

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

**Third Meeting/Workshop of Air Traffic Management (ATM) Authorities and Planners  
(Lima, Peru, 20.24 May 2002)**

**Agenda Item 4: Analysis of the Action Plan for RVSM Implementation in the CAR/SAM Regions**

**GUIDANCE MATERIAL FOR DEVELOPING  
A NATIONAL RVSM IMPLEMENTATION PLAN**

(Presented by the Secretariat)

**Summary**

This working paper examines the need to develop national RVSM implementation plans that are compatible with the Regional RVSM Implementation Programme and presents guidance material for preparing the respective national plans for consideration by the meeting.

**References:**

- Document 9574
- Example of a national RVSM plan prepared by Eurocontrol

**1 Introduction**

1.1 As we have seen, the RVSM implementation strategy is based on its execution in all of the Flight Information Regions (FIRs) of the CAR/SAM Regions. This means that regional agreements are needed for its execution, together with a formal commitment by all of the parties involved, States, ATS service providers, operators and international organizations, for a safe, orderly and efficient implementation.

**2 Analysis**

2.1 The States should meet the requirements concerning regulations, safety assessment, development of procedures, personnel training, quality assurance, preparation of manuals and publications and, more important, the establishment of a national RVSM implementation programme that covers all of these aspects.

2.2 This national RVSM programme should be in line with and fall within the Regional RVSM implementation programme. Officials should be assigned to take responsibility for the programme and should have sufficient authority to act as counterparts to the Regional Programme. Furthermore, each State and service provider should make a commitment to obtain the necessary funds and assign a budget for the programme in order to ensure that it is carried out without any mishaps, through their active involvement in the events that are carried out in the region, the training programmes, dissemination of the programme, etc.

2.3 In keeping with the above, guidance material has been prepared for drafting a national plan for the implementation and operation of a 300-meter (1000 ft) vertical separation minimum between FL290 and FL410, which is being submitted to the meeting for its consideration. If the meeting deems it advisable, it could be used by States and service providers to prepare their own RVSM implementation plans.

2.4 The main purpose of the plan would be to identify the activities and tasks that should be carried out for the implementation and safe operation of the RVSM in the FIRs involved.

2.5 This plan contains different chapters that are considered vital for RVSM implementation. They provide a general description of the tasks that each State should perform, establish the safety requirements and identify the impact on RVSM implementation of failure to perform the tasks in question in the way and by the deadlines specified for each of them.

### 3 Suggested action

3.1 The meeting is invited to review the guidance material for preparing a national plan for the implementation and operation of a 300-meter (1000 ft) separation minimum between FL 290 and FL 410 (Appendix to this working paper) and if it deems it advisable, to approve the following draft Conclusion:

#### **Draft Conclusion APATM3/XX**

#### **National RVSM implementation plan**

That the States, Territories and service providers of the CAR/SAM Regions:

- a) draw up a national RVSM implementation plan that is in line with the regional RVSM implementation programme;
- b) use the guidance material contained in Appendix **XX** to this part of the Report as a basis for the development of said document; and
- c) inform the respective ICAO NACC and SAM Regional Offices the name, position and address of the contact person responsible for co-ordinating with the regional RVSM programme.



# **DRAFT**

## **GUIDANCE MATERIAL FOR THE ELABORATION OF A**

### **NATIONAL PLAN FOR THE IMPLEMENTATION AND OPERATION OF THE 300 M (1 000 FT) REDUCED VERTICAL SEPARATION MINIMUM BETWEEN FL 290 AND FL 410 (RVSM) IN ..... (*name of the State*)**

(Lima, 20 May, 2002)

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### LIST OF ACRONYMS USED IN RVSM

AAD	assigned altitude deviation
ACAS	airborne collision avoidance system
ACC	area control centre
ASE	altimetry system error
ATC	air traffic control
ATS	air traffic services
CFL	cleared flight level
CMA	central monitoring agency
CRM	collision risk model
FAA	Federal Aviation Administration
FL	flight level
FMS	flight management system
FTE	flight technical error
GAT	general air traffic
GMS	GPS-based monitoring system
GMU	GPS-based monitoring unit
GPS	global positioning system
HF	high frequency
HMU	height monitoring unit
JAA	Joint Aviation Authority
MASPS	Minimum aircraft system performance specification
MNPS	minimum navigation performance specification
NAT	North Atlantic
NAT SPG	North Atlantic Systems Planning Group
NOTAM	notice to airmen
OAT	operational air traffic
PEC	position error correction
PMS	performance management system
QFE	atmospheric pressure at aerodrome elevation ( <i>or</i> at runway threshold)
QNH	altimeter subscale setting to obtain elevation when on the ground++
RGCSP	Review of the General Concept of Separation Panel
RMA	regional monitoring agency
RNAV	area navigation
RPG	regional planning group
RVSM	reduced vertical separation minimum of 300 m (1 000 ft) between FL 290 and FL 410 inclusive
SD	standard deviation
SSE	static source error
SSR	secondary surveillance radar
TLS	target level of safety
TVE	total vertical error
VSM	vertical separation minimum

### LIST OF DEFINITIONS MOSTLY USED IN RVSM

**Altimetry system error (ASE).** The difference between the altitude indicated by the altimeter display assuming a correct altimeter barometric setting and the pressure altitude corresponding to the undisturbed ambient pressure.

**Altimetry system error distribution.** The distribution of an aggregate altimetry system error.

**Altitude-keeping device.** Any equipment which is designed to automatically control the aircraft to a referenced pressure altitude.

**Assigned altitude deviation (AAD).** The difference between the transponded Mode C altitude and the assigned altitude/flight level.

**Collision risk.** The expected number of mid-air aircraft accidents in a prescribed volume of airspace for a specific number of flight hours due to loss of planned separation.

*Note.— One collision is considered to produce two accidents.*

**Flight technical error (FTE).** Difference between the altitude indicated by the altimeter display being used to control the aircraft and the assigned altitude/flight level.

**Height-keeping capability.** Aircraft height-keeping performance which can be expected under nominal environmental operating conditions with proper aircraft operating practices and maintenance.

**Height-keeping performance.** The observed performance of an aircraft with respect to adherence to cleared flight level.

**Occupancy.** A parameter of the collision risk model which is twice the count of aircraft proximate pairs in a single dimension divided by the total number of aircraft flying the candidate paths in the same time interval.

**Passing frequency.** The frequency of events in which two aircraft are in longitudinal overlap when traveling in the opposite or same direction on the same route at adjacent flight levels and at the planned vertical separation.

**Position error.** See static course error.

**Rogue aircraft.** Aircraft which have total vertical error (TVE) deviations of 300 feet or greater.

**Static source error.** The difference between the pressure sensed by the static system at the static port and the undisturbed ambient pressure.

**Static source error correction (SSEC).** A correction which may be applied to compensate for the static source error associated with an aircraft.

**Target level of safety (TLS).** A generic term representing the level of risk which is considered acceptable in particular circumstances.

**Total vertical error (TVE).** Vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

**Vertical separation.** The spacing provided between aircraft in the vertical plane to avoid collision.

**Vertical separation minimum (VSM).** VSM is documented in the *Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services* (PANS-RAC, Doc 4444) as being a nominal 300 m (1 000 ft) below FL 290 and 600 m (2 000 ft) above FL 290 except where, on the basis of regional agreement, a value of less than 600 m (2 000 ft) but not less than 300 m (1 000 ft) is prescribed for use by aircraft operating above FL 290 within designated portions of the airspace.

## INTRODUCTION

### 0 Introduction

#### 0.1 Objective of the Plan

The programme for the implementation of the reduced vertical separation minimum (RVSM) was established to provide additional airspace capacity and improve the operational performance of users. The main objective of the RVSM is to ensure the implementation of the 1000 ft separation between FL 290 and FL 410 between duly equipped and approved aircraft in the CAR/SAM Flight Information Regions. These 6 additional flight levels in the most frequently used altitudes will enable users to fly at or near optimum flight levels, thus reducing fuel consumption and operating costs and increasing the capacity of the ATS route system in the Region.

This national RVSM plan was drawn up within the framework of the CAR/SAM RVSM Implementation Programme (ref. Conclusion 10/11 Implementation of RVSM in the CAR/SAM Regions). Its purpose is to identify the activities and tasks that should be carried out by ..... (include the name of the State/service provider, as the case may be) for the implementation and safe operation of the RVSM in the ..... (identify the FIR(s) involved) FIR, as agreed by the CAR/SAM Regional Planning and Implementation Group (GREPECAS).

Maintaining an acceptable level of safety is the key factor on which this document is based, to which end ..... (name the State/service provider) shall ensure that the level of air traffic services and ATS procedures applicable to the airspace in which the RVSM will be applied are appropriate and adequate for maintaining an acceptable level of safety in the provision of ATS.

The activities required for RVSM implementation are described in detail, in order to identify all the tasks required for the implementation, the standards that must be applied to carry out these activities and additional tasks to guide the administration in the implementation of RVSM in the airspace in question.

#### 0.2 Contents

This plan contains different chapters that are considered vital for RVSM implementation.

Chapter 1:	Modification of the airspace
Chapter 2:	Modification of ATC procedures
Chapter 3:	Modification of ATC equipment
Chapter 4:	RVSM training for air traffic controllers
Chapter 5:	RVSM switchover
Chapter 6:	Aircraft and operators RVSM approval
Chapter 7:	RVSM operation monitoring
Chapter 8:	Financial resources for RVSM programme implementation

Each chapter of the plan:

- a) identifies the tasks to be fulfilled by the State;
- b) establishes safety requirements;
- c) identifies the impact that RVSM implementation would have if the task in question was not carried out;
- d) includes guidelines for drawing up the Plan, shown in italics. In any case, the State could adapt and include these guidelines in the text.

### 0.3 **Organisation and responsibilities**

*This text is for illustration purposes. In this text, States/service providers could describe their own national organisations and arrangements for the approval of the plan. The purpose of this description is to identify the individuals responsible for preparing and enforcing the plan in its pre-implementation stages. Subsequent stages will be defined briefly in chapter 7.*

The organisation for drawing up and enforcing this plan and related activities is defined as follows:

- a) ..... (insert name or unit) shall be responsible for drawing up the plan and maintaining target safety levels at all times. The approval of the plan confirms that it is acceptable and that it accurately describes the tasks required to verify the attainment of the target safety levels.
- b) Mr. .... (name of the responsible officer) has been appointed as the Officer Responsible for implementing the RVSM National Plan. In addition to his domestic responsibilities as the person responsible for implementing the national plan, this Officer shall also be the contact and person responsible for coordinating with the regional RVSM programme and will attend all events related to the RVSM implementation. He will also be responsible for keeping the national plan up to date and consistent with the regional programme. In addition, he must ensure that the national RVSM implementation plan is duly and timely disseminated among the national aeronautical community so that all interested groups obtain general knowledge about the project.
- c) Mr. ....(insert name), Chief of Air Traffic Services, is responsible for ATS operating services. By approving the plan, he is confirming that, as far as safety is concerned, all tasks required to ensure safety have been envisaged and will be implemented within the approved timetable, thus ensuring the implementation and safe operation of the RVSM.
- d) The Director General of Civil Aviation, Mr. .... (insert name) is the State-appointed authority responsible, among other things, for adequate provision of air traffic services within ..... (name of State).

- e) By approving the Plan, the DGCA is confirming that the plan was drawn up correctly and that the duties delegated to the aforementioned officials meet the safety and responsibility requirements for safe implementation and operation of the RVSM. It also guarantees that the official appointed to represent the DGCA at regional events for the implementation and operation of the RVSM is duly authorised to act on his behalf.

#### 0.4 **References**

The following documents were used as reference for preparing this document:

- a) ICAO Appendix 11
- b) ICAO Doc 4444, PANS RAC
- c) ICAO Doc 9574, RVSM Manual
- d) Example Plan for the National RVSM Safety Plan (Eurocontrol)
- e) ICAO Doc 7030

**SUBSEQUENTLY, INSERT ALL OTHER NATIONAL AND/OR INTERNATIONAL DOCUMENTS USED AS REFERENCE.**

## CHAPTER 1 – MODIFICATION OF THE AIRSPACE

### 1 Introduction

1.1 This chapter describes airspace modifications that would be required to ensure that RVSM operations develop in a safe and effective manner.

#### 1.2 Safety requirements

1.2.1 Safety requirements related to airspace modifications are intended to show that such modifications are appropriate and consistent with the safety of RVSM operations in the airspace of ..... (insert name of State).

#### 1.3 Modifications of the airspace

1.3.1 Appendix A to this document contains an airspace modification programme that has been developed to support RVSM implementation. The main changes that have been made are as follows:

#### Examples

- a) *changes in the enter/exit points to a given airspace;*
- b) *modification of the route network structure within a given airspace;*
- c) *if required, the designation of airspaces to transition from RVSM to non-RVSM, and vice-versa.*
- d) *re-sectorisation of upper airspace*

*Note: Any changes to the airspace structure are likely to affect an adjacent ACC; it will therefore be necessary to amend the relevant letters of operational agreement.*

#### 1.4 Monitoring changes to the airspace structure

1.4.1 For a safe and effective modification of the airspace, simulators will be used to verify compliance with all required airspace management reliability levels. This simulation of the new structure must show that controllers will be able to handle RVSM operations with absolute safety.

#### 1.5 Impact of failure to modify RVSM airspace

##### 1.5.1

Failure to modify the airspace will have a negative impact on RVSM implementation in .... (name of State) and could also cause a delay in RVSM implementation at the regional level, with the resulting loss of the investments made by other States/service providers and users of the Region.

## **CHAPTER 2 – MODIFICATION OF ATC PROCEDURES**

### **2 Introduction**

2.1 This chapter describes the changes required in ATC procedures as a result of RVSM implementation in the CAR/SAM Regions.

### **2.2 Safety requirements**

2.2.1 Safety requirements related to the modification of ATC procedures are intended to show that the proposed changes have been approved for use. The new procedures are guaranteed to be appropriate, create no excessive work load for controllers and pilots and, if so required, have been coordinated with adjacent ACCs and/or ATC units.

### **2.3 Planned activities for the implementation of new ATC procedures**

2.3.1 It is assumed that air operations carried out by State aircraft have no restrictions for operating in RVSM airspace. Within the scope of the Civil/Military Coordination Committee, arrangements have been made with State aircraft operators to apply special procedures, if applicable.

2.3.2 In view of the increased number of flights and the changes in traffic direction in each flight level with respect to the conventional 2000-ft vertical separation minimum (CVSM) above FL 290, RVSM implementation requires increased surveillance of aircraft clearances and making sure that crews fully understand and comply with such clearances.

2.3.3 Necessary steps must also be taken to cater to a possible increase in traffic and controllers must be informed of their responsibilities regarding the measures to be taken in the various cases.

2.3.4 At the regional level (Doc 7030, Regional Supplementary Procedures), in-flight contingency procedures have been developed for application in an RVSM environment, also to be applied in ..... (name of State).

2.3.5 The changes in the procedures, as well as the phraseology to be used, have been included in the operational handbooks of ..... ATS units (state which units).

2.3.6 The changes in the procedures have been coordinated with the adjacent..... (state which ATS units) ACCs/ATC units and included in the letters of operational agreement.

2.3.7 The new ATS procedures for RVSM operations appear in **Appendix B** to this document.

### **2.4 Monitoring changes to ATC procedures**

2.4.1 The changes to ATC procedures are guaranteed to be appropriate and to have been made in a professional way.

2.4.2 Several elements have been identified which should give us confidence in the changes made, based on the following:

- a) Guidance material from appropriate ICAO documents has been used, following a thorough review and development.
- b) The changes to ATC procedures and related phraseology were included in the operational handbooks of the ATS units concerned and reviewed by the operational staff of each unit.
- c) The changes to ATC procedures affecting adjacent ATS units were coordinated, duly approved and included in the letters of operational agreement.
- d) The new ATC procedures, the related phraseology and the new airspace structure were subject to a simulation procedure. The simulation validated said procedures as well as the new airspace structure.

2.4.3 **Impact of non-modification of ATC procedures on implementation**

2.4.4 Failure to modify ATC procedures will have a negative impact on RVSM implementation in ..... (name of State) and could also cause a delay in RVSM implementation at the regional level, with the resulting loss of the investments made by other States/service providers and users of the Region.

## CHAPTER 3 - MODIFICATION OF ATC EQUIPMENT

### 3 Introduction

3.1 This chapter describes the changes required in ATS equipment as a result of RVSM implementation and operation in the CAR/SAM Regions.

### 3.2 Safety requirements

3.2.1 Safety requirements related to the modification of ATS equipment are intended to show that the proposed changes have been approved for operational use.

### 3.3 Planned activities for the modification of ATC equipment

3.3.1 .....(name of State) has developed an ATC equipment modification programme that will enable RVSM implementation. Details of said modifications can be found in **Appendix C** to this document. The programme has been designed to ensure that the necessary modifications will be carried out well in advance of the RVSM implementation date.

3.3.2 The changes required are consistent with flight data processing (FDPS), radar data processing (RDPS), display systems, etc. (*it might be necessary to make modifications to the STCA or MTCA systems, ATC simulators, system software, etc.*).

### 3.4 Monitoring changes to ATC equipment

3.4.1 The modifications to ATC equipment are guaranteed to be appropriate and to have been made in a professional way.

3.4.2 The changes to ATC equipment have been made under strict control prior to their final installation in the ..... ACC (name the ATS unit). Once the modifications were made, these were accepted by the operational unit concerned.

3.4.3 Likewise, there are various elements that will allow us to have confidence in such changes:

**Note:** *In this paragraph, the State should mention the elements that provide the certainty that the changes have been made and were duly monitored.*

**Example:**

*As part of their RVSM training, controllers have assessed the human-machine interface, making sure that it is adequate and that it meets current needs.*

### 3.5 Impact of non-modification of ATS equipment on RVSM implementation

3.5.1 Failure to modify ATC equipment will have a negative impact on RVSM implementation in ..... (name of State) and could also cause a delay in RVSM implementation at the regional level, with the resulting loss of the investments made by other States/service providers and users of the Region.

## **CHAPTER 4 - RVSM TRAINING FOR AIR TRAFFIC CONTROLLERS (ATCOS)**

### **4 Introduction**

4.1 This chapter describes the activities that should be carried with respect to the training of air traffic controllers, in order to ensure that the staff is duly familiar with RVSM procedures.

### **4.2 Safety requirements**

4.2.1 Safety requirements related to the training of air traffic controllers are intended to prove that the staff has been duly trained in RVSM procedures and is capable of controlling traffic in a RVSM environment.

### **4.3 Planned activities for RVSM training of ATCOs**

4.3.1 The ATCO training programme has been designed to support RVSM implementation. Details of this training programme can be found in **Appendix D** to this document. The programme is addressed to all controllers who will be working at ATS units where RVSM will be applied, and will be completed before the RVSM implementation date established for the CAR/SAM Regions.

4.3.2 The training programme takes into account aspects related to the identified roles and responsibilities of ATCOs, the development of training material (RVSM Training Manual) which has been based on related ICAO documentation, the training sub-programme *per se* which will be carried out in XXX stages, and an on-the-job training (OJT) programme.

4.3.3 The training material has been prepared under strict control and approved by ..... (name of the corresponding operational unit or CATC).

4.3.4 *Traffic controllers do not require a new license for RVSM implementation and training.. The approval and implementation of this programme means that the State/service provider agrees and is committed to ensure that the appropriate staff receives proper training in order to continue providing safe services in the new RVSM environment.*

### **4.4 Monitoring the training of ATCOs**

4.4.1 *A significant number of causes of risk due to lack of ATCO training have been identified. The success of RVSM implementation depends on the training and qualification of the staff in charge of day-to-day operation of the system. Therefore, training is considered to be a key element for a successful implementation.*

4.4.2 ATCO training is guaranteed to have been the appropriate training conducted in a professional manner.

4.4.3 In order to ensure proper training of ATCOs, RVSM-related ICAO documentation was used as reference material, instructors with sufficient experience were engaged, and, during application in the ..... ACC (insert name), they were duly qualified to provide on-the-job training (OJT). This will guarantee that all RVSM-trained staff members are familiar with RVSM operations and have understood all the training material used.

4.4.4 ..... (insert name of State) acknowledges that it is responsible for the competence of air traffic controllers working in the RVSM field of the ..... (name of the FIR) FIR, and ensures that the necessary time was used for proper training, giving ATCOs who were undergoing training the opportunity to clarify aspects they had failed to understand, and establishing suitable refresher courses as needed.

#### 4.5 **Impact of failure to provide ATC training on RVSM implementation**

4.5.1 The lack of ATC training will have a negative impact on RVSM implementation in ..... (name of State) and could also cause a delay in RVSM implementation at regional level, with the resulting loss of the investments made by other States/service providers and users of the Region.

## CHAPTER 5 - RVSM SWITCHOVER

### 5 Introduction

5.1 This chapter describes the activities that should be carried out during the RVSM switchover, from 24 hours before implementation to 24 hours after, and the relevant contingency plans. This is the period in which the 2000-ft conventional vertical separation minimum (CVSM) will switch over to the 1000-ft reduced vertical separation (RVSM).

### 5.2 Safety requirements

5.2.1 The safety requirements related to the RVSM switchover are intended to prove that the special procedures for this period have been established and their use approved.

### 5.3 Planned activities for the switchover

5.3.1 Certain measures have been adopted to enable a safe and effective switchover to the RVSM. These activities appear in **Appendix E** to this document.

### 5.4 Monitoring of special procedures for the RVSM switchover

5.4.1 *There are elements that will allow us to monitor the rate of effectiveness, such as the establishment of special procedures to be used during the RVSM switchover period and duly approved contingency plans. It must be ensured that RVSM switchover planning is complete and effective.*

5.4.2 Special procedures for use during the RVSM switchover period and the contingency plans duly approved by ..... (the unit in charge of preparing and approving the special procedures) have been established.

5.4.3 Following RVSM implementation, procedures will be established for service providers and users to send information to the Regional Monitoring Agency within the first hour and then 12 and 24 hours after implementation. This information will refer to the status of implementation, the first impression and possible problems that could arise.

5.4.4 Impact of RVSM implementation without an effective planning of the RVSM switchover period.

5.4.5 The lack of an RVSM switchover programme and related contingency measures would place the effective implementation of RVSM at risk in ..... (name of State) and, consequently, the safety of air operations carried out during the switchover period.

## CHAPTER 6 - AIRCRAFT AND OPERATORS RVSM APPROVAL

### 6 Introduction

6.1 This chapter describes the activities required for the aircraft and operators approval that intend to fly in an RVSM environment in the CAR/SAM Regions.

### 6.2 Safety requirements

6.2.1 *Both operators and their aircraft require prior clearance to fly in RVSM airspaces. The State aeronautical authority is responsible for describing the regulatory activities in this respect.*

6.2.2 The safety requirements related to RVSM approval of aircraft and operators are intended to prove that all operators based in ..... (name of State) are aware of the RVSM implementation programme and have obtained RVSM approval, both for their operations and for their aircraft.

### 6.3 Planned activities for RVSM approval of aircraft and operators

6.3.1 Certain measures have been adopted for the approval of operators and their aircraft. These measures have been included in an RVSM approval programme for operators and aircraft, which appears in **Appendix F** to this document.

6.3.2 In order to guarantee the transition between the regions, height-keeping capability specifications have been developed. These requirements have served as the basis for the development of the minimum aircraft system performance specifications (MASPS). These MASPS specifications also include specifications and procedures for type approval, released from production and continued airworthiness. MASPS are applicable worldwide and the following material has been prepared at a regional level:

- a) Joint Aviation Authority (JAA) Temporary Guidance Leaflet (TGL) N° 6 “*Guidance material on the approval of aircraft and operators for flight in airspaces above FL 290, where a 300 m (1000 ft) vertical separation minima is applied*”; or
- b) Federal Aviation Administration (FAA) Document 91 -RVSM “ *Interim guidance on the approval of operators/aircraft for RVSM operations*”

*Note: Under Regional Project RLA/99/901 “Regional Safety Surveillance Cooperation System”, the CAR/SAM Regions are developing the Latin American Aeronautical Regulations (LAR). This project has placed priority on formulating guidelines for RVSM approval of aircraft and operators, based on the documents mentioned in items a) and b) above. These guidelines are expected to be available by .....*

6.3.3 The programme for the approval of aircraft and operators from ..... (name of country) is sub-divided into two main activities, one aimed at the dissemination of the RVSM implementation program and the other aimed specifically at the tasks for the approval of aircraft and operators.

#### 6.4 **Monitoring of approval activities**

6.4.1 Approval activities are effective and are aimed at the approval of aircraft capable of meeting the most stringent height-keeping criteria for RVSM operations in the CAR/SAM Regions and to ensure that crews are familiar with RVSM standards and procedures.

6.4.2 The programme for the approval of aircraft and operators covers airworthiness elements (including continued airworthiness) and operational approval, and includes the established procedures to be followed to that end.

#### 6.5 **Airworthiness approval (including continued airworthiness)**

6.5.1 The aircraft will be approved, considering that it meets all the requirements set forth in the appropriate airworthiness document of ..... (State), based on criteria regarding the height-keeping capability defined by the MASPS. Likewise, the aircraft altimetry and height-keeping equipment must be maintained in accordance with approved procedures and service schedules.

#### 6.6 **Operational approval**

6.6.1 ..... (State) has made certain that the operating programmes are adequate, that flight crew training and operational handbooks have been evaluated and that the operator has shown that it maintains high levels of height-keeping performance. The respective requirements appear in **Appendix F**.

#### 6.7 **Monitoring operational errors**

6.7.1 The CAR/SAM Regional Planning and Implementation Group (GREPECAS) has established a programme for collecting and evaluating operational deviations and errors. The information is obtained from the Area Control Centres when deviations are equivalent to or greater than 300 feet (90 mts). This information is sent by the States to the CAR/SAM Regional Monitoring Agency (CAR/SAMMA) .....

#### 6.8 **Impact of RVSM approval of aircraft and operators on RVSM implementation**

6.8.1 The region has set a date for continuing or postponing implementation, depending, among other aspects, on the degree of RVSM approval of aircraft and operators, which has been set at 90%.

6.8.2 The lack of an efficient RVSM approval programme for aircraft and operators would place the effective implementation of the RVSM at risk in ..... (name of State), thus hindering RVSM implementation on a national and regional scale, and affecting aircraft operations.

## CHAPTER 7 –RVSM OPERATION MONITORING

### 7 Introduction

7.1 This chapter describes the activities that should be carried out with respect to safety assessment, in order to make ensure that RVSM implementation meets the target level of safety (TLS) approved at the CAR/SAM RAN meeting.

### 7.2 Safety requirements

7.2.1 In Recommendation 5/29, the CAR/SAM RAN 3 meeting established that, before implementing RVSM and as long as operations in a 2000-ft vertical separation minimum setting continue, the proposed safety level of the designated airspace should be verified to ensure that it is equal to or less than  $5 \times 10^{-9}$  fatal accidents per hour of flight due to loss of vertical separation for all causes, in accordance with the following:

- a) The technical risk is the risk of collision associated to the height-keeping performance of the aircraft. Risks associated to operational errors are not included (e.g. pilot or controller error), nor are in-flight contingencies.
- b) Overall risk is the risk of collision due to all causes, which includes technical risk and all risks due to operational errors and in-flight contingencies. (*Relevant in-flight contingencies include: height deviations due to emergency procedures, turbulence and ACAS advisories*).

7.2.2 In turn, Annex 11 (paragraph 2.26) establishes that States shall implement systematic and adequate ATS safety management programmes to make sure that air traffic services remain safe within their airspace and at their airports.

7.2.3 In view of the above, any significant safety-related changes to the ATC system, including the implementation of a reduced separation minimum or a new procedure, shall only enter into force after a safety assessment has proven that the established target level of safety will be met.

7.2.4 In order to comply with the above and make sure that safety is maintained, appropriate measures will be established to monitor compliance with the established target level of safety after implementation.

### 7.3 Planned activities for monitoring RVSM operations

7.3.1 At a regional level, certain measures have been taken to guarantee safety before, during and after RVSM implementation. Safety objectives have been established for both technical risk and overall risk.

7.3.2 All CAR/SAM States that participate directly or indirectly in the RVSM implementation must provide the data required to conduct the safety assessment. To that end:

- a) ..... (name of State) has implemented a data collection programme as shown in **Appendix G** to this document.
- b) this information will be sent to the CAR/SAM RMA monitoring agency.
- c) the monitoring agency shall coordinate the data processing with the body/unit in charge of the safety assessment (the agency responsible for the safety assessment has yet to be defined).
- d) a safety evaluation will be conducted prior to implementation,.
- e) a system verification process will be carried out during a period agreed upon by the region, where the operating system will be fully assessed within a separation of 2000-ft environment.
- f) at the end of this period in which the integrity of the system has been verified, use of the RVSM separation will begin.
- g) an RVSM switchover period has been established.
- h) a continuous system monitoring programme has been established.
- i) post.-implementation assessment has been established to make sure that all RVSM requirements are met satisfactorily in the CAR/SAM Region.

#### 7.4 **Monitoring of special RVSM transition procedures**

7.4.1 Monitoring activities involving continuous assessment of the system have been established to verify compliance with all RVSM requirements.

7.4.2 Impact of failure to have an effecting RVSM switchover programming on RVSM implementation.

7.4.3 RVSM operation monitoring is a key factor in RVSM implementation and its continuous operation. Failure to have such a programme, fulfilled within the established terms and time frames, would have a negative impact on RVSM implementation in ..... (name of State) and could also cause a delay in RVSM implementation at the regional level, with the resulting loss of the investments made by other States/Service Providers and users in the Region.

## **CHAPTER 8 - FINANCIAL RESOURCES FOR RVSM PROGRAMME IMPLEMENTATION**

### **8 Introduction**

8.1 This chapter describes the activities, dates and costs involved in the national RVSM plan that will allow an efficient RVSM implementation. In order to implement the project and put it into operation, sufficient financial resources are required and the different funding alternatives should be evaluated.

### **8.2 Safety requirements**

8.2.1 Safety requirements related to the allocation of resources are of vital importance. Investment estimates should take into account administrative, personnel and input costs involved in the installation of new equipment and facilities, revision of procedures, preparation of handbooks, training of staff, continuous participation in events related to the RVSM implementation programme, etc.

### **8.3 Planned activities**

8.4 The measures described in this document have been adopted in order to enable a safe and efficient implementation of the RVSM. A summary of these measures, together with the target dates for implementation and the costs involved in each one, are shown in **Appendix H** to this document.

*Note: This Appendix should include the Regional RVSM Implementation Programme and, specifically, the tasks that States/service providers are responsible for.*

### **8.5 Monitoring of financial resources**

8.5.1 The person responsible for allocating and monitoring financial resources in ..... (insert name of the State/territory/service provider) for the RVSM implementation is ..... (insert name of the person, entity, unit, etc.).

8.5.2 The mechanism for the financial monitoring of the plan is..... (insert the mechanism used by the State/territory/service provider).

8.6 **Impact of inadequate resources assigned to the national RVSM implementation plan on RVSM implementation**

8.6.1 Failure to assign sufficient resources to the national RVSM implementation plan would place the effective implementation of the RVSM in ..... (name of State) at risk, and could also cause a delay in RVSM implementation at the regional level, with the resulting loss of the investments made by other States/service providers and users in the Region.

**LIST OF APPENDICES**

<b>APPENDIX A</b>	<b>New airspace structure for RVSM implementation</b>
<b>APPENDIX B</b>	<b>ATC procedures in an RVSM environment</b>
<b>APPENDIX C</b>	<b>Modification of ATC equipment</b>
<b>APPENDIX D</b>	<b>RVSM training programme for air traffic controllers</b>
<b>APPENDIX E</b>	<b>RVSM switchover programme</b>
<b>APPENDIX F</b>	<b>RVSM approval programme for aircraft and operators</b>
<b>APPENDIX G</b>	<b>Data collection programme</b>
<b>APPENDIX H</b>	<b>Fund allocation for the implementation of the RVSM programme</b>

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