Agenda Item 2: SAM airspace optimization
- **a) PBN en route**
- **b) PBN in terminal areas**
- **c) PBN procedures**

Results of the First Workshop on the Interface between TMAs and Version 03 of the South American ATS Route Network

(Presented by the Secretariat)

SUMMARY

The purpose of this working paper is to present the results of the First Workshop on the Interface between TMAs and Version 03 of the SAM Route Network (Lima, 16 to 20 March 2015) and discuss the next steps in the development and implementation of Stage 2, Version 03 of the SAM ATS Route Network.

REFERENCES:

- PBN/1, 2 and 3 workshop summaries
- SAM/IG meetings

ICAO strategic objectives:	*A - Safety* *B - Air navigation capacity and efficiency* *E - Environmental protection*

1. Background

1.1 As stated in working paper SAM/IG/15-WP/05, due to budgetary limitations of Project RLA/06/901, it was not possible to obtain the economic resources necessary for hiring experts to continue the in-depth study of the SAM ATS Route Network, with a view to developing Version 03 of the Route Network.

1.2 In order to mitigate the fact that experts had not been hired, the ICAO SAM Regional Office proposed the conduction of two workshops on the interface between TMAs and Version 03 of the South American ATS Route Network. The report of the First Workshop on the Interface between TMAs and Version 03 of the SAM Route Network appears in **Appendix A** to this working paper.

2. Discussion

2.1 The First Workshop on the Interface between TMAs and Version 03 of the SAM Route Network was conducted at the ICAO South American Regional Office on 16-20 March 2015. The workshop was attended by 21 experts of the SAM States, KLM and COPA, and from the ICAO Lima Office.

2.2 The objectives of the workshop were:

a) Main: Develop Stage 2 of Version 03 of the SAM ATS Route Network, based on the validated PBN design of airspaces selected by SAM States.

b) Other objectives: Fine-tune the routes of Stage 1 of Version 03 of the SAM Route Network; propose the implementation of other routes.

2.3 The workshop was divided into two main groups that analysed the main flows used by States to handle international traffic in the Region. Group 1 basically covered the "Atlantic" Region, while Group 2 analysed the "Pacific" Region.

2.4 The report of the workshop was divided into two parts, where part I corresponded to the main objective of the event, and part II dealt with other objectives.

2.5 **Part I of the Report**

2.5.1 The information contained in part I of the summary corresponds to the main objective, where some proposals concerning Stage 2 of Version 03 of the SAM ATS Route Network were analysed based on validated or proposed PBN designs for en-route and terminal airspaces of the States.

2.5.2 In this regard, an analysis was made of representative flows between the CAR and SAM Regions that were of interest to the States and some airlines, which submitted their proposals based on efficient paths in terms of fuel savings and CO_2 emissions.

2.5.3 The proposals identified the affected FIRs and described the tasks or actions to be performed for the conduction of the relevant study.

2.6 **Part II of the Report**

2.6.1 Part II of the report shows proposals for fine-tuning ATS routes of Stage 2 of Version 03 of the SAM ATS Route Network, and the proposal for the implementation of other routes, submitted mainly by the users. In this regard, proposals made by KLM and COPA Airlines were analysed.

2.7 **Work methodology adopted by the workshop**

2.7.1 *Use of trunk routes and SIDs/STARs to connect the main airports to the Route Network*

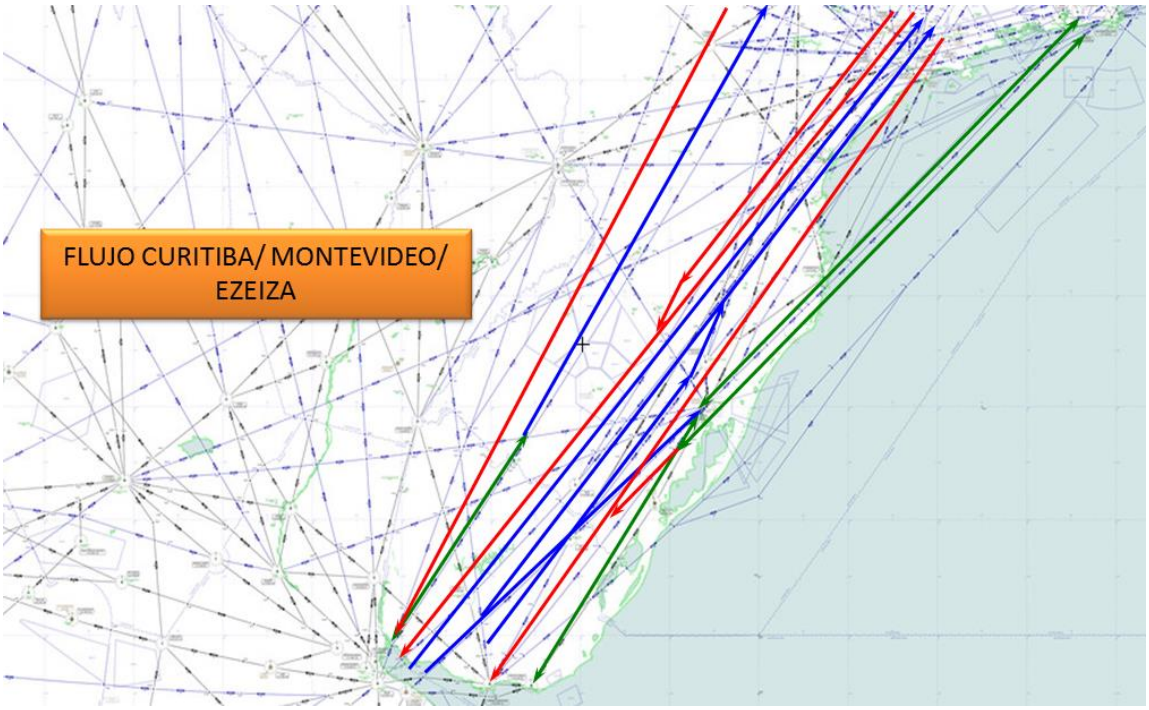
2.7.1.1 The workshop concluded that, taking into account the interrelationship between regional and domestic route networks, planning and implementation should be integrated in order to optimize airspace structure.

2.7.1.2 The SAM ATS Route Network should be implemented using a top-down strategy in order to identify the main regional traffic flows, based on which an integrated regional/domestic network that meets airspace user and ANSP requirements may be developed. This network should consider the need to integrate airports that are not directly served by it, through SIDs/STARs between the main airports and trunk routes, covering the main regional flows.

Examples of trunk routes and their connection through the SIDs/STARs proposed by the workshop

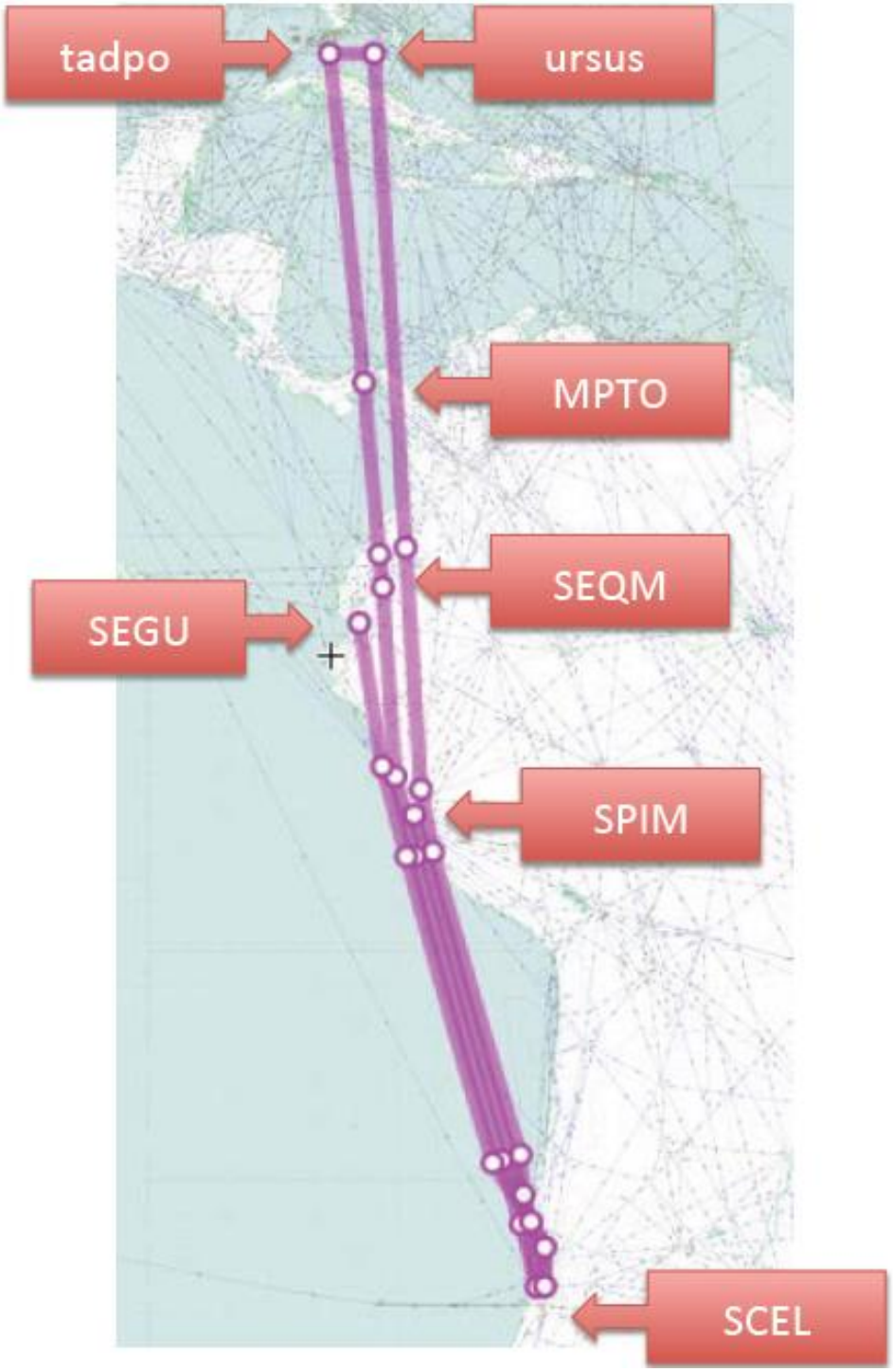
2.7.1.3 Some examples of trunk routes proposed by the workshop are shown below:

a) Curitiba/Montevideo/Ezeiza FIR flow



b) Miami /Santiago de Chile north-south flow

The parallel RNAV routes proposed along the Santiago de Chile/Miami flow, take into account the entry and exit points at the Santiago and Lima TMAs, as well as the existing entry points to the Miami FIR (URSUS and TADPO). The “trunk” route would serve the flows of: Santiago de Chile, Lima, Guayaquil, Quito and Panama.



2.7.2 **Use of entry and exit points of the main TMAs**

2.7.2.1 Although most South American TMAs have not yet reached the required level of maturity, through a validation process, it was possible to develop some proposals for new routes based on consistent entry and exit points, in the case of the Lima and Santiago TMAs, whose PBN designs have already been implemented. Some proposals were also made concerning the entry and exit points initially proposed for the Montevideo and Buenos Aires TMAs.

Routes proposed for the Lima/Santiago flow, based on the entry and exit points implemented under the PAMPA and PROESA projects for the Lima and Santiago de Chile terminals

2.7.3 **Location of holding points**

2.7.3.1 A preliminary assessment was made of the location of holding points in the STARs serving the airports of the Baires TMA, starting in the Montevideo FIR. In this sense, it would be the first experience in which the aircraft flow would be regulated by a foreign ACC through STARs and the corresponding holding points. Accordingly, it would be important to agree on optimum levels, identifying decision and holding points, and establish the corresponding Letter of Operational Agreement, as soon a the PBN designs of the Baires and Carrasco TMAs are validated.

2.7.4 **Calculation tool**

2.7.4.1 Typically, when calculating the distance flown, for purposes of comparing the current and the proposed situation, the calculation takes into account only the en-route distance. However, in order to make a calculation that is closer to reality, it is necessary to use, at least, the corresponding SID and STAR segments. When considering the proposals and the recommended paths submitted for analysis and assessment, the workshop agreed on the importance of having the appropriate resources and tools for obtaining data and information as realistic as possible. In this regard, the workshop received the effective contributions of users/operators, who shared their resources with the working groups.

2.7.4.2 For example, COPA Airlines contributed with the analysis of proposals submitted for its consideration and other proposals analysed by the States, providing its support with the flight calculation and projection system for the paths being analysed. A comparison between current and proposed routes revealed the most direct paths, which are of vital importance to define flight efficiency based on route length, fuel savings, and CO_2 emissions.

2.7.5 **User proposals**

COPA Airlines

2.7.5.1 COPA Airlines proposed and discussed with the representatives of each State concerned attending the workshop, the required changes to the routes between Panama and the different cities of the Region.

2.7.5.2 Some of the proposals are already being implemented, by paths, which can be optimised using the adjusted existing route network. COPA Airlines would make the necessary arrangements to ensure the regular use of the recommended paths.

2.7.5.3 Likewise, other paths will maintain their optimum profile, with only some adjustments to short segments identified in specific FIRs, enabling the implementation of RNAV routes following path adjustment and route optimization.

2.7.5.4 It should also be noted that the adjustments made or to be made in Stage 2 of Version 03 will favour COPA Airlines' destinations in Argentina, Paraguay and Uruguay.

Example of some proposals made by Copa Airlines

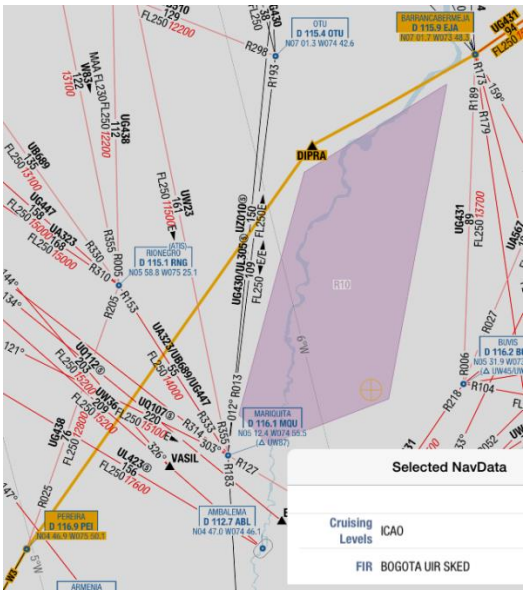
Panama city – Rio de Janeiro

Panama city – Recife

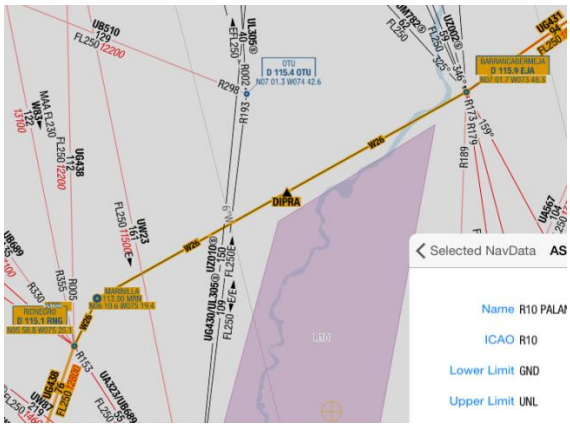
KLM

2.7.5.5 KLM has submitted proposals with different degrees of complexity, some of which could be implemented in the short term because of their low level of complexity. These proposals involve the Civil Aviation Authority of Colombia.

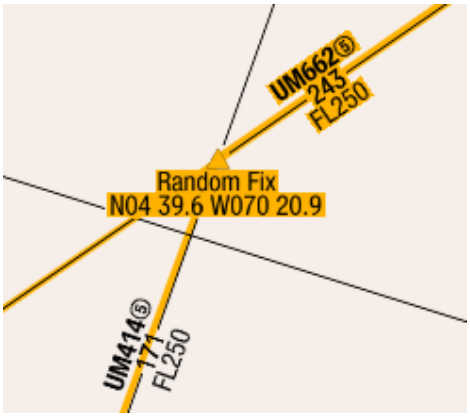
a) New upper airway north of restricted area R10 Palanquero:
   a) New upper route: PEI-DIPRA-EJA (preferred).
   b) or, alternatively, an upper route over lower airway W26 between RNG and EJA (routing: RNG-MRN-DIPRA-EJA).



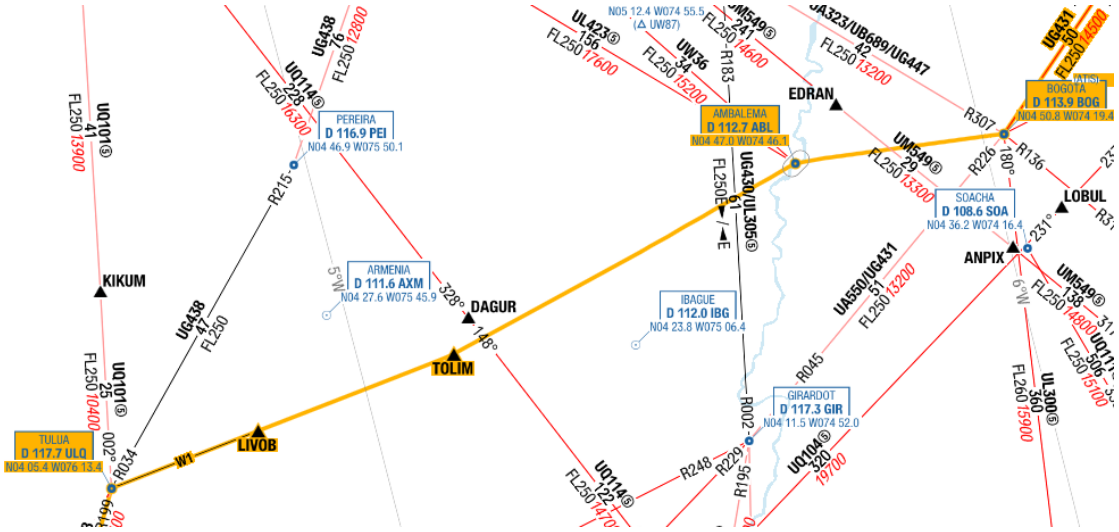
or



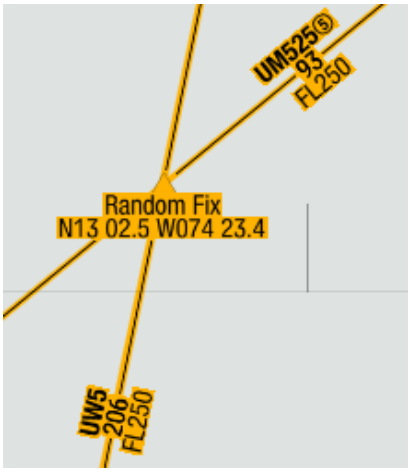
b) Establishment of a new reporting point at the intersection of airways UM414-UM662, to allow a transfer between these airways.



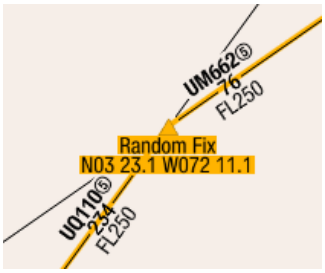
c) A new upper airway over lower airway W1 between LQ-ABL, and W17 between ABL-BOG (routing: ULQ-LIVOB-TOLIM-ABL-BOG).



d) Establishment of a new reporting point at the intersection of airways UW5 and UM525, to allow a transfer between these airways.



e) Establishment of a new reporting point at the intersection of airways UQ110-UM662 to allow a transfer between these airways.



2.7.5.6 KLM made other proposals with a higher level of complexity, which were assessed during the workshop. This analysis is shown in the report of the workshop (Appendix A).

3. Results of the workshop

3.1 Upon completion of the First Workshop on the Interface between TMAs and Version 03 of the South American Route Network, it was noted that:

3.1.1 The participation of a larger number of experts, mostly from SAM States, has favoured the conceptual proposal development phase, taking into account that each expert is well aware of the operational reality of his own State. However, the relatively large number of experts makes it difficult to collect and record the details needed for the implementation phase. Accordingly, it will be necessary to hire experts to ensure the detailed drafting of Stage 2 of Version 03 of the SAM ATS Route Network upon completion of the Second Workshop on the interface between TMAs and Version 03 of the South American ATS Route Network, tentatively scheduled for 7-11 September 2015, with a view to drafting a detailed report for ATS/RO/7 (12-16 October 2015).

3.1.2 Once again, it was noted that the group responsible for developing Stage 2 of Version 03 of the SAM ATS Route Network encountered a scenario with missing information, especially regarding entry and exit points in the PBN design of the main SAM TMAs. In this regard, it should be recalled that the implementation of Version 03 of the Route Network depends on consistent and harmonised implementation of SAM TMAs, and that a delay in project implementation in one or more States could affect the other States and the Regional PBN implementation project as a whole.

3.1.3 The concept of trunk routes, using SIDs/STARs to link the main airports, was properly used initially, but more in-depth and detailed analysis is required to reach a level of maturity in order to move to the implementation phase.

3.1.4 Negotiations have started between States that have airports near the borders, thus requiring STARs and SIDs in the neighbouring FIR, given the proximity between the airport and the political border. Accordingly, the existing Letters of Operational Agreement need to be reviewed.

3.1.5 The participation of COPA Airlines and KLM, although not directly related to the main objective of the workshop, has contributed significantly to the activities of the event, mainly in terms of the use of more appropriate tools, and proposal of some relatively simple adjustments to the existing route network that could result in effective operational gains.

4. Suggested action

4.1 The Meeting is invited to:

4.1.1 Take note of the information presented herein.

4.1.2 Review the report of the First Workshop on the Interface between TMAs and Version 03 of the South American ATS Route Network, shown in Appendix A to this working paper.

4.1.3 Assess the strategy adopted at the First Workshop on the Interface between TMAs and Version 03 of the South American Route Network, mainly with regards to the use of trunk routes and SIDs/STARs for linkage to the international airports, and propose any changes it may deem appropriate.

4.1.4 Request SAM States to carefully assess the proposals contained in the report of the First Workshop on the Interface between TMAs and Version 03 of the South American ATS Route Network, and send their comments and/or proposed changes by 7 August 2015, taking into account the PBN design proposed for the main South American TMAs and/or selected airspace.

4.1.5 Request the SAM States concerned to analyse the proposals made by COPA Airlines and KLM, and comment on the feasibility of their implementation, especially those considered to be of low complexity and for the short term.

4.1.6 Analyse the most appropriate tools to be used at the Second Workshop on the Interface between TMAs and Version 03 of the South American ATS Route Network and other similar events, taking into account the need for an objective comparison between the proposals made and the actual scenario, and considering, *inter alia*, SID and STAR segments used.

4.1.7 Propose a strategy to urge SAM States to participate in PBN forums, especially those related to the SAM ATS Route Network, taking into account that such participation is essential for reaching the agreements needed for the implementation of Stage 2 of Version 03 of the SAM ATS Route Network.

4.1.8 Propose mechanisms for coordination with SAM States that cannot participate in PBN events, especially those related to the regional ATS Route Network, as well as CAR States, through the NACC Regional Office.

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APPENDIX A

FIRST WORKSHOP ON THE INTERFACE BETWEEN TMAs AND VERSION 03 OF THE SOUTH AMERICAN ATS ROUTE NETWORK

FINAL REPORT

INTERNATIONAL CIVIL AVIATION ORGANIZATION

South American Regional Office

Regional Project RLA/06/901

FIRST WORKSHOP ON THE INTERFACE BETWEEN TMAs AND VERSION 03 OF THE SOUTH AMERICAN ATS ROUTE NETWORK

FINAL REPORT

Lima, Peru, 16 to 20 March 2015

1. INTRODUCTION

1.1. The First Workshop on the Interface between TMAs and Version 03 of the South American Route Network was held on 16-20 March 2015 at the ICAO South American Regional Office.

1.2. The objectives of the workshop were:

Main: Develop Stage 2 of Version 03 of the SAM Route Network, based on the validated PBN design of airspaces selected by SAM States.

Other objectives: Fine-tune the routes of Stage 1 of Version 03 of the SAM Route Network; propose the implementation of other routes.

1.3. The workshop worked in two groups, which analysed the main flows through which States handle international traffic in the Region. Group 1 basically analysed the "Atlantic" Region, while Group 2 mainly analysed the "Pacific" Region.

Composition of Group 1:

NAME	STATE	POSITION/FUNCTION
Sandra Naumovitch	Argentina	Expert
Alexander Bastos	Brazil	Expert/Coordinator
Marcelo Lobo	Brazil	Expert/XLSX templates
Luis Rojas	Bolivia	Expert
César Varela	Bolivia	Expert
Robin Dacak	Paraguay	Expert/PPT presentation
Tomás Yentzch	Paraguay	Expert/Rapporteur
Adriana San-German	Uruguay	Expert
Miguel Miraballes	Uruguay	Expert
José Tristão	Advisor	Expert

Composition of Group 2:

NAME	STATE	POSITION/FUNCTION
Tomas Macedo	Peru	Expert
Luis Perales	Peru	Expert
Christian Ramos	Ecuador	Expert
Marcelo Valencia	Ecuador	Expert
Arturo Griffiths	Bolivia	Expert
Ana T. Montenegro	Panama	Expert
Héctor Ibarra	Chile	Expert/Rapporteur
Marco Abarca	Chile	Expert

ICAO OFFICERS		
Julio Pereira	ICAO	ATM/SAR Officer
Roberto Arca	ICAO	ATM/SAR/AIM Officer

2. **PART I**

2.1. The information contained in this part of the report corresponds to the main objective, and involved the analysis of some proposals concerning Stage 2 of Version 03 of the SAM ATS Route Network, based on the validated or proposed PBN design for en-route and terminal airspaces of the States.

2.2. In this regard, an analysis was made of representative flows between the CAR and SAM Regions that were of interest to the States and some airlines, which submitted proposals based on efficient paths in terms of fuel savings and CO_2 emissions.

2.3. The suggested improvement options are numbered from 01 onwards, identifying the affected FIRs and describing the suggested proposals, as well as the tasks or actions to be performed for the conduction of the relevant study.

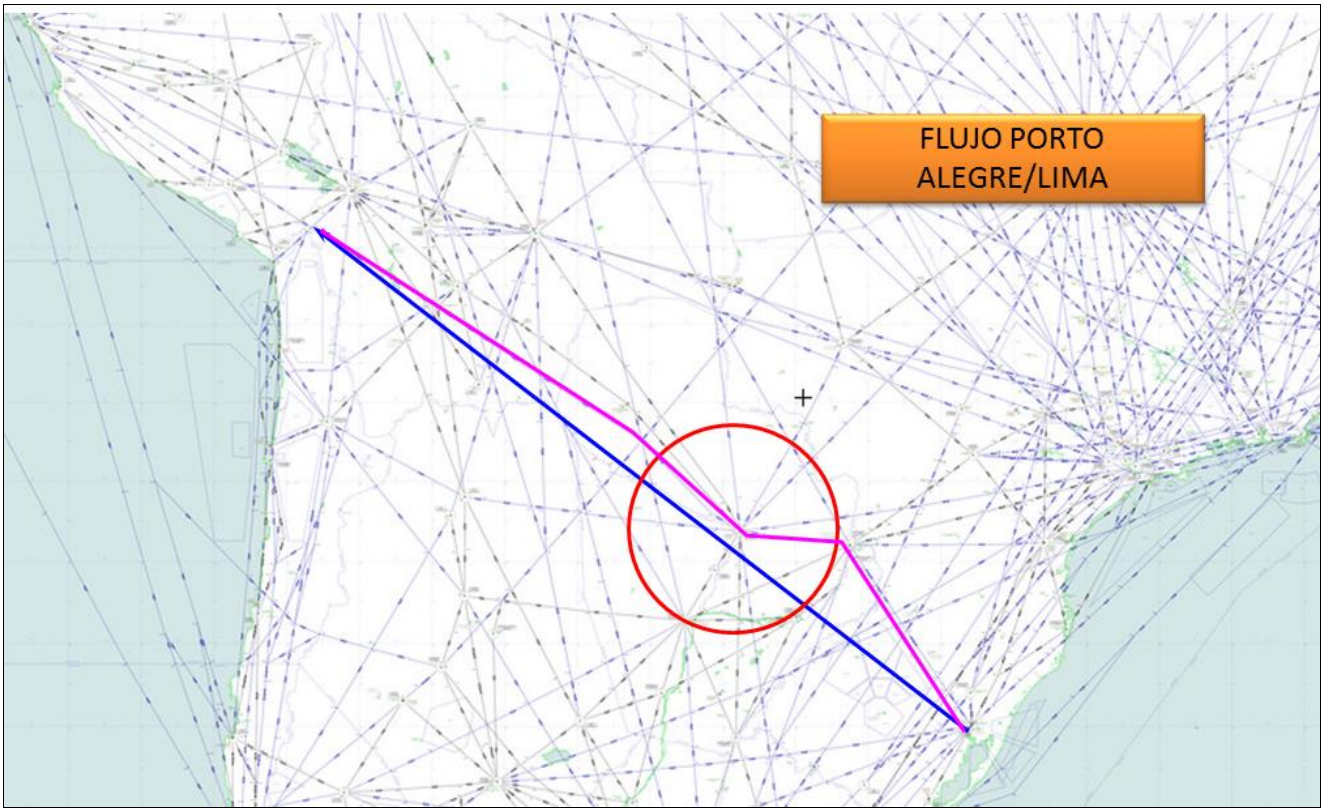
Suggested proposal – 01

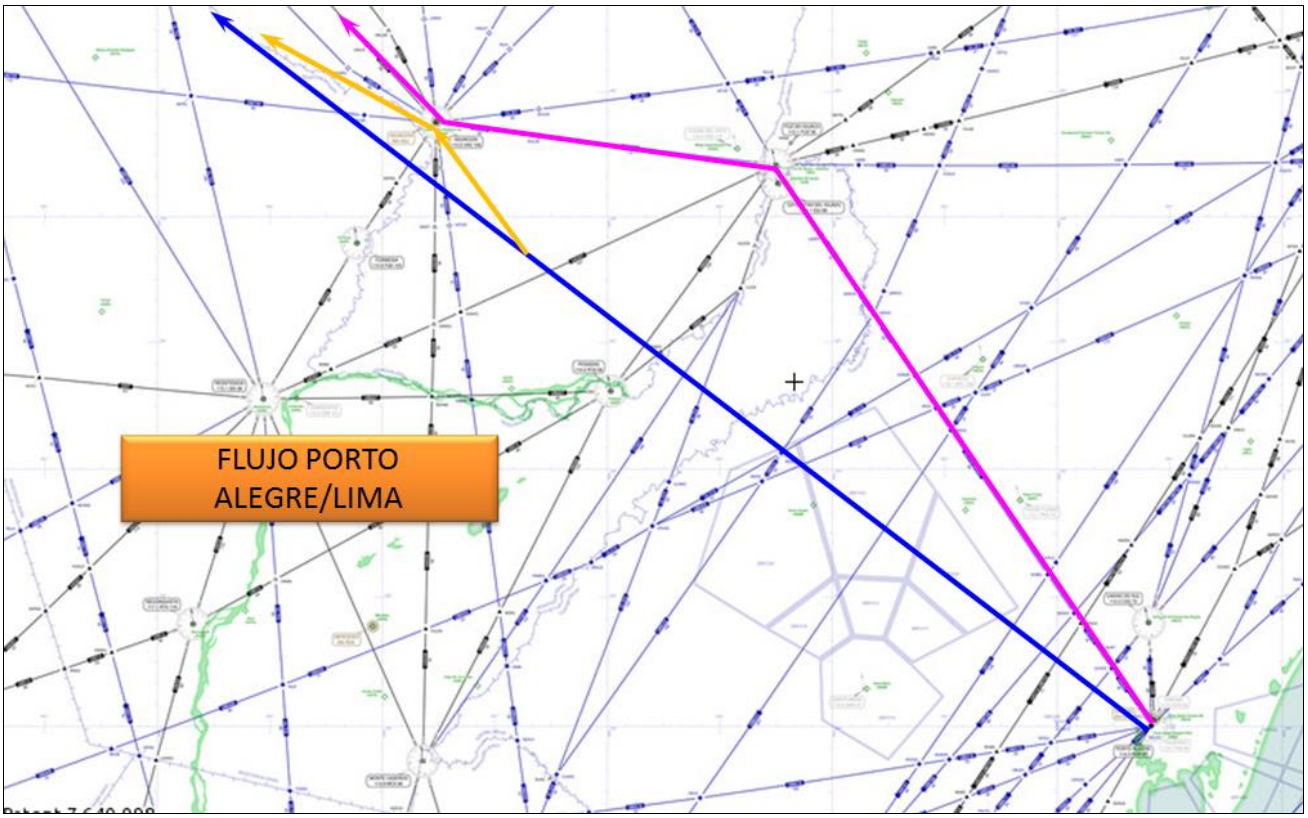
RNAV ROUTE PORTO ALEGRE/LIMA

- NOTE: It is important to consider the need to apply the Flexible Use of Airspace concept together with RNAV, CCO, and CDO, applying them in airspace restructuring. Within this context, the proposed RNAV route Porto Alegre/Lima will go from the POR VOR to the ARSUN position in the crossing of airways UM664 and UM548 in the La Paz FIR, and from there on, the existing UM548 is used.
- This same airway will serve the city of Asuncion with two STARs positioned for the Lima/Porto Alegre flow and *vice versa.*
- This path design will avoid penetration of segregated airspaces in the Santiago and Asunción FIRs.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Curitiba, Resistencia, Asuncion, La Paz, Lima	RNAV route Porto Alegre/Lima **Proposal "A"**	Current segment SBPA/ SBFI/ SGAS/ SPIM 1802,4 NM	UL216/ UM548	• Proposal by the State (NE) • Route data • Statistical data • Analysis of the proposal • CNS analysis • Savings • SMS analysis • LOAs • Publications • CTA training • …
		Proposed segment SBPA/ SGAS/ SPIM 1756.2 NM Up to the ASIA VOR 46.2 NM saved	U…./UM548	
	New RNAV route Porto Alegre/ Lima **Proposal "B"**	Current segment SBPA/ SBFI/ SGAS/ SPIM 1802.4 NM	UL216/ UR563/ UM548	• Proposal by the State (NE) • Route data • Statistical data • Analysis of the proposal • Analysis of restricted airspace • CNS analysis
		Proposed segment SBPA/SPIM	U….	

		1750.5 NM Up to ASIA VOR Via ARSUN 52.3 NM saved	This path had been previously proposed, but no implementation decision had been made. In light of progress with implementation in the region, and with a view to obtaining the biggest and best advantages for users, a new study on proposals A and B is recommended.	• Savings • SMS analysis • LOAs • Publications • CTA training • …



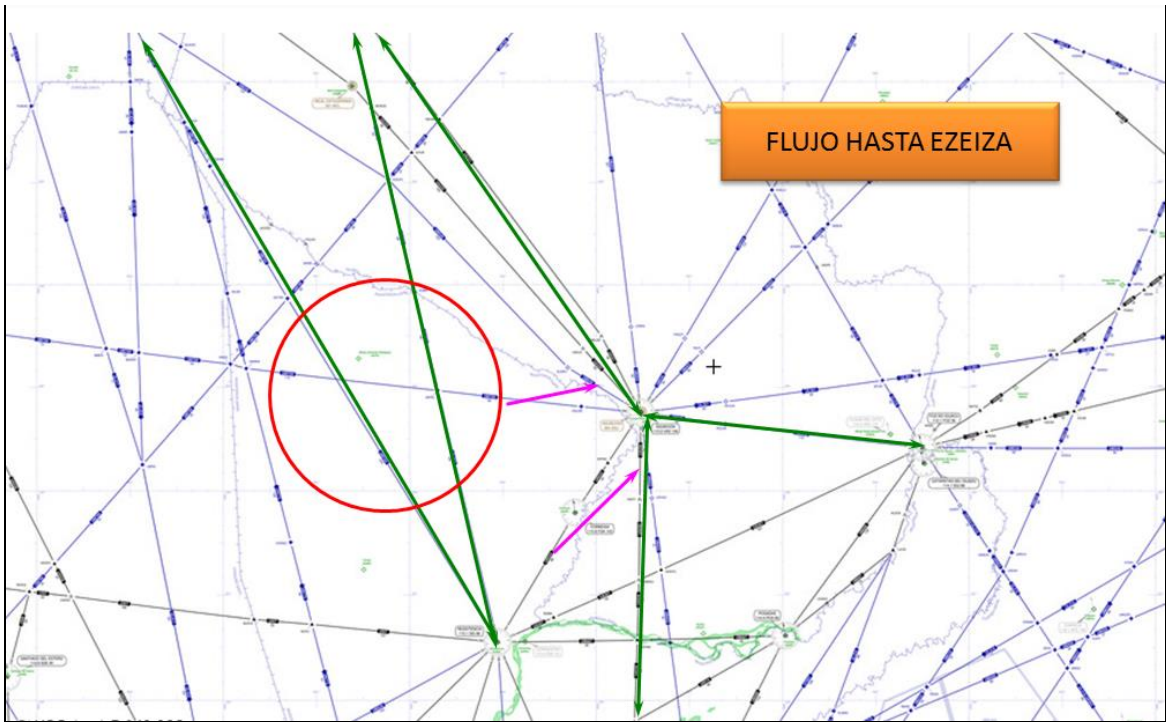

FLUJO PORTO
ALEGRE/LIMA

Suggested proposal – 02

IMPLEMENT SIDs/STARs

- These paths will connect arrival and departure routes in the western sector of the Asuncion TMA.
- The Letter of Operational Agreement with Resistencia must be reviewed to facilitate coordination and transfer of control and responsibility of flights that use these routes.
- Routes UL793 and UM799, which are used by the north/south flow with Asuncion as alternate in case Buenos Aires is closed, can also be added.
- This principle may be applied for channelling flows from the La Paz FIR to the Buenos Aires terminal.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Asuncion/ Resistencia	SID/STAR	SGAS/ UM789 SGAS/UR554 UL793 UM799	SIDs and STARs	• Proposal by the State (NE) • Data on SIDs and STARs • Analysis of the proposal • Savings • SMS analysis • LOAs • Publications • …



Suggested proposal – 03

IMPLEMENT SIDs/STARs

- These actions will improve the efficiency and safety of operations to the three existing controlled aerodromes in the terminal area and to the other visual aerodromes serving general aviation and military aircraft.
- It will also permit a more efficient use of airspace and PBN improvements contemplated for the sector, optimizing arrival and departure paths.
- It should be noted that instrument arrival paths to runway 23 of Guaraní and runway 14 of Foz are overlapping; this can be easily solved with a STAR/SID properly designed to serve both runways.
- Consider the possibility of incorporating position COSTA of A311 into UM548, requested by BR.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Resistencia, Curitiba, Asuncion	Implementation of SID/STAR at the FOZ TMA	Departures and arrivals at the airports of Foz, Guarani, Yguazu	SID/STAR SARP, SBFI, SGES	• The Administration of Brazil will start arrangements for a meeting between the representatives of Argentina, Brazil, and Paraguay to analyse and review the proposed SIDs and STARs to be implemented. • The States must submit proposals, statistical data on IFR and VFR flights and projections. • Submit proposal of amendment to the existing LOA.

Suggested proposal – 04

ENTRY AND EXIT POINTS AT THE EZEIZA AND CARRASCO TERMINALS

- Optimization is advancing gradually, analysing PAPIX/ KUKEN paths that impact Uruguayan airspace. This requires consensus concerning optimum levels, and identification of decision and holding points.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Ezeiza, Montevideo	Define entry and exit points at the Ezeiza and Carrasco terminals	Models of the Tango Project of Argentina	Baires TMA SID / STAR	• Incorporate the SIDs/STARs of the Tango Project of Argentina into the airspace structure. • Submit the relevant proposal to the affected State. • Review and update LOA. • Make the relevant publications. • Training of the staff involved. • …

SID: LANDA-BIVAM-ATOVO-EZ913-ASADA-GBE- EZ965- DORVO-

STAR: PAGON-SAN ANTONIO-TORUL-VALOS-GENERAL BELGRANO-TENIL-ESLAN-PAPIX-KUKEN-

Suggested proposal – 05

HOLDING POINTS AT THE MONTEVIDEO FIR

- Holding points need to be defined at the Montevideo FIR, which will serve the STARs of the airports in the Baires terminal.
- A consensus should be reached regarding optimum levels, identifying decision and holding points.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Ezeiza, Montevideo	Establish holding points at the Montevideo FIR, for the Ezeiza STARs.	Models of the Tango Project	Baires TMA STAR	• Incorporate the STARs of the Tango Project of Argentina into the airspace structure. • Submit the relevant proposal to the affected State. • Review and update LOA. • Make the relevant publications. • Training of the staff involved. • …

Suggested proposal – 06

CALCULATION TOOL

- When assessing the proposals and recommended paths, it is important to have the appropriate resources and tools to obtain data as close as possible to reality. In this sense, the effective contribution of users/operators who have shared their resources with the working groups should be highlighted.
- COPA has contributed with the analysis of the proposals submitted to its consideration, and has provided the system for calculating and projecting flights in the paths concerned. The results provide information on the most direct paths, comparing the existing and the planned route, which is of vital importance for determining flight efficiency based on route length, fuel savings and CO_2 emissions.

Suggested proposal - 07

NEW RNAV ROUTE

- Brazil proposes the creation of a new RNAV route network connecting the Curitiba, Montevideo, and Ezeiza FIRs.

Note 1: This principle can be used for channelling flows among the Curitiba, Buenos Aires, and Montevideo FIRs.

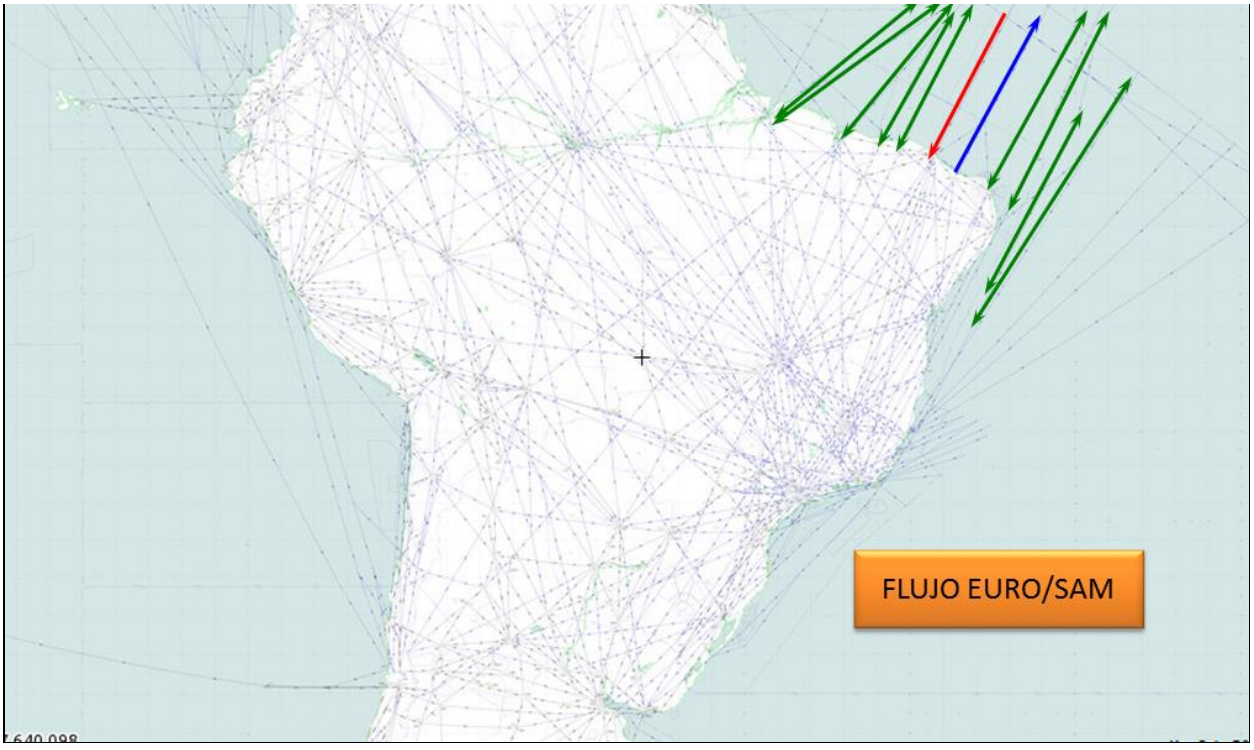
Note 2: The request seeks to enhance safety.

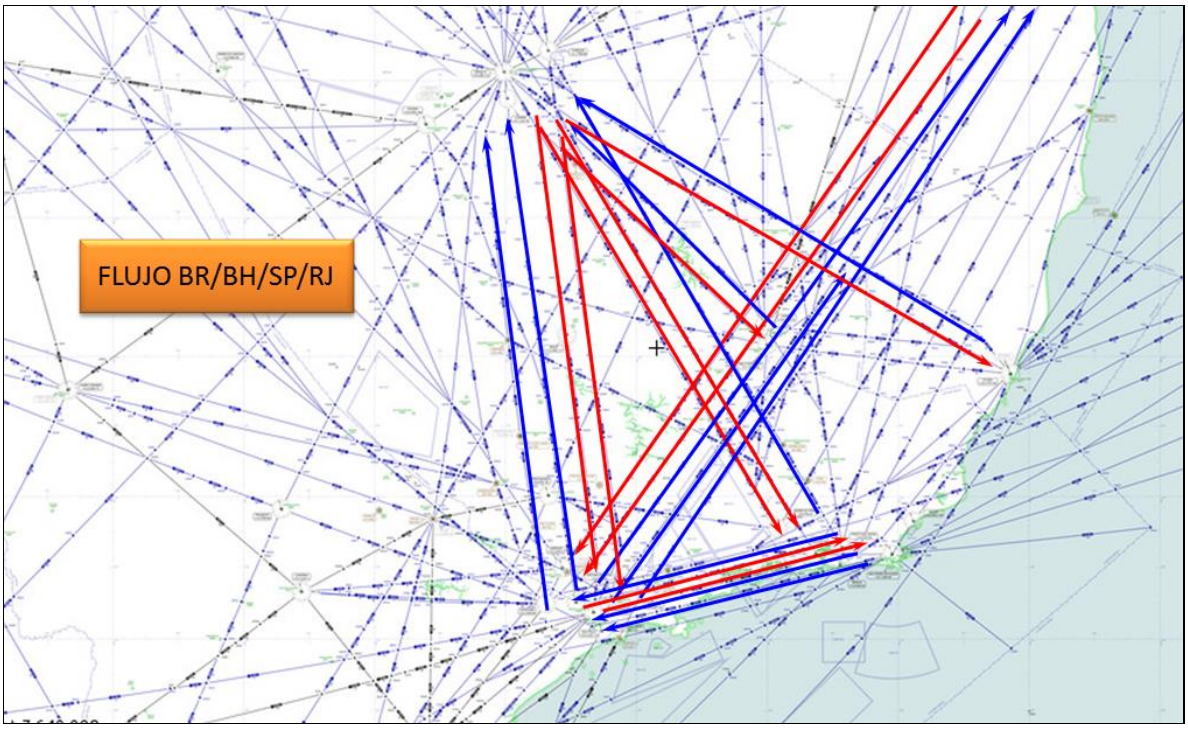
Note 3: The creation of the new route network involves applying the concept of parallel routes, maintaining the existing flows in routes UZ30, UZ21, UZ23, UZ14 and UZ36, up to the boundary between the Montevideo and the Ezeiza FIRs.

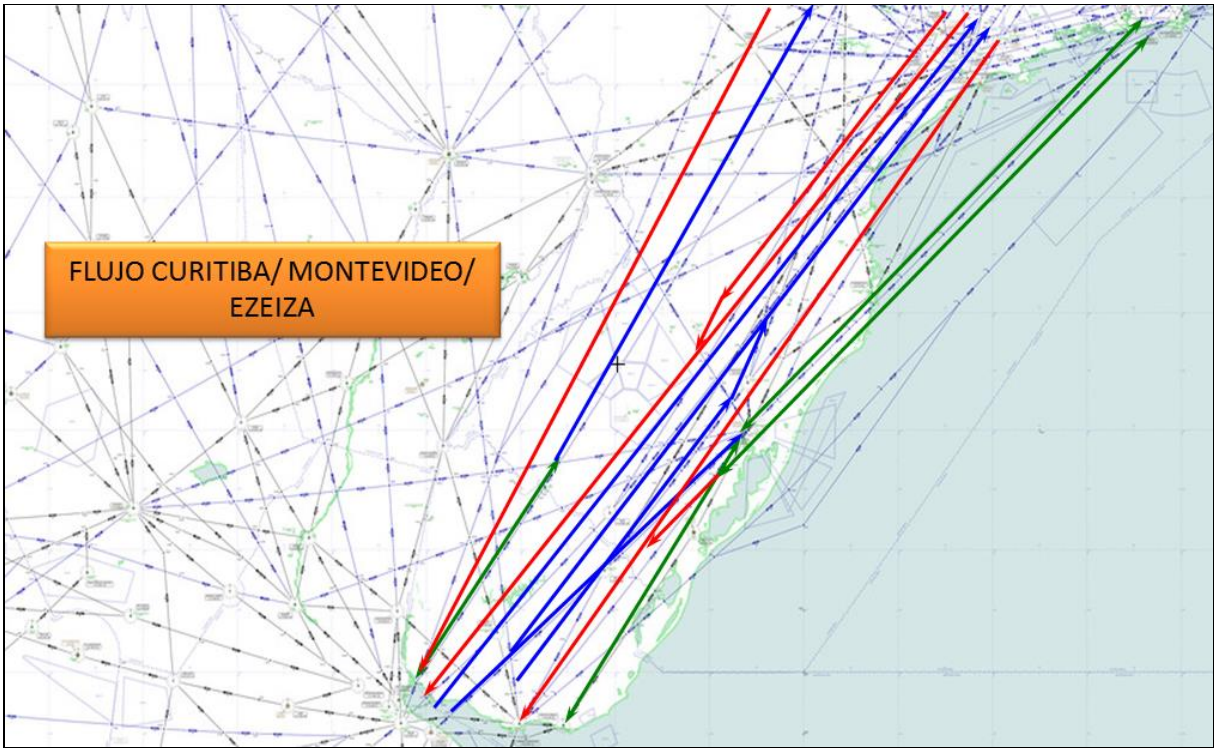
Nota 4: Define the flow between Rio de Janeiro and the Montevideo and Buenos Aires airports.

FIR	PROPOSAL	PATH	DIRECTION OF THE AWY	ACTIVITIES
Curitiba, Montevideo, Ezeiza.	Realign UM661	VOR ADA/ S2350.06W4327.23/S 3012.17W5053.53/S32 21.36W5337.40	Aldeia/S3012.17W505 3.53 (two-way); S3012.17W5053.53/S 3221.36W5337.40 (one-way)	
	Extend route UM424	VOR LDS/S3012.17W5053. 53	VOR LDS/S3012.17W5053. 53 (two-way)	Eliminate UA305 from LDS to POR; the route will be extended from EZE to LDS, in accordance with Proposal Nº4 of the master table.
	Change the direction of route UN857	MELO/POR	MELO/POR (one-way)	
	Realign route UM540	VOR SCP/OPROR/SCC	VOR SCP/OPROR/SCC (one-way)	Eliminate UM548 from RONUT to ANISE; UW21 from FLN to SAT; UZ36 from ANISE to SCP; UW47 from CTB to RDE

	Realign route UM788	VUKAS/NADAR/S2725.13W4953.60	VUKAS/NADAR/S2725.13W4953.60 (one-way)	
	Realign route UM792	ANDAN/S2725.13W4953.60/BCO	ANDAN/S2725.13W4953.60/BCO (one-way)	Eliminate UW24 from CGO to CTB
	New RNAV route	S3434.57W5750.50/S3328.07W5624.69/UTGER	S3434.57W5750.50/S3328.07W5624.69/UTGER (one-way)	
	New RNAV route	ILMUR/NOBEL/PAPIX	ILMUR/NOBEL/PAPIX (one-way)	
	Realign route UM654	SIDUL/UMGOR/MSS	SIDUL/UMGOR/MSS (one-way)	
	Realign route UN741	PUREU/LIVAD/MALBA/SIDUL/GAMOT/KUKEN	PUREU/SIDUL (one-way); SIDUL/KUKEN (two-way)	Obs: Proposal Nº86 and Nº87 of the master table
Curitiba	Realign/extend route UZ30	ITBAG/KEBOG/PERNA/NOBEL	ITBAG/KEBOG/PERNA/NOBEL (one-way)	




FLUJO BR/BH/SP/RJ


FLUJO CURITIBA/ MONTEVIDEO/
EZEIZA

2.4. **Results of the analysis by Group 2**

Suggested proposal

<table>
<tr><td colspan="5">Proposal 01

MIAMI /SANTIAGO DE CHILE NORTH-SOUTH FLOW</td></tr>
<tr><td colspan="5">• Within this context, the proposed parallel RNAV routes in the Santiago de Chile/Miami flow are analysed taking into account the entry and exit points at the SCEL and SPIM TMAs; and URSUS and TADPO at the MIA FIR.
• This trunk route will serve the flows of the following cities: Santiago de Chile, Lima, Guayaquil, Quito, and Panama.
• The new unidirectional parallel routes between Santiago de Chile and Lima will permit compliance with the strategic objective related to safety.</td></tr>
<tr><th>FIR</th><th>PROPOSAL</th><th>PATH</th><th>AWY</th><th>ACTIVITIES</th></tr>
<tr><td rowspan="2">Santiago, Antofagasta, Lima, Guayaquil, Bogota, Panama</td><td rowspan="2">Santiago/ Miami flow</td><td>Existing segment

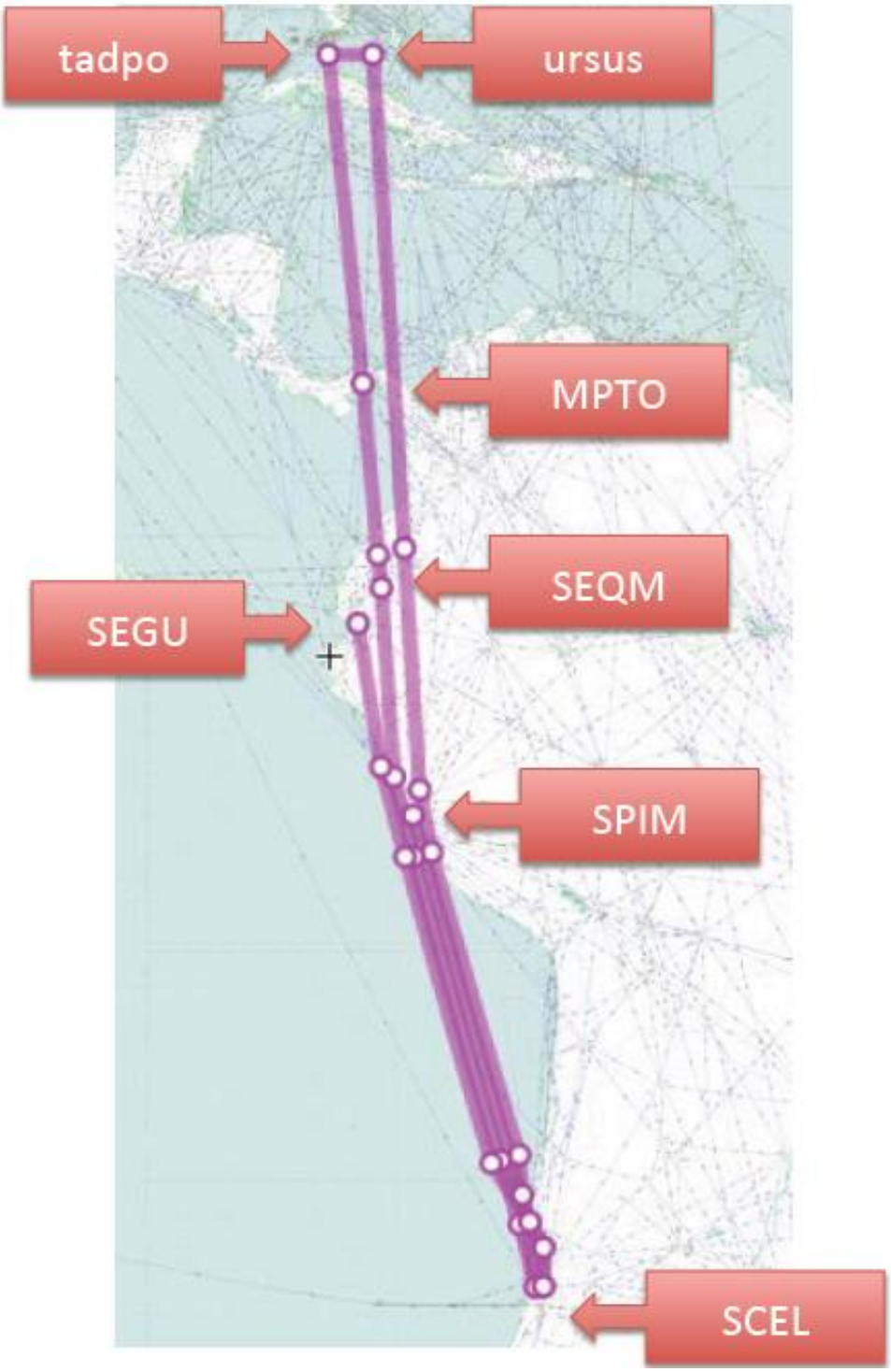
SCEL/ SPIM/ SEGU/ SKBO/MPZL</td><td>UL780/ UL302</td><td rowspan="2">• Proposal by States.
• Data on the route
• Statistical data
• Analysis of the proposal
• CNS analysis
• Savings
• SMS analysis</td></tr>
<tr><td>Proposed segment

Create route parallel to unidirectional UL780.

Create route parallel to UL302 extending to serve the MIA flow.</td><td>UL780 realigned from MOXES to the north.

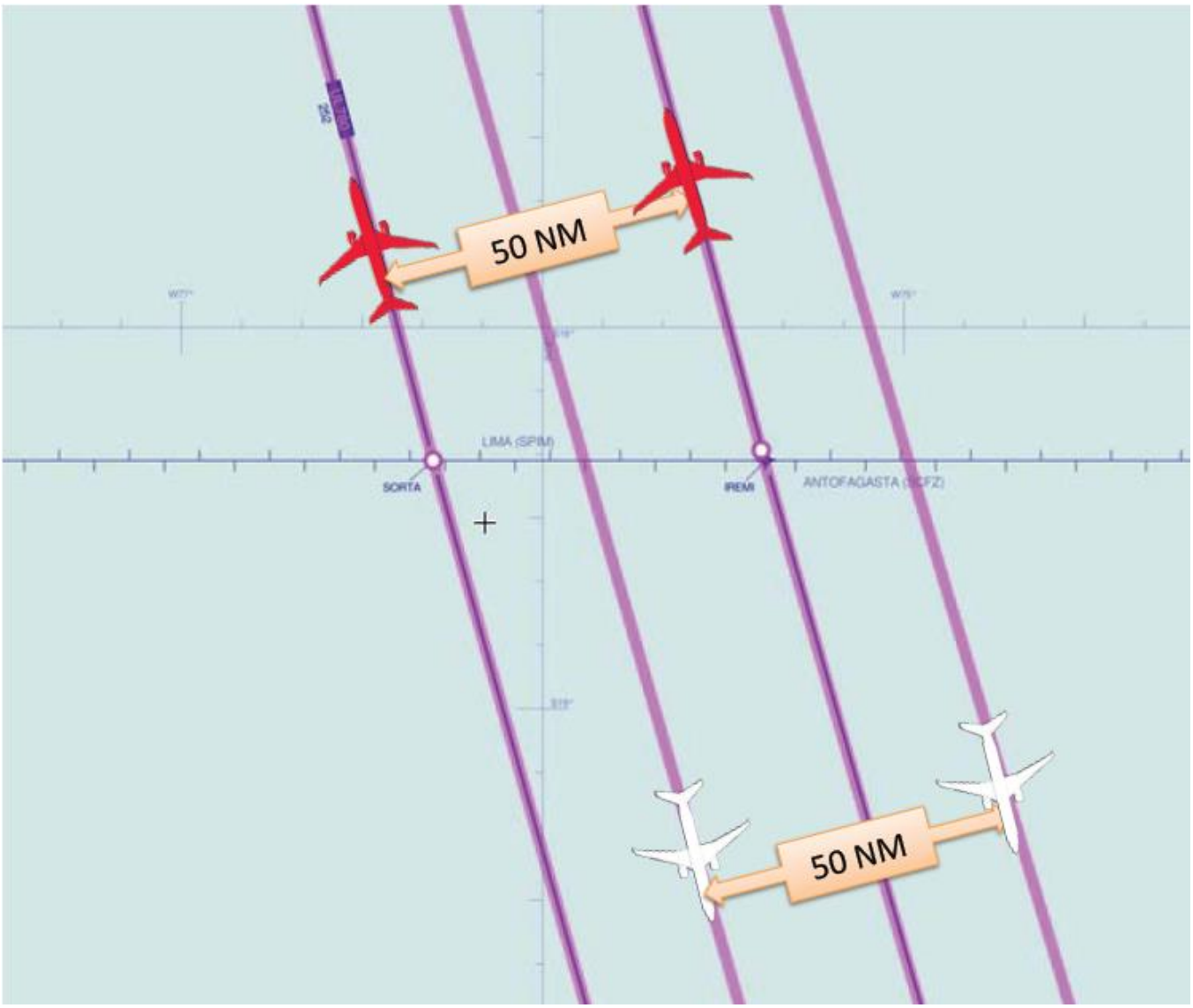
U…new route parallel to UL780.

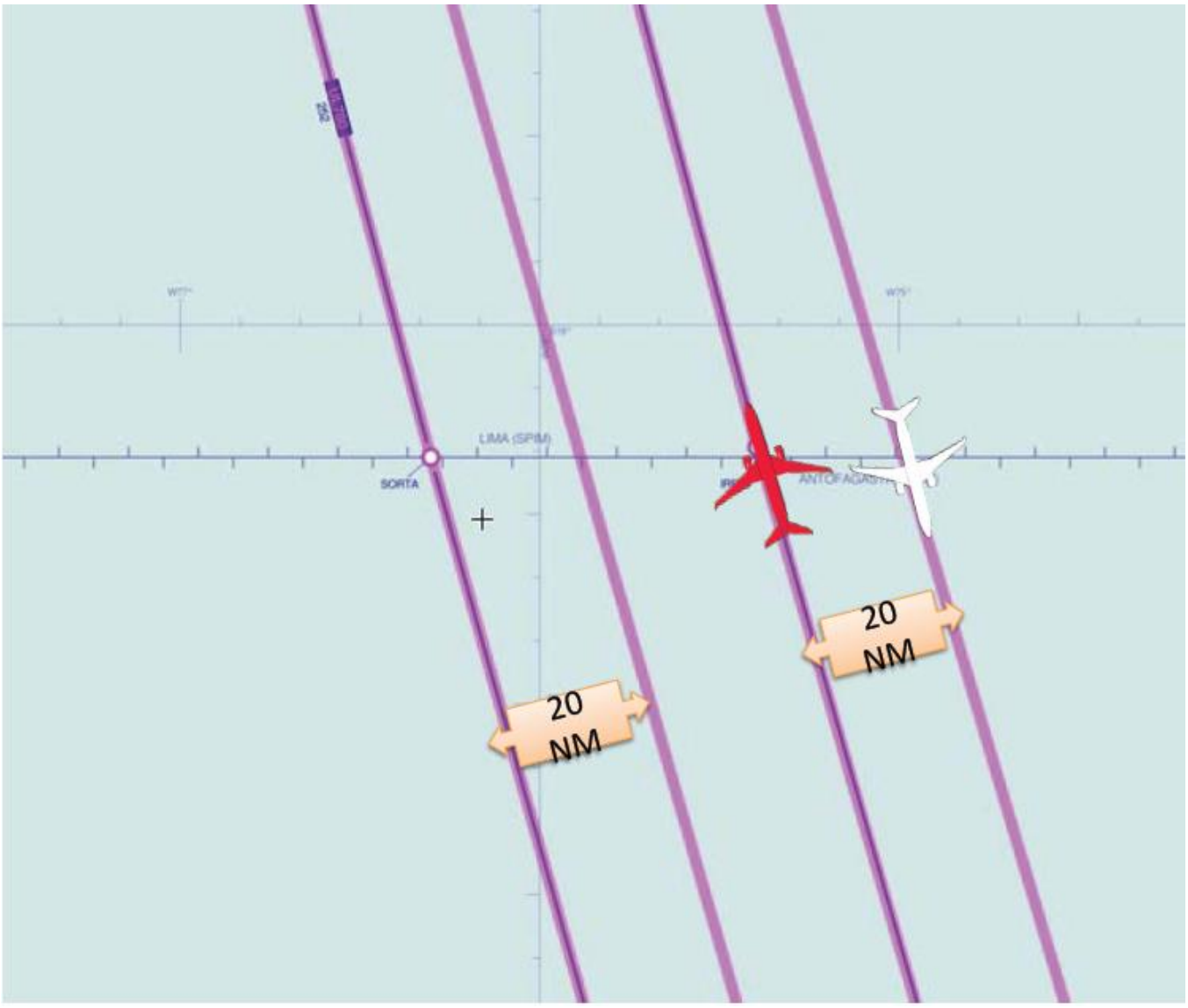
New route parallel to UL302 extending to URSUS.</td></tr>
</table>

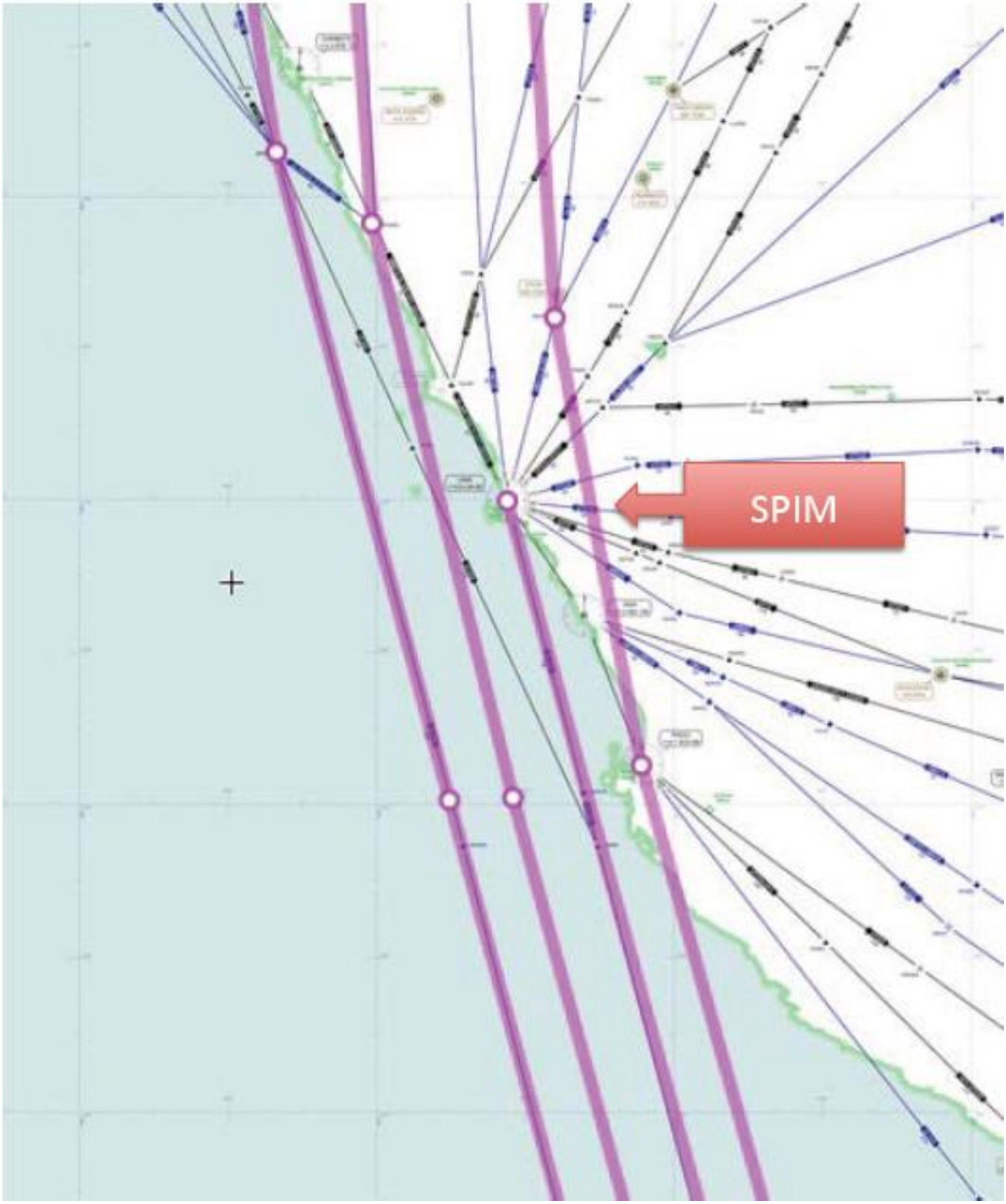

tadpo
ursus
MPTO
SEQM
SEGU
SPIM
SCEL


SPIM
SCEL

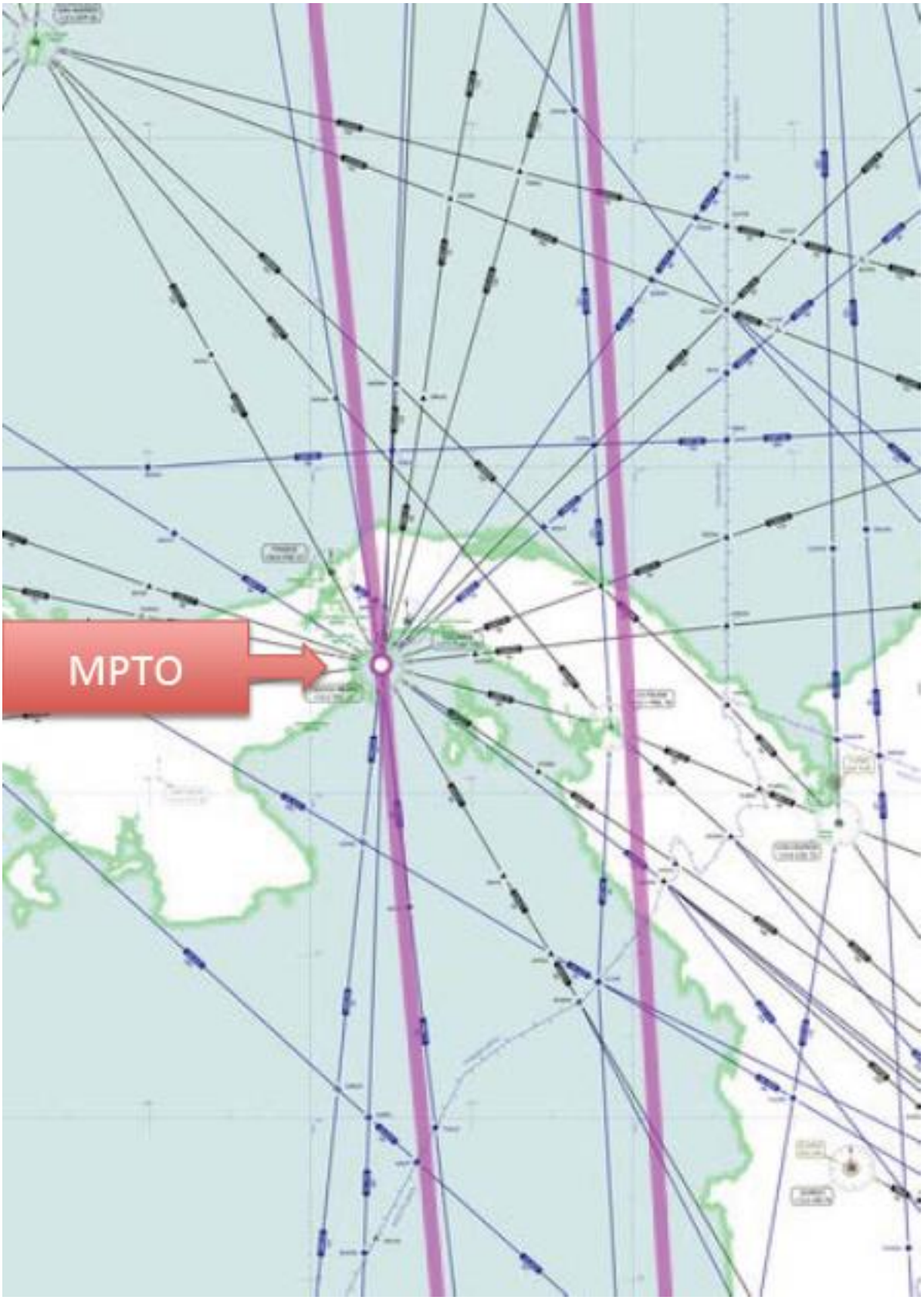

179° 95nm
SCEL


50 NM
LIMA (SPIM)
SORTA
IREMI
ANTOFAGASTA
50 NM


LIMA (SPIM)
SORTA
20
NM
20
NM


SPIM


SEQM
SEGU


MPTO

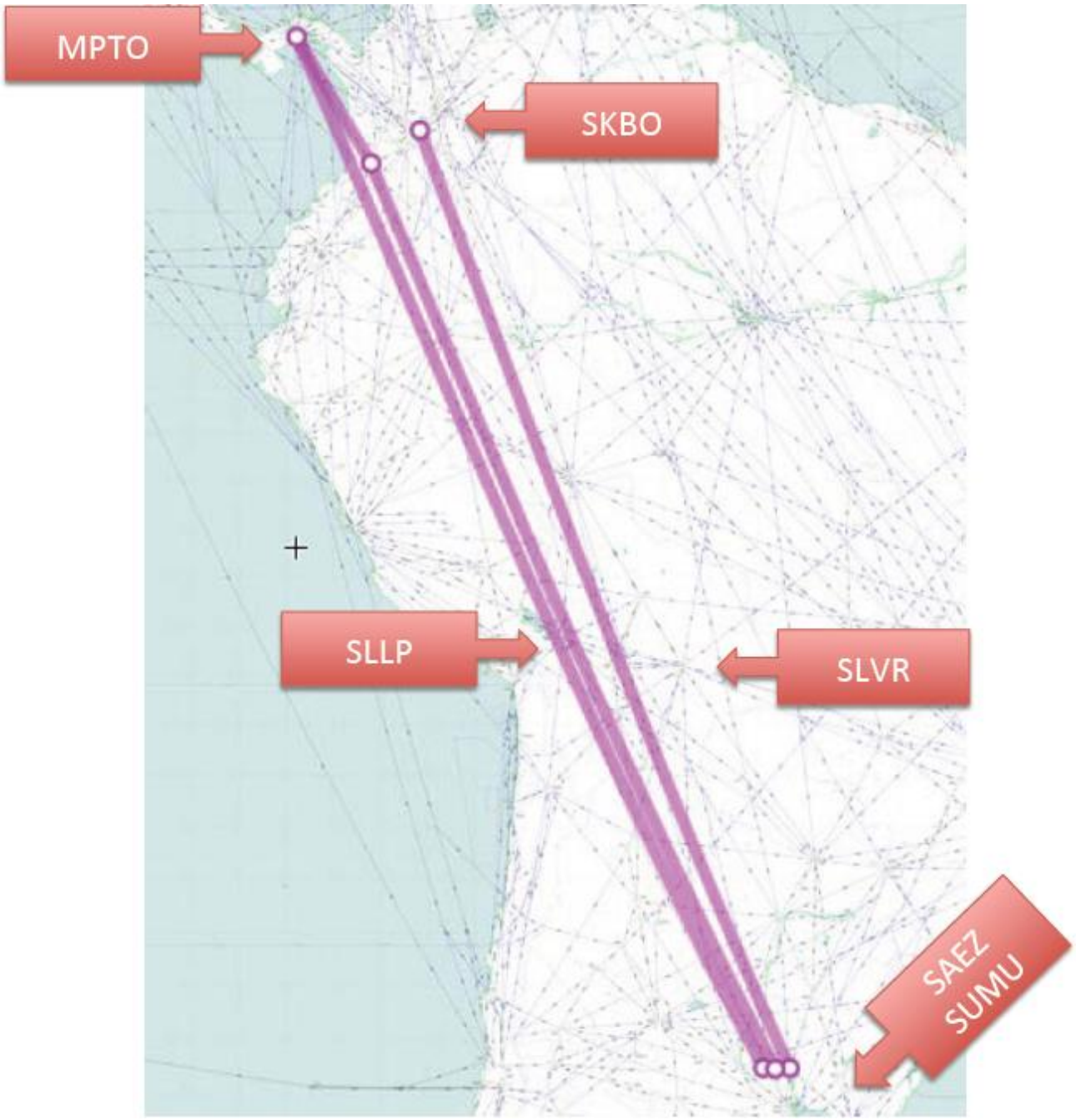

tadpo
ursus

Proposal 02

PANAMA /BUENOS AIRES NORTH-SOUTH FLOW

- RNAV route in the Panama /Buenos Aires - Montevideo flow.
- This trunk route will serve the flows of the cities of: Panama, Cali, Iquitos, La Paz, Buenos Aires, and Montevideo.
- Possibility of establishing a parallel RNAV5 route

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Panama, Bogota, Lima, Guayaquil, Amazonica, La Paz, Cordoba, Ezeiza.	Panama/ Buenos Aires, Montevideo flow	Bidirectional route from Panama terminal to Baires terminal.	UA321/ UR559/ UA558/ UW8	• Proposal by the States. • Data on the route • Statistical data • Analysis of the proposal • CNS analysis • Savings • SMS analysis

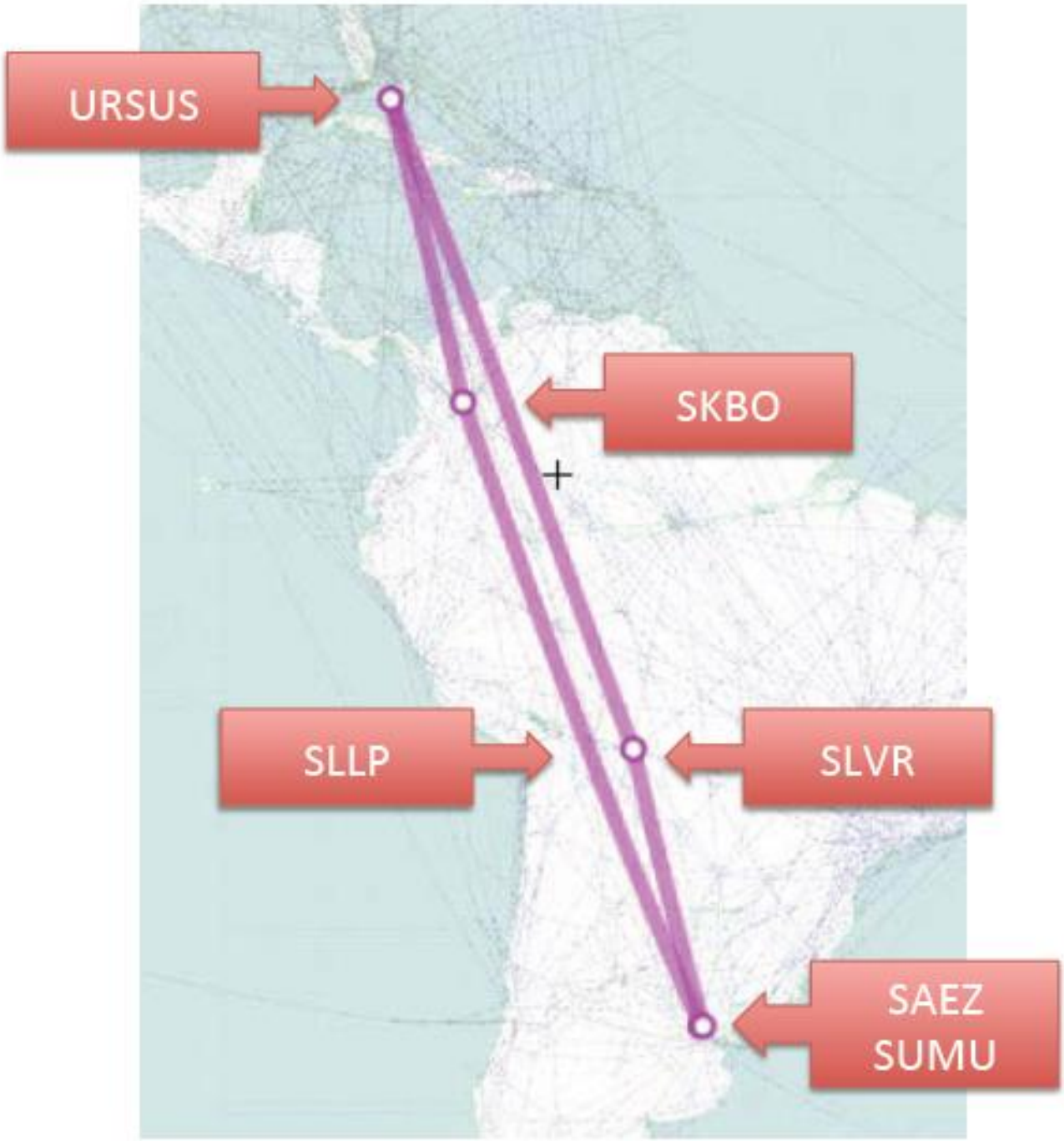

MPTO
SKBO
SLLP
SLVR
SAEZ
SUMU

Proposal 03

MIAMI /BUENOS AIRES NORTH-SOUTH FLOW

- RNAV route in the Miami/ Bogotá /Buenos Aires flow.
- RNAV route in the Miami/ Viru Viru flow.
- These trunk routes will serve the flows in the cities of: Miami, Bogotá, Santa Cruz de la Sierra, and Buenos Aires.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Miami, Bogota, Ezeiza.	Miami /Bogota/ Buenos Aires flow	Bidirectional route from URSUS - Bogota to Baires terminal.	UA321/ UR559/ UA558/ UW8	• Proposal by the States. • Data on the route • Statistical data • Analysis of the proposal • CNS analysis • Savings • SMS analysis


URSUS
SKBO
SLLP
SLVR
SAEZ
SUMU

Proposal 04

LIMA / SAO PAULO WEST-EAST FLOW

- RNAV route in the Lima /Sao Paulo flow.
- This trunk route will serve the flows in the cities of: Lima, La Paz, Viru Viru, and Sao Paulo.

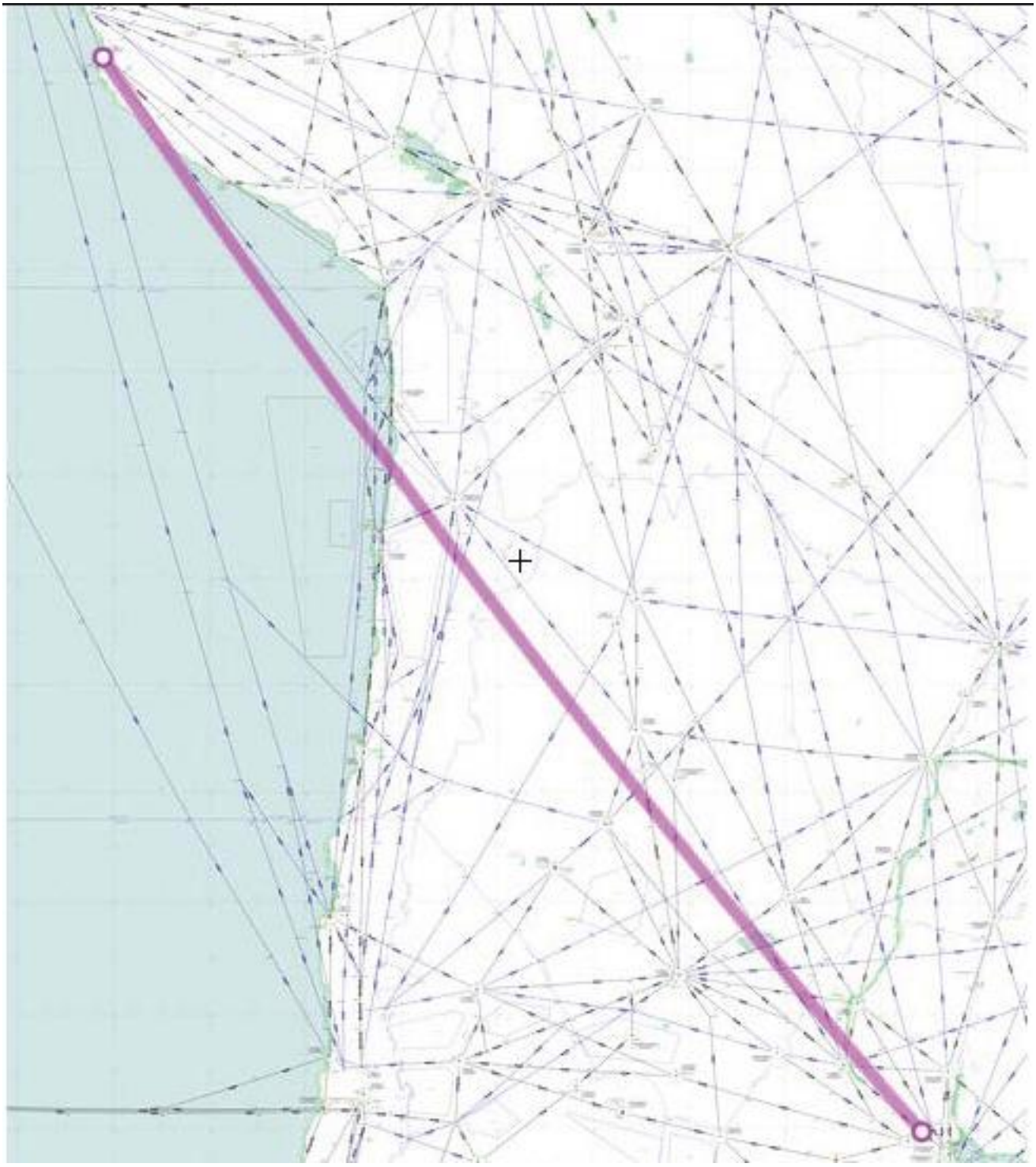
FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Lima, La Paz, Curitiba.	Lima /La Paz, Viru Viru and Sao Paulo flow.	Bidirectional route from Lima terminal to Sao Paulo terminal.	UM415	• Proposal by the States. • Data on the route • Statistical data • Analysis of the proposal • CNS analysis • Savings • SMS analysis

Proposal 05

LIMA / BUENOS AIRES WEST-EAST FLOW

- RNAV route in the Lima / Buenos Aires flow.
- This trunk route will serve the flows in the cities of: Lima and Buenos Aires.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Lima, Antofagasta, Cordoba and Ezeiza.	Lima/Buenos Aires flow	Bidirectional route from Lima terminal to Baires terminal	UL550	• Proposal by the States. • Data on the route • Statistical data • Analysis of the proposal • CNS analysis • Savings • SMS analysis



3. **PART II**

3.1. Other objectives established for the workshop include fine-tuning the routes of Stage 1 of Version 03 of the SAM Route Network and receiving proposals from users or providers in the Region for the implementation of other routes, as needed, for analysis by the group.

3.2. **Suggested proposals**

Suggested proposal – 01

NEW RNAV ROUTE

Note 1: Corresponds to proposal Nº 34 of the master table.

Note 2: The request seeks to enhance safety in the traffic between the Montevideo and Ezeiza FIRs.

- Uruguay proposes the creation of a new RNAV route in the segment CRR/DUR/LOA/UL550 to PISCO.
- The UB555 is eliminated in all its length (CRR/PAR).
- All the benefits of the PBN operational concept are obtained in the direct RNAV navigation segments; according to the comparison between the current flight plan and the new proposed route using the IFSET tool, fuel savings amount to 1.10% (10 tonnes of fuel). CO_2 amounts to -31.600, accounting for 88 operations per month.
- The difference in distance between the existing and the proposed paths was calculated using the tool of Copa Airlines, resulting in 18 NM of distance saved.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Montevideo, Ezeiza, Resistencia, Cordoba, Antofagasta, Lima	New RNAV route	Carrasco/Durazno/ Calama/ UL550/ Asia/Pisco	Eliminate UB555, in all its length	Define LOA responsibilities, design and publications

Suggested proposal – 02

ELIMINATION OF ROUTE UA556

- Corresponds to proposal Nº 24 in the master table.
- The request seeks to enhance safety in the traffic between the Montevideo and Resistencia FIRs.
- Uruguay proposes that traffic joins the existing RNAV UM402 through SEKLO to CRR.
- UA556 is eliminated from MCS to CRR.
- All the benefits of the PBN operational concept are obtained in the direct RNAV navigation segments.
- Consumptions and savings are being analysed.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Montevideo, Ezeiza, Resistencia Asuncion	Elimination of route	Monte Caseros/ Carrasco	Eliminate UA556, from MCS to Carrasco.	Define LOA responsibilities, design and publications

Suggested proposal – 03

ELIMINATION OF ROUTE UA305 AND EXTENSION OF UM424

- Eliminate route UA305 in the EZE/CRR/LDS/POR segment
- Extend UM424 in the EZE/CRR/LDS/POR segment. This segment will be unidirectional EZE/LDS/POR.
- Corresponds to proposal Nº 4 in the master table
- This proposal is consistent with the modifications foreseen by Brazil.

FIR	PROPOSAL	PATH	AWY	ACTIVITIES
Ezeiza, Montevideo, Curitiba	Eliminate route UA305 and extend UM424	Santiago de Chile/ Argentina/Uruguay	Eliminate route UA305 Extend UM424	Submit proposal to update LOA SMS Publish

3.3. **KLM proposals**

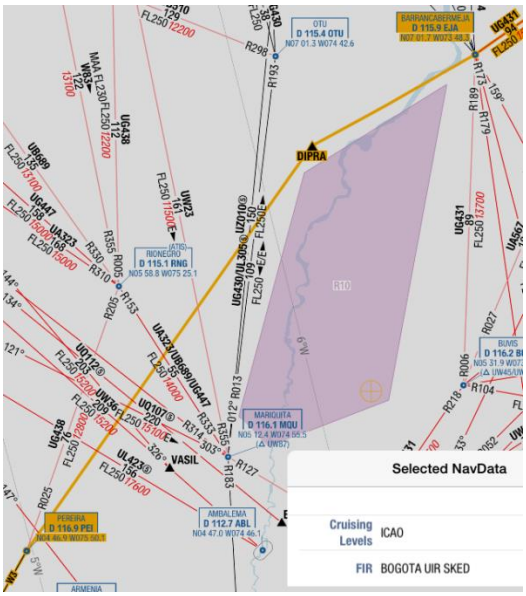
3.3.1. SHORT-TERM ROUTE OPTIMIZATION INITIATIVES

KLM Royal Dutch Airlines requested the Civil Aviation Authority of Colombia to consider the implementation of the following route optimization initiatives in the short term (by order of preference):

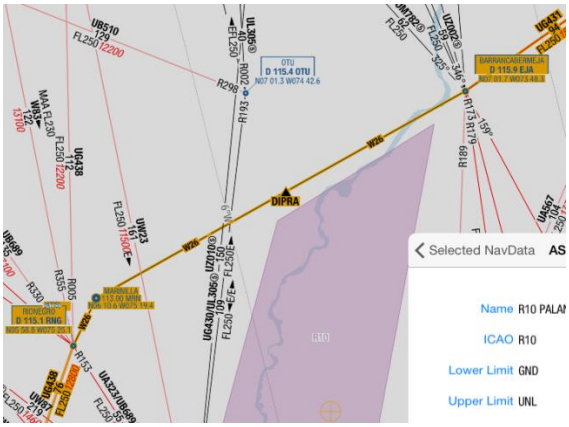
3.3.1.1. New upper airway north of restricted area R10 Palanquero:

a) New upper route: PEI-DIPRA-EJA (preferred).

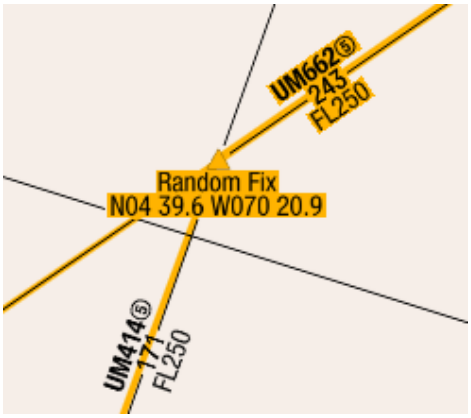
b) Or, alternatively, an upper route over lower airway W26 between RNG and EJA (routing: RNG-MRN-DIPRA-EJA).



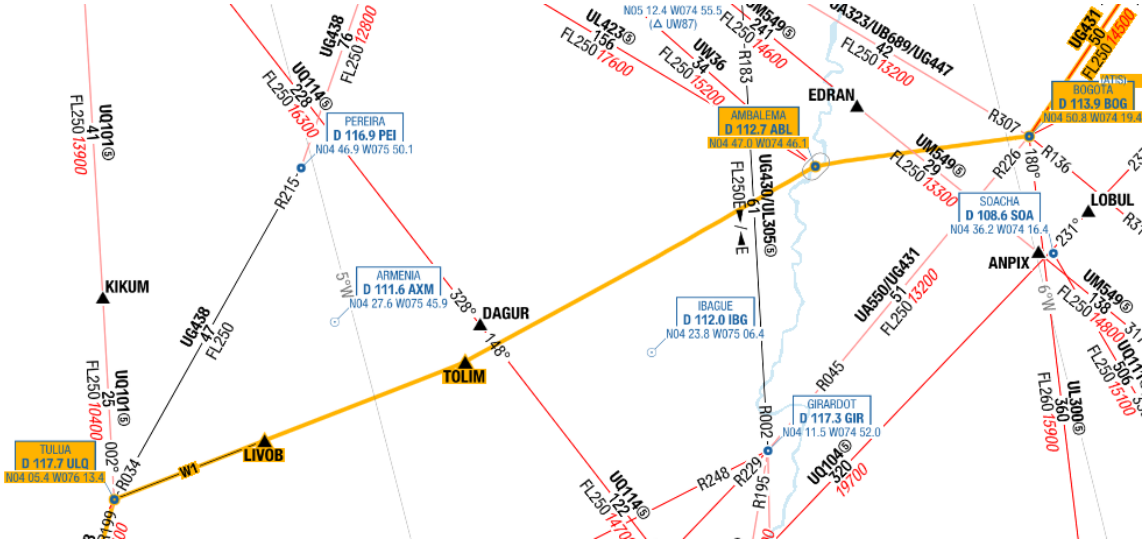
or



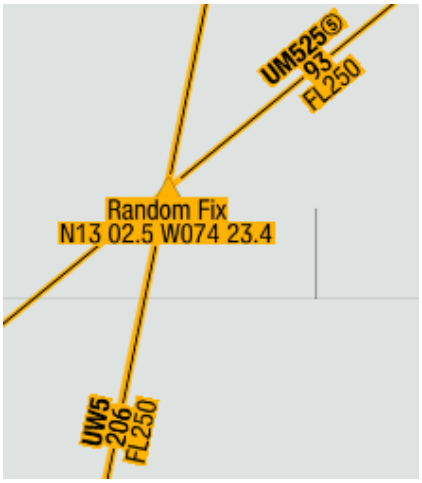
3.3.1.2. Establishment of a new reporting point at the intersection of airways UM414-UM662, to allow a transfer between these airways.



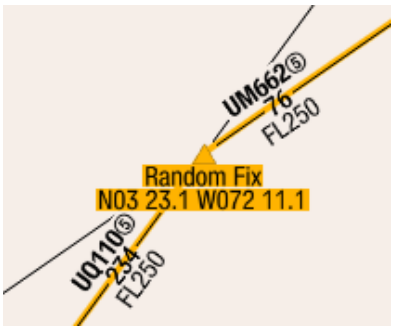
3.3.1.3. New upper airway over lower airway W1 between ULQ-ABL, and W17 between ABL-BOG (routing: ULQ-LIVOB-TOLIM-ABL-BOG).



3.3.1.4. Establishment of a new reporting point at the intersection of airways UW5 and UM525, to allow a transfer between these airways.



3.3.1.5. Establishment of a new reporting point at the intersection of airways UQ110-UM662 to allow a transfer between these airways.



3.3.2. In addition to short-term proposals, the workshop assessed KLM proposals, with the following results:

PROPOSAL KLM 1A				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota and Barranquilla	Direct RNAV route (conditioned upon crossing SKR10)	PEI – EJA in the upper level		Refer request to Colombian authorities

PROPOSAL KLM 1B				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota and Barranquilla	New RNAV route In order to avoid SKR10 on the north	PEI – DIPRA - EJA in the upper level		Refer request to Colombian authorities

PROPOSAL KLM 1C				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota and Barranquilla	Create RNAV route in the upper level over existing lower route. In order to avoid SKR10 on the north		W26 between RNG - EJA	Refer request to Colombian authorities

PROPOSAL KLM 1D				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota and Barranquilla	Create RNAV routes in the upper level over existing lower routes. In order to avoid SKR10 on the south		W1 – W17 between ULQ and BOG.	Refer request to Colombian authorities

PROPOSAL KLM 2				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota and Barranquilla	Create direct RNAV route to optimize exit from Cali.	Direct segment between RNG and BAQ VORs		Refer request to Colombian authorities

PROPOSAL KLM 3				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Guayaquil, Bogota and Barranquilla	Establish WPT at the intersection of UW5 and UM525 routes		UW5 – UM525	Feasible in the short term. Submit request to Colombian authorities

PROPOSAL KLM 4				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota and Barranquilla	Direct RNAV route from Ecuador to northern Colombia	TCO – OROSA and establish a WPT at the intersection with UM525.	UR564 – UG438 – CTG – UA574.	Refer request to Colombian authorities

	Create RNAV route between GYV and RHC.	At VULKY – OSIGO –TCO – WPT (INT UQ101) – BUTAL – WPT (INT UG444) - RHC		Assessed by AD HOC Group 2. Ecuador deemed it feasible in the medium term.

PROPOSAL KLM 5				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota and Barranquilla	Create routes to enter/exit the BAQ UIR close to the Guajira peninsula.	VOR/DME RHC – RNG –TCO.		Refer request to Colombian authorities

PROPOSAL KLM 6				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota	Establish WPT at the intersection of routes UM414 and UM662		UM414 – UM662	Feasible in the short term Submit request to the Colombian authority

PROPOSAL KLM 7				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Bogota	Establish new route from ILMUX - AMAYA and establish WPT at the intersection of routes UQ110 and UM662 and of routes UM414 and UM662		UM414 – UM662 UQ110 – UM662	Feasible in the short term Submit request to the Colombian authority Peru considers that the new route could go from IQT to AMAYA.

PROPOSAL KLM 8				
FIR	**PROPOSAL**	**PATH**	**AWY**	
Guayaquil	Establish WPT at the intersection of routes UW21 and UM662		UW21 – UM662	Ecuador considers it feasible in the short term

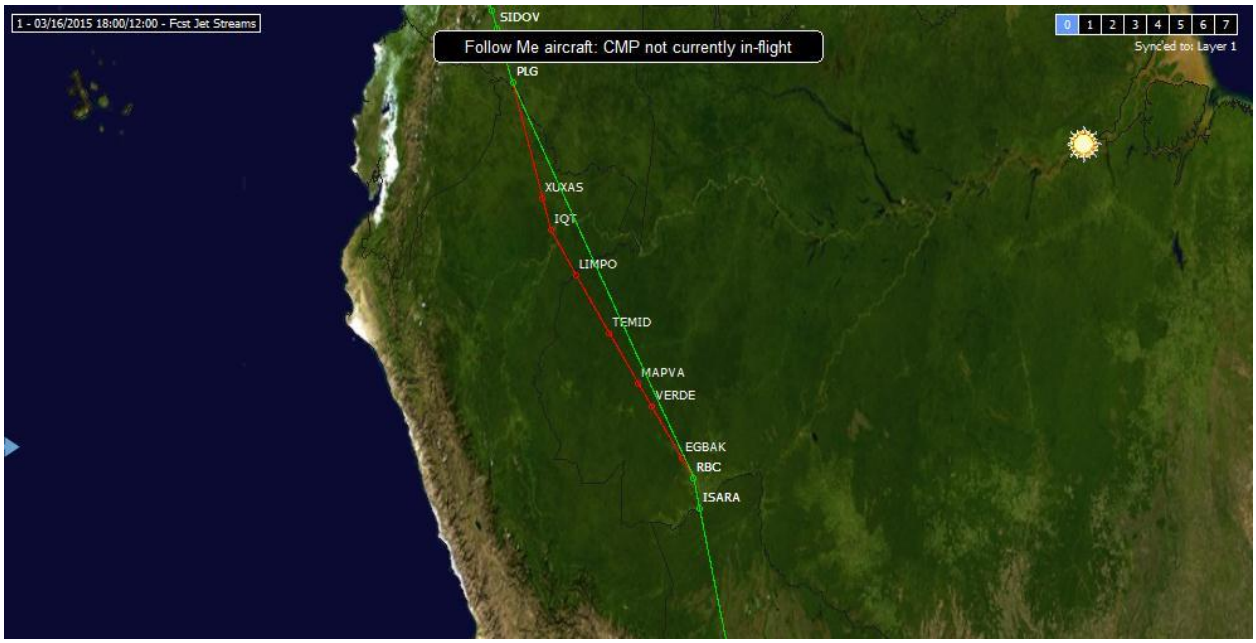
3.4. **Proposals by COPA**

EXISTING AND PROPOSED ROUTES - COPA AIRLINES
• COPA has proposed and discussed segments between Panama and the different cities of the Region, with the representatives of each State concerned. • Some of the analysed proposals are being applied through paths that can be optimized using the adjusted existing route network. COPA Airlines will make the corresponding arrangements for regular use of the recommended paths. • Likewise, it has been noted that other paths will achieve their optimum profile by only adjusting some short segments identified in specific FIRs, thus permitting the implementation of RNAV routes by adjusting paths and optimizing the route. • It should also be noted that the adjustments made or to be made in Stage 2 of Version 03 will significantly favour major destinations in Argentina, Paraguay and Uruguay.

EXISTING AND PROPOSED ROUTES - COPA AIRLINES:		
ORG-DST	**ROUTE (EXISTING/PROPOSED)**	**NM (EXISTING/ PROP)**
MPTO-SAEZ	MPTO OREPI1B IRATA BUSMO UA321 RCO UL417 ERE UA558 MULTA UW24 SNT SNT6A SAEZ	2825
	MPTO OREPI1B IRATA BUSMO UA321 PLG RBC UL417 ERE UA558 MULTA UW24 SNT SNT6A SAEZ	2817
MPTO-SBGL	MPTO OREPI1A DAKMO UM549 MTU UM782 ABIDE UM549 OGTIT UZ40 BSI UZ6 ISOPI UZ35 LUVSU UZ24 OGMUK VAKUB1A SBGL	2906
	MPTO OREPI1A DAKMO UM549 MTU UM782 ABIDE UM549 OGTIT POVOX OGMUK VAKUB1A SBGL	2867
MPTO-SBPA	MPTO OREPI1B DAKMO UQ114 ASAPA UL655 DIKAL UL793 EVOLO UL216 FOZ UL216 EAGLE EAGLE1 SBPA	2737
	MPTO OREPI1B DAKMO UQ114 ASAPA ARMUK UL216 FOZ UL216 EAGLE EAGLE1 SBPA	2724

EXISTING AND PROPOSED ROUTES - COPA AIRLINES:		
ORG-DST	**ROUTE (EXISTING/PROPOSED)**	**NM (EXISTING/ PROP)**
MPTO-SBRF	MPTO OREPI1A DAKMO UW87 MQU UA323 MNS UZ11 ILNOT ILNOTA SBRF	2907
	MPTO OREPI1A DAKMO UW87 MQU UA323 SGC ILNOT REC SBRF	2904
MPTO-SCEL	MPTO OREPI1A OREPI BUXOS UL780 SULNA UT315 TOY UL302 ISGUD UQ815 SIMOK SIMOK1A SCEL	2612
	MPTO OREPI1A OREPI BUXOS UL780 VAKUD ISGUD UQ815 SIMOK SIMOK1A SCEL	2603
MPTO-SGAS	MPTO OREPI1B IRATA UA321 LIMPO UM784 PALIV UA320 UKELA SGAS	2448
	MPTO OREPI1B IRATA UA321 LIMPO UM784 KILEV MCL UA320 UKELA SGAS	2434
MPTO-SUMU	MPTO OREPI1A OREPI IRATA UA321 BUSMO UQ106 PLG UA321 LIMPO UM784 PALIV UA320 MOROS UL793 SIS UW7 MCS UA556 MONSA MONSA1C SUMU	2932
	MPTO OREPI1A OREPI IRATA UA321 BUSMO UQ106 PLG UA321 LIMPO UM784 PALIV MCS UA556 MONSA MONSA1C SUMU	2897
MPTO-SLVR	MPTO OREPI1B IRATA UA321 PAKES PAKES VVI SLVR	1883
	MPTO OREPI1B IRATA UA321 PLG EGBAK UA321 PAKES VVI SLVR	1874
SACO-MPTO	SACO IRAVO LOGET UW6 SDE GAVEX UBRIX UL417 RCO UA321 IRATA ITEDO1 MPTO	2699
	SACO IRAVO LOGET UW6 SDE GAVEX UA558 PAZ UR559 IQT UA321 IRATA ITEDO1 MPTO	2620
SBPA-MPTO	SBPA JAUNT1A JAUNT UM216 EVOLO UL793 DIKAL UL655 ASAPA UQ114 DAKMO ITEDO1 MPTO	2879
	SBPA JAUNT1A JAUNT UL216 SIDAK ASAPA UQ114 DAKMO ITEDO1 MPTO	2860
SBRF-MPTO	SBRF IBEK2A IBEK ILNOT UZ11 MNS UA323 MQU UW87 DAKMO ITEDO1 MPTO	2909
	SBRF IBEK2A IBEK ILNOT SGC UA323 MQU UW87 DAKMO ITEDO1 MPTO	2906
SGAS-MPTO	SGAS VAS UA321 CLO A321 ASIKO UA321 BUSMO ITEDO1 MPTO	2436
	SGAS VAS UA321 RBC SIDOV UA321 BUSMO ITEDO1 MPTO	2429
SLVR-MPTO	SLVR PAKES1 PAKES UA321 BUSMO ITEDO1 MPTO	1646
	SLVR PAKES1 PAKES UA321 RBC SIDOV UA321 BUSMO ITEDO1 MPTO	1637

MPTO-SAEZ



MPTO-SBPA

MPTO-SBGL

SBPA-MPTO

MPTO-SBRF

SBRF-MPTO

MPTO-SCEL


1 - 03/16/2015 18:00/12:00 - Fcst Jet Streams
Follow Me aircraft: CMP not currently in-flight
0 1 2 3 4 5 6 7
Sync'ed to: Layer 1
IVSUP
KILEV
ALBEG
OBKUL
DIBUG
MALVA
MILIX
SAVRA
MUDIL
ESELA
RAXUS
MOROS
ILPUR
UKELA
SGAS
UBRIX


1 - 03/16/2015 18:00/12:00 - Fcst Jet Streams
Follow Me aircraft: CMP not currently in-flight
0 1 2 3 4 5 6 7
Sync'ed to: Layer 1
GYV
KNOG
TRU
SREN
MOXES
MILIX
SORTA
RAXUS
ISPEL
LIVOR
UBRIX
SULNA
TIVGU
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EDRON
ISELO
SIMOK

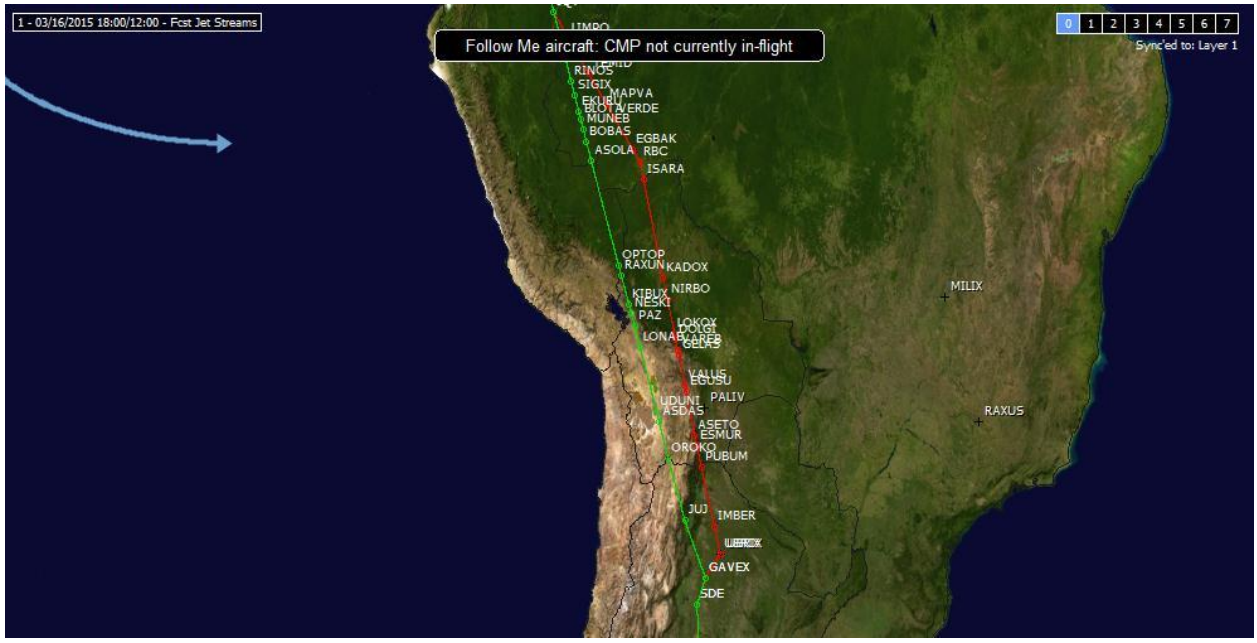
SGAS-MPTO

MPTO-SUMU

SLVR-MPTO

MPTO-SLVR

SACO-MPTO


1 - 03/16/2015 18:00/12:00 - Fcst Jet Streams
Follow Me aircraft: CMP not currently in-flight
0 1 2 3 4 5 6 7
Synced to: Layer 1
RINGS
SIGIX
MAPVA
VERDE
MUNEB
BOBAS
EGBAK
ASOLA
RBC
ISARA
OPTOP
RAXUN
KADOX
NIRBO
KIBUX
NESKI
PAZ
LOKOX
LONAB
VALUS
EGUSU
UDUNI
PALIV
ASDAS
ASETO
ESMUR
OROKO
PUBUM
JUJ
IMBER
GAVEX
SDE
MILIX
RAXUS

Quantification of benefits:							
N°	**ORIGIN-DESTINATION**	**CURRENT NM**	**PROPOSED NM**	**NM/ FLIGHT SAVINGS**	**ANNUAL KG FUEL SAVINGS***	**ANNUAL KG CO2 SAVINGS****	**FLIGHTS PER YEAR**
1	MPTO-SAEZ	2825	2817	8	40,652.93	128,463.27	884
2	MPTO-SBGL	2906	2867	39	209,840.87	663,097.16	936
3	MPTO-SBPA	2737	2724	13	27,201.59	85,957.04	364
4	SBPA-MPTO	2879	2860	19	39,756.18	125,629.52	364
5	MPTO-SBRF	2907	2904	3	3,587.02	11,334.99	208
6	SBRF-MPTO	2909	2906	3	3,587.02	11,334.99	208
7	MPTO-SCEL	2612	2603	9	88,778.83	280,541.11	1716
8	MPTO-SGAS	2448	2434	14	46,033.47	145,465.76	572
9	SGAS-MPTO	2436	2429	7	23,016.73	72,732.88	572
10	MPTO-SUMU	2932	2897	35	115,083.67	363,664.40	572
11	MPTO-SLVR	1883	1874	9	29,592.94	93,513.70	572
12	SLVR-MPTO	1646	1637	9	29,592.94	93,513.70	572
13	SACO-MPTO	2699	2620	79	165,302.00	522,354.32	364
					822,026.22	**2,597,602.85**	

References:
*(NM/FLIGHT SAVINGS)*FLIGHTS PER YEAR*(5.75kg/NM)
**(AHORRO KG FUEL ANNUAL*3.16)

Pre-arrangements between Copa Airlines – States

- MPTO – SBGL: The proposal was refused by the Brazilian State, since it is over a "*one-way*" route for flights leaving SBGL.
- MPTO – SAEZ: Pending confirmation by the Brazilian State if PLG – RBC direct is included in the "*master*" route redesign document.
- MPTO – SBPA: Only involves the Brazilian State. An analysis will be conducted to see if ASAPA – ARMUK direct is included in the "*master*" route redesign document. According to the State, there should be no problem with its inclusion, if so required.
- SBPA – MPTO: The Brazilian State agrees, in the absence of confirmation with the "*master*" route redesign document. The Bolivian State proposes that route SIDAK ALGIB VAROM ASAPA be used.
- MPTO – SBRF: The Brazilian State authorises direct from BRACO (FIR boundary) to some point prior to arrival (*e.g.:* ILNOT); or from VVC if authorised by the Colombian State.
- SBRF – MPTO: The Brazilian State authorises direct from some point after departure (*e.g.*: ILNOT) to BRACO (FIR boundary); or to VVC if authorised by the Colombian State.
- MPTO – SCEL: The Chilean State made two counterproposals *via* OREPI TOKUT EVLIM ATOGO LIM ILMAR TOY ISGUD SIMOK (airways UL780 and UM302).
- MPTO – SGAS: Paraguay made a counterproposal *via* BUSMO PLG IQT RBC TRI VIR UKELA.
- SGAS – MPTO: Paraguay made a counterproposal *via* UKELA VIR TRI RBC IQT PLG BUSMO.
- MPTO – SUMU: Try route using airway UM402 instead of UA556, which is normally used. Use route BUSMO PLG IQT RBC TRI VIR and from thereon, *via* KIMIK SEKLO MUKIB MIGOT ILSIM ETEXU OGLAP ANDAN VUKAS CRR to SUMU.
- MPTO – SLVR: Pending confirmation by the Brazilian State as to the inclusion of PLG – RBC direct in the "*master*" route redesign document.
- SLVR – MPTO: Pending confirmation by the Brazilian State as to the inclusion of PLG – RBC direct in the "*master*" route redesign document.
- SACO – MPTO: The Bolivian State proposes that route JUJ TEBOK RBC or route OVKUL KILEV be used through airway UM784.

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