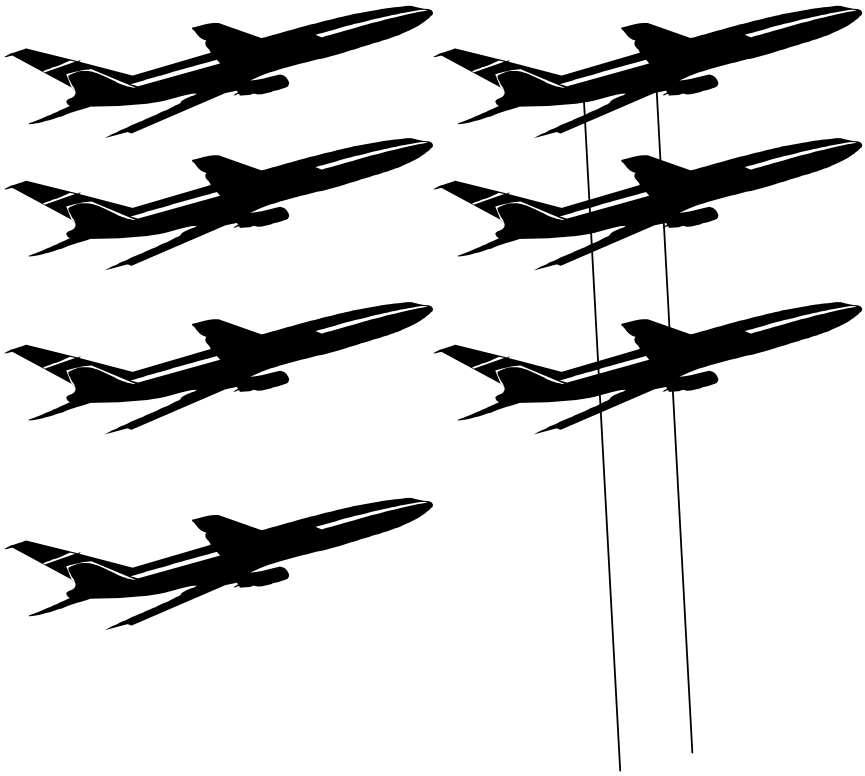
Appendix E

CARIBBEAN/SOUTH AMERICA
(CAR/SAM)

REDUCED VERTICAL SEPARATION MINIMUM
(RVSM)

CONCEPT OF OPERATIONS



Prepared by the Caribbean/South American (CAR/SAM) RVSM Implementation Task Force
January, 2003

FOREWORD

The *Caribbean/South American RVSM Concept of Operations* is published by the ATM/CNS Subgroup of the Caribbean/South American Regional Planning and Implementation Group (GREPECAS). It describes anticipated future RVSM operations within the CAR/SAM region*.

**Note: For the purposes of this document, the Caribbean and South American regions will be referred to as one region, i.e.; CAR/SAM region.*

The GREPECAS and its contributory bodies will issue revised editions of the Document as required to reflect ongoing implementation activities.

Copies of the *CAR/SAM Concept of Operations* can be obtained by contacting:

ICAO NORTH AMERICAN, CARIBBEAN, AND CENTRAL AMERICAN OFFICE		
MEXICO CITY, MEXICO		
e-mail	:	icaonacc@mexico.icao.int
Internet	:	www.icao.int/nacc
Fax	:	+5255 5203-2757
Mail	:	Apartado Postal 5377, Mexico 5 D.F., Mexico
PCO e-mail	:	
PCO web site		

ICAO SOUTH AMERICAN OFFICE		
LIMA, PERU		
e-mail	:	mail@lima.icao.int
Internet	:	www.lima.icao.int
Fax	:	+511 575-0974 / 575-1479
Mail	:	Apartado Postal 4127, Lima 100, Peru
PCO e-mail	:	
PCO web site		

AMENDMENT HISTORY		
Version No.	**Date**	**Originator**
V 1.0	September 2002	First version developed by ATC Working Group of the RVSM Task Force
V 1.1	January 2003	Revision containing GREPECAS Dec. 2002 Conclusions

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1. PART I – SCOPE

1.1 SCOPE OF THE CAR/SAM REGION RVSM CONCEPT OF OPERATIONS

1.1.1 The intent of this concept of operations is to define the use of Reduced Vertical Separation Minimum separation standards within the Caribbean and South American Regions. RVSM has been successfully implemented within a vast portion of the world's airspace over the last 5 years. The States, ATC service providers, and airspace users of the CAR/SAM regions have recognized the benefits of RVSM operations and have authorized, through GREPECAS, the use of RVSM separation standards beginning in 2004.

1.1.2 This document will begin with a short history of RVSM implementation efforts in the region. This will be followed by an explanation of the basic operating principles of the region and a description of operations within the current system. Section Three identifies the airspace within which RVSM operations will be conducted. Section Four deals with the envisioned use of RVSM, including those aspects covered by ICAO directives and those aspects that will be unique to the CAR/SAM region. Section Five outlines the necessary ATC personnel issues associated with RVSM implementation. Sections Six and Seven deal with the anticipated airspace and document changes. Section Eight contains procedures for switching from the current system to RVSM operations.

1.1.3 The completion of a preliminary cost/benefit analysis has shown a favorable benefit to system users through the implementation of RVSM.

1.2 BASIC PRINCIPLES USED IN THE DEVELOPMENT OF THIS DOCUMENT

Introduction

1.2.1 RVSM has been an active subject at CAR/SAM regional meetings since its initial implementation in the North Atlantic in 1997. Recognizing the benefits of RVSM operations, the Third CAR/SAM Regional Air Navigation Meeting (Buenos Aires, Argentina, 1999) approved the use of RVSM standards in the Caribbean region. GREPECAS 10, held in October 2001, directed that CAR/SAM States and ATC service providers implement RVSM in two phases beginning in April 2004. RVSM operations began in the European/South American Corridor in 2001. Initial plans called for RVSM implementation in the domestic United States, Mexico, and southern Canada in December 2004. However, it now appears that this date will change slightly to accommodate chart dates and other AIC issues. Regardless of the actual date, this document envisions a simultaneous implementation between the CAR/SAM region and the North American region. In fact this Concept of Operations assumes that all aspects of RVSM implementation; altitudes, exclusionary and transition airspace, operational procedures, etc., will be harmonized throughout the region(s). This concept has been accepted by the full RVSM Task Force and was submitted to the States for approval at the December 2002 meeting of GREPECAS.

1.2.2 ICAO Doc. 9574 states that one factor to be considered when studying RVSM implementation is the cost benefit, if any, for system users. An initial cost benefit analysis was performed for the CAR/SAM using data from various regional sources, including IATA, ICAO, and the States. The preliminary results of this study show a positive benefit for RVSM of approximately Thirty Million U.S. Dollars ($30,000,000 U.S.D.) annually once implementation costs have been absorbed. The preliminary cost to benefit ratio is approximately 1 to 4.4. This represents one of the best cost benefits in the history of RVSM implementation.

2. OVERVIEW OF THE CURRENT CAR/SAM SYSTEM

2.1

2.1.1 The CAR/SAM airspace is divided into the following Flight Information Regions (FIRs).

- Mazatlan Oceanic
- Mexico
- Houston
- Miami Oceanic
- Port au Prince
- Santo Domingo
- Habana
- San Juan
- Piarco
- Kingston
- Curacao
- Central America
- Panama
- Barranquilla
- Maiquetia
- Georgetown
- Paramaribo
- Rochambeau
- Bogota
- Guayaquil
- Lima
- Porto Velho
- Manaus
- Belen
- Recife
- Brasilia
- La Paz
- Asuncion
- Montevideo
- Resistencia
- Curitiba
- Comodoro Rivadavia
- Antofagasta
- Atlántico
- Puerto Montt
- Easter Island
- Ezeiza
- Cordoba
- Mendoza
- Punta Arenas
- Santiago

Every FIR offers some level of ATC services, with most States/ATC service providers offering positive control under IFR flight rules, flight following, search and rescue, flight information services, and inter-facility/intra-facility communications and coordination.

2.1.2

Airborne Collision Avoidance Systems (ACAS/TCAS)

2.1.3 Almost 100% of the long haul international commercial aircraft fleet is equipped with ACAS, with most operators having installed, or planning to install, the latest upgrades (TCAS v.7/ACAS III) that accommodate RVSM operations and eliminate "nuisance alerts". These new systems accommodate 1000 feet separation when issuing alerts and resolutions. In addition to the air carrier fleet, a substantial portion of the business aviation turbojet fleet has equipped with ACAS.

Traffic flows and traffic demand

2.1.4 Traffic within the region is comprised of several identifiable flows, both on an international and domestic level. International traffic within the CAR/SAM region runs primarily on a North/South basis, mainly between the major airports and population centers. In the major market runs between North America and South America most of the flights are in excess of 3 hours in length, and are flown by new generation aircraft.

2.1.5 Within the CAR region, most high altitude flights that exceed four hours in length originate or end on the east coast of the United States, Mexico, or Central America. There is also a substantial flow of traffic between the CAR/SAM and Europe. The European/New York aircraft are already RVSM approved since they must transit RVSM exclusionary airspace in the North Atlantic.

2.1.6 Within the SAM region, high altitude international flights mirror the environment of both North America and Europe. The route system is complex and dynamic and features numerous crossing points that increase the complexity of operations.

2.1.7 With the exception of Brazil, very few States have domestic operations that exceed 3 hours in length. However, many States have substantial amounts of domestic traffic that utilize the altitude stratum envisioned for RVSM operations. These operations occur with some frequency. In addition, there is a substantial amount of "short haul" international traffic between States. Although these flights are less than 3 hours long, the vast majority of them use the high altitude route structure.

2.1.8 Approximately 80% of the long haul international fleet is already capable of being certified for RVSM operations. Approximately 60% of the short haul international and domestic fleet is currently approved. Unconfirmed estimates are that 95% of the long haul fleet can be expeditiously approved for RVSM operations by the 2004/2005 timeframe, with approximately 85% of the short haul fleet meeting the same criteria. Estimates for the general aviation and business fleets are currently being developed.

2.1.9 If the above estimates prove correct, approximately 15% of the air carrier fleet will normally operate below RVSM exclusionary altitudes. This figure is similar to the percentage of aircraft operating below FL290 in today's environment. These figures do not take into account state/military aircraft, or the cargo fleet. Cargo fleet numbers are expected to be slightly lower than those of the air carrier fleet.

2.1.10 It should be noted that there are only a few areas of the CAR/SAM region that experience sustained, ongoing periods where operational demand exceeds capacity. This is because 80% of long haul international traffic operates in the "hub-spoke" concept. This means that aircraft operations tend to come in waves of traffic, with several airlines operating flights between city-pairs in close time proximity to each other. However, this causes what could be termed "rolling demand pockets", where demand exceeds capacity in small, focused patches of airspace that move around the ATC system. These pockets of congestion are greatly impacted by weather systems and system equipment outages, and they tend to present the greatest operational challenge at places in the system where routes and traffic flows intersect or merge. It is in this type of scenario that RVSM offers the greatest operational benefit for the region.

2.2 GROUND SYSTEMS

2.2.1 General

The majority of ground based ATC systems are currently aligned to provide service along the major traffic flows of the region.

2.2.2 Air/ground Communications

Currently, some 70% of the airspace within the CAR/SAM region is covered by direct pilot/controller communications. This figure excludes oceanic airspace located on the eastern and western edges of the region.

This Concept of Operations assumes that over 80% of the airspace within which RVSM operations will be conducted will have direct pilot/controller communications capability in the 2004/2005 timeframe. It also assumes that over 95% of the major traffic flow routes within this airspace will be covered by direct pilot/controller communications capability. These numbers apply to FL290 and above.

2.2.3 Ground/Ground Communication

Currently inter-facility communications capability in the region approaches 100%. Although there are ongoing problems with reliability and compatibility between systems, these problems are being addressed through regional work groups. A comprehensive and realistic plan is in place to address these issues over the next 2-3 years.

This Concept of Operations assumes that 100% of the facilities providing ATC services to aircraft operating in RVSM airspace will have the capability to exchange flight data and critical flight information with those ATC service providers adjacent to them. This may be accomplished via several methods, including voice communication and electronic data exchange.

2.2.4 Navigation

Currently, a system of ground based navigational aids, supported by a growing system of advanced navigational routes (RNAV/RNP/GNSS) serves the major traffic flows in the region.

Because RVSM increases capacity along a given route, regardless of the technology that supports it, RVSM will enhance operations under any situation. This Concept of Operations assumes that the number and scope of advanced navigational routes in the region will continue to grow. This route system will be complimented by the introduction of RVSM operations. As the level of

navigational accuracy increases with the use of advanced technology, the risk of collision actually increases. This is due to the fact that aircraft will fly the centreline of existing routes with more precision, placing them in closer proximity with each other during any type of vertical maneuver. Procedures for the use of lateral offsets will be included in RVSM implementation to reduce the impact of this issue on the safety analysis.

2.2.5 Surveillance

In today's environment, approximately 55% of airspace in the CAR/SAM region is covered by radar surveillance. This excludes the oceanic airspace located on the eastern and western edges of the CAR/SAM regions.

This Concept of Operations assumes that approximately 65% of CAR/SAM airspace will be covered by radar surveillance in the 2004/2005 timeframe. This is mainly due to the addition of several new radar installations within Brazil. Additionally, this Concept of Operations assumes that approximately 85% of the routes along which RVSM operations will be conducted will have radar coverage. The region will also see the introduction of other surveillance methods, including Automatic Dependant Surveillance (ADS) in the mid-term timeframe.

In summary, this document assumes that controllers will have both radar coverage and voice communications with approximately 80% of aircraft operating in RVSM airspace along the major route systems in the region when RVSM operations begin.

2.2.6 Separation standards

Vertical

Current standards used in the region are 2000 feet above FL290 and 1000 feet at FL290 and below. **Consistent with ICAO Documents

Lateral

Current standards used in the region are radar, 50 miles lateral and 90 miles lateral. as well as domestic VOR/NDB standards for crossing and parallel traffic. **Consistent with ICAO Documents

Longitudinal

Current non-radar standards used in the region are 10 minutes, 15 minutes, and 20 minutes. There are also a number of procedural rules in use that allow less separation during climbing and descending. Radar standards being used in the region include 5 and 10 miles, with smaller standards in use in terminal areas. **Consistent with ICAO Documents

2.3 AIR TRAFFIC MANAGEMENT

Planning Requirements

2.3.1 The impact of RVSM implementation on the regional traffic flow must be considered to insure that the system is enhanced by the new capability. This will be accomplished by harmonizing

regional planning efforts, insuring that procedures are in place to handle unusual or significant events such as weather and equipment outages, harmonizing altitudes and airspace issues, and taking steps to insure the additional capacity realized from RVSM does not negatively impact controller workload. Coordination between ATC service providers must be standardized to:

a) maintain or improve safety at increasing levels of traffic density;
b) increase tactical control, both in the resolution of conflicts and the issuance of a timely and flexible ATC response to unusual system events, such as weather deviations;
c) take full advantage of reduced separation minima;
d) improve the co-ordination between adjacent centres by maximum use of automated facilities; improve the co-ordination/transition issues between Oceanic and Domestic ATS units.

A regional manual is being developed that will contain detailed procedures to handle all situations where RVSM will have a unique impact on traffic management issues, including the termination of RVSM operations due to weather or turbulence.

Several States within the CAR/SAM region have expressed interest in the implementation of a regional traffic flow management facility (RTFMF). Such a facility is not required to implement RVSM, however, an RTFMF could be extremely beneficial, not only in the implementation of RVSM, in the overall management of CAR/SAM air traffic. The following are a few examples of the types of services that an RTFMF could provide:

- Suggested traffic management restrictions to insure that RVSM operations do not result in any one sector/FIR becoming saturated with air traffic.
- An "early warning" capability based on projected flight schedules
- Suggested routings and any associated traffic restrictions needed to deal with severe weather events, turbulence, special traffic events, equipment failures, staffing issues, military training areas, etc.
- Offering daily or hourly updates to regional ATC service providers to assist them with planning traffic management strategies.
- Serving as a backup communications network for the region.
- Coordinating the suspension/resumption of RVSM operations within a sector/FIR/region due to turbulence or mountain wave activity.
- Coordination of departure times of flights to insure destination airport arrival rates are not exceeded.

Sector Overloading and Complexity

An additional point of concern is en route sector overloading. This occurs when traffic density within a single sector exceeds a predetermined level or and negatively impacts controller workload. This predetermined level, sometimes known as the "do not exceed" traffic level, can change due to factors such as weather, equipment failures/outages, or staffing. The implementation of RVSM does not increase the number of flights, but it can also result in more aircraft in a sector at one time. States should consider this factor when studying whether or not to increase sector capacity limits after RVSM is implemented. Those States that do not have individual sector traffic limits should consider developing such limits prior to RVSM implementation. However, States should find that once RVSM is in place and ATC personnel are comfortable working traffic in an RVSM

environment, it should be possible to safety work higher levels of traffic per sector due to the increased capacity.

The additional traffic level possible under RVSM operations can also raise the complexity levels of individual sectors, especially when coupled with severe weather or equipment failures/outages. This problem can be address in the same manner as sector overloading. States should brief controllers to apply traffic management initiatives to RVSM operations just as they would for any other significant event. States that do not have traffic management plans should consider having them in place prior to RVSM implementation.

It is important to note that Traffic Flow Management procedures, or the presence of a regional traffic flow management facility, are not a requirement for RVSM implementation. However, controller workload issues must be carefully considered prior to implementation. This effort is being accomplished by the ATC Working Group.

3. IDENTIFICATION OF RVSM AIRSPACE

3.1 RVSM Airspace

3.1.1 This Concept of Operations assumes that all airspace within the CAR/SAM region from FL290 to FL410 will be identified as RVSM airspace, where RVSM operations may be conducted under either exclusionary or transitional procedures. The required safety analysis and documentation shall be completed for all airspace that falls within this description, with the exception of that airspace in the EUR/SAM corridor where RVSM operations are already conducted. It is acknowledged that individual States may chose to limit the scope of RVSM operations within their sovereign airspace. However, by conducting the safety analysis and document changes needed to conduct RVSM operations for all airspace in the region, these States can easily expand RVSM into this airspace at a later date, depending on their individual needs. This scenario was endorsed at the December 2002 meeting of GREPECAS. All required safety analysis and procedural development will be accomplished prior to implementation. Additionally, it is expected that a limited amount of transition airspace may have to be established in those FIRs where CAR/SAM airspace adjoins the airspace of other regions were RVSM operations are not conducted.

Non-RVSM approved aircraft will not be allowed to operate in RVSM airspace, with the following exceptions:

- States may develop procedures to accommodate non-approved aircraft in RVSM airspace as long at the flight will be contained within their domestic airspace.º When operationally feasible, preference for altitudes in RVSM airspace will be given to approved aircraft. RVSM approved aircraft will be given priority for level allocation over non-RVSM approved aircraft unless an operational advantage is gained by giving priority to the non-approved aircraft.

- Non-RVSM approved Stateºº, humanitarian, maintenance, and ferry/delivery flights will be accommodated within RVSM airspace in accordance with regionally approved procedures.

- Non-RVSM approved aircraft will be allowed to climb or descend through RVSM airspace, provided the aircraft climbs or descends at no less than standard rate and does not stop at any intermediate altitude in RVSM airspace.

    - Domestic airspace is defined as the airspace under the jurisdiction of a sovereign State (such as Brazil or Mexico), or ATC service provider (such as COCESNA). For the purposes of this document, domestic airspace does not include oceanic FIRs under a State's control unless specifically noted in regional documentation.

    - °°State aircraft designation includes military aircraft.

3.2 Transition Airspace

3.2.1 This Concept of Operations assumes that the following airspace will be transition in nature:

- That airspace adjacent to RVSM airspace where transition to/from RVSM is necessary to allow aircraft to enter non-RVSM airspace.

Aircraft will not be required to have RVSM approval to flight plan in, or operate within, RVSM transition airspace. Transition procedures will be implemented to transition aircraft from RVSM airspace to non-RVSM airspace. These procedures will be included in regional documentation. Transition procedures may be included in appropriate Letters of Agreement between States. Controller workload issues should be considered when implementing Transition airspace and/or procedures.

4. RVSM OPERATIONAL PROCEDURES

4.1 RVSM Approved Aircraft

Approved aircraft will be allowed to flight plan into, and operate within, RVSM airspace. Controllers may assign any of the following altitudes to these aircraft, depending on operational needs and user requests:

- FL290
- FL300
- FL310
- FL320
- FL330
- FL340
- FL350
- FL360
- FL370
- FL380
- FL390
- FL400
- FL410

Controllers will separate RVSM approved aircraft by 1000 feet from other RVSM approved aircraft. All current procedures in use by ATC service providers that stipulate the use of 2000 feet vertical separation will be amend to reflect 1000 feet when applied to RVSM approved aircraft.

4.2 Non-RVSM Approved Aircraft

Non-RVSM approved aircraft operating at FL290 and above will be separated by 2000 feet from all other aircraft, including RVSM approved aircraft. 2000 feet vertical separation must be used regardless of the type of airspace within which the aircraft is operating. Non-RVSM approved aircraft will not be allowed to flight plan into, or operate within, RVSM airspace. The exception to this rule will be those aircraft specifically identified in regional procedures, such as military/state/humanitarian flights, or aircraft operating entirely within a single state's domestic airspace under procedures developed and coordinated by that state. Non-RVSM approved aircraft can be cleared to operate at any RVSM altitude, i.e.; FL360 or FL380, provided they are separated by 2000 feet from other aircraft.

4.3 Identification of RVSM Aircraft

This concept of operations assumes that every state will have a method in place to identify RVSM approved aircraft to each ATC service provider. This identification will be in the form of an identifier located within the filed flight plan of the aircraft and must be available in some form at each control position that provides service to the aircraft. Aircraft operators must insure that any aircraft that is RVSM approved uses the appropriate identifier for each flight. Those ATC service providers that do not utilize automated data processing or automated data transfer must insure that proper coordination of an aircraft's RVSM status is coordinated with other service providers in the same manner other critical flight data is coordinated. Controllers must verify the approval status of any aircraft that operates in RVSM airspace. This can be accomplished by checking the equipment suffix on the flight plan. States utilizing automated flight plan processing will insure that their automation systems are capable of forwarding the regionally accepted RVSM designation.

4.4 State/Military Flights

Non-RVSM approved state and military flights will be accommodated in RVSM airspace with prior coordination. Prior coordination will consist of the filing of a flight plan. The issuance of a valid ATC clearance shall constitute approval for the aircraft to operate in RVSM airspace. Continued flight by these aircraft in RVSM airspace shall be subject to normal operational considerations.

4.5 Weather/Turbulence Procedures/ Suspension of RVSM Operations

RVSM operations can be particularly impacted by the presence of turbulence. This includes turbulence caused by either severe weather activity or the phenomenon known as orographic flow, or mountain wave turbulence.

4.5.1 Numerous FIRS within the CAR/SAM region are impacted by turbulence caused by orographic flow/mountain wave. The RVSM implementation NOTAM/AIC contains the following language:

The pilot must notify ATC whenever the aircraft:

- **Encounters turbulence that affects the capability to maintain flight level.**

This will normally occur when the aircraft is in areas of greater than moderate turbulence. When ATC service providers receive reports of greater than moderate turbulence, they should evaluate the situation to determine if RVSM operations should be suspended.

4.5.2 Turbulence/mountain wave activity can also be forecast with high levels of accuracy. During periods of forecast mountain wave activity, controllers should ask for pilot reports on a regular basis in order to quickly identify any potential problem. Technology that predicts and models orographic flow is also becoming more and more advanced, giving ATC service providers highly accurate forecasts.

4.5.3. When an ATC service provider becomes aware that turbulence/mountain wave conditions will interfere with an aircraft's ability to maintain the assigned altitude, the first step is to insure that standard vertical separation is established for any aircraft that are, or will be affected by this turbulence. After 2000 feet vertical separation has been established, the next step is to define the area within which the activity is occurring. The ATC service provider should then consider the option to

suspend RVSM operations within the defined area. Some of the factors to consider when deciding whether or not to suspend RVSM are:

- Current/ Expected traffic volume
- Availability of other separation methods
- Other impacts on traffic, such as equipment outages

4.5.4 If necessary, the ATC service provider should take the required action to suspend RVSM operations within the defined area. In addition to taking action to restore 2000 feet of vertical separation between aircraft operating with 1000 feet of separation, the service provider must immediately coordinate with surrounding service providers to advise them of any suspension of RVSM operations. This coordination should include at a minimum:

- The reason for RVSM suspension
- The airspace and routes affected
- The time that RVSM operations are/will be suspended
- The expected time RVSM operations will resume, if known
- Any traffic flow management restrictions
- Revised flight data for any aircraft that will enter the adjacent airspace from the airspace where RVSM operations were suspended
- Revised flight date for any aircraft that are leaving the area where RVSM has been/will be suspended.

4.5.5 The suspension of RVSM does not necessarily mean that controllers cannot still utilize any available altitude within RSVM airspace. Suspension of RVSM for any other operational reason should be handled as above, except that the coordination should include the reason for the suspension. ATC service providers must insure that adequate notice is given to all affected facilities in order to insure an orderly transition to conventional separation standards. In those cases where numerous aircraft are affected by turbulence/mountain wave activity within a relatively small area, controllers may consider the use of other means of separation, such as lateral or longitudinal separation.

4.6 Lateral Offsets

4.6.1 Due to the increasing accuracy of navigational equipment found on today's aircraft, aircraft are able to fly along the current route structure with little or no deviation from route centreline. Although this high level of accuracy is desirable from an operational standpoint, it also increases the risk to aircraft that are climbing or descending through the altitude of another similarly equipped aircraft, since this increased navigational accuracy means that the aircraft are more likely to occupy the same lateral airspace at any given point in time. This risk also occurs during altitude deviations caused by turbulence/mountain wave activity. One method of mitigating this risk is to allow for the use of lateral offsets. A sample lateral offset procedure is described in Appendix xx to this document. The Separation and Airspace Safety Panel of ICAO is currently studying the implementation of a global offset procedure. If adopted, this global procedure could be included in regional documentation, including the RVSM operations manual.

4.7 Data Collection

4.7.1 ATC service providers should establish a system for gathering and relaying significant information concerning RVSM operations to the appropriate authorities. This information includes suspected non-RVSM approved aircraft operating in RVSM airspace without proper authorization,

large height deviations, unexpected increases or decreases in the amount of RVSM operations, etc. This data will be collected and forwarded to the CAR/SAM Regional Monitoring Agency (CARSAMMA) using forms prepared by the CAR/SAM RVSM Task Force. In addition, RVSM utilization data will be tracked for use by both State and regional traffic flow management officials, and for long term monitoring studies by the CARSAMMA.

5. ATC PERSONNEL ISSUES

- **Training**

  Controller training for RVSM will be accomplished using material prepared by both the RVSM Task Force and the State's own civil aviation authorities. Use of RVSM in the operational environment will be very similar to vertical separation standards currently in use. Special emphasis should be given to those areas where RVSM procedures differ from current procedures, such as suspension of RVSM operations, RVSM contingency procedures and sector airspace management issues. Training material for controllers will be prepared by the RVSM Task Force and made available to each state. States may use the initial RVSM NOTAM/AIC as an early briefing guide. States should plan for sufficient time to provide individual controller training shortly before RVSM implementation. Each State should consider it's own operational situation when initiating training programs, and should customize training materials to match the technology they currently use to deliver air traffic services, such as radar or procedural control. It is highly recommended that States utilize the RVSM Regional Training manual to assist them. States should make use of practice RVSM scenarios and training problems to allow controllers the opportunity to practice the use of RVSM separation prior to actual implementation.

- **Automation**

  Those States utilizing automated flight plan processing shall insure that their automated systems can accept, recognize, process, and forward RVSM related flight plan data. This data must be presented to the controller in an easily recognizable format, and in such a way as to enhance the controller's ability to conduct safe, orderly, and efficient operations within their assigned airspace.

6. AIRSPACE CHANGES

6.1 After analysis of the airspace, it has been determined that RVSM implementation in and of itself will not require the alteration of airspace within the CAR/SAM region. However, the use of RVSM will expedite the development of new route systems in the region by allowing the elimination of some routes, due to the increased capacity offered by RVSM.

7. DOCUMENT CHANGES

7.1 Changes will made to all necessary regional documentation, including the CAR and SAM Doc 7030s.

8. SWITCHOVER PROCEDURES

8.1 Switchover procedures will be as follows:

(Content to be developed by ATC working group)

9. FLIGHT LEVEL ALLOCATION SCHEME (FLAS)

9.1 Because RVSM adds additional usable altitudes to the operating environment, the current system of allocating flight levels no longer applies. Annex II of ICAO Doc. 4444 provides a flight level allocation scheme that can be used to develop a procedural system for the CAR/SAM region.

Assign altitudes within RVSM airspace using the following flight level allocation system:

*****This is a draft flight level allocation system and is subject to change by the RVSM Task Force**

Aircraft within RVSM or RVSM transition airspace	Assigned route, track, course, or vector is between 000 degrees and 179 degrees magnetic	Assign any the following cardinal altitudes	FL290 FL310 FL330 FL350 FL370 FL390 FL410
Aircraft within RVSM or RVSM transition airspace	Assigned route, track, course, or vector is between 180 degrees and 359 degrees magnetic	Assign any of the following cardinal altitudes	FL300 FL320 FL340 FL360 FL380 FL400

It is important to remember that any aircraft, RVSM approved or non-RVSM approved, can be assigned any cardinal altitude in compliance with the above system. However, standard 2000' vertical separation **must** be applied to all non-RVSM approved aircraft within RVSM transition airspace. This provides a significant benefit for non-RVSM approved aircraft on domestic flights as they can achieve some of the same fuel economy benefits as approved

aircraft. Aircraft not in compliance with the above system must be coordinated and approved by each receiving controller.

9.2 **Operation of non-RVSM aircraft within RVSM airspace**

RVSM approved aircraft will be given priority for level allocation over non-RVSM approved aircraft, unless an operational advantage is gained by giving priority to the non-RVSM approved aircraft. The vertical separation minimum between non-RVSM aircraft operating in the RVSM stratum and all other aircraft is 2,000 ft. ATC may clear non-RVSM aircraft to climb or descend *through* RVSM airspace, provided they do not climb or descend at less than standard rate, or level off while passing through the RVSM stratum.

LIST OF ACRONYMS

ACAS	Airborne Collision Avoidance System
ADS	Automatic Dependent Surveillance
AFI Region	Africa-Indian Ocean Region
AFS	Aeronautical Fixed Services
AFTN	Aeronautical Fixed Telecommunications Network
AIDC	Air Traffic Services (ATS) Inter-facility Data Communications
AMSS	Aeronautical Mobile-Satellite Service
ASM	Airspace Management
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
CAR/SAM	Caribbean/South American Regions
CNS/ATM	Communications, Navigation and Surveillance/Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
CTA	Control Area
ETOPS	Extended Range Operations of Twin-Engined Aeroplanes
FANS-1/A	Future Air Navigation Systems Avionics
FIR	Flight Information Region
FLAS	Flight Level Allocation Scheme
FMS	Flight Management System
GNE	Gross Navigation Error
GNSS	Global Navigation Satellite System
HF	High Frequency
ICD	Interface Control Document
IGA	International General Aviation
IRU/INS	Inertial Reference Unit/Inertial Navigation System
MNPS	Minimum Navigation Performance Specifications
NAT	North Atlantic
NDB	Non Directional Beacon
OAC	Oceanic Area Control Centre
OCA	Oceanic Control Area
OLDI	On Line Data Interchange
OTS	Organized Track System
RNP	Required Navigation Performance
RVSM	Reduced Vertical Separation Minimum
SARPS	Standards and Recommended Practices (ICAO)
SATCOM	Satellite Communications
SSR	Secondary Surveillance Radar
TLS	Target Level of Safety
UTC	Universal Co-ordinated Time
VHF	Very High Frequency
VDL	VHF Data Link
VOR/DME	Very High Frequency Omnidirectional Range/Distance Measuring Equipment