de Gestión Colaborativa de la Afluencia del Tránsito Aéreo (ATFM), Documento 9971, Tercera Edición, 2018, OACI
- Servicio de tránsito aéreo, Anexo 11, Décimo quinta edición, julio de 2018
- Gestión del Tránsito Aéreo, Documento 4444, Decimosexta edición, 2016, OACI
- Metodología para el cálculo de capacidad de pista, EANA-C-MCCP-GPDP-MA-002-C, EANA
- Metodología para el cálculo de sector ATC, EANA-C-MCCS-GPDP-MA-003-B, EANA
- Plan mundial de navegación aérea, GANP, sexta edición, OACI
- Guía para la aplicación de una metodología común para el cálculo de capacidad de aeropuerto y sectores ATC para la región SAM, Oficina Regional Lima, 2009, OACI.
- Serviço de gerenciamento de fluxo de tráfego aéreo, ICA 100-22, DECEA
- Capacidade do Sistema de Pistas, MCA 100-14, DECEA
- Capacidade de setor ATC, MCA 100-17, DECEA
- ORDER JO 7210.3BB, FAA

3 Introducción

Distintos documentos establecen que se implantará la gestión de afluencia del tránsito aéreo (ATFM) en el espacio aéreo en el que la demanda de tránsito aéreo exceda, o se espera que exceda, la capacidad declarada de los servicios de control de tránsito aéreo de que se trate.

La definición de la “capacidad declarada” es la medida de la capacidad del sistema ATC o cualquiera de sus subsistemas o puestos de trabajo para proporcionar servicio a las aeronaves durante el desarrollo de las actividades normales. Esta se expresa como el número de aeronaves que aterrizan o despegan de una pista o que pueden ser atendidas en un sector ATS, en un período determinado; teniendo debidamente en cuenta las variables que pudiesen afectar dicha capacidad (condiciones meteorológicas, la configuración de la dependencia ATC, su personal y equipo disponible, y cualquier otro factor que pueda afectar el volumen de trabajo del controlador responsable de la pista).

Es por esto que resulta fundamental poder calcular esta capacidad, de forma armonizada y con un enfoque no solo a la obtención del resultado, sino al proceso y al entendimiento de sus variables para lograr un camino de mejora continua.

Es importante resaltar que la Capacidad de pista y la Capacidad de sector ATC están relacionadas entre sí y no deben verse como datos aislados, sino comprender que los mismos forman parte de un sistema en donde la variación de cualquier valor puede tener un impacto directo o indirecto en estas capacidades.

Los cálculos de capacidad de pista y sector suelen ser valores determinantes para toma de decisiones en colaboración (CDM) tanto a nivel ATFM como a nivel Aeropuerto (A-CDM).

A su vez mediante este proceso de toma de decisiones, es posible establecer procedimientos operacionales que tiendan a mejorar el uso de la capacidad disponible tanto en pistas como en sectores ATC.

4 Objetivo

Este manual fue elaborado con el objeto de proporcionar a los Estados (Proveedores de servicio ATS) un documento que los guíe en la aplicación de una metodología común para el cálculo de capacidad de pista y sectores ATC. Para lo cual se presenta un modelo matemático robusto y que al mismo tiempo dispone de una sencilla interpretación para facilitar su uso en las distintas FIR de la Región SAM.

Como se cita en el párrafo anterior, no solo se trabajó en los aspectos matemáticos, sino también se busca agregar valor al explicar conceptos de capacidad, orientaciones para la mejora de la capacidad y ejemplos para el uso de indicadores con datos obtenidos a través de la realización del proceso. De la misma forma se cuenta con planillas de hoja de cálculo que incluyen las fórmulas matemáticas necesarias para la recopilación de datos.

5 Antecedentes

El Anexo 11 al Convenio de la OACI en el numeral 3.7.5.1, establece que se implantará la gestión de afluencia del tránsito aéreo (ATFM) en el espacio aéreo en el que la demanda de tránsito aéreo excede a veces, o se espera que exceda, de la capacidad declarada de los servicios de control de tránsito aéreo de que se trate y en el numeral 3.7.5.2 se establece una recomendación que indica que debería implantarse la ATFM mediante acuerdos regionales de navegación aérea o, si procede, mediante acuerdos multilaterales y que en estos acuerdos deben considerarse procedimientos comunes y métodos comunes de determinación de la capacidad.

Complementariamente, el Documento 4444 ATM, Procedimientos para los Servicios de Navegación Aérea en el Capítulo 3 numeral 3.1.4.1, se establece que la autoridad ATS competente debería examinar periódicamente la capacidad del ATS en relación con la demanda del tránsito; y debería prever el uso flexible del espacio aéreo para mejorar la eficiencia de las operaciones y aumentar la capacidad. Seguidamente, en el numeral 3.1.4.2 se indica que en caso de que la demanda de tránsito exceda regularmente de la capacidad del ATC, con el resultado de demoras continuas y frecuentes del tránsito, o cuando resulte evidente que el pronóstico de demanda de tránsito excederá de los valores de la capacidad, la autoridad ATS competente debería, en la medida de lo posible poner en práctica medidas destinadas a utilizar al máximo la capacidad existente del sistema; y preparar planes para aumentar la capacidad a fin de satisfacer la demanda actual o pronosticada.

En el año 2009 se publica la guía para la aplicación de una metodología común para el cálculo de capacidad de aeropuerto y sectores ATC para la región SAM como parte del proyecto RLA/06/901. La aplicación de esta guía facilitó el cálculo de las capacidades de pistas y sectores ATC por parte de los Estados y Proveedores de Servicios de Navegación Aérea.

El presente manual se encuentra basado en las últimas publicaciones de la OACI, especialmente el documento 9971 en su última edición del año 2018 y otros documentos de referencia de los Estados que han sido desarrollados para las actividades de medición y cálculo de la capacidad, buscando de esta forma consolidar las mejores prácticas mundiales y de la región SAM.

6 Consideraciones Generales

6.1 Conceptos de capacidad

El concepto de capacidad se define genéricamente como la cantidad de aeronaves que pueden ser atendidas en un período determinado.

Dicho valor no debe entenderse como un valor estático, sino que es dinámico, debido a que durante la operación aérea y suministro de servicio ATM, las variables que determinan su valor son cambiantes. Es por esto que el resultado debe ser usado como una referencia para efectos de planificación.

De la misma forma puede existir alguna situación específica donde por cambios en variables, la capacidad por un determinado tiempo se reduzca o se incremente respecto de la capacidad declarada, debiendo ajustarse la demanda a la nueva capacidad.

Los valores de capacidad deberían ser actualizados periódicamente o cuando ocurra algún cambio significativo en alguna de las variables que determina su capacidad (Por ejemplo, ante un cambio en una calle de rodaje o un rediseño del espacio aéreo).

Una vez calculada la capacidad, la misma debe ser declarada a fin de ser utilizada tanto para fines de planificación como fines operacionales.

La declaración de capacidad es un proceso por el cual se confirman o rectifican los valores calculados matemáticamente en base a los datos recopilados.

Este proceso debería hacerse de forma lo más transparente posible e involucrando a todos los actores que participan en la prestación, regulación y uso del recurso que está siendo declarado.

De la misma forma con la participación de todos los involucrados, es posible tomar acciones para optimizar la capacidad. Algunas recomendaciones se encuentran disponibles en el numeral 8 del presente documento.

6.2 Actividades de preparación

Antes de realizar cada medición, se deberá realizar con el equipo que medirá la pista o el sector ATC un briefing a fin de garantizar que el mismo esté familiarizado con el elemento que será medido.

Existen distintas formas para la realización del proceso de obtención de la capacidad. Una forma consiste en que las personas que realicen la medición, al finalizar la actividad realicen los cálculos, mientras que otra forma es que el equipo medidor le envíe sus planillas a un grupo calculador generando de esta forma especialistas medidores y calculadores.

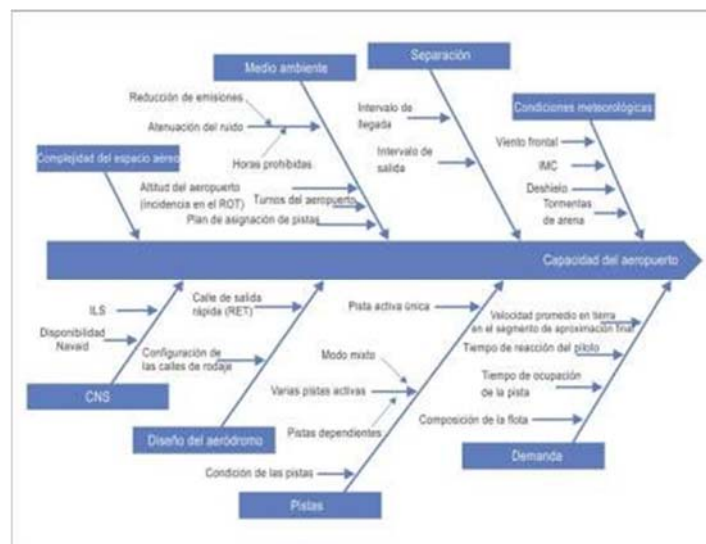
7 Metodología para el cálculo de Capacidad de Pista

La medición de la capacidad de pista considera múltiples y diferentes parámetros y por lo tanto es necesario ser cuidadoso al definir el alcance de esta capacidad para entender mejor los datos a considerar para evaluarla. Este documento define la capacidad de pista como el número máximo de operaciones de aeronaves para una determinada pista, en condiciones especificadas (Ej.: diseño del aeródromo, mix de aeronaves, condiciones meteorológicas, etc.) tomando en cuenta todas las operaciones de aeronaves en despegue y aterrizaje para un período especificado de tiempo (hora, día, mes, año, estacional). Una vez finalizado el cálculo de acuerdo con la metodología, se deberá explorar cada una de sus variables para comprender su influencia en el resultado obtenido.

Durante el proceso de medición se obtendrán valores de Capacidad Física de Pista (CFP), la cual representa la cantidad máxima de operaciones posibles suponiendo una eficiencia del 100% en su ocupación y Capacidad Teórica de Pista (CTP), donde se incorpora un buffer (B) ajustable contemplando distintas necesidades para otorgar una mayor separación.

Se debe considerar que la pista no es utilizada solo para aeronaves en operación de Despegue y Aterrizaje, sino que también en distintas oportunidades son usadas por vehículos realizando inspecciones o cruces de pista. Luego de obtenidos los valores de capacidad teóricos, estos pueden ser ajustados en base a la cantidad y tipo de otros usos para su declaración de capacidad.

El Documento 9971 de OACI ofrece una representación gráfica de las variables que afectan la capacidad de pista:



Factores que determinan la capacidad del aeropuerto

Fuente: Documento 9971, pág. II-3-4, Figura II-3-2

Nota: El apéndice E describe los pasos para la obtención de las capacidades físicas y teóricas del “conjunto de pistas”, considerando cálculos anualizados, a fin de ponderar las capacidades calculadas respecto a la distribución en la utilización de cada umbral.

El proceso de cálculo de capacidad de pista se basa en la obtención de:

- Tiempos de ocupación de Pista de Despegue (TOPD)
- Tiempos de ocupación de Pista de Aterrizaje (TOPA)
- Tiempos entre Outer Marker (OM) y Umbral *
- Mix de aeronaves
- % de utilización de umbrales de pista

* Nota: En caso de inexistencia del OM, se deberá determinar un punto en la aproximación final cuya distancia sea conocida (FAF, FAP, Distancia DME, etc.) y que determine la imposibilidad de ingreso en la pista por cualquier otra aeronave, mientras la que aterriza esté pasando por él o esté en cualquier otro tramo entre el referido punto y el umbral en estudio.

Para la obtención de estos datos los materiales mínimos que se requieren son:

- Planillas;
- Bolígrafo;
- Cronómetro; y
- Binoculares

Con los datos obtenidos se calculará en primera instancia las capacidades suponiendo que existirá una aeronave despegando y cuando esta cruza el umbral opuesto otra aterrizando. En base a esta capacidad se le suman separaciones mínimas y con un buffer (B) de valor entre 0 y 1 que puede ser ajustado desde un valor de 1 (Conservador) hasta un valor 0 (Tendiendo a la capacidad física)

Consideraciones:

La metodología descrita a continuación, se basa en los siguientes supuestos:

- Secuencia Aterrizaje – Despegue – Aterrizaje (ADA), es decir un despegue entre dos aterrizajes.
- Condiciones de secuenciamiento y coordinaciones ideales
- Inexistencia de medidas ATFM que limiten las salidas

El resultado de la metodología reflejará los valores encontrados para los datos medidos. A fin de obtener resultados más precisos se recomienda por lo menos tomar 30 muestras de una (1) hora, en los horarios de mayor afluencia (día o noche), distribuidas en 7 días consecutivos, verificando que las condiciones de operación sean similares.

Podrá realizarse la medición en distintas situaciones a fin de contar con valores para distintos escenarios (VMC, IMC, Calle de Rodaje no utilizable, etc.)

Los redondeos cuando la unidad son aeronaves son mandatoriamente hacia el inmediato inferior y los tiempos deben ser calculados en segundos.

Las recolecciones deberían ser realizadas desde la Torre de Control del Aeródromo donde se realiza el Cálculo de Capacidad de Pista y se recomiendan entre 1 y 2 especialistas a cargo de las mismas.

Nota: En caso de disponer de un sistema de vigilancia en superficie que permita la obtención de dichos datos, se recomienda el uso del mismo.

Cada paso del método que será descrito a continuación, incluye un ejemplo de Despegues y Aterrizajes para las pistas 13 y 31 de un aeropuerto ficticio denominado ANYPORT (OACI: ANYP), cuyo caso completo de cálculo está en el APÉNDICE D.

Cálculo de Capacidad Física de Pista (CFP):

La capacidad Física de Pista es aquella que contempla únicamente los tiempos de ocupación en pista suponiendo que la pista estará siendo ocupada el 100% del tiempo, es decir al momento que una aeronave despegando está cruzando el umbral opuesto, habría otra aterrizando en la pista. La CFP es expresada como aeronaves por hora (ACFT/HR).

1° Paso: RECOLECCIÓN DE DATOS

TIEMPO DE OCUPACIÓN DE PISTA (TOP):

Se debe registrar el cronometraje del tiempo de ocupación de pista durante las operaciones de despegue y de aterrizaje respectivamente en las Planillas específicas, a saber:

- Planilla de recolección del tiempo de ocupación de pista durante el despegue (TOPD) (Disponible también en **APÉNDICE A**)

CP01 - Planilla Tiempos de Ocupación de Pista durante el Despegue					
AERÓDROMO: ANYP			FECHA-HORA INICIO: 20/08/19 – 12:30UTC		
DATOS					
CALLSIGN	ACFT	CAT	RWY	TWY	TIEMPO DEP (Seg)
XXCMI	C152	A	13	A	55.22
JZ2609	E190	C	13	A	62.41
DATOS ADICIONALES	XXCMI Caso A XXCMI Caso B				
RELEVADO POR:	Juan Perez		FIRMA		
Hr. FINALIZACIÓN:	13:30				

Para las operaciones de despegue se pueden encontrar dos casos, que parecerían ser distintos para la toma de datos, pero en si solo se deberá tener en cuenta a partir de cuándo comienza el cálculo de ocupación.

Caso A: La aeronave en el punto de espera es autorizada a despegar. Se toma el tiempo desde que la aeronave cruza el punto de espera.

Caso B: La aeronave es autorizada a ingresar y mantener en pista, mientras la que acaba de aterrizar libera

la misma. Se comienza a tomar el tiempo de ocupación de pista a partir que la aeronave que aterrizó despejó la pista. Se deberá asentar en la columna observaciones que para esa operación ocurrió lo antes establecido. Esto se realiza a fin de no contabilizar dos veces el mismo tiempo.

CP02 - Planilla Tiempos de Ocupación de Pista durante el Aterrizaje					
AERÓDROMO: ANYP			FECHA-HORA INICIO 20/08/19 – 12:30 UTC		
DATOS					
CALLSIGN	ACFT	CAT	RWY	TWY	TIEMPO ARR (Seg)
XCZMA	C150	A	13	B	180
JZMAA	E190	C	13	B	71
DATOS ADICIONALES					
RELEVADO POR:	Juan Perez		FIRMA		
Hr. FINALIZACIÓN:	13:30				

En el campo “datos adicionales”, deberá detallarse cualquier otro dato relevante para la validación de los datos recolectados.

2° Paso: CÁLCULO DE LA MEDIA ARITMETICA DE LOS TIEMPOS DE OCUPACIÓN DE PISTA (MTOPI)

Deberá ser considerado cada uno de los umbrales existentes en el aeródromo, insertando los referidos datos en la ficha de cálculo de las medias de los tiempos de ocupación de pista (ARR/DEP) por categoría de aeronaves.

o Media aritmética de los tiempos de ocupación de pista durante el **aterriaje** por categoría de aeronaves: **MTOPA**

$$\sum \frac{TOPA_{CAT X}}{N^{\circ} ACFT_{CAT X}}$$

o Media aritmética de los tiempos de ocupación de pista durante el despegue por categoría de aeronaves **MTOPD**.

$$\sum \frac{TOPD_{CAT X}}{N^{\circ} ACFT_{CAT X}}$$

o Media aritmética de los tiempos de ocupación de pista por categoría de aeronaves **MATOP**

$$\frac{\sum MATOPP + \sum MATOPD}{2}$$

Ejemplos:

$$MATOPA = \frac{\sum MATOPPA + \sum MATOPDA}{2} \quad MATOPC = \frac{\sum MATOPPC + \sum MATOPDC}{2}$$

$$MATOPB = \frac{\sum MATOPPB + \sum MATOPDB}{2} \quad MATOPD = \frac{\sum MATOPPD + \sum MATOPDD}{2}$$

RWY	13	13	31	31
CAT	DEP	ARR	DEP	ARR
A	92,7220	73,4271	104,4633	115,9592
B	138,2908	81,0263	72,4150	93,6000
C	150,4057	86,3808	76,7837	75,6343

MATOP RWY 13 CAT-A: $(92.7720 + 73.4271) / 2 = 83.0746\text{seg}$

MATOP RWY 13 CAT-B: $(138.2908 + 81.0263) / 2 = 109.6585\text{seg}$

MATOP RWY 13 CAT-C: $(150.4057 + 86.3808) / 2 = 118.39325\text{seg}$

MATOP RWY 31 CAT-A: $(104.4633 + 115.9592) / 2 = 110.2125\text{seg}$

MATOP RWY 31 CAT-B: $(72.4150 + 93.6000) / 2 = 83.0075\text{seg}$

MATOP RWY 31 CAT-C: $(76.7837 + 75.6343) / 2 = 76.209 \text{ seg}$

3° Paso: CÁLCULO DEL MIX DE AERONAVES

Tomándose por base los registros del movimiento total diario, adquirido por medio de cualquier fuente estadística reconocida que indique el movimiento total de aeronaves en el aeródromo, se obtiene el muestreo necesario de una semana para que se efectúe el cálculo del mix de aeronaves, insertando los valores

encontrados en la ficha de recolección del porcentual de utilización del aeródromo por categoría de aeronaves - mix.

El valor del mix será encontrado por medio de la comparación porcentual, por día de la semana, entre el total de aeronaves en el respectivo día y el número total de aeronaves de cada categoría.

La tabla siguiente muestra un ejemplo de cálculo de mix de aeronaves:

MEDIA ARITMÉTICA MIX		
CAT	CANTIDAD	PORCENTAJE
A	77	28.73%
B	65	24.25%
C	126	47.02%
D	0	0%
TOTAL	268	100%

4° Paso: CÁLCULO DEL TIEMPO MEDIO DE OCUPACIÓN DE PISTA (TMOP)

Los valores de los tiempos de ocupación de pista, por categoría de aeronave, y el respectivo MIX, deberán ser transportados a la tabla: cálculo del tiempo medio de ocupación de pista, a partir del cual, será calculado, por medio de la media aritmética ponderada, el tiempo medio de ocupación de pista (TMOP).

$$TMOP = \frac{\sum MATOP_{CAT X} * MIX_{CAT X}}{100}$$

$$TMOP 13 = (83.0746 * 28.73 + 109.6585 * 24.25 + 118.3933 * 47.01) / 100 = 106.12723\text{seg}$$

$$TMOP 31 = (110.2113 * 28.73 + 83.0075 * 24.25 + 76.2090 * 47.01) / 100 = 87.6272\text{seg}$$

5° Paso: CÁLCULO DE LA CAPACIDAD FÍSICA DE PISTA (CFP)

Este cálculo se obtiene dividiendo los segundos de una hora (3600) entre los tiempos medios de ocupación de pista por cada una de las pistas.

$$CFP = \frac{3600}{TMOP}$$

Este valor considerará que la pista está siendo ocupada cada hora al 100%.

CFP 13: $3600 / 106.12723 = 33.9215 = 33 \text{ ACFT/HR}$

CFP 31: $3600 / 87.6272 = 41.0831 = 41 \text{ ACFT/HR}$

Calculo de Capacidad Teórica de Pista (CTP):

La capacidad teórica de pista se calcula, para un intervalo de 60 (sesenta) minutos, en función del tiempo medio de ocupación de pista, teniendo en consideración la separación entre aeronaves requerida, así como los factores de planificación y los factores relativos a las operaciones de aterrizaje y despegue del aeródromo en el estudio. Serán utilizados los datos referentes al tiempo de ocupación de pista, el MIX de las aeronaves, tiempo de ocupación medio de pista y el porcentual de utilización anual de pista, realizados para el cálculo de la capacidad física de pista y de aeródromo como pasos subsiguientes a los ya realizados.

6° Paso: TIEMPO DE VUELO ENTRE EL OM Y EL THR

Se deberá recolectar y colocar en la Planilla CP03 (disponible en Apéndice C) los tiempos de vuelo entre el OM y el THR de la pista en estudio, considerando las diversas categorías de aeronaves que operan en el aeródromo. En caso de inexistencia del OM, se deberá determinar un punto en la aproximación final cuya distancia sea conocida y que determine la imposibilidad de ingreso en la pista por cualquier otra aeronave, mientras la que aterriza esté pasando por él o esté en cualquier otro tramo entre el referido punto y el umbral en estudio.

CP03 – Planilla de Tiempos de entre OM y THR				
AERÓDROMO: ANYP			FECHA-HORA INICIO: 20/08/19 – 12:30UTC	
DATOS				
CALLSIGN	ACFT	CAT	RWY	TIEMPO OM/THR
XXAMC	C150	A	13	270
JZ2421	E190	C	13	125
DATOS ADICIONALES	Referencia OM: 5nm			
RELEVADO POR:	Juan Perez		FIRMA	
Hr FINALIZACIÓN:	13:30			

Luego se deberá calcular los tiempos medios (TM) a través de la media aritmética de los tiempos recolectados por pista y por categoría de aeronave. A continuación, se describe la fórmula matemática y una tabla con resultados ya procesados a modo de ejemplo:

$$TM = \frac{\sum T_{CATX}}{N^{\circ}ACFT_{CAT X}}$$

Ejemplos:

$$TM13A = \frac{\sum T_{CATA}}{N^{\circ}ACFT_{CAT A}}$$

$$TM13B = \frac{\sum T_{CATB}}{N^{\circ}ACFT_{CAT B}}$$

$$TM13C = \frac{\sum T_{CATC}}{N^{\circ}ACFT_{CAT C}}$$

$$TM13D = \frac{\sum T_{CATD}}{N^{\circ}ACFT_{CAT D}}$$

La tabla siguiente muestra resultados ya procesados:

CAT / RWY	13	31
A	148,9167	75,8460
B	128,5322	246,9580
C	198,8575	238,1989

7° Paso: CÁLCULO DE LA VELOCIDAD DE APROXIMACIÓN ENTRE EL OM Y EL THREL THR (VA)

Con los datos obtenidos se calculará en millas náuticas por segundo, para cada pista, las velocidades de aproximación (VA) en millas náuticas por segundo aplicadas en el segmento entre el OM y el umbral (en este caso denominado Segmento de Aproximación Final - SAF), tomando en cuenta cada categoría de aeronave y se

registrarán los valores encontrados en la Tabla velocidad media entre el OM y el THR.

$$VAA = \frac{SAF}{TMA} \quad VAB = \frac{SAF}{TMB} \quad VAC = \frac{SAF}{TMC} \quad VAD = \frac{SAF}{TMD} \quad VAE = \frac{SAF}{TME}$$

Ejemplo de media de las velocidades entre OM y THR, expresados en nm/seg:

SAF = 5 NM

VA	RWY	
	13	31
A	0,03357583	0,06592305
B	0,03890075	0,02024636
C	0,02514363	0,02099086

8° Paso: VELOCIDAD MEDIA DE APROXIMACIÓN FINAL (VM)

La velocidad media de aproximación final (VM), se calculará como la sumatoria de cada velocidad media de aproximación entre el OM y el THR multiplicado por el correspondiente porcentaje del MIX de aeronaves, todo esto dividido entre 100%.

Velocidad media ponderada, llevándose en consideración el MIX de aeronaves, de las velocidades de aproximación final.

$$VM = \frac{MIX_A * VAA + MIX_B * VAB + MIX_C * VAC + MIX_D * VAD + MIX_E * VAE}{100}$$

VM13: $(0.03357583 * 28.73 + 0.03890075 * 24.25 + 0.02514363 * 47.01) = 0,03090293$ NM/seg

VM31: $(0.06592305 * 28.73 + 0.02024636 * 24.25 + 0.02099086 * 47.01) = 0,03371991$ NM/seg

9° Paso: DETERMINACIÓN DE LA SEPARACIÓN MINIMA/TOTAL ENTRE DOS ATERRIZAJES CONSECUTIVOS

Al efecto de lograr mantener los márgenes de seguridad operacional requeridos, la separación mínima se compone por 2 veces el TMOP. Esto es contemplando el tiempo de un despegue y un aterrizaje, previo al segundo aterrizaje.

$$SM = 2 * TMOP * VM$$

Este valor SM representa la distancia que debe haber entre 2 aeronaves para que se pueda realizar un despegue en el medio con una precisión de utilización de la pista en un 100%.

En aquellos casos que la complejidad operativa de la pista (Contaminación, estructura, etc.) exija tomar mayores recaudos y bajo la consideración que, en la operación real no se suele trabajar con una utilización del 100%, se podrá añadir una separación de seguridad:

$$SS = TMOP * VM * B$$

Nota: Cuando se utilice la SS, con intención de tender a optimizar el uso de la capacidad disponible, a la Separación de Seguridad se le debería añadir un factor de multiplicación llamado B (Buffer). Este valor debe oscilar entre 0 y 4, definiendo con qué nivel de buffer se desea operar. A medida que se avanza en la operación y se aumenta la precisión con la que se trabaja, se espera que el valor B tienda a 1. Se recomienda como primer valor utilizar 1 (Conservador) y posterior a realizar estudios de optimización, proceder a la variación de este valor, por ejemplo 1.8. Algunas consideraciones, no excluyentes, para determinar el valor de B incluyen las herramientas tecnológicas disponibles y la pericia de los controladores.

Al utilizar la SS, aparecerá el concepto “separación total entre dos aterrizajes consecutivos”, la cual es el tiempo convertido a distancia que permite mantener una secuencia de 2 aeronaves aterrizando, con un despegue entre las mismas, aun cuando existan factores que afecten la operación normal en la pista en uso.

El cálculo de la separación total se compone de 2 elementos, la separación mínima y la separación de seguridad. La separación total es el resultado de la suma de la separación de seguridad con la separación mínima.

$$ST = SM + SS$$

IMPORTANTE: Deberá verificarse que la ST sea igual o mayor a la separación mínima reglamentaria entre aeronaves prevista para la pista. En caso que la ST resulte menor a la separación mínima reglamentaria prescrita, se descarta y debe tomarse la separación mínima reglamentaria.

Ejemplo:

$$SM = 2 * TMOP * VM$$

$$SM13 = 2 * 106.12723 * 0,03090293 = 6,55928464 \text{ NM}$$

$$SM31 = 2 * 87.6272 * 0,03371991 = 5,90956305 \text{ NM}$$

$$SS = TMOP * VM * B$$

B = 1

$$SS13 = 106.12723 * 0,03090293 * 1 = 3,27964208 \text{ NM}$$

$$SS31 = 87.6272 * 0,03371991 * 1 = 2,95478152 \text{ NM}$$

$$ST = SM + SS$$

$$ST13: 9,83892696 \text{ NM}$$

$$ST31: 8,8643 \text{ NM}$$

El Aeropuerto AnyPort tiene una separación mínima reglamentaria de 5nm, por lo tanto, los valores ST13 y ST31 cumplen el requisito.

**10° Paso: DETERMINACIÓN DEL TIEMPO MEDIO PONDERADO, ENTRE DOS ATERRIZAJES CONSECUTIVOS,
CONSIDERANDO LA SEPARACIÓN TOTAL (TMST)**

El tiempo medio ponderado consumido para recorrer la separación total entre dos aterrizajes consecutivos se obtiene dividiéndose esa distancia por la velocidad media ponderada del mix de aeronaves.

$$TMST = \frac{ST}{VM}$$

TMST 13: 9,83892696 / 0,03090293 = 318,38169 seg

TMST 31: 8,8643 / 0,03371991 = 262,881586 seg

11°. Paso: DETERMINACIÓN DEL NÚMERO DE ATERRIZAJES EN EL INTERVALO DE UNA HORA (A)

El resultado obtenido, será el divisor del número de segundos contenidos en una hora (3600 seg), presentando como resultado, el número de aterrizajes posibles con la separación propuesta para el umbral en estudio. Este valor también puede ser usado como AAR (Airport Arrival Rate - Índice de Llegadas al aeropuerto)

$$N^{\circ} \text{ ATERIZAJES} = \frac{3600'}{TMST} \quad A = \frac{1 \text{ HORA}}{TMST}$$

A13: $3600 / 318,38169 = 11.307 = 11 \text{ ACFT/HR}$

A31: $3600 / 262,881586 = 13.694 = 13 \text{ ACFT/HR}$

12° Paso: DETERMINACIÓN DEL NÚMERO DE DESPEGUES EN EL INTERVALO DE UNA HORA (D)

Aplicándose la separación total encontrada, es posible intercalar un despegue entre dos aterrizajes consecutivos.

Entonces, al sustraer una aeronave del total de aterrizajes, encontramos el número posible de despegues en el intervalo de tiempo considerado.

Este valor también puede ser usado como ADR (Airport Departure Rate – Índice de Salidas del Aeropuerto).
De lo anterior:

$$N^{\circ} \text{ DESPEGUES} = N^{\circ} \text{ ATERRIZAJES} - 1$$

$$D = A - 1 \text{ (Número de aterrizajes en el intervalo de una hora [A], menos 1)}$$

$$D13 = 11 - 1 = 10 \text{ ACFT/HR}$$

$$D31 = 13 - 1 = 12 \text{ ACFT/HR}$$

13° Paso: DETERMINACIÓN DE LA CAPACIDAD TEÓRICA DE PISTA

Sumar el número de aterrizajes y despegues obtenidos, en el intervalo de sesenta minutos, para cada umbral, que resultará en la capacidad teórica de operación para el respectivo umbral.

$$\text{CAPACIDAD TEÓRICA DE PISTA} = N^{\circ} \text{ ATERRIZAJES} + N^{\circ} \text{ DESPEGUES} \quad \text{CTP} = A + D$$

CTP13: $11 + 10 = 21$ ACFT/HR

CTP31: $13 + 12 = 25$ ACFT/HR

8 Orientaciones para mejoras de la capacidad de Pista

Cuando existen situaciones donde la demanda se aproxima a los valores de la capacidad declarada, deberían explorarse opciones de mejora desde dos puntos de vista.

El primer análisis debería ser como incrementar el uso de la capacidad y su infraestructura (Eficiencia, Procedimientos), mientras que el segundo como incrementar la misma capacidad (Infraestructura).

Dado que una forma directa para incrementar la capacidad de pista se obtiene a través de la reducción de

tiempos de ocupación de pista, obtenido mediante la construcción de nuevas infraestructuras lo que requerirá mucho tiempo y un costo elevado, es en ese sentido, que se debería previo a la realización de la inversión, realizarse los esfuerzos a fin de optimizar el uso de la infraestructura disponible.

Algunos ejemplos para incrementar el uso de la capacidad disponible son:

a. **Establecer distintas secuencias posibles de tránsito:**

AA: Aterrizaje – Aterrizaje

ADA: Aterrizaje – Despegue – Aterrizaje (Calculada en la metodología directamente)

DD: Despegue – Despegue

ADDA: Aterrizaje – Despegue – Despegue – Aterrizaje

Aplicar estas medidas (secuencias de Aterrizaje/Despegue) son especialmente útiles en casos de que existen diferencias significativas en tiempos de despegue y aterrizaje por distintos umbrales de pista.

b. **Control de velocidad en Aproximación:**

La aplicación de control de velocidad en aproximación permite un mejor control y secuenciamiento a las pistas. El uso de la misma además de sumar eficiencia, añade predictibilidad tanto al ATC como a las tripulaciones de vuelo.

c. **Planificación de aterrizaje:**

La estandarización en el uso de un rodaje preferencial para liberar la pista también añade predictibilidad y eficiencia a las operaciones al reducir el tiempo de ocupación de pista en el aterrizaje.

d. **Uso del punto de espera para verificaciones previas al despegue:**

A fin de reducir los tiempos de ocupación de pista, debería verificarse que se aprovechen al máximo los tiempos que la aeronave se encuentre fuera de la pista para la realización de la mayor cantidad de verificaciones y procedimientos operativos que sean posibles.

e. **Permisos Condicionales:**

Según sea aplicable en cada Estado, el uso de los permisos condicionales de acuerdo con el Documento 4444 permiten también optimizar los tiempos de ocupación de pista y de cantidad de comunicaciones entre el ATC y las tripulaciones de vuelo.

9 Metodología para el cálculo de sector ATC

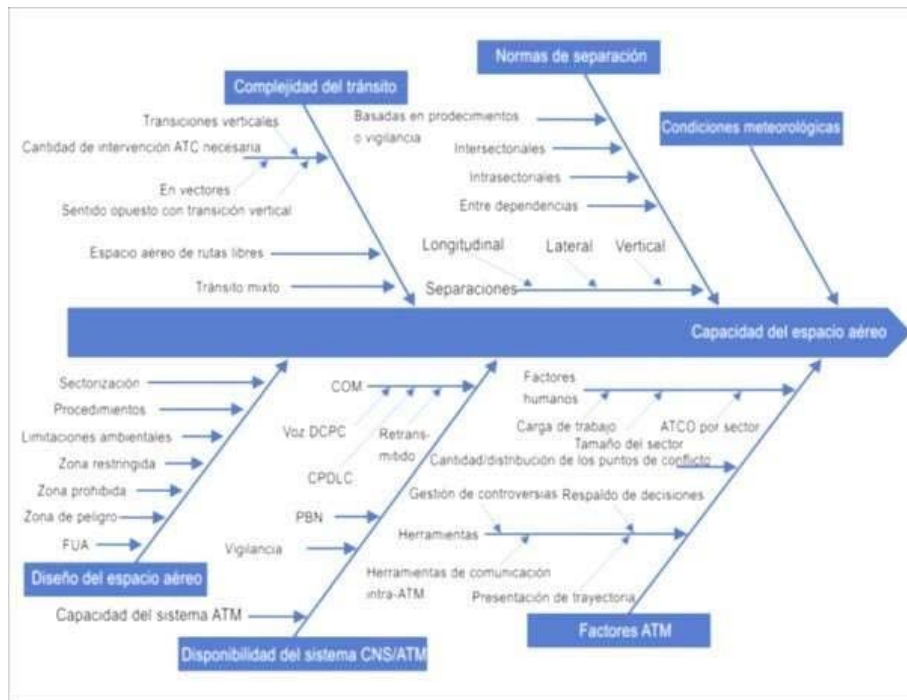
Existen diversos elementos que afectan la capacidad de un sector ATC, pero no todos están presentes en todos los sectores y cada uno afecta la capacidad de forma distinta.

La capacidad de un sector ATC no está determinada solamente por el criterio de saturación espacial. Se debe considerar además la carga de trabajo de los controladores aéreos. Por lo tanto, la capacidad de un sector ATC

se puede definir en términos de flujo como el número máximo posible de aeronaves que pueden ingresar a un sector durante un período determinado de tiempo, normalmente una (01) hora, teniendo en consideración un nivel de carga de trabajo para los controladores.

El número máximo de aeronaves que un ATCO puede controlar simultáneamente depende de la complejidad que le represente la sumatoria de las tareas que debe cumplir por cada vuelo.

El documento 9971 establece un gráfico representando las variables que determinan la capacidad de un sector ATC:



Factores que determinan la capacidad del espacio aéreo

Fuente: Documento 9971, pág. II-3-3, Figura II-3-1

9.1 Carga de trabajo

Es necesario analizar la incidencia de la “carga de trabajo” del controlador en la medición en la capacidad ATC. La naturaleza de las tareas que constituyen la carga de trabajo (CT) es importante a la hora de evaluar la capacidad, puesto que hay tareas que pueden ser observables y posibles de cuantificar y otras que no son observables, por lo tanto, no son tan fáciles de cuantificar.

Sin embargo, se pueden establecer algunas constantes para estas tareas no cuantificables, como producto de los análisis estadísticos y así reflejar un número en la metodología aplicada por algunos modelos.

Hay tres factores que contribuyen a la carga de trabajo del controlador:

- a) Comunicaciones de rutina realizadas entre el ATCO y las tripulaciones de vuelo
- b) Todas las actividades que no sean propiamente las comunicaciones de rutina entre el ATCO y las tripulaciones de vuelo, pero que son inherentes al control de tránsito aéreo con el fin de mantenerlo seguro, ordenado y rápido – como la interacción hombre-máquina (sistema automatizado ATM), las coordinaciones realizadas por el ATCO (con el ATCO ayudante,

planificador, coordinador, supervisor) etc.

- c) Todo el tiempo que el controlador utiliza para pensar y planificar las actividades del sector, mientras está controlando el tránsito aéreo.

Dado que todo servicio tiene una capacidad, resulta fundamental poder conocer la cantidad de aeronaves que pueden operar en un determinado sector ATC. Este capítulo describe la metodología para realizar el cálculo de capacidad de sector ATC, enfocándose en un caso de un sector de área de control (CTA). En 9.6 se establecen parámetros para la medición de sectores de ATZ y CTR. En la misma se describirán los pasos para obtener los valores del Número de Referencia (**Nref**), Número Máximo (**Npico**) y Capacidad Horaria del Sector (**CHS**).

Para la realización de la medición del cálculo de capacidad de sector se recomiendan entre 2 y 3 especialistas por cada sector. En una medición podrán ser medidos varios sectores de una misma dependencia ATC.

Los datos que se recolectarán para la realización de los cálculos son:

- o Tiempo de permanencia de la aeronave en el sector (T)
- o Tiempo de comunicación (Tcom)
- o Tiempo de Tarea Secundaria (TTS)

Los elementos que se requieren para la realización de los cálculos son:

- o Planillas y bolígrafo
- o Cronómetro
- o Audios de frecuencias ATS (Recomendable para registro del Tiempo de Comunicaciones)

9.2 Gestión de la Fatiga en el ATC

El Anexo 11 - Servicios de Tránsito Aéreo en su enmienda 50-B, vigente desde el 5 de noviembre del 2020, ha incluido la gestión de la fatiga para los controladores de tránsito aéreo y se la considera como riesgo para la seguridad operacional. Por ello es importante que se la tenga en cuenta al momento de calcular o establecer la capacidad de un sector.

La fatiga puede disminuir la capacidad de un ATCO para desempeñar todas las tareas operacionales y aumentar el riesgo de un sector, aun cuando exista un menor nivel de demanda, puede ser afectada la capacidad de ese sector. La fatiga entonces puede afectar la capacidad calculada y ser la causal de eventos que influyan sobre las actividades operacionales críticas para la seguridad operacional.

En esta consideración, el cálculo de la capacidad de pista o sector puede ser afectado positiva o negativamente si el personal actuante se ve afectado por efecto de la fatiga, lo que se podría reflejar en un aumento en los tiempos de reacción y en variación en los tiempos requeridos para realizar sus tareas.

Los anterior nos indica que, si el cálculo de capacidad se realiza en horarios donde el personal, ya haya estado trabajando bajo carga de trabajo, por un tiempo, esto podría verse reflejado en la necesidad de mayores tiempos que indiquen valores distintos de capacidad.

NOTA: Tanto el cálculo de capacidad de pista, como el de sector pueden ser afectados por eventos de fatiga en el personal actuante. En tal medida que para el cálculo de sector se debería evaluar y diagramar correctamente, si la posición y el horario es el mejor en base a la posibilidad que el personal se vea afectado por algún nivel de fatiga.

Se considera que los cálculos establecidos en el presente manual no deben ser modificados al considerar la fatiga del ATCO, pero sí debería tenerse en cuenta que el tiempo de trabajo continuo y mantener al ATCO bajo una carga de trabajo continua pueden provocar que los parámetros de cálculo utilizados varíen. Por lo cual, los supervisores y los operadores de la FMU correspondiente deben tener en cuenta el correcto diagrama de relevos y tiempos continuos de los ATCOs en un sector de trabajo.

Nota: Mantener un equilibrio de la capacidad/demanda en el 80% de la capacidad declarada del sector, mantiene una carga de trabajo en cuanto a fatiga dentro de parámetros aceptables, teniendo que tener un control permanente cuando se tome la decisión de, aun por cortos períodos de

tiempo, permitir que se trabaje con porcentajes mayores de tránsito.

Por definición, el Número Máximo es una capacidad de control simultáneo que, un sector ATC dado es capaz de soportar durante un **máximo de 19 (diecinueve) minutos en una hora**, continua o no, para satisfacer una demanda de corta duración.

El controlador de un sector que gestionará un número de aeronaves superior a la capacidad de referencia durante un tiempo superior a 19 minutos, continuos o no, en un período superior a 1 hora, estará sujeto a un proceso de fatiga. En estos casos, se recomienda reemplazarlo por otro operador después de 1 hora de operación, para no comprometer la seguridad operacional, ya que se reduce el nivel de atención del controlador.

Si el operador no ha gestionado el número del sector pico durante más de 19 minutos en 1 hora de funcionamiento, podrá permanecer en la posición de control durante un máximo de 2 horas, siempre que el movimiento del sector, en el segundo periodo de tiempo, no debe ser mayor que la capacidad referencial.

Después de 2 horas de funcionamiento continuo, **obligatoriamente**, el controlador debe ser reemplazado por otro, con el fin de evitar la fatiga, y por ende los errores que puede cometer por efecto de esta.

9.3 Definiciones para el cálculo de Capacidad de Sector ATC

Para efectos del presente manual, se describen las definiciones que se aplican específicamente al cálculo de Capacidad de Sector ATC:

Balance: Relación de equilibrio entre la demanda de tránsito aéreo y las capacidades ATC declaradas.

Capacidad de sector ATC (n): Número de aeronaves bajo la responsabilidad de un sector de control ATC simultáneamente.

Capacidad de sector ATC ajustada: Adecuación de los valores de capacidad de sector ATC calculada, debido a la creación y/o mejora de procedimientos operacionales para la reducción de parámetros del modelo matemático de capacidad de sector ATC, especialmente el TCom.

Capacidad de sector ATC calculada: Resultado numérico encontrado en el cálculo del modelo matemático de capacidad ATC.

Capacidad de sector ATC declarada: Número de aeronaves dentro de una parte específica del espacio aéreo en un periodo determinado de tiempo, teniendo en cuenta las condiciones climáticas, la configuración de la unidad ATC, la cantidad de personal operacional y equipamiento disponibles, y otros factores cualesquiera que puedan afectar la carga de trabajo del controlador responsable por el espacio aéreo.

Capacidad de sector ATC estimada: Número estimado de aeronaves por sector ATC. Se utiliza cuando no hay muestras suficientes para calcular la capacidad ATC.

Capacidad de sector ATC referencial (Nref): Número óptimo de aeronaves simultáneamente bajo control dentro de un sector ATC.

Capacidad horaria de sector ATC total (CHS total): Número de aeronaves para las cuales un sector ATC es capaz de proporcionar el servicio de control de tránsito aéreo en el intervalo de una hora. Representa la capacidad que tiene el sector ATC para hacer fluir el tránsito aéreo.

Carga de trabajo del ATCo (CT): Es el tiempo utilizado por el controlador de tránsito aéreo para procesar todas las tareas que una posición de control exige, en un intervalo de tiempo, para mantener un tránsito aéreo seguro y ordenado.

Demanda de tránsito aéreo: Número de aeronaves requiriendo los servicios del sistema ATM en un dado período de tiempo.

Desbalance: Situación en que la demanda de tránsito aéreo excede la capacidad declarada de sector ATC y/o de aeródromo.

Desviación estándar: Es la medida de dispersión más ampliamente utilizada, que se puede considerar como una medida de la variabilidad de datos de una distribución de frecuencias. Es decir, la desviación estándar mide la

dispersión de los valores individuales alrededor de la media.

Gestión de la afluencia del tránsito aéreo: Servicio establecido con el objetivo de contribuir a una afluencia de tránsito aéreo segura, ordenada y eficiente, garantizando la máxima utilización posible de la capacidad ATC y que la demanda de tránsito sea compatible con las capacidades declaradas por la autoridad competente.

Gestión del espacio aéreo: Gestión de las actividades en el espacio aéreo en los niveles estratégico, pre-táctico y táctico, a fin de lograr el uso más eficiente del espacio aéreo y la satisfacción de las necesidades de los usuarios, evitando en lo posible la segregación permanente de los espacios.

Instantaneidad de pico de tránsito: Periodo en el que se da el mayor número vuelos simultáneos, teniendo en cuenta un intervalo de 3 minutos.

Medidas ATFM: Procedimientos adoptados con el fin de maximizar el uso de las capacidades declaradas y/o ajustar la afluencia del tránsito aéreo en una parte del espacio aéreo, en una ruta específica, o en un aeródromo, de modo a evitar el desbalance.

Número Máximo del sector ATC (Npico): Es la capacidad de control simultáneo que un sector ATC en particular es capaz de mantener, por un máximo de 19 (diecinueve) minutos, continuos o no, en una hora, con el fin de cumplir con un aumento de la demanda a corto plazo. Durante ese período, el ATCO experimenta una sobrecarga de trabajo controlada. Si se percibe que la situación tiende a prolongarse, se deben tomar medidas ATFM.

Sector de control: Subdivisión de una dependencia ATC donde son proporcionados los servicios de tránsito aéreo en diferentes partes del espacio aéreo.

Dependencia ATC: Responsable por la prestación de los servicios de control de tránsito aéreo, además de los servicios de información de vuelo y de alerta.

9.4 Factores para la determinación de Capacidad de Sector

Para la determinación de la capacidad de Sector ATC, se consideran los siguientes factores:

- Factores de Planificación; y
- Factores relacionados a las Operaciones de ATC.

Factores de planificación

Factores de planificación se llama a los supuestos que se utilizan para realizar modelos matemáticos que influyen en la determinación de la capacidad de los sectores ATC. Los que se aplican frecuentemente son:

- a) Condiciones ideales de secuenciamiento y coordinación del tránsito aéreo;
- b) Se considera que todo el personal tiene la misma capacitación y el mismo desempeño operacional; y
- c) Se considera que todos los equipos de radionavegación, ayudas visuales y equipos de comunicaciones (VHF / telefonía), técnica y operativamente, funcionan sin restricciones.

Factores relacionados a las operaciones ATC

- a) Tiempos promedios de permanencia en el sector;
- b) Tiempos promedios de tarea secundaria del ATCO;
- c) Tiempos promedios de comunicación con las aeronaves;
- d) Factor cognitivo del ATCO;
- e) Factor de convergencia relacionado al tiempo de permanencia en el sector;
- f) Corredores visuales;
- g) Configuración de las pistas de aterrizaje;
- h) Llegada normalizada por instrumentos (STAR);
- i) Distribución de sectores ATC;
- j) Distribución de rutas en cada sector ATC;
- k) Procedimientos de Operación (Modelo Operativo y Manual de Operaciones);

l) Procedimientos de Navegación Aérea (SID, IAC etc.).

9.5 Modelo matemático para el Cálculo de Capacidad de Sector

9.5.1 Fórmula Completa para el Cálculo de capacidad de Sector

La capacidad de sectores ATC se calcula a partir del siguiente modelo matemático:

$$N_{Ref} = \frac{T \times \alpha_n}{(TCom+TTS) \times 1,30}$$

NRef	Capacidad de sector ATC calculada
T	Tiempo promedio de permanencia en el sector (en segundos)
α	Factor de convergencia
TCom	Tiempo promedio de comunicación del ATCO (transmisión y recepción) con la aeronave (en segundos)
TTS	Tiempo promedio utilizado por el controlador para realizar tareas secundarias (en segundos) (*)
1,30	Factor cognitivo (adimensional)

(*) Nota: En algunos casos se incluye los TTS del ayudante/planificador.

9.5.2 Observaciones sobre los términos del modelo matemático.

Número de referencia (NRef)

El NRef expresa el número óptimo de aeronaves bajo control simultáneo en un sector ATC durante un período de tiempo sin que en ningún momento la cantidad de vuelos provoque una sobrecarga de trabajo para el ATCO. Se debe tener en cuenta que la capacidad calculada de un sector ATC es basada principalmente al NRef.

Tiempo promedio de permanencia en el sector (T)

Es el tiempo promedio de permanencia de la aeronave en el sector en estudio.

Factor de convergencia (α)

Es un factor de reducción del tiempo promedio de permanencia en el sector (T). El factor de convergencia tiene la función de minimizar los efectos discrepantes en sectores ATC muy extensos para que el NRef no sea mayor que 18 aeronaves. (1) Para cada clase de tiempo promedio de permanencia en el sector (T), un coeficiente (α) fue establecido, como sigue:

(1) De acuerdo a valor óptimo del Documento 9971 Apéndice II-C y MCA 100-17 6.2.3.1

T (seg)	α	Nref
0 a 899	1,00	0,00
900 a 999	0,98	15,11
1000 a 099	0,92	15,79
1100	0,87	16,37
1200	0,82	16,86
1300	0,78	17,27
1400	0,74	17,61
1500	0,70	17,88
1600	0,66	18,09

1700	0,63	18,23
1800	0,60	18,33
1900	0,57	18,36
2000	0,54	18,35
2100	0,51	18,29
2200	0,48	18,19
2300	0,46	18,04
2400	0,44	17,85
2500	0,41	17,62

Tabla 2. Factor de convergencia.

El factor de convergencia está destinado a limitar el NRef. para cada clase de tiempo promedio de estadía en el sector (T), se estableció un coeficiente (α), de la siguiente manera:

- Multiplicar el T encontrado por el factor de convergencia correspondiente al coeficiente de su respectiva clase (α);
- Multiplicar el factor encontrado por el límite superior de la clase anterior para obtener el factor de convergencia ($\alpha-1$); y
- Comparar los valores de (α) y de ($\alpha-1$), y utilizar el que sea mayor, como se muestra a continuación:
Para $\alpha \geq \alpha -1$, utilice α . De lo contrario, utilice $\alpha -1$.

Tiempo de comunicaciones (TCom)

El TCom es la suma del tiempo de comunicaciones entre las aeronaves y el ATCO en un período de tiempo determinado, dividida por el número de aeronaves que mantuvieron contacto en ese mismo período.

Tiempo promedio de Tareas Secundarias del ATCO (TTS)

El TTS es el tiempo promedio utilizado por el ATCO en el desempeño de las tareas de coordinación, relleno de FPV, actualización de la pantalla radar y cualquier otra actividad visible inherente al servicio de tránsito aéreo, salvo el uso del canal de comunicación con la aeronave. En ciertos casos se suma un porcentaje de las tareas realizadas por el ayudante cuando influye en los TTS del ATCO.

La constante 1,30

La constante 1.30 consiste en la adición de un 30% de la suma de Tcom y TTS a la carga de trabajo (CT). Se refiere a las operaciones de pensamiento del ATCO (factor cognitivo) durante el tiempo dedicado a las funciones de planificación, organización del tránsito y de vigilancia por radar. (2)

9.5.3 Fórmula reducida, expresando Carga de Trabajo (CT)

De la fórmula completa, se puede llegar a la fórmula reducida utilizándose el concepto de carga de trabajo (CT), como sigue:

$$CT = (TCom + TTS) \times 1,30$$

Determinando entonces,

$$N_{Ref} = \frac{T \times \alpha}{CT}$$

CT: Tiempo promedio utilizado por el ATCO para ejecutar todas las tareas necesarias para brindar el control de tránsito aéreo en una posición ATC (en segundos).

9.5.4 Fórmula para el cálculo del Número Máximo (NPico)

El Npico es la capacidad de control simultáneo de aeronaves que un determinado sector ATC está en condiciones de mantener durante un máximo de 19 (diecinueve) minutos, continuos o no, dentro de una hora, a fin de atender un aumento de la demanda a corto plazo. Durante ese período, el ATCO podría experimentar una sobrecarga de trabajo controlada. Si se observa que la situación tiende a prolongarse, se deberían tomar medidas ATFM.

En el modelo matemático, el número de referencia debe ser tratado como un valor óptimo de capacidad al que se puede añadir un margen para llegar al NPico por un período de tiempo de hasta 19 minutos:

$$N_{pico} = \frac{T_{max} \times \alpha}{(TCom_{min} + TTS_{min}) \times 1,30}$$

El Tmax se obtiene por la fórmula

$$T_{max} = T + \sigma_T$$

T: Tiempo de Permanencia en el sector σ_T : Desviación Estándar de T

donde:

El TCommin se obtiene por

$$TCommin = TCom + \sigma_{TCom}$$

donde:

Tcom: Tiempo de Comunicaciones σ_{TCom} : Desviación Estándar del Tcom

El TTSmin se obtiene por $TTSmin = TTS + \sigma_{TTS}$ donde:

TTS: Tiempo de Tareas Secundarias σ_{TTS} : Desviación Estándar del TTS

Una Sigma (σ : desviación estándar) es equivalente a 68,3% de la representatividad de la muestra. Considerando que la probabilidad de variación causada por el uso de las σ de Tmax, TCommin y TTSmin es la misma, sucederá el 31,7% del tiempo (una hora) – lo equivalente a aproximadamente 19 (diecinueve) minutos.

9.5.5 Fórmula para la obtención de la Capacidad horaria del sector

La capacidad horaria del sector (CHS) es el número de aeronaves al que determinado sector ATC es capaz de

proporcionar servicio de control de tránsito aéreo en el intervalo de una hora.

$$CHS = \frac{3.600 \times (0,683 \times N_{Ref} + 0,317 \times N_{pico})}{T}$$

La CHS representa la capacidad que tiene el sector ATC para hacer fluir el tránsito aéreo. Así, la fluidez del tránsito aéreo en un sector ATC será mayor cuanto mayor sea la CHS del ese sector.

La CHS varía de acuerdo con cuantas aeronaves pueden ser controladas de forma simultánea (complejidad del sector) y al tiempo de permanencia en el sector (T).

Por lo tanto, para aumentar la capacidad horaria del sector se debe reducir su complejidad y reducir los tiempos de permanencia en el sector.

9.6 Pasos para la recolección y el cálculo de capacidad de sector ATC

A continuación, se describirán los pasos para la recolección y cálculo de capacidad de Sector ATC.

La misma incluye ejemplos con planillas con datos ficticios a fin de facilitar la interpretación del llenado de las mismas.

Paso 1. Planificación de la recolección de los datos.

Para que se tenga éxito en la recolección de los datos para calcular la capacidad ATC es necesario analizar toda la información disponible respecto al funcionamiento del sector (Por ejemplo: la lista de turnos operativos, el manual de funcionamiento interno y libros o registros de turno de la dependencia ATC, etc). Los factores que puedan alterar la rutina deben ser tenidos en consideración para evitarse la recolección de datos cuando los mismos causen un impacto operativo considerable, dichos factores pueden ser:

- a) Épocas de mucha inestabilidad meteorológica;
- b) Operaciones militares;

- c) Eventos y días festivos;
- d) Mantenimiento de radar;
- e) Mantenimiento de ayudas a la navegación aérea (VOR, ILS etc.) y equipos de comunicación (VHF);
- f) Actualización de base de datos;
- g) Cambio de sistemas automatizados ATM;
- h) Estadística de volumen de tránsito en el periodo de recolección (media o alta demanda);
- i) Análisis de agrupamientos de sectores más utilizados en la dependencia ATC

Nota: A requerimiento se pueden realizar mediciones extraordinarias en épocas de alta demanda como eventos, días festivos, mantenimiento de equipamiento, a fines de obtener información específica sobre el comportamiento de las variables. Estos datos pueden servir para distintas etapas del proceso ATFM.

Análisis de agrupamientos de sectores y horarios de media y alta demanda por sector

Se debe solicitar a las dependencias ATC para análisis y planificación de mediciones, en donde considere necesario por la configuración de sectores, con antelación suficiente, un listado de los agrupamientos de los mismos para analizar la configuración de consolas operacionales, a fin de preparar la recolección de datos e identificar los horarios de media y alta demanda de tránsito en cada sector. Este paso no se considera necesario en caso de sectores poco complejos o donde la información esté disponible de otra fuente (por ejemplo, estadísticas). El proceso de medición es el mismo para sectores agrupados como desagrupados.

Ejemplo:

- a) Dependencia ATC:
ACC ANYPORT (Sector 1).
- b) Período previsto para la recolección de audios:
del 03/10/2017 al 03/11/2017.
- c) Período previsto para la recolección de datos:
del 03/11/2017 al 12/11/2017.
- d) Horarios seleccionados con media o alta demanda de tránsito:
de las 1130UTC a las 1330UTC y de las 2130UTC a las 2330UTC.

Paso 2. Recolección y tratamiento del Tiempo de Tareas Secundarias (TTS)

- Tipos de TTS**
- 1- Coordinación (otros controles, ayudante, supervisor)
 - 2- Interacción con sistema de comunicaciones
 - 3- Llenado de FPV y ordenamiento del tablero
 - 4- Tratamiento de FPL
 - 5- Interacción con Pantalla radar

Recolección del TTS del controlador ejecutivo

Cronometrar, en la dependencia ATC, al menos 35 mediciones de TTS de 180 segundos cada una para cada sector. Las mediciones deben cumplir con los siguientes criterios:

- Mínimo de cinco y máximo de diez mediciones de cada tipo de TTS de un mismo controlador;
- La recolección se debe hacer cuando la demanda sea igual a o mayor que un 50% (cincuenta por ciento) del número de referencia o momentos identificados de demanda media/alta;
- Para la recolección de hasta un 10% (diez por ciento) de las mediciones de un sector, se puede observar a un ATCO en instrucción (fase final). Los demás practicantes no deben ser observados;
- Dependiendo del sector a analizar, se recomienda un tiempo de recolección de 7 a 10 días;
- En sectores no radar, se podrá omitir o indicar otros tipos de TTS
- Deberán ser medidas (en segundos) todas las actividades inherentes a la prestación del ATS realizadas por el ATCO, excepto el tiempo de comunicaciones con las aeronaves, separando por tipo los TTS.

Recolección del TTS del controlador planificador

En casos donde, por el diseño de sector y metodología de trabajo utilizada, la influencia de las tareas del controlador planificador (ayudante) influye significativamente en la carga de trabajo del ATCO ejecutivo en frecuencia principal, se tomarán mediciones de TTS del planificador siguiendo los parámetros mencionados en el punto anterior. El valor encontrado de TTS y su desviación estándar se representará como un 20% ponderado de los TTS del sector3.

Las mediciones deben ser registradas en la Planilla CS01, a continuación, se presenta un ejemplo de la planilla:

Planilla CS01													
TIEMPO DE TAREAS SECUNDARIAS													

Dependencia: ACC XXX Sector: S1

Fecha	C/A	S/A	INICIO (HHMM)	FINAL (HHM)	Tipo de TTS	Tiempo TTS (seg)	Observaciones	Densidad de tránsito						RECOLECTOR	ATCO
								Inicio			Final				
								VFR	IFR	Total	VFR	IFR	Total		
20/8	X		1300	1303	1	31.26		0	8	8	0	8	8	Juan Perez	Jose Perez
20/8	X		1305	1308	1	28.55		0	8	8	0	7	7	Juan Perez	Jose Perez
20/8	X		1307	1310	3	37.21		0	7	7	0	5	5	Juan Perez	Jose Perez
20/8	X		1309	1311	5	29.53		1	3	4	1	3	4	Juan Perez	Jose Perez

- Tipos de TTS**
- Coordinación (otros controles, ayudante, supervisor)
 - Interacción con sistema de comunicaciones
 - Llenado de FPV y ordenamiento del tablero
 - Tratamiento de FPL
 - Interacción con Pantalla radar

C/A: Con controlador Ayudante/Planificador

S/A: Sin controlador Ayudante/Planificador

TIEMPO DE TAREAS SECUNDARIAS

Tratamiento de los tiempos recolectados

En caso de medir los TTS del planificador se agregarán de la siguiente manera al cálculo de TTS de sector:

$$MediadeTTSporSector = \frac{X_A * 80 + X_B * 20}{100} = xx \text{ seg}$$

XA: Promedio de TTS del ATCO

XB: Promedio de TTS del Ayudante.

Ejemplo:

Para encontrar el TTS del sector en una hora, debe calcularse el promedio de las mediciones de TTS por sector, multiplicar por 3600 segundos y dividir por 180 segundos, como se muestra a continuación:

$$TTSporHora = \frac{3.600 \times (MediadeTTSporsector)}{180} = xx \text{ seg}$$

Media TTS = Promedio (31.26, 28.55, 37.21, 29.53) = 31.64seg

TTS por Hora = (3600 * 31.64) / 180 = 632.75seg

Para calcular el TTS por ACFT de cada muestra de T y TCom se divide el TTS en una hora por la cantidad de Aeronaves de cada muestra (n):

$$TTSporACFT = \frac{TTSporHora}{n} = xxseg$$

Muestra 1: 632.75 / 8 = 79.09 seg

Muestra 2: 632.75 / 7 = 90.39 seg

Muestra 3: 632.75 / 5 = 126.55 seg

Muestra 4: 632.75 / 4 = 158.19 seg

A continuación, se obtiene el Tiempo promedio de TTS y su desviación estándar:

Para conseguir el tiempo promedio se suman los TTS por ACFT y se multiplica por la cantidad de muestras recolectadas (35):

$$TTSpromedio = \frac{\sum (TTS_1 + TTS_2 + \dots + TTS_{35})}{35} = xxseg$$

Ejemplo: TTS promedio = Promedio (79.09, 90.39, 126.55, 158.19 (...)) = 113.56

La desviación estándar resulta de la suma de las diferencias de cada TTS y el promedio de TTS obtenido en el paso anterior:

$$\sigma_{TTS} = \sqrt{\frac{\sum_{n=1}^{35} (TTS_n - TTS)^2}{n-1}}$$

Ejemplo: $\sigma_{TTS} = \sigma (79.09, 90.39, 126.55, 158.19 (\dots)) = 35.99$

Los resultados se insertarán en la Tabla 1.

Muestras	Tiempos promedio de TTS		Tiempos promedio de Permanencia en el sector (T)		Tiempos promedio de com por aeronave (TCom)	
	<i>TTS₁</i>	31.26	<i>T₁</i>		<i>TCom₁</i>	
Muestra 2	<i>TTS₂</i>	28.55	<i>T₂</i>		<i>TCom₂</i>	
Muestra 3	<i>TTS₃</i>	37.21	<i>T₃</i>		<i>TCom₃</i>	
...	
...	
Muestra 35	<i>TTS₃₅</i>	29.53	<i>T₃₅</i>		<i>TCom₃₅</i>	
Tiempo promedio	<i>TTS</i>	113.56	<i>T</i>		<i>TCom</i>	
Desviación estándar	σ_{TTS}	35.99	σ_T		σ_{TCom}	

Tabla1. Medias y desviaciones estándar TTS

Paso 3. Recolección y tratamiento del Tiempo de Permanencia en el Sector (T)

Recolección del T

Registrar el horario de la primera y última comunicación (horario de ingreso y salida del sector en minutos) de las aeronaves en los periodos de mayor volumen de tránsito, separando por sector y/o grupo de sectores, en el

intervalo de una hora continua. Cada hora continua representará una muestra. Los datos recolectados se cargarán en la Planilla (CS02) a continuación.

Planilla CS02: RECOLECCIÓN DEL TIEMPO DE PERMANENCIA DE SECTOR Y TIEMPO DE COMUNICACIONES- T - TCOM									
DEPENDENCIA		Sector XX		MUESTRA N°		X		Total TCOM	
SECTOR		Ruta		FECHA		20/8/19		MIN	SEG
RELEVADO POR:		XXX		HORA DE INICIO		10:00:00			
AERONAVES		Entrada			Salida			OBSERVACIONES	
		HORA	MIN	SEG	HORA	MIN	SEG		
1	XX-ZPC	10	10	10	10	25	00		
2	XZ-JPZ	10	11	00	10	24	25		
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									

Tratamiento del T

Se deben sumar los tiempos de permanencia de las aeronaves que tienen primer y último contacto registrado. Luego, se debe dividir el total de tiempos por la cantidad de aeronaves consideradas (n).

De esta manera se consigue el promedio de cada muestra y el promedio general de todas las muestras. A continuación, se calculan las desviaciones estándar.

$$T_{porACFT} = \frac{T_1 + T_2 + \dots + T_{35}}{n} = \text{xx seg}$$

T: El T de cada aeronave se obtiene de cada muestra.

T por ACFT: Entre todas las aeronaves de cada muestra, se obtiene el promedio por muestra

$$\sigma_T = \sqrt{\frac{\sum_{n=1}^{10} (T_n - T)^2}{n-1}}$$

Muestras	Tiempos promedio de TTS		Tiempos promedio de Permanencia en el sector (T)		Tiempos promedio de com por aeronave (TCom)	
Muestra 1	<i>TTS1</i>	31.26	<i>T1</i>	14.13	<i>TCom1</i>	
Muestra 2	<i>TTS2</i>	28.55	<i>T2</i>	15.13	<i>TCom2</i>	
Muestra 3	<i>TTS3</i>	37.21	<i>T3</i>	...	<i>TCom3</i>	
...	
...	
Muestra 35	<i>TTS35</i>	29.53	<i>T35</i>	...	<i>TCom35</i>	
Tiempo promedio	<i>TTS</i>	113.56	<i>T</i>	14.63	<i>TCom</i>	
Desviación estándar	σTTS	35.99	σT	0.71	$\sigma TCom$	

Tabla 2. Media y desviaciones estándar T.

Nota: Se debe descartar el T en las siguientes situaciones:

vuelos de inspección, vuelos de prácticas, aeronaves realizando esperas, vuelos locales, vuelos de periodismo, vuelos acrobáticos, grandes desviaciones derivadas de formaciones meteorológicas, espacios aéreos condicionados y cualquier otro evento que cambie el escenario y la circulación en el espacio aéreo analizado.

Paso 4. Recolección y tratamiento del Tiempo de Comunicación (TCom)

Recolección del TCom

Para obtener el TCom se siguen los mismos criterios de recolección del T y se van sumando las muestras hasta que se llegue a 35. Se utiliza un cronómetro o algún sistema automatizado disponible, para tomar los tiempos de comunicaciones entre el piloto y el ATCO en el periodo de una hora. Se registra el tiempo total de audio en las celdas de TCom MIN y SEG de la correspondiente Planilla CS02. Dicho valor, convertido a segundos, se dividirá por la cantidad de aeronaves que se comunicaron en esa hora. Así se obtiene el TCom de cada muestra.

Tratamiento del TCom

Se calcula para cada sector el promedio de todas las muestras y las respectivas desviaciones estándar de los tiempos de comunicación por aeronave:

$$TCom_{porACFT} = \frac{TCom_1 + TCom_2 + \dots + TCom_{35}}{n} = \text{xxseg}$$

$$\sigma_{TCom} = \sqrt{\frac{\sum_{n=1}^{35} (TCom_n - TCom)^2}{n - 1}}$$

Estos resultados se anotarán en la Tabla 3.

Muestras	Tiempos promedio de TTS		Tiempos promedio de Permanencia en el sector (T)		Tiempos promedio de comunicación por aeronave (TCom)	
Muestra 1	$TTS1$	31.26	$T1$	14.13	$TCom1$	92.50
Muestra 2	$TTS2$	28.55	$T2$	15.13	$TCom2$	142
Muestra 3	$TTS3$	37.21	$T3$...	$TCom3$...
...
...
Muestra 35	$TTS35$	29.53	$T35$...	$TCom35$...
Tiempo promedio	TTS	113.56	T	14.63	$TCom$	117.25
Desviación estándar	σTTS	35.99	σT	0.71	$\sigma TCom$	35.00

Tabla 3. Media y desviaciones estándar TCom.

Nota: En el análisis de los datos debe ser observado si en las muestras existen comunicaciones que han bloqueado la radiofrecuencia innecesariamente, causando un aumento excesivo en el TCOM.

Paso 5. Análisis de los resultados
Cálculo del NRef:

Luego de calcular los parámetros de TTS, T y TCom de cada sector dichos valores deben ser aplicados a la fórmula matemática, teniendo en cuenta el factor de convergencia que se utilizará. Por lo tanto, la capacidad de sectores ATC se calcula a partir del modelo matemático, indicado a continuación:

$$N_{Ref} = \frac{T \times \alpha}{(TCom + TTS) \times 1,30} = N^{\circ} \text{ ACFT}$$

Se debe comprobar la capacidad encontrada para el límite superior del intervalo anterior (Nn-1). Una vez encontrado este valor, se compararán ambos resultados y se utilizará el mayor.

Ejemplo:

$$N_{ref} = (14.63 * 1) / (117.25 + 113.56) * 1.3 = 2.92 = 3 \text{ acft}$$

Cálculo Npico:

A partir del NRef encontrado, calcular el Npico, de acuerdo con la siguiente secuencia:

Cálculo:

$$T_{max} = T + \sigma_T$$

Cálculo:

$$TCom_{min} = TCom - \sigma_{TCom}$$

Cálculo:

$$TTS_{min} = TTS - \sigma_{TTS}$$

$$N_{pico} = \frac{T_{max} \times \alpha}{(TCom_{min} + TTS_{min}) \times 1,30}$$

De la misma forma que se procede con el NRef, se calcula el NPico con el límite superior del intervalo anterior del factor de convergencia, y se selecciona el más alto.

Ejemplo:

$$T_{max} = 14.63 + 0.71 = 15.33$$

$$Tcom_{min} = 117.25 - 35 = 82.25$$

$$TTS_{min} = 113.56 - 35.99 = 77.57$$

$$N_{pico} = (15.33 * 0.98) / (82.25 + 77.57) * 1.3 = 4.34 = 4 \text{ acft}$$

Cálculo de la Capacidad Horaria de Sector total:

A partir del NRef y del Npico será calculada la CHS (capacidad horaria del sector):

$$CHS = \frac{3.600(0,683N_{ref} + 0,317N_{pico})}{T}$$

Nota: Se debe comparar los resultados con la actual capacidad ATC y evaluar si estos resultados son coherentes con el volumen de tránsito que el sector puede soportar, y así establecer los valores de capacidad del Sector ATC recomendados.

Ejemplo:

$$CHS = (3600 (0.683 * 3 + 0.317 * 4)) / 14.63 = 13.61 = 14 \text{ acft/hr}$$

Optimización de la capacidad de los sectores ATC.

Se pueden crear o mejorar procedimientos operacionales para que se reduzcan los valores de las variables que determinan el Nref y Npico.

En caso de que se detecte un exceso en los valores de Tcom o TTS y se proponga un procedimiento operativo para su mejora, podrá ajustarse el valor de este al nuevo valor.

Ejemplo:

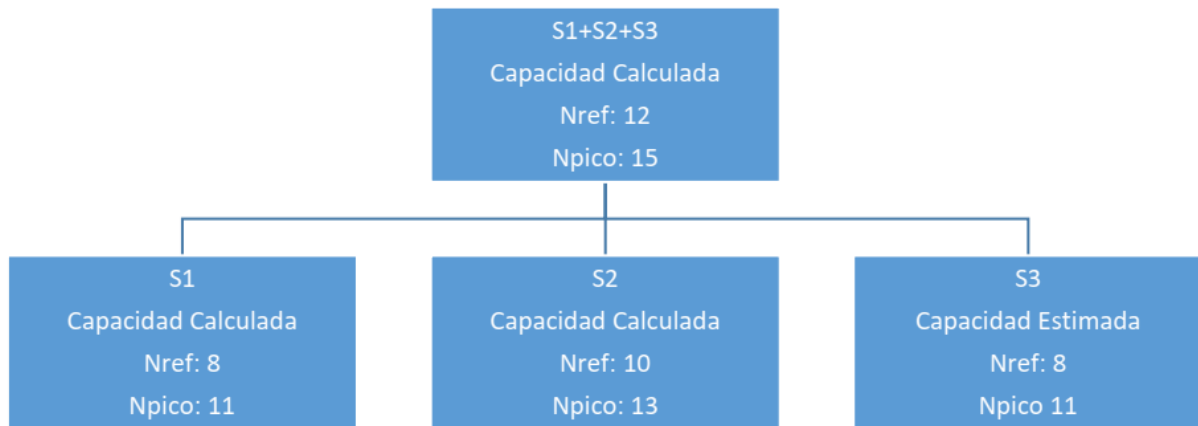
Se detecta un sector en donde el **Tiempo de Comunicación** resulta excesivo y sin uso de fraseología estándar. Al proponer el uso de la misma podrá reemplazarse el valor del **Tcom** incluyendo el nuevo procedimiento y recalculer los valores de capacidad.

Capacidad estimada de los sectores ATC

Para el sector del cual no sea posible calcular la capacidad ATC debido a un número insuficiente de muestras (por permanecer, por ejemplo, constantemente agrupado), se determinará la capacidad estimada. La misma será estimada en relación con los demás sectores que conformen la agrupación del sector principal.

Ejemplo:

En los sectores 1+2+3 se ha podido medir su capacidad con los 3 sectores agrupados, así como en los sectores 1 y 2 desagrupados, quedando el sector 3 sin haber sido podido calcular de forma individual.



En este ejemplo, el sector **S3** tendrá su capacidad estimada igual o menor respecto a la calculada para los otros dos sectores con suficientes muestras. Se recomienda que la capacidad estimada solo sea declarada luego de un análisis entre expertos del sector y capacidad.

9.7 Parámetros de Medición para CTR o ATZ

Esta medición no debe considerarse como mandatorio; al observar ciertos sectores ATC, como Zonas de Control (CTR) y Zonas de Tránsito de Aeródromo (ATZ) de aeropuertos con gran densidad de tránsito, puede surgir la necesidad de analizarlos y calcular sus capacidades, a fines de planificación y buscando la mejora de las mismas.

Se analizará cada caso por separado, considerando cantidad de puestos, complejidad del espacio aéreo, dimensiones del mismo, cantidad e infraestructura de pistas y calles de rodaje, procedimientos utilizados, tipos de aeronaves que hacen uso del espacio aéreo.

Se diferenciarán los sectores ATC de acuerdo con el servicio brindado, ya sea control de Aproximación, o de Aeródromo, con sus particularidades.

Se mantienen los parámetros empleados en las mediciones convencionales, con ciertas características singulares detalladas a continuación:

9.7.1 Tiempo de permanencia en el sector (T).

En el caso de CTR:

Por límites definidos, verticales y/o laterales hasta que deja de estar bajo el control del ATCO. En caso de ser APP hasta OM o al ingreso al circuito de tránsito, cuando se encuentren unificados los servicios de APP y AD hasta que se libera la pista. Para operaciones de despegue se considerará desde que ingresa a pista para despegar.

En el caso de ATZ:

De acuerdo con límites definidos, si existen, o al ingreso del circuito de tránsito hasta que libera la pista activa. En caso de ida al aire, se considerará que continúa o ingresa nuevamente al sector, dependiendo el caso.

9.7.2 Tiempo de Comunicaciones (TCom).

Se tomará el tiempo desde que la aeronave esté en frecuencia del control de jurisdicción del sector a estudiar, incluyendo cuando la aeronave esté en la pista.

9.7.3 Tiempo de Tareas Secundarias.

Se aplicará el mismo procedimiento que en la recolección de los demás sectores ATC. En estos casos no es necesariamente relevante clasificar los tipos de TTS.

10 Orientaciones para mejoras de la capacidad de Sector

Habiendo comprendido el proceso de cálculo de Sector ATC es posible detectar oportunidades de mejora para la capacidad del sector:

Analizando la fórmula matemática de cálculo de Nref y CHS:

$$N_{Ref} = \frac{T \times \alpha_n}{(TCom + TTS) \times 1,30}$$

$$CHS = \frac{3.600 \times (0,683 \times N_{Ref} + 0,317 \times N_{pico})}{T}$$

Se puede observar que en la fórmula de Nref, en el nominador se encuentra el tiempo de permanencia en el sector y en el denominador la Carga de Trabajo del controlador dividida en Tiempos de Comunicación, Tiempos de Tareas Secundarias y un factor constante cognitivo. Esto significa que la cantidad de aeronaves que puede controlar un ATCO de forma simultánea depende de la cantidad de carga de trabajo que tenga que destinar a cada aeronave. Un valor T elevado proporcionará un Nref alto, pero en la capacidad horaria de sector al estar en el denominador no permitirá alcanzar una máxima capacidad. La mejor capacidad se encuentra a través de una baja carga de trabajo con un bajo valor de T (generando una alta renovación de aeronaves por un mismo sector).

Es entonces que se puede concluir que la máxima capacidad se alcanzará con la reducción de las variables de T, Tcom y TTS.

A continuación, se detallan ejemplos de mejoras en estas variables:

1- Mejoras en Tiempo de Permanencia de Sector (T):

Sectorización
Rediseño de trayectorias de ruta, SID/STARS

2- Mejoras en Tiempos de Comunicaciones (Tcom):

Estandarización de Fraseología
Uso de comunicación vía Datos cuando sea posible Estandarización de Procedimientos ATS
Implementación de procedimientos instrumentales de vuelo con separaciones desde el diseño

3- Mejoras en Tiempos de Tareas Secundarias (TTS):

Estandarización de Procedimientos ATS
Uso de sistemas de coordinación automáticos
Uso de Fichas de progreso de vuelo electrónicas

11 Mejora a través del uso de datos para análisis e indicadores

Capacidad de Pista

Los procesos de medición de capacidad de pista y sector no deberían ser únicamente una búsqueda del resultado final del valor de capacidad, sino ser comprendidos como un proceso que además de un valor final en el mismo proceso se detectarán una gran cantidad de datos que pueden servir como base para medir futuras implementaciones y detectar oportunidades de mejora.

En el caso de pista uno de los datos directos que se obtienen son los de tiempo de ocupación de pista, por categoría de aeronave. Este dato sirve como referencia para medir cuantitativamente variaciones luego de haber realizado implementaciones en infraestructura o procedimientos operativos.

También partiendo de un total de 3600 segundos por hora, es posible calcular en base a la capacidad declarada y al uso real de la pista cuál es su % de utilización, para así visualizar la oportunidad de mejora disponible, por ejemplo:

TMOP: 106seg

Capacidad Declarada de Pista: 21acft/hr

Uso de Pista / Variables	Cantidad de Segundos con pista ocupada	% de segundos con pista ocupada	Cantidad de Segundos con pista libre	% de segundos con pista libre	Segundos entre operaciones sin utilización de pista
21 (100% CDP)	2226	62%	1374	38%	65
16 (80% CDP)	1696	47%	1904	53%	119

Como se puede observar en caso de usar el 100% de la capacidad declarada con un Buffer de 1, la pista estaría el 62% del tiempo ocupada, dejando un 38% libre. Esto se traduce en que, si se dividen los 1374 segundos que la pista estaría libre entre las 21 aeronaves que operan, entre cada operación existiría 65 segundos (Supuesto Aterrizaje – Despegue – Aterrizaje).

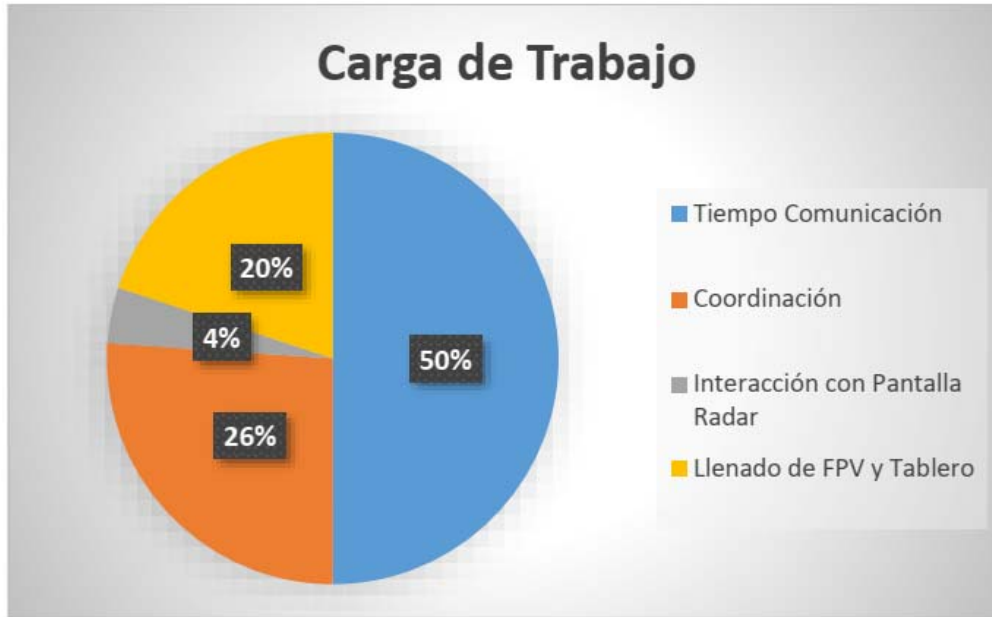
En base a distintos análisis se debería trabajar en reducir el valor de B para que tienda al mínimo posible.

Capacidad de Sector

En el caso de Capacidad de Sector, resulta valioso entender el motivo del valor de la Carga de Trabajo (Tcom + TTS).

En base a las recolecciones realizados del TCOM y el TTS con sus subcategorías es posible identificar la distribución de la carga de trabajo del controlador y de esta forma entender donde deberían ser enfocados los recursos para el incremento de la capacidad.

Por ejemplo:



Este tipo de acercamiento puede realizarse para cada actividad, tantas veces y con tanta profundidad sea necesaria. Cuanto más profundo logre analizarse, mayores serán las oportunidades de mejora.

También los valores nominales de las variables permiten realizar comparaciones con otros sectores para comprender el motivo de porque un sector tiene más o menos carga de trabajo que otro y descubrir mejores prácticas que puedan ser traspasadas de sector a sector.

Planilla Tiempos de entre OM y THR – CP03				
AERÓDROMO			FECHA-HORA INICIO	
DATOS				
CALLSIGN	ACFT	CAT	RWY	TIEMPO OM/THR
DATOS ADICIONALES				
RELEVADO POR:			FIRMA	
Hr FINALIZACIÓN:				

APÉNDICE D – Ejemplo de cálculo de capacidad de pista

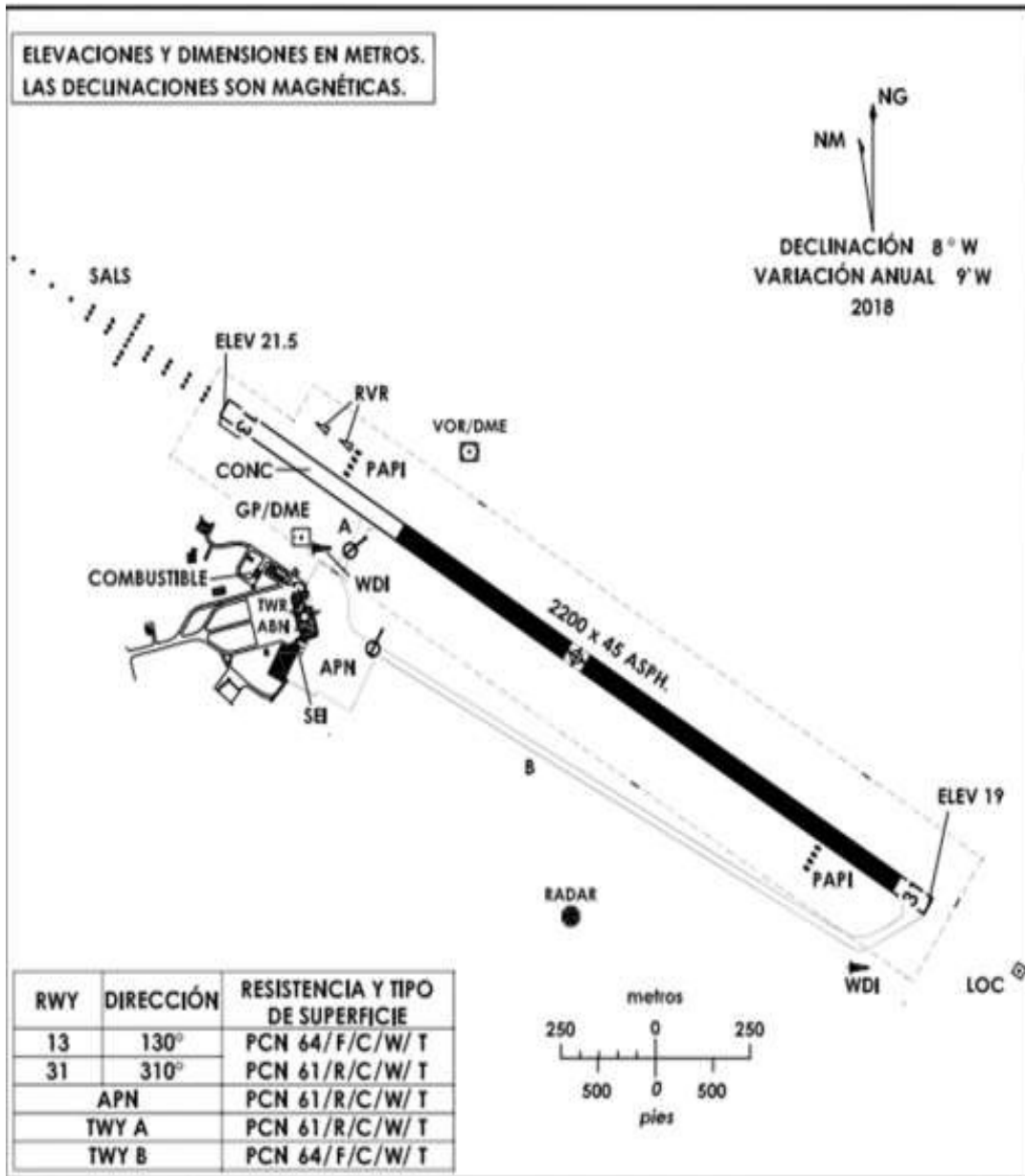


Ilustración 1. Plano de Aeródromo AnyPort

MOVIMIENTO MENSUAL DE AERONAVES

<i>MES</i>	PISTA 13	Pista 13	MOV. MENSUAL
<i>ENE</i>	5000	2500	7500
<i>FEB</i>	5153	2516	7669
<i>MAR</i>	5606	5618	11224
<i>ABR</i>	2154	5150	7304
<i>MAY</i>	2151	3000	5151
<i>JUN</i>	5108	6010	11118
<i>JUL</i>	7500	3000	10500
<i>AGO</i>	8000	2000	10000
<i>SEP</i>	5181	5205	10386
<i>OCT</i>	2055	3500	5555
<i>NOV</i>	5085	5085	10170
<i>DIC</i>	6505	1200	7705
TOTAL	59498	44784	104282

% DE UTILIZACIÓN DE PISTA (PU)	
A	57,05
B	42,95
TOTAL	100

CALLSIGN	ACFT	CAT	RWY	TIEMPO 5nm/THR	TIEMPO	TIEMPO
----------	------	-----	-----	----------------	--------	--------

					ARR	DEP
XXCMI	C152	A	13			55,22
XXCDK	C150	A	13			68,47
XXATE	C152	A	13			69,78
XXCJE	C152	A	13			72,93
XXCMI	C150	A	13			76,15
XXFOK	P46T	A	13			77,22
XXCMI	C150	A	13			83,72
XXCDW	C150	A	13			101,16
XXCZG	C152	A	13			161,28
XXCVK	C150	A	13			161,29
XXCJA	C152	A	13		42,40	
XXCMI	C150	A	13		48,06	
XXCML	C152	A	13		56,47	
XXCJA	C152	A	13		77,83	
XXATE	C152	A	13		78,19	
XXCDG	C150	A	13		100,31	
XXCMI	C150	A	13		110,73	
XXATE	C152	A	13	83,00		
XXCML	C152	A	13	156,97		
XXCMI	C150	A	13	206,78		
XXGPF	C182	B	13			47,33
XXGPF	C182	B	13			61,75
N85MV	BE58	B	13			75,10
KX7185	ATR76	B	13			109,87
KX7815	ATR76	B	13			137,10
KX7187	ATR76	B	13			148,97
XXMCZ	C210	B	13			158,15
XXCDW	C182	B	13			158,53
KX7187	ATR76	B	13			171,31
KX7183	ATR76	B	13			174,00
KX7183	ATR76	B	13			179,56
KX7185	ATR76	B	13			186,76
XXCBZ	BE20	B	13			189,35
KX7184	ATR76	B	13		72,15	
KX7182	ATR76	B	13		75,66	
KX7182	ATR76	B	13		75,91	
KX7811	ATR76	B	13		76,71	

				TIEMPO	TIEMPO ARR	TIEMPO DEP
--	--	--	--	--------	------------	------------

CALLSIGN	ACFT	CAT	RWY	5nm/THR		
KX7184	ATR76	B	13		77,86	
KX7184	ATR76	B	13		83,47	
KX7184	ATR76	B	13		90,72	
XXGWT	AE50	B	13		95,73	
KX7184	ATR76	B	13	70,97		
N85MV	BE58	B	13	77,94		
KX7182	ATR76	B	13	80,9		
KX7182	ATR76	B	13	92,19		
KX7182	ATR76	B	13	132		
KX7184	ATR76	B	13	148,81		
KX7184	ATR76	B	13	235,91		
KX7184	ATR76	B	13	239,12		
XXGWT	AE50	B	13	78,95		
JZ2609	E190	C	13			62,41
JZ2628	E190	C	13			125,31
XXCPS	LJ45	C	13			128,10
XQBFS	LJ45	C	13			134,41
JZ2601	E190	C	13			152,00
JZ2609	E190	C	13			152,65
JZ2523	E190	C	13			155,03
XXFVZ	LJ60	C	13			158,59
JZ2623	E190	C	13			161,78
JZ2669	E190	C	13			169,78
JZ2625	E190	C	13			171,31
JZ2612	E190	C	13			177,94
JZ2601	E190	C	13			195,94
JZ2600	E190	C	13			160,43
JZ2640	E190	C	13		67,47	
JZ2668	E190	C	13		72,12	
JZ2600	E190	C	13		72,31	
JZ2640	E190	C	13		85,82	
JZ2608	E190	C	13		65,30	
JZ2613	E190	C	13		65,30	
JZ2622	E190	C	13		66,07	
JZ2637	E190	C	13		66,83	
JZ2601	E190	C	13		67,75	
JZ2608	E190	C	13		69,26	
JZ2608	E190	C	13		69,83	
JZ2601	E190	C	13		70,85	
JZ2629	E190	C	13		71,09	

CALLSIGN	ACFT	CAT	RWY	TIEMPO 5nm/THR	TIEMPO ARR	TIEMPO DEP
JZ2601	E190	C	13		71,23	
JZ2523	E190	C	13		75,19	
JZ2622	E190	C	13		75,34	
JZ2624	E190	C	13		77,37	
XQCFS	LJ45	C	13		81,91	
JZ2622	E190	C	13		82,11	
XQCPS	LJ45	C	13		82,81	
XQZZZ	B735	C	13		91,27	
XXFVZ	LJ60	C	13		94,55	
JZ2601	E190	C	13		215,07	
JZ2523	E190	C	13		216,29	
JZ2629	E190	C	13	125,05		
JZ2523	E190	C	13	125,37		
XXFVZ	LJ60	C	13	135,69		
JZ2608	E190	C	13	158,56		
JZ2601	E190	C	13	177,09		
XQCPS	LJ45	C	13	181,94		
JZ2601	E190	C	13	190,75		
XQBFS	LJ45	C	13	190,9		
JZ2523	E190	C	13	191,53		
JZ2622	E190	C	13	192,65		
JZ2637	E190	C	13	197,65		
JZ2640	E190	C	13	202,53		
JZ2608	E190	C	13	216,35		
JZ2624	E190	C	13	221,56		
JZ2622	E190	C	13	235,53		
JM1624	B737	C	13	258		
JZ2613	E190	C	13	280,47		
XKZZZ	B735	C	13	302,03		
JZ2604	E190	C	13	147,62		
JZ2668	E190	C	13	245,88		
XXS025	SYRA	A	31			61,30
XXKXN	C150	A	31			74,08
XXCMI	C150	A	31			83,59
XXS025	SYRA	A	31			85,75
XXFVQ	C150	A	31			90,25
XXCDG	C150	A	31			92,53
XXAMI	C150	A	31			92,59
XXBFS	C152	A	31			101,28
XXGPK	SYRA	A	31			101,37

CALLSIGN	ACFT	CAT	RWY	TIEMPO 5nm/THR	TIEMPO ARR	TIEMPO DEP
XXZRW	C150	A	31			111,19
XXMCI	C150	A	31			112,06
XXJIZ	PA28	A	31			126,75
XXCMI	C150	A	31			128,40
XXHKC	C150	A	31			139,03
XXHKJ	PA39	A	31			166,78
XXAMI	C152	A	31		90,83	
XXCMI	C150	A	31		91,57	
XXS025	SYRA	A	31		95,84	
XXHKJ	PA39	A	31		98,52	
XXZRW	C150	A	31		103,66	
XXKXN	C150	A	31		108,75	
XXCMI	C150	A	31		117,16	
XXCMI	C150	A	31		118,32	
XXFVQ	C150	A	31		121,44	
XXCDG	C150	A	31		123,84	
XXIQI	C150	A	31		126,90	
XXCDG	C150	A	31		146,17	
XXCDG	C150	A	31		164,47	
XXCDG	C150	A	31	50		
XXAMI	C150	A	31	67,75		
XXCDG	C150	A	31	74,69		
XXCMI	C150	A	31	91,07		
XXCMI	C150	A	31	95,72		
XXGWT	AE50	B	31			56,69
XXWDR	C560	B	31			61,87
KX7187	ATR76	B	31			62,60
KX7187	ATR76	B	31			69,10
KX7183	ATR76	B	31			73,78
KX7185	ATR76	B	31			82,22
KX7183	ATR76	B	31			84,59
KX7183	ATR76	B	31			88,47
XXGPF	C182	B	31		70,37	
KX7184	ATR76	B	31		70,92	
KX7182	ATR76	B	31		74,93	
KX7182	ATR76	B	31		77,01	
KX7180	ATR76	B	31		93,46	
XXCBZ	BE20	B	31		97,32	
XXWDR	C560	B	31		101,10	
XXCZG	C150	B	31		163,69	

CALLSIGN	ACFT	CAT	RWY	TIEMPO 5nm/THR	TIEMPO ARR	TIEMPO DEP
XXZRW	C150	A	31			111,19
XXMCI	C150	A	31			112,06
XXJIZ	PA28	A	31			126,75
XXCMI	C150	A	31			128,40
XXHKC	C150	A	31			139,03
XXHKJ	PA39	A	31			166,78
XXAMI	C152	A	31		90,83	
XXCMI	C150	A	31		91,57	
XXS025	SYRA	A	31		95,84	
XXHKJ	PA39	A	31		98,52	
XXZRW	C150	A	31		103,66	
XXKXN	C150	A	31		108,75	
XXCMI	C150	A	31		117,16	
XXCMI	C150	A	31		118,32	
XXFVQ	C150	A	31		121,44	
XXCDG	C150	A	31		123,84	
XXIQI	C150	A	31		126,90	
XXCDG	C150	A	31		146,17	
XXCDG	C150	A	31		164,47	
XXCDG	C150	A	31	50		
XXAMI	C150	A	31	67,75		
XXCDG	C150	A	31	74,69		
XXCMI	C150	A	31	91,07		
XXCMI	C150	A	31	95,72		
XXGWT	AE50	B	31			56,69
XXWDR	C560	B	31			61,87
KX7187	ATR76	B	31			62,60
KX7187	ATR76	B	31			69,10
KX7183	ATR76	B	31			73,78
KX7185	ATR76	B	31			82,22
KX7183	ATR76	B	31			84,59
KX7183	ATR76	B	31			88,47
XXGPF	C182	B	31		70,37	
KX7184	ATR76	B	31		70,92	
KX7182	ATR76	B	31		74,93	
KX7182	ATR76	B	31		77,01	
KX7180	ATR76	B	31		93,46	
XXCBZ	BE20	B	31		97,32	
XXWDR	C560	B	31		101,10	
XXCZG	C150	B	31		163,69	

CALLSIGN	ACFT	CAT	RWY	TIEMPO 5nm/THR	TIEMPO ARR	TIEMPO DEP
JZ2523	E190	C	31	223,88		
JZ2601	E190	C	31	247,72		
JZ2668	E190	C	31	272,81		
JZ2523	E190	C	31	274,82		
JZ2640	E190	C	31	281,47		
JZ2600	E190	C	31	220,59		
JZ2600	E190	C	31	252,03		

Paso 1: En Tabla previa

Paso 2:

MTTOP:

RWY	13	13	31	31
CAT	DEP	ARR	DEP	ARR
A	92,7220	73,4271	104,4633	115,9592
B	138,2908	81,0263	72,4150	93,6000
C	150,4057	86,3808	76,7837	75,6343

MATOP RWY 13 CAT-A: $(92.7720 + 73.4271) / 2 = 83.0746\text{seg}$

MATOP RWY 13 CAT-B: $(138.2908 + 81.0263) / 2 = 109.6585\text{seg}$

MATOP RWY 13 CAT-C $(150.4057 + 86.3808) / 2 = 118.39325\text{seg}$

MATOP RWY 31 CAT-A: $(104.4633 + 115.9592) / 2 = 110.2125\text{seg}$

MATOP RWY 31 CAT-B: $(72.4150 + 93.6000) / 2 = 83.0075\text{seg}$

MATOP RWY 31 CAT-C: $(76.7837 + 75.6343) / 2 = 76.209 \text{ seg}$

MATOP		
CAT/RWY	13	31
A	83,0746	110,2113
B	109,6585	83,0075
C	118,3933	76,2090

Paso 3:

MIX	Vuelos	%
A	77	28,73
B	65	24,25
C	126	47,01
Total	268	100

Paso 4:

TMOP 13:

$$TMOP = \frac{\sum MATOP_{CAT X} * MIX_{CAT X}}{100}$$

$$TMOP 13 = (83.0746 * 28.73 + 109.6585 * 24.25 + 118.3933 * 47.01) / 100 = 106.12723\text{seg}$$

$$TMOP 31 = (110.2113 * 28.73 + 83.0075 * 24.25 + 76.2090 * 47.01) / 100 = 87.6272\text{seg}$$

Paso 5:

$$CFP 13: 3600 / 106.12723 = 33.9215 = 33\text{acft/hr}$$

$$CFP 31: 3600 / 87.6272 = 41.0831 = 41\text{acft/hr}$$

Paso 6:

$$TM = \frac{\sum T_{CAT X}}{N^{\circ}ACFT_{CAT X}}$$

RWY	13	31
CAT	OM	OM
A	148,9167	75,8460
B	128,5322	246,9580
C	198,8575	238,1989

Paso 7:

$$VAA = \frac{SAF}{TMA} \quad VAB = \frac{SAF}{TMB} \quad VAC = \frac{SAF}{TMC} \quad VAD = \frac{SAF}{TMD} \quad VAE = \frac{SAF}{TME}$$

SAF = 5nm

VA	RWY	
	13	31
A	0,03357583	0,06592305
B	0,03890075	0,02024636
C	0,02514363	0,02099086

Paso 8:

$$VM13: (0.03357583 * 28.73 + 0.03890075 * 24.25 + 0.02514363 * 47.01) = 0,03090293 \text{ NM/seg}$$

Paso 9:

La separación mínima (SM) que se calcula permitirá que en condiciones normales de operación de pista se pueda autorizar un despegue entre dos aterrizajes consecutivos.

$$SM = 2 * TMOP * VM$$

$$SM13 = 2 * 106.12723 * 0,03090293 = 6,55928464\text{nm}$$

$$SM31 = 2 \times 87.6272 \times 0,03371991 = 5,90956305nm$$

En caso que, debido a condiciones complejas de pista u operativas la SM, por si sola, no cubra el valor de separación mínima reglamentaria establecida por el Estado, se podrá utilizar un valor de separación total (ST), el cual se obtiene sumando a la SM un valor de separación de seguridad (SS).

$$SS = TMOP * VM * B$$

$$SS13 = 106.12723 \times 0,03090293 \times 2 = 6,55928464nm$$

$$SS31 = 87.6272 \times 0,03371991 \times 2 = 5,90956305nm$$

$$ST = SM + SS$$

$$ST13: 13,11856928$$

$$ST31: 11,8191261$$

Paso 10:

$$TMST = \frac{ST}{VM}$$

$$TMST 13: 9,83892696 / 0,03090293 = 318,38169$$

$$TMST 31: 8,8643 / 0,03371991 = 262,881586$$

Paso 11:

$$A13: 3600 / 318,38169 = 11.307 = 11acft/hr$$

$$A31: 3600 / 262,881586 = 13.694 = 13 acft/hr$$

Paso 12:

$$D = A - 1$$

$$D13 = 11 - 1 = 10 acft/hr$$

$$D31 = 13 - 1 = 12 acft/hr$$

Paso 13:

$$CTP: A + D$$

$$CTP13: 11 + 10 = 21 acft/hr$$

$$CTP31: 13 + 12 = 25 acft/hr$$

APÉNDICE E – Cálculo de las capacidades de conjuntos de pistas

En algunos escenarios, puede resultar útil en un contexto de planificación estratégica poder ponderar las capacidades físicas y teóricas obtenidas respecto a las utilizations de cada pista de manera tal de obtener un único valor para el conjunto de pistas.

Para realizar este cálculo se utilizarán los valores de capacidad física y teórica por pista ya obtenidos y los % de utilización anual de cada cabecera.

Ejemplo:

Porcentual de utilización de pista (PU)

Índice calculado a partir del movimiento total mensual, obtenido por medio de un muestreo conteniendo datos referentes al período de un año. La siguiente tabla muestra un ejemplo ilustrativo del cálculo del porcentaje de utilización de pista:

MOVIMIENTO MENSUAL DE AERONAVES			
MES	PISTA 13	Pista 31	MOV. MENSUAL
ENE	5000	2500	7500
FEB	5153	2516	7669
MAR	5606	5618	11224
ABR	2154	5150	7304
MAY	2151	3000	5151
JUN	5108	6010	11118
JUL	7500	3000	10500
AGO	8000	2000	10000
SEP	5181	5205	10386
OCT	2055	3500	5555
NOV	5085	5085	10170
DIC	6505	1200	7705
TOTAL	59498	44784	104282

% DE UTILIZACIÓN DE PISTA (PU)	
A	57,05
B	42,95
TOTAL	100

De esta forma se puede obtener un valor para el Conjunto de Pistas tanto físico como teórico:

Capacidad Física de Conjunto de Pistas (CFCP):

$$CFCP = \sum \frac{CFP_{PISTA X} * \%UTIL_{PISTA X}}{100}$$

CFCP: $(33 * 57.05 + 41 * 42.95) / 100 = 36.997 = 36 \text{ acft/hr}$

Capacidad Teórica de Conjunto de Pistas (CTCP):

$$CTCP = \sum \frac{CTP_{PISTA X} * \%UTIL_{PISTA X}}{100}$$

CTCP: $(21 * 57,05 + 25 * 42,95) / 100 = 22.71 = 22 \text{ ACFT/HR}$

Agenda Item 3: Report of activities and deliverables of the GT - Interop and Subgroups

- a) Review of air navigation priorities in the CNS field.**
- b) CNS Implementation. Progress of the Subgroups.**
- c) Proposed Conclusions**
- d) Review of the 2022 Work Plan**

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

- a) WP/3.1 – *Activities executed by the ATM/AIDC Subgroup* (presented by the Secretariat)
- b) WP/3.2 – *Activities executed by the ATM/FPL Subgroup* (presented by the Secretariat)
- c) WP/3.3 – *Activities executed by the CNS/AMHS Subgroup* (presented by the Secretariat)
- d) WP/3.4 – *Activities executed by the CNS/ANP Subgroup* (presented by the Secretariat)
- e) WP/3.5 – *Activities executed by the CNS/SUR Subgroup* (presented by the Secretariat)
- f) WP/3.6 – *Activities executed by the MET/IWXXM Subgroup* (presented by the Secretariat)
- g) WP/3.7 – *Work Plan 2023 of the Interop TF* (presented by the Secretariat)

3.2 The Meeting analyzed the following subjects:

Review of air navigation priorities in the CNS field

3.3 The priorities of TF Interop consist of promoting the implementation of the ASBUs Elements of Version 6 of the Global Air Navigation Plan (GANP), which support the operational improvements of air navigation services. The main ASBU Elements addressed by the current TF Interop activated Subgroups are:

- AMET-B0/4: Dissemination of meteorological products (in IWXXM format);
- ASUR-B0/1: Automatic Dependent Surveillance – Broadcast (ADS-B);
- ASUR-B1/1: ADS-B Signal Reception by Satellite (SB ADS-B);
- COMI-B0/7: ATS ATS Message Handling System (AMHS);
- COMI-B1/1: ATN ground-ground/Internet Protocol Suite (ATN/IPS); and
- FICE-B0/1: ATS Interfacility Data Communication between ATS Units (AIDC).

CNS implantation. Advances of the Subgroups

3.4 Under this agenda item, the main deliverables provided by the activated subgroups and progress made to date were noted.

ATM/AIDC Subgroup

3.5 The main objective of the ATM/AIDC Subgroup is to establish the 76 connections for the Data Link Communication between ATS Units (AIDC) by the States of the SAM Region.

3.6 The Meeting took note that, to date, 16 intra-regional AIDC communications and 2 inter-regional AIDC communications had been established.

3.7 Due to the pandemic, in 2021 there were no establishment of new AIDC connections, but during the tests carried out, necessary changes were identified in the automated systems that will provide progress in the implementation of the connections, as soon as the adjustments are made:

- Atech has made the changes in the SAGITARIO systems used in the ACCs of Brazil, Paraguay and Venezuela. The company reported that the new version cannot be installed remotely, requiring installation in person. It is estimated that for the second semester the new software version will be installed with the correction of the errors already identified;
- Those in charge of the Lima ACC reported to the company Indra the need for adjustments to solve an interoperability issue with the SAGITARIO system of the Amazonico ACC. A small correction is necessary in the Lima Indra system, so that some ABI messages from the Amazonico ACC do not reject, due to the order in which the letters of the equipment listed in box 10 come; and
- During the Second MEVA III – REDDIG II Interconnection Meeting (MIIR-II/INTERCON/02), held in Lima from 5 to 6 May 2022, a new interconnection scheme was adopted that will implement REDDIG II nodes in Aruba, Curaçao, Jamaica and San Juan (Puerto Rico). With the new scheme, it will be possible to implement AMHS interconnections with CAR States, contributing to the establishment of AIDC communications with these States.

ATM/FPL Subgroup

3.8 The ATM/FPL Subgroup was activated to address issues related to error mitigation and duplication/multiplicity of flight plans, as well as issues related to the centralization of flight plan management and associated messages.

ATM/FPL Roadmap

3.9 During the GT INTEROP/3 Meeting (Virtual, March 14-17, 2022), the ATM/FPL Roadmap document was updated to add the DOF (Day of Flight) element to the ACK message. Version 2.2 of the ATM/FPL Roadmap can be accessed at the link below:

<https://www.icao.int/SAM/Documents/2022-RLA06901-GTINTEROP3/Hoja%20de%20Ruta%20rev%2009%20Mar%202022%20-%20ACTUALIZADO%20VERSION%202.2.pdf>

3.10 The Meeting was informed that, through an email message dated 29 April, 2022, the Brazilian representative of the TF Interop Coordination Nucleus expressed the initiative to adapt the Brazilian systems to the ACK and REJ message formats approved by the SAM Region Implementation Group; as well, he consulted the reference documents on the matter. In response, the SAM CNS Officer confirmed that the document adopted as a reference on the subject is the ATM/FPL Roadmap version 2.2.

Methodology for quantifying FPL errors

3.11 The participants of the Subgroup have identified the need to establish a common methodology to quantify errors in flight plans and associated messages, in order to obtain indicators to measure the level of mitigation achieved, with the application of the measures indicated in the ATM/FPL Roadmap. An Ad-hoc group was formed to work on this matter, made up of representatives from Argentina, Chile, Ecuador, Panama and Peru.

Standard procedure for publication in the AIP

3.12 The Subgroup agreed to establish a standardized format to include the information in the Aeronautical Information Publication (AIP) of the States that adopt the measures recommended in the ATM/FPL Roadmap.

Request for establishment of direct flights

3.13 The Airlines, through IATA representatives, have requested more direct flights to save fuel due to the rise in prices, caused by the recent pandemic crisis and the conflict in Eastern Europe. This implies a challenge for the Subgroup, in reviewing the syntax of the routes by coordinates, to verify if it is accepted by the automated systems in operation.

Designation of a new Rapporteur of the ATM/FPL Subgroup

3.14 The Meeting was informed that, due to the appointment of the current Rapporteur of the FPL/ATM Subgroup to perform a new function in the DGAC of Peru, as of 6 June, 2022, a new Rapporteur of the Subgroup should be appointed. In this sense, the Subgroup participants deliberated on the matter and agreed that the Rapporteurship of the Subgroup will now be held by Mr. Jorge Zuñiga from Ecuador.

CNS/AMHS Subgroup*AMHS Interconnections (PI)*

3.15 The Meeting took note that, currently, of the 28 intra-regional interconnections, 26 have already been established. The following interconnections are pending:

- Brasilia COM Center – Montevideo COM Center (SBBR – SUMU); and
- Ezeiza COM Center – Montevideo COM Center (SAEZ – SUMU).

3.16 Uruguay reported that a new system has already been acquired for the COM AMHS Center of Montevideo, and the installation must occur in the first semester, and should be operational in the second half of 2022.

3.17 With regard to interregional interconnections, the following need to be implemented:

- Caracas COM Center – Curaçao COM Center (SVCA – TNCC);
- Caracas COM Center – Madrid COM Center (SVCA – LEEE);
- Ezeiza COM Center – Johannesburg COM Center (SAEZ – FAOR);
- Gerogetown COM Center – Piarco COM Center (SYCJ – TTPP).

3.18 With the installation of the REDDIG II (MPLS) nodes in Johannesburg and Madrid in June 2022, it is estimated that the AMHS interconnections with South Africa and Spain would be established in the second semester.

Additional AMHS (P1) Interconnections

3.19 Argentina will implement the following interconnections, additionally, with Spain and Venezuela:

- Ezeiza COM Center – Caracas COM Center (SAEZ – SVCA); and
- Ezeiza COM Center – Madrid COM Center (SAEZ – LEEE).

3.20 During SAM/IG/27, the representatives of Argentina and Venezuela confirmed that the interoperability tests (IOT) between the AMHS COM Centers of Caracas and Ezeiza were successfully completed and the interconnection will become operational on 6 June, 2022.

3.21 Brazil has reported that it has carried out successful tests to establish an AMHS (P1) interconnection with Portugal and awaits the completion of the contracting procedures of the definitive communication link:

3.22 Likewise, Colombia stated its intention to establish an interconnection with the United States (Atlanta) and another with COCESNA.

CNS/ANP Subgroup

3.23 The CNS/ANP Subgroup was activated at the SAM/IG/26 Meeting (Virtual, 20 to 23 September, 2021) in order to support the review of the information contained in Part III (CNS) of Volume II of the CAR/SAM Air Navigation Plan, as well as providing support in the preparation of Volume III of the CAR/SAM ANP, on CNS issues.

3.24 The current formation of the CNS/ANP Subgroup is as follows:

- **CNS/ANP Subgroup**
 - o **Rappourter: Edmundo Cortés Mancilla, ecortes@dgac.gob.cl, Chile**
 - Andrés Espina, aespina@anac.gob.ar, Argentina
 - Diego Frigerio, dfrigerio@anac.gob.ar, Argentina
 - Hernan Aguirre, haguirre@eana.com.ar, Argentina
 - Antonio Gonzalez, agonzalez@eana.com.ar, Argentina
 - Jaime Yuri Álvarez Miranda, jalvarez@dgac.gob.bo, Bolivia
 - Wallace Gutemberg Medeiros Luz, gutembergwgml@decea.mil.br, Brazil
 - Vahe Antoine Yaghdjian, vahevay@decea.mil.br, Brazil
 - Edmundo Cortés Mancilla, ecortes@dgac.gob.cl, Chile
 - Javier Leal Pavez, jleal@dgac.gob.cl, Chile
 - Cristian Parra Montecinos, cristian.parra@dgac.gob.cl, Chile
 - Francisco Gálvez Gómez, francisco.galvez@dgac.gob.cl, Chile
 - Christian Vergara Leyton, cvergara@dgac.gob.cl, Chile
 - Pedro Pastroán Céspedes, ppastrian@dgac.gob.cl, Chile
 - Sewchan Hemchan, hemchan@gcaa-gy.org, Guyana
 - Daniel De Ávila, daniel.deavila@aeronautica.gob.pa, Panama
 - Giuliano Guzmán, gguzman@mtc.gob.pe, Peru
 - Jaime Contreras, jcontreras@corpac.gob.pe, Peru

- Jorge García, jgarcia@corpac.gob.pe, Peru
- Guillermo Beleván, gbelevan@corpac.gob.pe, Peru
- Mariela Rodriguez, mrodriguezgu@corpac.gob.pe, Peru
- Jorge Merino, jmerino@corpac.gob.pe, Peru
- Henry Loza, hloza@corpac.gob.pe, Peru
- Horacio Berreta, hberreta@dinacia.gub.uy, Uruguay
- Jarumy Castillo, ja.castillo@inac.gob.ve, Venezuela
- Luis Escobar, l.escobar@inac.gob.ve / escoguil5@gmail.com, Venezuela

3.25 States that have not yet appointed participants of the CNS/ANP Subgroup, were urged to take the necessary steps to contribute to the revision of the information in Part III (CNS) of Volume II of the CAR/SAM ANP.

3.26 The Meeting was informed that, on 26 May, 2022, the first teleconference was held, with the objective of identifying the activities to carry out the review, as well as the distribution of tasks among the participants of the Subgroup.

3.27 The intention is to propose the changes referring to the SAM States in order to later coordinate with the CAR States to consolidate all the changes referring to Part III of Volume II of the CAR/SAM ANP, for presentation at SAM/IG/28 and subsequent approval. by GREPECAS.

CNS/SUR Subgroup

3.28 The CNS/SUR Subgroup was activated to deal with interoperability issues of surveillance systems and specifically, make an analysis on the implementation of Space-based ADS-B through a Technical Cooperation Project, using the regional IP network (REDDIG II), as a platform for the distribution of surveillance data.

First NAM/CAR/SAM Meeting/Workshop on Planning the Implementation of Automatic Dependent Surveillance – Broadcasting (ADS-B/ANP/1)

3.29 The Meeting took note that in the period from 2 to 4 March, 2022, the **First NAM/CAR/SAM Meeting/Workshop on Planning the Implementation of Automatic Dependent Surveillance – Broadcasting (ADS-B/ANP/1)** was virtually held, with the participation of representatives of 22 States of the NAM/CAR/SAM Regions and COCESNA, two international organizations, two companies and ICAO Officers, totaling 107 people.

3.30 The documents and presentations of the Meeting/Workshop ADS-B/ANP/1 are available at the following link:

<https://www.icao.int/SAM/Pages/MeetingsDocumentation.aspx?m=2022-RLA06901-ADSBYADSBANP1>

Terrestrial ADS-B implementation in the SAM Region

3.31 The following SAM states have implemented ADS-B stations: **Brazil, Chile, Colombia, Guyana, Panama, Paraguay and Peru**. Currently, only in Brazil is using ADS-B OUT as the primary means of surveillance information, in the TMA Macaé, to support the operation of helicopters in the Campos oil basin.

3.32 Colombia has reported that it is using ADS-B OUT operationally as of April 2022. For areas in which the information presented to the controller comes exclusively from ADS-B, either because there is no radar coverage in it or because there is failure of the radar system, the controller may use the information from the ADS-B to maintain surveillance of the progress of air traffic, in order to obtain:

- Better position information regarding aircrafts under control;
- Supplementary information regarding other transit;
- Information on any significant deviation of the aircrafts, with respect to what is stipulated in the corresponding air traffic control authorizations, including the authorized routes and flight levels when applicable;
- No separation by surveillance shall apply; and
- No vector guidance will be provided.

3.33 Argentina has a technological upgrade project of 22 secondary radars manufactured by INVAP, currently operational. The modernization includes incorporating Mode S and ADB-B in the surveillance stations. The planning contemplates that the implementations of the sensors will begin in 2023 and will be developed progressively until 2025.

3.34 The planned improvement of the existing radars incorporating the S mode and ADS-B technology and the addition of new ADS-B systems and stations, will allow to progressively incorporate experience in the use of ADS-B.

Space-based ADS-B Implementation in the SAM Region

3.35 The SAM/IG/27 participants recognized that since the Meeting GT INTEROP/2 (Virtual, 9 to 13 August 2021) and SAM/IG/26 (Virtual, 20 to 23 September 2021) there had been no substantial progress in the implementation of Space-based ADS-B, through a Regional Technical Cooperation Project, using REDDIG II (MPLS) as a platform for the distribution of surveillance information.

3.36 The three States that expressed interest in the proposal (Chile, Panama and Trinidad & Tobago), continue to evaluate the possibility, considering the strong impact caused by the pandemic on the planning and prioritization of projects under development in the States.

3.37 The entry of Panama as a member of the Regional Technical Cooperation Project RLA/03/901, will administratively facilitate a potential contracting of the service, within the framework of Project RLA/03/901, enabling the use of the Digital Network of the SAM Region (REDDIG II) as a distribution platform for the contracted surveillance information.

3.38 The last proposal presented by the provider of Space-based ADS-B for implementation through an ICAO Technical Cooperation Project consisted of:

- 1) The previous cost of USD 275,000.00 for each Service Delivery Point, would be reduced to USD 125,000.00 with 2 to 3 States participating in the Regional Project. In the event that more than 3 States participate in the Project, the cost would drop to USD 50,000.00 for each SDP implemented.
- 2) The cost of surveillance information for a 5-year contract would be according to the following table:

Service Volume	ICAO Prices (2021)	Prices 2022
High Density/Sole Source	\$42	\$44
Low Density/Sole Source	\$21	\$22
Low Density/ Augmenting existing surveillance/ Contingency	\$8.5	\$9
Medium Density/ Augmenting existing surveillance/ Contingency	\$5.25	\$5.50
High Density/ Augmenting existing surveillance/ Contingency	\$3.15	\$3.30
Ultra High Density/ Augmenting existing surveillance/ Contingency	\$1.05	\$1.10

- 3) The company would provide 2 free users of the Aireon situational awareness display in each State participating in the Project and one user for the SAM Regional Office.
- 4) One year (free) of information from the SAM Region for ATFM purposes.
- 5) The company provides (free of charge) 50 NM of the adjacent airspace for ATS planning purposes. This facility would solve the surveillance data exchange issues, once the ANSP that contracts the services has the information of the adjacent centers close to its area of responsibility, increasing situational awareness.

MET/IWXXM Subgroup

3.39 The MET/IWXXM Subgroup was formed for the purpose of testing and exchanging OPMET messages in the new IWXXM format.

Tests carried out with the Regional OPMET Data Bank (RODB) of Brasilia

3.40 The Meeting took note that the following States have already conducted tests with the Regional OPMET Data Bank (RODB) of Brasilia: Argentina, Cuba, Guyana and Venezuela. In addition, complete and successful tests have already been carried out between the RODB of Brasilia with the RODB of Brussels and Vienna.

3.41 It was emphasized that the reference for the implementation of the new IWXXM format is the document *Guidelines for the Implementation of OPMET Data Exchange Using IWXXM – Fourth Edition*.

3.42 To facilitate understanding, an (unofficial) version in Spanish was prepared by the South American Regional Office and can be accessed through the link below:

https://www.icao.int/SAM/Documents/2022-RLA06901-GTINTEROP3/5.%20Guia%20Implem%20IWXXM_nov2020.pdf

Web Service of the Brasilia RODB

3.43 The Meeting took note that a letter from the SAM Regional Office was sent, communicating the guidelines for the exchange of information via web service, together with the *System Interface Control Document (SICD)* of the system implemented in Brasilia.

3.44 States interested in implementing the exchange of information with the RODB of Brasilia, via web service, must request, through the SAM Regional Office, the registration of user and password to obtain the token.

3.45 During the GT INTEROP/3 Meeting, a representative of the company that developed the Brazilian system (Atech), made a presentation with the aim of encouraging the States of the CAR/SAM Region to develop integration with the web service of the OPMET Regional Data Bank of Brasilia.

3.46 DECEA is considering the possibility of developing an application example to teach how to use the web service of the RODB of Brasilia. The application example would allow the use of temporary users for testing, explain the necessary configurations, create scenarios for using the web service for the search and insertion of meteorological messages and all documentation, scripts and source code would be available to interested parties.

Proposed Conclusions

3.47 During the SAM/IG/27 Meeting, no new conclusions were drawn up related to the activities of the Interop TF Subgroups.

Review of the 2022 Work Plan

3.48 The 2022 Work Plan related to the activities of the Interop GT is being fully complied with up to now. The **Appendix** to this part of the Report presents the 2022 Work Plan, with the activities already carried out in italics.

APPENDIX

Work Plan 2022 of the Interop TF – under support of RLA/06/901

**In italics, the activities already carried out*

Activities	Objectives / Deliverables	Tentative Dates
<i>Activities for preparation of VOL III of the CAR/SAM ANP.</i>	<i>Preparation of VOL III, participation of all SAM and CAR States. Use of the AN SPA, and filling out of forms and templates.</i>	<i>First Workshop (virtual) held from 9 to 12 May, 2022</i>
SAM/IG/27 <i>Air navigation implementation priorities considered in GREPECAS programs, VOL III Regional ANP and Regional initiatives.</i>	<i>Continue with the activities of implementation, execution and optimization under the studies of GESEA and TF Interop. (5 days)</i>	<i>Lima, 23 to 27 May, 2022</i>
SAM/IG/28 <i>Air navigation implementation priorities considered in GREPECAS programs, VOL III Regional ANP and Regional initiatives.</i>	<i>Continue with the activities of implementation, execution and optimization under the studies of GESEA and Interop TF. (4 days)</i>	<i>Lima, 3 to 7 October, 2022 (Hybrid)</i>
GT INTEROP/3 <i>Third Workshop/Meeting of the Interoperability Task Force Subgroups</i>	<i>Provide a meeting of the participants of the TF Interop Subgroups, to consolidate the previous work carried out, with the aim of finalizing the products and deliverables that will be presented to the SAM Region Implementation Group (SAM/IG). (4 days)</i>	<i>Virtual, 14 to 17 March, 2022</i>
COM AMHS/3 <i>Third Workshop/Meeting of Supervisors/Operators of COM AMHS Centers of the SAM Region</i>	<i>This is an event for the exchange of information and experiences between the supervisors/operators of the COM AMHS Centers of the SAM Region. Review of routing tables. Review of Contingency Plans. (4 days)</i>	<i>Virtual, 21 to 24 February, 2022</i>
ADS-B/ANP/1 <i>First NAM/CAR/SAM Meeting/Workshop on Planning the Implementation of Automatic Dependent Surveillance - Broadcasting (ADS-B) (ADS-B ANP/1)</i>	<i>Assist States in the implementation of ADS-B OUT in accordance with the planning methodology applied in the new Volume III of the CAR/SAM ANP, based on the Leading Threads and ASBU (Aviation System Block Upgrade) Modules/Elements recommended in the sixth edition of the Global Air Navigation Plan (GANP).</i>	<i>Virtual, 2 to 4 March, 2022</i>

Activities	Objectives / Deliverables	Tentative Dates
Advanced Course on AMHS	Training aimed at technical and operational personnel who maintain and operate the AMHS system and that are involved in the implementation of AMHS interconnections. (5 days)	Virtual, 15 to 19 August, 2022

Agenda Item 4: SAM/IG Conclusions and next actions - Plenary**a) Summary of Sessions****b) Review and approval of Conclusions**

4.1 Under this Agenda item, the SAM/IG Meeting, formed in Plenary, analyzed the following notes:

- a) WP/4.1 - *GESEA analysis and approval of conclusions* (presented by the Secretariat)
- b) WP/4.2 - *Analysis of the Interop TF and approval of conclusions* (presented by the Secretariat)

4.2 The Meeting formed in plenary, with the participation of the Air Navigation Directors and/or their representatives, received from the Secretariat executive summaries of the two groups formed: GESEA and GT Interop.

Conclusions on GESEA matters

4.3 The deliberations and topics presented by GESEA, as well as the characteristics and content of the deliverables developed by subgroups SG1, SG2 and SG3, were reported. These topics are detailed in the report on Agenda Item 2.

4.4 In this regard, four Conclusions were approved, as detailed below:

CONCLUSION SAM/IG/27-01 Adoption of Concept of Operations for efficiency and capacity in SAM airspace 2022-2026 (CONOPS EC/SAM)	
<p>That:</p> <p>The States adopt the document Concept of Operations for efficiency and capacity in SAM airspace 2022-2026 (CONOPS EC/SAM), prepared with the purpose of supporting the studies of the specialists and ATM planners involved in the formulation of Volume III of the CAR/SAM ANP, facilitating the understanding of the methodology of Doc. 9883 assumed in the GANP.</p>	<p>Expected impact:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input checked="" type="checkbox"/> Economic <input checked="" type="checkbox"/> Environmental <input checked="" type="checkbox"/> Technical/Operational
<p>Why: To harmonize the efforts of SAM States in the implementation of GANP modules and elements. Additionally to support the formulation of Volume III of the CAR/SAM Regional ANP.</p>	
<p>When: Immediately</p>	<p>Status: Adopted by SAM/IG/27</p>
<p>Who: <input type="checkbox"/> Coordinators <input checked="" type="checkbox"/> States <input checked="" type="checkbox"/> ICAO Secretariat <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: Users/industry</p>	

CONCLUSION SAM/IG/27-02 Adoption of the Roadmap 2022–2026: Performance-based optimisation of SAM airspace	
<p>That:</p> <p>The States adopt the Roadmap 2022–2026: Performance-based optimisation of SAM airspace, and taking into account the metrics and deadlines stipulated in the document, review their national plan and further PBN implementation activities.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input type="checkbox"/> Inter-regional</p> <p><input checked="" type="checkbox"/> Economic</p> <p><input checked="" type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Technical/Operational</p>
<p>Why: To continue and harmonize the efforts made by the SAM Region to optimize SAM airspace based on PBN and other optimization elements of airspace.</p>	
<p>When: Immediately</p>	<p>by SAM/IG/27</p>
<p>Who: <input type="checkbox"/> Coordinators <input checked="" type="checkbox"/> States <input checked="" type="checkbox"/> ICAO Secretariat <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: Users/industry</p>	

CONCLUSION SAM/IG/27-03 Adoption of amendment 1 of the SAM Region ATS Contingency Framework Plan (MCATS / SAM) and alignment of National Plans.	
<p>That:</p> <p>States adopt the guidelines of the SAM Region ATS Contingency Framework Plan incorporating Amendment 1 covering Appendix E and Appendix I, aimed at completing and publishing their national ATS Contingency Plans, in order to having such documentation for the regional events on optimization of ATS coordination and Contingency Plans (SOUTH SAM and NORTH SAM), scheduled for the second half of 2022.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input checked="" type="checkbox"/> Inter-regional</p> <p><input checked="" type="checkbox"/> Economic</p> <p><input checked="" type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Technical/Operational</p>
<p>Why: To obtain a harmonized implementation of national ATS Contingency Plans duly agreed with neighboring States. This increases the resilience of ATS services and SAM airspace..</p>	
<p>When: No later than 31 July 2022</p>	<p>by SAM/IG/27</p>
<p>Who: <input checked="" type="checkbox"/> Coordinators <input checked="" type="checkbox"/> States <input checked="" type="checkbox"/> ICAO Secretariat <input type="checkbox"/> ICAO HQ <input checked="" type="checkbox"/> Other: Users/industry</p>	

CONCLUSION SAM/IG/27-04 Adoption of Manual for the Calculation of Runway Capacity and ATC Sector	
That: States adopt the Manual for the Calculation of Runway Capacity and ATC Sector, and carry out calculation activities in their airports and ATS units, recognizing that it is essential to have updated data to provide the ATFM service efficiently	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input checked="" type="checkbox"/> Economic <input checked="" type="checkbox"/> Environmental <input checked="" type="checkbox"/> Technical/Operational
Why: For SAM States to implement a common methodology for the calculation of runway capacity and ATC sectors. To raise the quality of demand/capacity balance information that is analyzed and shared in the OPSAM regional dashboard and/or national dashboards	
When: Immediately	Status: Adopted by SAM/IG/2
Who: <input type="checkbox"/> Coordinators <input checked="" type="checkbox"/> States <input checked="" type="checkbox"/> ICAO Secretariat <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: Users/industry	

2022 Work Plan 2022 under support of RLA/06/901

4.5 The Work Plan approved in SAM/IG/26 was reviewed, and the dates of these events were confirmed, according to the review of the GESEA Plenary in coordination with RLA/06/901. The reactivation of face-to-face activities in the Regional Office from July 2022 is taken into account according to the following Table:

Work Plan 2022 – under support of RLA/99/901

** In italics activities concluded*

Activities	Objectives / Deliverables	Tentative Dates
<i>Plenary Meeting GESEA</i>	<ul style="list-style-type: none"> • <i>Organization of the implementation of concepts according to deliverables of 2021 Subgroups.</i> • <i>Review and adjustments of the PTA.</i> • <i>Monitoring of activities.</i> 	<i>Virtual, 9 to 11 March</i>
<i>GESEA SG1 Meeting Airspace Planning</i>	<ul style="list-style-type: none"> • <i>Continuation of scheduled studies.</i> • <i>Monitoring of implementation and optimization activities</i> 	<i>Virtual, 30 March to 1 April</i>
<i>GESEA SG2 Meeting PANS OPS</i>	<ul style="list-style-type: none"> • <i>Continuation of scheduled studies.</i> • <i>Monitoring of activities for the implementation of operational elements of the APTA module and optimization of TMA.</i> 	<i>Virtual, 6 to 8 April</i>
<i>GESEA SG3 Meeting ATFM</i>	<ul style="list-style-type: none"> • <i>Continuation of scheduled studies.</i> • <i>Monitoring of implementation and optimization activities of the ATFM service.</i> 	<i>Virtual, 25 to 27 April</i>
<i>SAMIG/27 Air navigation implementation priorities considered in GREPECAS programs, VOL III Regional ANP and Regional initiatives.</i>	<ul style="list-style-type: none"> • <i>Continue with the activities of implementation, execution and optimization under the GESEA studies.</i> • <i>Sign the latest LOA ATS and Harmonize contingency plans</i> • <i>Action plans derived from the CONOPS South American airspace efficiency - capacity and elements of VOL III of the ANP.</i> 	<i>Lima, 30 May to 3 June</i>

Activities	Objectives / Deliverables	Tentative Dates
Workshop/Meeting on data management and ATFM regional indicators	<ul style="list-style-type: none"> • Standardization of ATFM data. • Analysis of demand forecasts and indicators. • Power BI application for Regional and national analysis. 	Mission 2 facilitators Lima, 18 to 22 July
Workshop/Meeting on Methodology for ATFM Capacity Calculation	<ul style="list-style-type: none"> • Application of the updated Calculation Manual. • Planning activities for measurement (or update) of capacity in the Region. 	Mission 2 facilitators Lima, 22 to 26 August
1st Workshop/Meeting on optimization of ATS coordination and SAM/ATS/ATFM Contingency Plans - SAM SUR.	<ul style="list-style-type: none"> • Regional harmonization based on MCATS • Update operational letters of agreement between States, including ATS Contingency Plans and including ATFM. Subscription of Agreements. • Promote the implementation of the minimum separation of 20 NM in continental space. 	Lima, 5 to 9 September
Preparation of regional guide material on airspace planning regulations.	<ul style="list-style-type: none"> • Material on the formulation of projects for airspace implementation/optimization of airspace. 	Mission Lima, 8 to 19 August
SAM/IG/28 Air navigation implementation priorities considered in GREPECAS programs, VOL III Regional ANP and Regional initiatives.	<ul style="list-style-type: none"> • Follow-up • Continue with the activities of implementation, execution and optimization under the GESEA studies. • Sign the latest LOA ATS and Harmonize contingency plans • Action plans derived from the CONOPS South American airspace efficiency - capacity and elements of VOL III of the ANP. 	3 to 7 October
Workshop for Airspace Planners.	<ul style="list-style-type: none"> • At least one planning specialist per Member State trained in airspace design and organization techniques - ASM 	Mission: Lima, 31 October to 4 November Workshop: Lima, 7 to 11 November

4.6 The support of the RLA/06/901 project was confirmed to have two facilitators in the ATFM Workshop/Meetings this year. It was indicated that the face-to-face events will have a virtual interface (hybrid), however, the importance of the presence in the Regional Office of the participants was stressed given the technical nature of the subjects, and the use of aids and classroom work in the Workshops.

4.7 The Meeting instructed the Secretariat to coordinate the dates of SAM/IG and SRVSOP-LAR activities to avoid overlaps, considering the Delegates who attend work for both groups. The Secretariat took note, and will address it in Planning 2022 and 2023.

Conclusions on GT Interop matters

4.8 No new conclusions concerning the activities of the Interop WG were drawn up during the SAM/IG/27 Meeting.

2023 Work plan under support of RLA/06/901

4.9 Under this subject, participants of the Interop WG discussed the Work Plan for 2023 according to Table 2 below, proposing activities that must be supported by the Technical Cooperation Project RLA/06/901, to be approved by the Coordination Committee of the aforementioned project.

Table 2: Proposal of Work Plan 2023 under the support of RLA/06/901

Activities	Objectives / Deliverables	Tentative Dates
SAM/IG/29 Air navigation implementation priorities considered in GREPECAS programs, VOL III Regional ANP and Regional initiatives.	Continue with the implementation, execution and optimization activities under the GESEA and GT Interop studies. (5 days)	Lima, TBD
SAM/IG/30 Air navigation implementation priorities considered in GREPECAS programs, VOL III Regional ANP and Regional initiatives.	Continue with the implementation, execution and optimization activities under the GESEA and GT Interop studies. (4 days)	Virtual, TBD
GT INTEROP/4 Fourth Workshop/Meeting of the TF Interop Subgroups.	Provide a meeting to the participants of the Interop GT Subgroups, to consolidate the previous work carried out, with the objective of finalizing the products and deliverables that will be presented to the SAM Region Implementation Group (SAM/IG). (4 days)	Virtual, TBD

Activities	Objectives / Deliverables	Tentative Dates
COM AMHS/4 Third Workshop/Meeting of Supervisors/Operators of COM AMHS Centers of the SAM Region	This is an event for the exchange of information and experiences between the supervisors/operators of the COM AMHS Centers of the SAM Region. Review of routing tables. Review of Contingency Plans. (4 days)	Lima, TBD (Hybrid)
Advanced AMHS Course	Training aimed at technical and operational staff who maintain and operate the AMHS system and that are involved in the implementation of AMHS interconnections. (5 days)	Virtual, TBD
ATM/FPL Workshop	Event aimed at the development of a common methodology to quantify errors in flight plans and associated messages; definition of a standardized format for the inclusion of information in the Aeronautical Information Publication (AIP) of the States adopting the measures recommended in the ATM/FPL Roadmap; and, review of the syntax of the routes by coordinates, to verify if it is accepted by the automated systems used, in order to provide more direct flights to aircraft operators, for fuel savings. (5 days)	Lima, TBD (Hybrid)
Frequency Finder tool training	Training aimed at the members of the CNS/ANP Subgroup with the responsibility of updating the COM Lists of frequency assignments used in the aeronautical context. (5 days)	Lima, TBD (Hybrid)
AIDC Training	Training aimed at the members of the AIDC Implementation teams of the States of the Region. (5 days)	TBD

Agenda Item 5: Other business

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

- a) WP/5.1 – *SAM Region RVSM airspace monitoring the impact of the implantation on the reduction of coordination errors* (presented by the Secretariat)
- b) WP/5.2 – *Standardization of the work methodology in the IFP approval process (presented by Uruguay)*
- c) IP/5.1 - *EU-LAC Aviation Partnership Project activities with European partners on regional cooperation in the ATM/ANS domain and opportunities for the SAM Region* (presented by European Aviation Safety Agency – EASA)

5.2 Under this matter, the Meeting took note of the information presented in working paper WP/5.1 regarding significant altitude deviations (LHDs), mainly those caused by errors in coordination between air traffic services.

5.3 It was highlighted that the data analysis made it possible to identify that 97% of LHDs are the result of coordination errors between air traffic services; recognizing that causes the lack of implementation or an inadequate implementation of services and facilities.

5.4 Information on the total LHD, and the trend of these events in the SAM region during the last four years was presented with WP/5.1; as well as the "hot spots" located mainly at the FIRs borders. The important contribution of improvements in communications and surveillance to reduce LHDs, especially those produced by coordination errors in ATS, was analyzed. Examples included the optimization of communication between the FIR Barranquilla-Kingstown, and the improvement of surveillance between Barranquilla and Curacao, which affected the reduction in the number of events in recent years.

5.5 States agreed to continue with the implementations that optimize communications and surveillance, since they have a direct impact on operational security; support to the Secretariat in the construction of a map on the scope of ATS communications and surveillance was also called upon, to promote implementations with a risk-based approach using map information, and its relationship with LHD events as an input for decision making.

5.6 WP/5.2 - Standardization of the working methodology in the IFP approval process, presented by Uruguay, is addressed in the report on Agenda Item 2.

5.7 Argentina reported on the implementation of the ATS surveillance control service in the FIR Córdoba and FIR Comodoro Rivadavia, according to a State plan. As a result, new control areas (CTAs) with Classification A have been established in the aforementioned FIR. It was highlighted that this initiative for efficiency is complemented by improvements in the structure of ATS routes in Argentina.

5.8 Activities of the EU-LAC Civil Aviation Partnership Project in the ATM/ANS domain with European partners and the opportunities for the SAM Region were presented, including the Regional Workshops of 2020 and 2021 that have allowed a wide participation of air navigation specialists and the field of operational safety.

5.9 The Meeting was informed on the second stage of project (EU-LAC-APP II) started on June 1, 2022, which will allow the continuity of cooperation activities, foster institutional ties between the European Union and the Region, work together for the protection of the environment, and promote technical exchanges.

5.10 The company Transoft made a presentation on the use of the Air-Top tool, by DFS, Germany, to generate simulations in accelerated time, for decision making in cases of airspace planning and analysis of air traffic flows, respectively.