



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

**Sixth Meeting/workshop of Air Traffic Management (ATM) Authorities and
Planners for RVSM, RNAV routes and RNP implementation in the CAR and SAM Regions**

(San José, Costa Rica, 29 September-3 October 2003)

Agenda Item 2: Action Plan for RNP Implementation in the CAR/SAM Regions

b) Review of the CAR/SAM RNP Application Strategy

Proposal for the updating of the FASID ATM Evolution Tables

(Presented by the RNAV/RNP Rapporteur)

Summary

This working paper presents a proposal to update the ATM Evolution Tables taking into account the need for the establishment of new implementation dates and new RNP values for each flow of the CAR/SAM Regions. In addition, this note also presents a CAR/SAM RNP implementation strategy, based on the statistical data presented by the CARSAMMA.

References

- Annex 11 – Air Traffic Services
- Doc. 4444/ATM/501 – Air Traffic Management
- Doc. 9689/AN/953 – Manual on Airspace Planning Methodology for the Determination of Separation Minima
- Doc 9613/AN/937 – Manual on Required Navigation Performance (RNP)

1. Introduction

1.1 As it is of general knowledge, the application of air navigation techniques (RNAV) in several parts of the world has already demonstrated a significant number of advantages on the conventional navigation modes, that include:

- a) establishment of more direct routes, allowing flight distances reduction;

- b) establishment of optimum localization for flight; and
- c) reduction of the number of air navigation radioaids.

1.2 In this context, the Required Navigation Performance (RNP) is one of the possible changes in the airspace current structure, which is determined by factors such as: airspace user demand, lack of airspace capacity and/or availability of last generation technologies, on board of aircraft and/or from the Air Traffic Service provider.

1.3 Besides the RNP, there are several ways of attending the necessary airspace changes, that include:

- a) Improve the level of air traffic services supply;
- b) Reduce the separation minima;
- c) Improve ATC intercession capacity;
- d) Review routes structure; and
- e) Restrict air traffic services demand.

1.4 Consequently, the airspace planner, after evaluating the need for a change in the airspace structure, in order to gain the necessary operational benefit, should use the systems current data and new technologies to evaluate which airspace characteristics could be changed.

1.5 Whichever the proposed change is, an important factor in the process evaluation should be the cost-benefit analysis, followed by the determination of priorities of the reasonable alternatives. It is not probable that aircraft operators and ATS providers invest in new equipment without cost-benefit decisive studies that could demonstrate the financial viability of such investment. The guidance material for all the process of airspace change and determination of the separation minima is contained in ICAO Doc 96897AN7953 - Manual on Airspace Planning Methodology for the Determination of Separation Minima.

1.6 The benefits for RNP implementation in a specific airspace are not very clear regarding RVSM, taking into account that the RVSM could be implemented as well in the airspaces where there is no significant air traffic demand, in order to allow only the users flight in their optimum profiles. Contrary to the above, RNP is only justified in airspaces where the demand cannot be attended in the actual airspace structure or by the implementation of more simple ways of increasing airspace capacity.

2. **Updating of the ATM evolution tables**

2.1 Part 5 (Air Traffic Management) of the Document on Facilities and Services of the CAR/SAM Regions (FASID CAR/SAM) contains the details of the facilities and services to be provided to satisfy the basic requirements of the CAR/SAM Air Navigation Plan and correspond to an agreement between provider and user States. In such agreement the commitment of the States interested in the implementation of the specified requirements, is indicated. This element of the FASID, together with the CAR/SAM ANP, is object of constant revision by GREPECAS in accordance with its management

schedule, in consultation with user and provider States and with the assistance of the ICAO North American, Central American and Caribbean (NACC) and South American (SAM) Offices.

2.2 The RNP implementation dates have already been trespassed and need an updating. In addition, there are some RNP values that need to be changed, taking into account that there RNP values appropriate for oceanic and remote airspaces (RNP 12, 6, RNP 10 and RNP 4) and other values for continental airspaces (RNP 5, RNP4 and RNP 1), as foreseen in Appendix B of Annex 11 to the International Civil Aviation Convention. In case of RNP 4, its application to oceanic/remote airspaces or continental airspaces will, obviously, depend on the airspace where the RNP will be applied and of the aircraft and operators operational approval process.

2.3 In general terms, the updating proposal of the RNP implementation dates was based in the following aspects.

- a) there is no significant air traffic demand in the CAR/SAM Regions that urges the RNP implementation in a short term. The demand has really decreased in most of the CAR/SAM Regions;
- b) RVSM implementation will demand great efforts from the CAR/SAM States and International Organizations involved in the process, turning it difficult to visualize the time of the State experts and international organizations for the necessary studies for a short term RNP implementation;
- c) Aircraft and Operators Approval Process documentation demands time and experts involved in this matter for its development.

2.4 Taking into account the issued mentioned in paragraphs 2.2 and 2.3 above, the main changes in the ATM evolution tables, attached as **Appendix A** to this working paper, are the following:

- a) Change in the starting date of RNP implementation in every traffic flow for 2007, with the exception of RNP values already or almost implemented (EUR/SAM corridor and Santiago de Chile/Lime routes).
- b) Exclusion of RNP 10 and RNP 4 (separation minima 30/30 NM) of continental airspaces.
- c) Exclusion of some comments of the tables that were considered irrelevant.
- d) Insertion of some comments on the need for the development of RNP operational approval process documentation.

3. **Possibility of anticipation of RNP implementation in some FIRs**

3.1 Whereas the proposal for RNP implementation date in every traffic flow of the CAR/SAM Regions is 2007, there are some FIRs involving a significant part of the air traffic and that should be deeply analyzed.

3.2 The airspaces of the CAR/SAM Regions are very different and involve continental airspaces, of low and medium density, remote and oceanic airspaces. Additionally, air traffic movements are concentrated in some areas, turning very difficult to find a unique RNP value to be applied homogeneously

in the CAR/SAM Regions. That is why, the CAR/SAM FASID makes implementation predictions by traffic flow.

3.3 However, the implementation by traffic flow is also very difficult, taking into account that these flows partially involve some FIRs. In this way, we could reach a partial RNP implementation, which will mean a mix operation, with an RNP operation in part of a FIR and without RNP in the other part, or even, an RNP “X” operation and RNP “Y” in the same FIR. These will increase the complexity of the operations, the workload of the controller and will difficult the ATC personnel training. The air traffic movement analysis by Homogeneous Area and Traffic Flow is attached as **Appendix B** to this working paper.

3.4 Taking into account paragraphs 3.2 and 3.3 above, a more efficient way of implementing RNP would be to identify the regions with major air traffic density in which RNP could be implemented homogeneously.

3.5 Using the CARSAMMA provisional database, which does not yet include all the data of the CAR/SAM States, it is possible to identify some areas that could be more deeply studied, envisaging the possible anticipation of RNP implementation.

3.6 One of the areas, is the one corresponding to Brasilia, Curitiba, Ezeiza and Montevideo FIRs, that has the following air traffic movement characteristics, according to the CARSAMMA database, composed by the data received from the CAR/SAM States and based on the month of December 2002:

- a) Data was collected from 47.822 flights, between FL 290 and 410, in the Brasilia, Curitiba, Ezeiza and Montevideo FIRs, corresponding to the 50,5% of the air traffic movement of the CAR/SAM Regions. The movements of the CAR/SAM Regions FIRs are attached as **Appendix C** to this working paper.
- b) When analyzing the 20 city pairs with major air traffic movement, 19 originate or arrive at a city located in one of the mentioned FIRs. The movements of the first 20 city pairs with major air traffic movement are attached as **Appendix D** to this working paper, totaling 11.540 movements.
- c) Considering the flights of the 20 more used aircraft types in the Brasilia, Curitiba, Ezeiza and Montevideo FIRs, representing 41.809 flights, 86,71% of the total movement, it could be noted that 10% are of ancient aircraft, that could have any difficulty to obtain an RNP approval (B732, B722, MD80 and LJ35). The movements of the flights of the 20 more used aircraft types in the Brasilia, Curitiba, Ezeiza and Montevideo FIRs are attached as **Appendix E** to this working paper.

3.7 The studies of RNP implementation in the Brasilia, Curitiba, Ezeiza and Montevideo FIRs could be based in RNP 5 implementation in Europe, considering that:

- a) that area of the SAM Region has good air navigation radioaids coverage;
- b) the spacing foreseen for RNP 5 (18 NM for bi-directional routes and 16,5 NM for unidirectional routes) will offer conditions for an adequate airspace restructure;

- c) the reference material of EUROCONTROL will be used as an important starting point.

3.8 Another area identified as a potential area for RNP implementation is Havana FIR, which has the following air traffic movement characteristics, according to the CARSAMMA database, composed by the data received from the CAR/SAM States and based in the month of December 2002:

- a) Data from 13866 flights was collected between FL 290 and 410 in the Havana FIR, corresponding to 14,64% of the air traffic movement of the AR/SAM Regions. The Havana FIR movements are included in **Appendix C** to this working paper.
- d) Considering the flights of the 20 more used aircraft types in the Havana FIR, representing 1.242 flights, 88,29% of the total movement, it could be noted that 11,5% are ancient aircraft, that could have some difficulty to obtain RNP approval (B722, B732, DC86, DC87 y MD80). The movements of the flights of the 20 more used aircraft types in the Havana FIR are attached as **Appendix F** to this working paper.

3.9 In addition to the air traffic movements in the Habana FIR, the main reason for RNP implementation would be the possible airspace restructure, necessary to optimize the air traffic flow from the CAR/SAM Regions to the United States, mainly to Miami city.

3.10 The studies on RNP implementation in the Havana FIR could be based in the Separation and Airspace Safety Panel for RNP 4 implementation in oceanic airspaces, considering that:

- a) Havana FIR could be considered as oceanic airspace, taking into account its situation and the limited air navigation radioaids coverage.
- b) The space foreseen for an RNP 4 in an oceanic airspace is of 30 NM, offering conditions for an adequate airspace restructure, having the intersections of the CAR/SAM Regions for the NAM Region.
- c) The aircraft and operators operational approval document is in its final phase of development in the SASP.

3.11 It is important to emphasize that RNP 4 implementation obliges a data link capacity (ADS/CPDLC), on board of the aircraft as well as in the ATS unit involved, in the Havana ACC case.

3.12 Adding the air traffic movements of the Brasilia, Curitiba, Ezeiza, Havana and Motevideo FIRs, a total of 61.688 monthly movements is reached, representing about 65% of the total movement of the CAR/SAM Regions, included in the CARSAMMA database.

4. **Advantages and disadvantages of the RNP implementation strategy proposal**

4.1 The advantages of the RNP implementation strategy proposal are the following:

- a) RVSM implementation in the CAR/SAM Regions on 20 January 2005 could cause a significant change in the aircraft fleet flying in the CAR/SAM Regions, including more modern aircraft, facilitating RNP implementation process;

- b) RNP implementation in the Brasilia, Curitiba, Ezeiza, Havana and Montevideo FIRs will involve about 65% of the air traffic movement of the CAR/SAM Regions;
- c) The necessary studies for RNP implementation in the above mentioned FIRs will involve experts of only 4 States of the CAR/SAM Regions, avoiding the workload increase of the experts from the other States, which will be devoted to RVSM implementation.

4.2 The disadvantages of the RNP implementation strategy proposal are the following:

- a) Taking into account the complexity of the studies necessary for RNP application, the proposal of starting RNP values studies at the same time (RNP 5 and RNP 4 oceanic) could be considered a disadvantage;
- b) The lack of experience of the States of the CAR/SAM Regions in the development of Guidance Material for Aircraft and Operators Approval could represent an important impediment for RNP implementation.

5. **Suggested Action**

5.1 The meeting is invited to:

- a) take note of the information contained in this working paper; and
- b) approve the adoption of the following draft conclusions:

Draft Conclusion AP/ATM/6/X

Updating of the CAR/SAM ATM Evolution Tables

That the proposals for amendment to the CAR/SAM ATM Evolution Tables, included in **Appendix X** to this part of the report, be submitted to the GREPECAS ATM/CNS Subgroup to initiate the approval process.

Draft Conclusion AP/ATM/6/X

Análisis of RNP implementation in the Brasilia, Curitiba, Ezeiza, Havana and Montevideo FIRs

That the RNAV/RNP task force, with the support of the Argentina, Brazil, Cuba and Uruguay experts, initiates the RNP implementation viability studies in the Brasilia, Curitiba, Ezeiza, Havana and Montevideo FIRs.