



**International Civil Aviation Organization
UNDP/ICAO Regional Project RLA/98/003
Transition to CNS/ATM Systems in the CAR and SAM Regions**

**Tenth Meeting/Workshop of ATM Authorities and Planners
of the CAR/SAM Regions (AP/ATM/10)**

(Lima, Perú, from 10 to 14 May 2005)

Item 1: Program for the implementation of RNAV routes in the CAR/SAM Regions

b) Review of the Phase II-b Action Plan

RNAV routes proposed by Brazil

(Paper presented by Brazil)

Summary

This working paper proposes some necessary modifications to the National RNAV Route Implementation Program of Brazil in order to reduce some paths leading to a compatible transition between the en-route and the terminal control area (TMA) flight phases, taking into account the increase in modern technical communications, surveillance and automation resources in the Brazilian FIRs.

The action suggested to the meeting appears in paragraph 4.

References:

- UNDP/ICAO regional project RLA/98/003 – Transition to the CNS/ATM systems in the CAR and SAM Regions;
- Report of the AP/ATM/6 meeting/workshop;
- Reports of the GREPECAS/10 and GREPECAS/11 meetings.

1. Introduction

1.1 The UNDP/ICAO Regional Project RLA/98/003 – Transition to the CNS/ATM Systems in the CAR/SAM Regions, analyzed the various needs for the implementation of RNAV routes in both Regions, with a view to uniting city pairs whose aircraft flows were significant enough to justify said routes. These include several routes which cross the Brazilian airspace, connecting domestic airports with airports in the CAR/SAM, North American and European Regions.

1.2 The AP/ATM/3 meeting established the continuity of pre-operational trials and tests of the set of RNAV routes approved by the GREPECAS/10 meeting. The work done for the approval of these routes was successful, and some of them have been definitively implemented as of March 2003.

1.3 The Brazilian airspace contains most of the international flights crossings in the Region, and, thus, suffers the greatest impact in terms of air traffic control services and coordination. Consequently, it has been necessary to begin an RNAV Route Implementation Program which envisages shorter route paths, and integrates the national RNAV and ATS route network of Brazil with those of neighboring countries.

2. Analysis

2.1 From the point of view of air traffic control and management, the new air flow in Brazil, which involves the Brasilia, Curitiba, Recife, Amazónica and Atlántico FIRs, as well as the SIDs and STARs of the main terminal control areas, guarantees the transition between en-route and TMA flights, properly linking airports with domestic and international routes through specific arrival and departure sectors. This aeronautical flow model is mainly based on the use of the national route network, and is supported by upper and lower ATS routes.

2.2 The studies for the Brazilian RNAV Route Implementation Program (GREPECAS/11 **Conclusion 11/21**) seek the harmonization between the domestic route network and international RNAV routes, the realignment of existing routes, and the conversion of some of these into RNAV routes for their common and optimized use by domestic and international air traffic, reducing flight times, even during the departure and arrival phases in Brazilian aerodromes.

2.3 In this sense, according to that established by the GREPECAS/11 meeting (**Conclusion 11/21**), the Brazilian aeronautical administration has begun studies for the implementation of a group of RNAV routes between the main capitals of the SAM States and the main capitals of Brazil, as well as for flights that will use Brazilian airspace heading to airports in Europe and the United States. These studies are based on the needs defined by Project RLA/98/003, as well as on subsequent air traffic evolution analyses. The results of these studies were submitted to the AP/APTM/5 meeting, which approved conclusions favoring the implementation, realignment and elimination of RNAV routes, which would be proposed through amendments to the Regional Air Navigation Plan.

2.4 In addition to changes in the Brazilian aeronautical flow with the inclusion, realignment and elimination of international and domestic RNAV and ATS routes, the Brazilian airspace management authorities have decided to also include the new Amazónica FIR to replace the Porto Velho, Manaus and Belem FIRs, and to adjust the boundaries between the other FIRs (Curitiba, Brasilia and Recife) as of 10 June 2004, in order to optimize the use of communication and radar display systems.

2.5 Consequently, and taking into account that all the technical communication, display and system automation resources are available, and that we can treat all the Brazilian upper airspace as upper control area (UTA), we must seek the best paths for the routes, so that users can save fuel through the realignment, activation and elimination of RNAV routes.

3 Conclusion

3.1 Taking into account the large size and location of the Brazilian airspace in the CAR/SAM setting and the need to harmonize routes, it is important for some of the adjacent States to understand the need for the proposed modifications to the Brazilian RNAV route implementation program, the content of which is contained in **Appendix A** to this working paper.

4 **Suggested action**

4.1 The meeting is invited to create working groups to analyze in detail the route segments of the Brazilian RNAV Route Implementation Program, and to formulate appropriate conclusions with a view to applying the implementation date mentioned in **Appendix B** to this working paper.

Appendix A

MODIFICATIONS TO THE BRAZILIAN RNAV ROUTE PROGRAMME

INTERNATIONAL RNAV ROUTES TO BE IMPLEMENTED

RNAV	PROPOSED SEGMENT IN THE BRAZILIAN AIRSPACE	COMMENTS
UM xx1	VOR FRM/POLAN/VUMPI (SU)	Serves the traffic from Rio de Janeiro to Miami. Follows route UL795 starting in VUMPI
UMxx2	VOR BVI/TAROP/VOR PSN (SU)	Serves all aircraft coming from Central America along routes UA300 or UA304 destined to Sao Paulo, entering the Amazónica FIR through ISANI or PAKON. This route crosses the restricted airspaces SBR 601 and SBR 602. Once these airspaces are activated, the segment TAROP/VOR PSN will be eliminated and deviated to TAROP/XINGU/SAMAR/VOR BAG/VOR PSN.
UMxx3	VAGAN/TAROP/VOR PSN (SU)	Serves all aircraft coming from Central America along route UA315 destined to Sao Paulo, entering the Amazónica FIR through VAGAN. This route crosses the restricted airspaces SBR 601 and SBR 602. Once these airspaces are activated, the segment TAROP/VOR PSN will be eliminated and deviated to TAROP/XINGU/SAMAR/VOR BAG/VOR PSN.
UMxx4	VOR SVD/VOR PTL/VOR BEL-SIMOL/OTONI (DS)	This route has been requested by the Brazilian airline for its flights from Salvador to Central America and Miami. It is proposed that its path be extended to the ZY (ZAMBERY) VOR or beyond.
UMxx5	VOR REC/CLARK/VOR CYR (CAYENNE) (DS)	As for route UMxx4, this route has been requested by the Brazilian airline for its flights from Recife to Central America and Miami.
UMxx6	VOR POR/VOR FOZ/ARGOS/VOR PVH (DS)	As for route UMxx5, this route has been requested by the Brazilian airline for its flights from Porto Alegre to Central America and Miami.
UMxx7	VOR TIM (TIMEHRI)/VOR MAN(DS)	As for route UMxx6, this route has been requested by the Brazilian airline for its flights from Europe and the Caribbean to Manaus.

Legend: SU = One way; DS = Two ways

INTERNATIONAL RNAV ROUTES TO BE ELIMINATED/EXTENDED		
RNAV	CURRENT SEGMENT IN BRAZILIAN AIRSPACE	NEW SEGMENT/JUSTIFICATION
UL304	VOR BRS/POLAN/TESAL/DARLO/TEPIM/PUERA/VOR BVI/ISANI (DS).	VOR BCO/NDB PCL/VOR GOI/TERES/DARLO/TEPIM/PUERA/VOR BVI/ISANI (SU). Reduces the distance from São Paulo to ISANI
UL201	VOR TUY/ABIDE/CLOTI/DEMUR/NAFTA/EGLER/.....VOR PSN (SU).	VOR MTU/ABIDE/CLOTI/BUMBA/EGLER/.....VOR PSN (SU). Harmonizes the reporting point of other routes.
UL795	VUMPI/TANGO/.....VOR ATF/.....VOR BAG/..... VOR PSN. (DS TODO EL TRAMO).	Maintains the original path, but changes to one way from MTU VOR to PSN VOR. Harmonizes the route with the entry sector in the São Paulo TMA.
UM548	VOR VAS/ROLOK/GAXAS/CRANE/RENAN//PIPAL/VERBO/VOR CTB (SU)	VOR VAS/VOR FOZ /ILBEK/VOR CTB (DS). Permits its use for flights from Curitiba to Asuncion, stopping in Foz del Iguazú.
UM782	NDB BRU/VOR CIA/.....VOR TUY	VOR SCB/NDB BRU /VOR CIA/.....VOR TUY (SU) from VOR SCB to NDB BRU; (DS) segment NDB BRU/VOR CIA; (SU) from CIA VOR to TUY VOR. Harmonizes the route with the exit sector of the São Paulo TMA.

Legend: SU = One way; DS = Two ways

ATS INTERNATIONAL ROUTES –UPPER AIRSPACE- TO BE ELIMINATED

ATS ROUTE	CURRENT SEGMENT IN BRAZILIAN AIRSPACE	SEGMENT TO BE ELIMINATED/JUSTIFICATION
UB695	VOR BRS/VOR URP/.....KALAD/VOR VAS.	ELIMINATE SEGMENT BRS VOR/URP VOR. Route UB688 already serves this segment.
UA 315	VAGAN/VOR MAN/VOR JAC/VOR ATF	ELIMINATE SEGMENT MAN VOR/JAC VOR/ATF VOR. Route UW9 is more direct, and already serves this segment.
UR640	VOR MAM/NEBIL/VORPAY (DS)	ELIMINATE SEGMENT MAM VOR/NEBIL/PAY VOR (DS). Route UZ6 serves this segment. Requires an agreement with Venezuela.

Legend: SU = One way; DS = Two ways

In addition to the above, the following tables refer to changes in the domestic route network that will be used as a supplement or extension to international RNAV routes in order to permit flights with more direct segments, and entries and exits through different sectors of the TMAs involved.

DOMESTIC RNAV ROUTES TO BE IMPLEMENTED

RNAV	SEGMENT	OBS.:
UZxx	TAROP/XINGU/SAMR/VOR SVD(SU)/NDB BBC	Will be used to serve the traffic going to the Sao Paulo TMA along routes UMxx2 and UMxx3, once the restricted airspaces SBR 601 y SBR 602 are activated.

Legend: SU = One way; SD = Two ways

DOMESTIC RNAV ROUTES TO BE REALIGNED/EXTENDED

RNAV	CURRENT SEGMENT	NEW SEGMENT
UZ6	NEBIL/VOR MAN/VOR BRS (DS).	TANGO/VOR MAN/VOR BRS (SU). This route permits different paths between Brasilia and Manaus, and also replaces route UR 640.

Legend: SU = One way; SD = Two ways

Appendix B

**Action plan to make modifications to the Brazilian
 RNAV Route Implementation Program**

Activity	Beginning	End	Remarks
Collection of information	10/06/04	15/04/05	Period completed
Establishment of geographic coordinates	14/03/05	5/9/03	Underway
Discussion of proposals at the AP/ATM/10 meeting	14/05/05	31/05/05	Underway
Preparation of the proposal of amendment to the CAR/SAM ANP	To be defined at the AP/ATM/10 meeting		Waiting for information on the geographic coordinates at significant points in order to define the routes in question.
Circulation of the proposed amendment to the CAR/SAM ANP to the States	To be defined by the Secretariat of the ICAO SAM Office		One month for receiving comments on the proposed amendment.
Delivery of the proposed amendment to the ICAO Council for approval	To be defined by the Secretariat of the ICAO SAM Office		As soon as the information from the States is received.
Internal tasks of each State in preparation for the implementation, extension and/or elimination of ATS routes	N/A	N/A	The internal tasks of each State can be performed in parallel to the approval process by the ICAO Council, making the necessary adjustments after the approval by the Council.
Publication and reception of amendments by the aeronautical user	To be defined by the Secretariat of the ICAO SAM Office		The date to begin circulating the amendments shall be coordinated among the States so as to have a single date.
Entry into effect of the routes and their SID/STAR supplements /domestic ATS/RNAV routes necessary for joint implementation.	Three AIRAC cycles as of the approval by the ICAO Council		The effective date of the amendments shall be three AIRAC cycles following the date of publication/reception of the amendment by the aeronautical user.