



**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 3: Review of the issues related with RVSM Implementation in the CAR/SAM  
Regions**

**a) ATC Operations Working Group (ATC/WG)**

(Presented by Brazil)

**Summary**

This working paper presents proposals for modification of CONOPS RVSM and publication of a new AIC RVSM, based on the results of the Brazilian ATC RVSM Simulation.

**1. Introduction**

1.1 Some issues of the ATC/WG depends on the results of ATC Simulations, taking into consideration that the implementation of RVSM should follow the peculiarities of the CAR/SAM Regions, in terms of ATC infrastructure, ATCO workload, traffic density, etc.

1.2 In this regard, beside the objective to obtain data to decide about the best way to implement the RVSM in the Continental Brazilian Airspace, the RVSM ATC Simulation carried out in Brazil, object of the previous working paper, have already had the aim to follow the Conclusion AP/ATM/5/26 (ATC RVSM Simulations) and Conclusion AP/ATM/5/27 (Aspects to evaluate in ATC RVSM simulations), in order to get some additional data to help GREPECAS, through AP/ATM Meetings, to decide about the aspects mentioned in both conclusions.

**2. Aspects to evaluate in ATC RVSM simulations, based on conclusion AP/ATM/5/27**

**2.1 Evaluation of RVSM application in the RVSM exclusionary and non-exclusionary  
airspace**

2.1.1 The ATC RVSM Simulation in Brazil indicated that it is possible to accommodate non RVSM approved aircraft in an operational configuration of small/medium traffic density, in large sectors of control, which normally occurs when some sectors are grouped into a single sector. It is very important to emphasize that the simulation occurred in an ideal environment, with fully radar coverage and fully ground/ground and ground/air communication, that normally occurs in all Brazilian FIR's. However, if these ideal conditions are temporarily suspended due to maintenance or

unexpected outages, it will be very difficult to accommodate the majority non approved RVSM aircraft in the RVSM Airspace. So, the conclusions that could be obtained by Brazilian FIR, that may be used as an example to further studies in other FIR's are the following:

- a) Brasília FIR – The simulation in the Brasília FIR was made during non peak hours, with low/medium traffic movement, with sectors from Rio de Janeiro Region (sectors 8, 9, 10 e 11) grouped in a single sector and from São Paulo Region (sectors 1,2, 3 e 14) grouped in a single sector as well. This operational configuration occurs normally between 02:00/08:00 UTC. So, taking into consideration that all non RVSM approved aircraft were easily accommodated in the RVSM Airspace, during the ATC simulation, in the requested flight levels, it was possible to conclude that it will be possible to accommodate non approved aircraft during the non peak hours, between 02:00/08:00 UTC. A traffic analysis made during the peak hours indicated that some portions of Brasília FIR should be object of further studies, taking into consideration the airspace characteristics (ATS Route crossing, small sectors, traffic density). In this regard, further simulation will be necessary to determine the possibilities of accommodation in Brasília FIR in the remaining periods, out of 02:00/08:00 UTC.
- b) Belém, Manaus e Porto Velho FIR – Taking into consideration the parameters developed by the simulation, that indicated that it will be possible to accommodate non RVSM aircraft in low/medium traffic movement environment in large sectors, the existent traffic movement and operational configuration in Belém, Manaus and Porto Velho FIR indicate that it will be possible to accommodate non RVSM approved aircraft most of the time. During the peak hours, that normally occur during the night, but is often used by International Flights, the accommodation of non approved RVSM aircraft probably would not be necessary, taking into consideration that these flights will be RVSM approved, in accordance with CONOPS CAR/SAM.
- c) Curitiba FIR – The inclusion of two sectors, grouped into single one, of Curitiba ACC in the simulation had the objective to measure the coordination process between Brasília and Curitiba ACC. So, there was no sufficient data to define the possibilities of accommodation in Curitiba FIR and further simulation will be necessary, especially to analyze the peak hours movement.
- d) FIR Recife – The full operational configuration of Recife ACC most of the time is composed by 6 sectors grouped 2 by 2 (sectors 1/2, 3/4 and 5/6). In this configuration, with the traffic movement existent it will be possible to accommodate non RVSM approved aircraft, except during the peak hours, that normally occurs between 18:00 and 21:00 UTC. In this regard, further simulation will be necessary to determine the possibilities of accommodation in Recife FIR in the peak hours.

## 2.2 **Detection of necessary specific procedures to be developed**

2.2.1 Procedures to accommodate non RVSM approved aircraft into RVSM airspace are fundamental for the States that have made the option to implement RVSM as a non exclusive airspace. The procedures developed to the Brazilian Continental RVSM ATC Simulation should be reviewed by the meeting in order to be inserting in the RVSM CONOPS and/or be used by States and International Organization as guidance to the development of Domestic Plans to Accommodate Non RVSM Approved, in accordance with the Conclusion AP/ATM/5/33. These procedures adopted to accommodate non RVSM approved aircraft into RVSM Airspace were the following:

- a) Blockage of the adjacent flight levels, above and below of the cleared flight level of the non approved RVSM aircraft, maintaining this aircraft in the cleared flight level while the traffic situation permits it.
- b) Climb or descent the non approved RVSM aircraft 2000' (bidirectional routes) or 1000' (unidirectional routes), depending on, respectively, if there is another conflict traffic in the adjacent flight below or above, of the non approved RVSM aircraft.
- c) Climb or descent the non approved RVSM aircraft 4000' (bidirectional routes) or 3000' (unidirectional routes), if there are conflict traffics in both flight levels, above and below of non approved RVSM aircraft.
- d) Remove the non RVSM approved aircraft from the RVSM airspace.

2.2.2 It's important to emphasize that these procedures involve just vertical separation. The longitudinal and lateral separation was applied in accordance with the standard procedures of each ACC.

**2.3 Application the aeronautical RVSM phraseology**

2.3.1 The RVSM phraseology applied during the simulation was based on the phraseology of the draft version 0.2 of the ATC Guidance Material for RVSM Training in the CAR/SAM Regions. However, this phraseology was first developed for the European Airspace, which does not allow any kind of non RVSM aircraft in the RVSM Airspace, except State aircraft. For airspace where it will be possible to accommodate non RVSM aircraft into RVSM airspace it will be important to develop a specific phraseology, particularly to inform an estimated of ingress in the RVSM airspace, in case of not being possible to immediately authorize the non RVSM aircraft into the RVSM airspace. In the simulation was adopted the following phraseology:

**(call sign) UNABLE CLEARANCE INTO RVSM AIRSPACE, MAINTAIN [or DESCEND TO, or CLIMB TO] FLIGHT LEVEL (number). EXPECT CLEARANCE TO ENTER RVSM AIRSPACE AT (TIME OR FIX)**

**2.4 Impact of RVSM suspension due to greater grade of severity than moderate turbulence**

2.4.1 The meeting should review the flight level allocation scheme for total suspension of RVSM due to turbulence greater than moderate, taking into consideration the necessity of procedures harmonization among all ACC's involved in the RVSM Operations in the CAR/SAM Regions. The flight level allocation scheme used during the simulation was the following:

Magnetic Track	000° a 179°	180° a 360°
Flight Level	⇨ FL 330	⇨ FL 300
	⇨ FL 390	⇨ FL 360

## 2.5 **Training of ATC personnel**

2.5.1 The RVSM simulation was used as a beginning of the training of ATC personnel, taking into consideration that the personnel involved in the simulation belongs to 3 different Brazilian ACC's and these personnel will be responsible for the dissemination of information regarding the RVSM. The Brazilian Guidance Material for ATC training is under development, based on the results of the simulation.

## 2.6 **Aircraft altitude systems failure**

2.6.1 During the simulation, the procedures applied to the aircraft with altitude systems failure or unable RVSM due to turbulence were the same procedures applied to accommodate the non RVSM aircraft into RVSM airspace.

2.6.2 During the Brazilian Continental RVSM ATC Simulation the aircraft that lost the RVSM capability was maintained in the RVSM Airspace, even in the scenario 2 (exclusive airspace). In this regard, the RVSM CONOPS should reflect a decision about maintaining or not the aircraft that lose the RVSM Capability in an exclusive RVSM airspace, mainly for the States that decide for a RVSM exclusive airspace.

## 3. **Proposal for a new AIC RVSM**

3.1 During the RVSM simulation the CAR/SAM RVSM CONOPS was fully applied, and it was very clear for the personnel involved that the CONOPS is suitable for RVSM Implementation in the CAR/SAM Regions. One of the concepts most applied during the development of procedures applicable to accommodate non RVSM aircraft in the RVSM airspace was the concept of giving preference of level allocation for RVSM approved aircraft over non-RVSM approved aircraft.

3.2 In the paragraph 4.1 of the AIC RVSM, published on April 19, 2003 was stated that any further restrictions on non RVSM approved aircraft flights will be published prior to 20 January 2005. In this sense, the preference of level allocation for RVSM approved aircraft constitutes a restriction to the non RVSM approved aircraft. Other important restriction is that the non RVSM approved aircraft will not be allowed to flight plan into RVSM airspace, and both should be published as soon as possible.

3.3 So far very few operators started the process to approve their fleet to RVSM operations, probably because they have no idea about the restrictions to their flights after RVSM implementation. Other aspect to be mentioned is that some operators are in process of changing their fleet and they should know about the restriction to the non RVSM approved aircraft, in order to decide about the best option for their new fleet. For the States that decided to accommodate non RVSM approved domestic flights into the RVSM airspace, it will be very important to publish a new AIC that specify the restrictions to the non RVSM approved aircraft, in order to stimulate the operators to approve their fleet to the RVSM operations.

## 4. **Suggest Action**

4.1 The meeting is invited to:

- a) take note of the information provided in this working paper;
- b) evaluate the procedures to accommodate non approved RVSM aircraft into the RVSM airspace and Aircraft altitude systems failure, developed for the Brazilian ATC RVSM Simulation, and consider the convenience to include them in the CONOPS RVSM;

- c) evaluate the phraseology adopted during Brazilian ATC RVSM Simulation to inform an estimated of ingress in the RVSM airspace, in case of not being possible to immediately authorize the non RVSM aircraft into the RVSM airspace, and consider the convenience to include it in the “Guidance Material on the Implementation of a 300 m (1 000 ft) vertical separation minimum (VSM) between FL 290 and FL 410 inclusive for application in the airspace of the Caribbean and South American Regions”, together with the proposal made in the working paper 12 from secretary;
- d) evaluate the flight level allocation scheme adopted for RVSM suspension due to greater grade of severity than moderate turbulence and consider the convenience to include in the CONOPS RVSM;
- e) evaluate the convenience to publish a new AIC RVSM, considering the aspect mentioned on item 3.