Ref: ES AN 4/44 - 0253

7 April 2004

Subject: **Draft National Plan and ATC Operations Manual for Reduced Vertical Separation Minimum (RVSM)**

Action required: **Reply before 31 May 2004**

Sir/Madam,

I have the honour to draw your attention to APIRG/14 meeting held in Yaounde, Cameroon, from 23 to 27 June 2003. APIRG/14 Conclusion 14/21 and AFI RVSM Task Force/2 meeting Conclusion 2/13 *inter alia* advocated as follows:

Conclusion 14/21: Implementation of RVSM in the AFI Region:

That:

States do their utmost to implement RVSM in selected airspaces, as per plan by AIRAC cycle date of 20 January 2005 concurrently with the CAR/SAM Region.
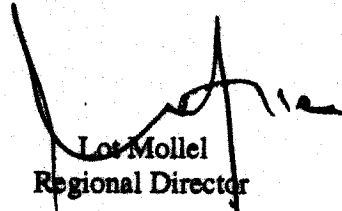
Conclusion 2/13:

That:

ATC Manual for RVSM in AFI Region be circulated to States for action.

In order to meet the target date of **20 January 2005**, you are urged to implement your own National RVSM Plan and ATC Operations Manual at the earliest possible time but not later than **31 May 2004**. Furthermore, it is essential to appoint a National Program Manager at the earliest possible time to direct the National RVSM Program. Kindly send me the name, title and complete address of the National Programme Manager that you appoint.

Attached please find guidance material for development of a RVSM plan and ATC Operations Manual that are required for implementation of RVSM at national level. Furthermore, States which may not be conversant with the RVSM implementation process may wish to contact the ICAO RVSM Program Office in Nairobi.

Accept, Sir/Madam, the assurances of my highest consideration.

Lot Mollel
Regional Director

Attachment A: Draft National Plan

Attachment B: ATC Operations Manual for Implementation of Reduced Vertical Separation Minimum

DRAFT NATIONAL PLAN FOR IMPLEMENTATION OF REDUCED VERTICAL SEPARATION MINIMA

(State name)

(Date)

DRAFT NATIONAL PLAN FOR IMPLEMENTATION OF REDUCED VERTICAL SEPARATION MIMINIMUM

DRAFT: STATE RVSM MASTER PLAN AND IMPLEMENTATION PROGRAM

1.   RVSM BACKGROUND

In the late 1970s, the International Civil Aviation Organization (ICAO) initiated a comprehensive program of studies to examine the feasibility of reducing the 2000 ft vertical separation minimum (VSM) applied above flight level (FL) 290 to the 1000 ft VSM as used below FL 290. Throughout the 1980s, various studies were conducted under the auspices of ICAO in Canada, Europe, Japan and the United States.

The studies demonstrated that the global reduction of vertical separation was safe, feasible and without the imposition of unduly demanding technical requirements and would be cost-beneficial. The studies also showed that the North Atlantic (NAT) minimum navigation performance specification (MNPS) airspace was an ideal area for the introduction of a reduced vertical separation minimum (RVSM) because of the types of aircraft and the essentially unidirectional tidal flow of traffic. Planning for RVSM in the NAT Region commenced in 1990. The first stage of the Operational Evaluation phase, using the 1000 ft RVSM (between FL 330 and FL 370 inclusive), began in March 1997. A second stage extended RVSM to between FL 310 and FL 390 inclusive in October 1998.

NAT Region implementation involves the application of RVSM in the transition area of States within the European Region. In an early stage of the studies, it was determined that the introduction of RVSM in upper European airspace would have considerable benefits. However, from the outset, it was clear that the complex nature of the European air traffic services (ATS) route structure, its wide variety of aircraft types and high traffic density, as well as the high percentage of aircraft climbing and descending, would be a more demanding environment than the NAT Region. Therefore, the introduction of RVSM in the European environment addressed all aspects of en-route operations such as the safety implications of European traffic complexity, the mix of aircraft types, the many stakeholders involved (39 RVSM participating States, industry, aircraft operators), etc.

1.1   Africa-Indian Ocean RVSM Airspace

Before RVSM can be implemented within the Africa-Indian Ocean (AFI) Region, the AFI Planning and Implementation Regional Group (APIRG) must ensure that:

- safety objectives will be met;
- the operational acceptability and feasibility of RVSM in AFI airspace is feasible and operationally acceptable; and
- a positive cost/benefit ratio can be demonstrated for the stakeholders.

2.   RVSM PLAN

2.1   General.

An AFI RVSM Plan will introduce the AFI Reduced Vertical Separation Minimum (RVSM) Program, its contents and challenges, and describe how it will be organized and managed by the numerous stakeholders. The AFI RVSM will provide six additional flight levels between FL 290 and FL 410 inclusive in the airspace of 53 RVSM States. This will result in additional airspace capacity, reduction in flight delays and fuel economies for the users.

As required in other regions, AFI RVSM will have to demonstrate that the target level of safety (TLS) set out by ICAO for the vertical collision risk will not be exceeded in the AFI RVSM airspace. To this end, an AFI RVSM Implementation Safety Case will be developed. The three main deliverables to be included in this effort are the functional risk assessment (FRA), the collision risk assessment (CRA) and the national safety plans.

A RVSM Implementation plan is also required for each State. A National RVSM Master Plan should set out the scope of the work needed to safely implement RVSM at the earliest realistic date and in an efficient manner. The application of a reduced vertical separation minimum by the States and ATS providers requires completion of a wide-ranging and coordinated array of activities by the various stakeholders in the AFI RVSM States, as well as by the airspace users. These activities must be identified to enable RVSM operations to be conducted in a safe and efficient manner. National RVSM Master Plans must therefore be developed in consultation with the AFI RVSM Program Office (ARPO), service providers, airspace users and other relevant stakeholders.

2.2   Purpose

The purpose of the National RVSM Master Plan is to identify the essential elements that need to be addressed in order for the ICAO RVSM concept to be adopted in the AFI Region. The plan should present the actions that need to be taken to ensure that all safety and operational criteria are met prior to implementation.

2.3   Scope

Numerous tasks to be accomplished from a wide range of stakeholders. This plan will serve as the basis for managing stakeholder activities and will form part of the AFI RVSM Master Plan to ensure a common timescale. The plan should encompass:

- all key activities, including tasks for the AFI RVSM Program Office, States, airspace users and manufacturers;
- an overview of RVSM Program tasks;

- key milestone dates and associated timescales of required activities;
- assumptions on which the RVSM Program and its activities and timescales have been based; and
- the National RVSM program structure and management, allowing effective cooperation between all participants involved.

Note: A draft schedule is attached as Appendix A.

2.4   Objectives

The objectives of the National RVSM Master Plan are to:

- identify all key activities, milestones and deliverables;
- establish realistic timescales;
- identify roles and responsibilities;
- reflect the commitment of individual States;
- form part of the AFI RVSM Program; and
- serve as the basis for national RVSM program plans.

2.5   RVSM Plan and Program Application

An AFI RVSM Program Office was established to effectively manage the Regional RVSM Program in consideration of the many stakeholders and the interdependence of their tasks.

A National RVSM Management Committee would be required to direct the establishment of an RVSM Program and Master Plan. This should be accomplished in consultation with AFI RVSM Program Office, airspace users and other relevant RVSM stakeholders. The National Program Managers and all other stakeholders will form an integral part of the AFI RVSM Implementation Program. The identification and resolution of any issue that may affect the overall RVSM Program will need to be a cooperative effort, with the RVSM Master Plan as a common basis for all States. The program should:

- provide for the safe operational introduction of RVSM at the earliest possible date;
- combine tasks with realistic timescales; and
- enable full commitment on the part of all RVSM stakeholders to the program.

Development of the National RVSM Master Plan, through consultation with stakeholders corresponding, and the detailed work schedule should be submitted for approval by the relevant State authority. Once approved, the National RVSM Master Plan should be used as the framework for the organization, management and implementation of the National RVSM Program. The RVSM Master Plan will be used to meet the agreed common target dates, major milestones and assess progress by all national stakeholders.

National Program Managers will report progress to the AFRI RVSM Program Office for inclusion in the AFI RVSM master schedule. The Program Manager must identify potential delays to the National RVSM master schedule, take necessary actions to address the relevant issues and find potential solutions.

3.   NATIONAL RVSM PROGRAM

The RVSM Program is large and complex, with many interdependent stakeholder activities. If the program is to succeed and attain the agreed implementation date of January 2005, it will require full cooperation and the commitment and coordination of the numerous stakeholders. Identified stakeholder activities must be developed into a Work Program. This Work Program can be summarized into five sub-programs. *See Appendix B*.

3.1   Sub-Program 1 - RVSM Program Management.

The main deliverable is the RVSM Plan for which full Stakeholder commitment is required to meet the agreed RVSM implementation date. RVSM Implementation includes program management activities throughout the required period, especially progress monitoring and progress/status reports to the ARPO.

3.1.1 National RVSM Implementation Master Plan

The main deliverable to be developed in consultation with relevant Stakeholders is a National RVSM Master Plan with realistic time scales.

3.1.2 RVSM Implementation Program Management Plan

States should develop a National RVSM Implementation Program Management Plan and processes to enable effective and proactive management of the RVSM Program. NPMs should manage the national RVSM Program throughout the required period and provide informative progress/status reports to the ARPO and relevant Stakeholders.

3.1.3 RVSM Promotion

RVSM promotion awareness needs to be undertaken by each State. Increasing the levels of awareness throughout the industry and within each State will reduce the risk of the RVSM Implementation program failing to attain its objectives and gain needed support. NPMs should establish information methods and links with all RVSM affected Stakeholders in order to provide support to the RVSM Program via advance information and collaborative actions.

3.2   Sub-Program 2 - Aircraft Operations and Airworthiness

To ensure timely RVSM approvals for Aircraft Operations and Airworthiness by States all technical, operational and regulatory directives must be available for airspace users. The availability of such directives will also assist the monitor and approval process. Aircraft height-keeping accuracy must be verified through the

operation of a height-monitoring infrastructure system. The monitoring program will provide the technical data to confirm that safety objectives are met.

3.2.1 Flight Crew Procedures

In order to support safe operations in AFI RVSM airspace, appropriate flight crew procedures need to be available and flight crew training needs to include these RVSM specific procedures. Flight crew procedures should allow flight crews to comply with the normal, abnormal and contingency AFI RVSM operational procedures. The assurance that the aircraft equipment meets the RVSM minimum aircraft system performance specification (MASPS) requirements for operation in AFI RVSM airspace could be included in these procedures. The AFI RVSM Program Office should ensure that AFI RVSM procedures are not different from those of other regions.

3.2.2 Aircraft Requirements

For operations in RVSM airspace, flights are required to be RVSM-approved. Military authorities should be encouraged to make their transport fleet compatible with RVSM requirements. To obtain RVSM approval, aircraft may need modifications based on service bulletins produced by aircraft manufacturers. Joint Aviation Authority (JAA) Temporary Guidance Leaflet No.6 (TGL 6) provides MASPS, guidance on airworthiness and operational practices and procedures for RVSM airspace that can be used as bases for the approval processes. The RVSM requirements must also be reflected in ICAO's Doc 7030 (*Regional Supplementary Procedures*) as a basis for national regulation.

3.3 Sub-Program 3 – Air Traffic Management (ATM)

This sub-program will ensure that all ATS provider units are well prepared and ready for the introduction of RVSM on the agreed date. Tasks should be identified to allow States to restructure airspace, introduce RVSM Procedures, modify ATC systems, provide ATC Training and resolve legislative issues, etc.

3.3.1 Airspace

The definition of the National RVSM area should be based on the operational requirement for a homogeneous area with no significant gaps in it. Additionally, considering its significant benefits, the RVSM should be implemented in an area as wide as possible.

Within RVSM airspace, sectorization and ATS routes will need to be reviewed in the context of the availability of the additional RVSM flight levels. These aspects need separate attention in airspace where the transition to and from non-RVSM airspace will be accommodated.

3.3.2 ATC Procedures

Air traffic control (ATC) operational procedures for the National RVSM airspace will need to be developed and implemented, including:

- flight planning procedures;
- contingency procedures;
- transition procedures; and
- procedures for handling non-RVSM State aircraft.

These procedures must be reflected in the individual State ATC manuals for reduced vertical separation minima and in an amendment to ICAO's Doc 7030 (*Regional Supplementary Procedures*).

3.3.3 ATC Systems

In order to accommodate and support the provision of ATC in an RVSM environment, ATC systems may need to be modified. The modifications are related to the need for the controller to distinguish between RVSM-approved aircraft and -non-approved aircraft, and to accommodate the extra RVSM flight levels and possible re-sectorization. ATC training simulators will require similar modifications.

3.3.4 ATC Training

Specific ATC procedures will be used to facilitate the safe transition of aircraft to/from RVSM and non-RVSM airspace while operating in the RVSM airspace. The transition tasks must be accomplished within the designated RVSM airspace in order to make RVSM operations transparent to adjacent non-RVSM regions. The RVSM Program will also require that specific training of ATC staff be performed prior to the start of RVSM operations. Furthermore, the Program will require that ATC equipment and procedures be modified according to specific Program requirements prior to the start of RVSM operations.

ATC training syllabi must therefore be developed to support RVSM ATC training by the ATS providers. In the context of the additional RVSM flight levels, the associated review of sectorization, ATS routes, locally applied flight level allocation systems and letters of agreement will need to be reviewed and amended. Further, the legal aspects associated with RVSM operations will require identification, with possible consequential amendments to national legislation.

3.4   Sub-Program 4 - RVSM Safety Assurance

Each State is responsible for the safe implementation of RVSM in the airspace over which it has jurisdiction. The State NPMs will be responsible for providing assurance through national safety plans that their responsibilities have been met. The ARPO has assumed responsibility of providing guidance to the States on how to develop these national safety plans.

The introduction of RVSM must be achieved in conjunction with a thorough assessment of the safety implications that will result from this change of operation in a State. It is therefore important that clear safety objectives and safety evaluations showing the attainment of these objectives be met before the introduction of RVSM.

A National RVSM safety policy must also be developed taking into account ICAO guidance. The derived safety objectives, after endorsed by the AFI RVSM Program Office, will form the basis for the RVSM Program tasks.

In order to demonstrate that the above objectives are met, appropriate risk estimation methodologies will need to be available, and sufficient operational and technical data will need to be collected to obtain risk estimates with sufficient confidence.

3.5   Sub-Program 5 – Height Monitoring

It is recognized that there is a requirement for monitoring of aircraft height keeping performance as part of RVSM implementation program. The AFI RVSM Task Force established an AFI Regional Monitoring Agency (ARMA) in South Africa to monitor aircraft height within the Region. The ARMA will provide Safety Oversight Services in connection with implementation and continued safe use of RVSM within the designated airspace. However, States are required to certify aircraft for RVSM operations and conduct RVSM implementation readiness assessments.

3.6   RVSM Program Schedule

National Program Managers (NPM) should develop a schedule for all the activities in conjunction with the various stakeholders. This schedule will serve as the benchmark against which the national program progress will be assessed and should contain the following significant items:

- provisional State approval of the Master Plan;
- monitoring infrastructure fully operational;
- sufficient aircraft approved;
- pre-implementation safety assessment;
- implementation or delay decision;
- implementation date;
- initial post implementation safety assessment; and
- final post implementation safety assessment.

The National Program Managers (NPM) should:

- review and comment on the program;
- develop their national schedule to interface and conform with the AFI RVSM master schedule; and

- ensure that they can implement RVSM on the agreed date.

Note: See Appendix C

4   RVSM PROGRAM MANAGEMENT STRUCTURE

An AFI RVSM Program Office (ARPO) was established to manage an AFI RVSM Master Plan. The ARPO will provide guidance to National Program Managers (NPM) and forward recommendations to AFI RVSM TF for endorsement. The NPM will coordinate RVSM activities at national level and provide inputs to the ARPO.

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              │    APIRG    │
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                     ↑
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              │ AFI RVSM TF │
              └─────────────┘
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              ┌─────────────┐
              │    ARPO     │
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              │     NPM     │
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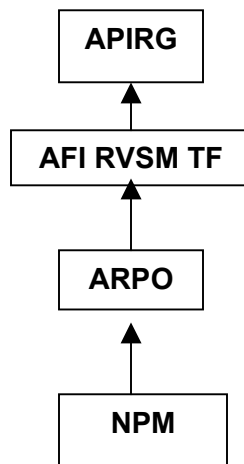
4.1   AFI RVSM Program Office (ARPO)

The ARPO will:

- provide strategic guidance to the national RVSM Program Manager;
- ensure continued involvement and commitment of participating States, users and other international organisations to all elements of the RVSM Program;
- where necessary, submit specific proposals for strategic actions to AFI RVSM TF;
- monitor the overall RVSM Program on the basis of progress reports by the RVSM Program Manager and check progress against agreed milestones and propose necessary corrective actions;
- provide detailed and in-depth analyses of the RVSM Program progress;
- submit progress reports to AFI RVSM TF; and
- provide guidance to the States on how to develop national safety plans.

4.2   National RVSM Program Manager
A National RVSM Program Office similar the ARPO should be established by individual States to manage an RVSM Master Plan. However, it is essential that States identify a National Program Manger (NPM) at the earliest possible date

and forward the contact details to the ARPO. The NPM will act as the National RVSM Implementation focal point, report to the ARPO and provide guidance to relevant stakeholders at National level. *See Appendix D.*

The RVSM Program Manager will:

- be responsible for the day-to-day management of the RVSM Program;
- be responsible for ensuring adequate coordination with all RVSM Sub-Program Managers;
- submit regular progress reports to the ARPO, focusing on constraints, difficulties and areas that require strategic decisions;
- ensure that the RVSM Program is maintained on schedule and within the overall assigned budget;
- coordinate the required availability of resources with all concerned;
- be responsible to the ARPO for the execution of the applicable national activities within the AFI Program and Master Plan;
- report, in accordance with a Communication Plan, on progress against the agreed RVSM Program Plan; and
- participate at the relevant RVSM Program Managers Meetings.

5   RVSM Management Processes

5.1   Program Management Plan (PMP)

A detailed National Program Management Plan (PMP) must be developed which will provide a baseline and communication tool against which to monitor the cost, schedule and performance aspects of the RVSM Program. Using the approved RVSM Master Plan and current program management techniques as a basis, the PMP will include the following:

- work break down schedule;
- risk management plan;
- communications management plan; and
- individual State National Plans.

5.2   Communications Management

Communications management is a key program control process that will contribute to the stakeholders achieving the agreed implementation date. Communications management is summarised here but should be fully described in the PMP. RVSM Communications Management will ensure timely and appropriate generation, collection, dissemination and storage of program information.

An AFI RVSM Communications Management Plan will guide the process. It will define who needs what information, when they need it, and how it will be provided to them. Preparation and maintenance of this plan is the responsibility of ARPO but the full support and commitment of the participating States and

stakeholders in this process is essential if the RVSM Program is to attain the agreed implementation date.

5.3   Progress Reporting

Progress information will be required by the ARPO from each State's National Program Manager. These progress reports should describe what the program stakeholders have accomplished. This information will be assembled into an overall RVSM progress report for all stakeholders and provide them with a means of measuring progress towards achieving the program objectives.

As the national RVSM activities are critical to the timely success of the program, progress monitoring at the national level is of great importance. In order to achieve a consistent monitoring picture at the program level, it is important that all States provide accurate and timely information regarding the achievements of each National RVSM Plan.

6   STAKEHOLDER COMMITMENT TO THE RVSM PROGRAM

Each of the stakeholders has an important role to play. Successfully attaining the agreed implementation date necessitates that stakeholders deliver their elements of the program on time. Therefore, delivering the RVSM Program on the agreed implementation date will require that each stakeholder respect the schedule.

The commitment to the whole program by national representatives will signify commitment to key milestones within the program. The detailed activities leading up to each milestone are to be managed by National Program Managers. Only if stakeholders achieve key activities' dates will the Program as a whole attain the agreed RVSM implementation date.

6.1   Stakeholder Responsibility

Each stakeholder responsibility is reflected in the key activities outlined below.

6.1.1 AFI RVSM Program Office
The AFI RVSM Program Office (ARPO) is responsible for the overall management of the RVSM Program, implementation and infrastructure monitoring operation, as well as for the preparation of the safety assessment.

6.1.2 ICAO
ICAO is responsible for providing guidance and a framework to enable the introduction of national regulations needed to be in place for the introduction of RVSM.

6.1.3 JAA
Joint Airworthiness Authority (JAA) guidance material could be used for the approval of aircraft and operations in RVSM airspace at national level.

6.1.4 RVSM States
State stakeholders include the national civil aviation authority, certification/ regulation authorities and ATS providers. Together they are responsible for the provision of regulations to enable air traffic controllers to safely handle aircraft flying in RVSM airspace, as well as for approving national users for RVSM operations.

6.1.5 Non-RVSM States
Non-RVSM States are responsible for approving aircraft requiring access to RVSM airspace. In addition, non-RVSM States adjacent to the RVSM area may require airspace changes and procedure amendments to handle transition between RVSM airspace and non-RVSM airspace.

6.1.6 Civil Airspace Users
Users wishing to fly in RVSM airspace must gain RVSM approval in the State where the aircraft is registered. A significant proportion of the aircraft population flying in the Region has to be RVSM approved and monitored before RVSM can be introduced on a Regional basis.

6.1.7 Military Authorities
Although certain military aircraft types may be entitled to exemption from obtaining RVSM approval, military users are urged to modify their transport aircraft to meet RVSM requirements.

6.1.8 Aircraft Manufacturers
A wide variety of aircraft types operate in the AFI RVSM airspace. Aircraft manufacturers and their suppliers will be responsible for the development of new service bulletins and equipment to meet RVSM requirements.

7   ISSUES AFFECTING THE RVSM PROGRAM

7.1   RVSM Program Assumptions

The RVSM Program should be based upon a number of assumptions. These assumptions should be identified and agreed upon at the beginning of program development. Assumptions include items such as the existence of an interface with the airborne collision avoidance system (ACAS), that sufficient resources and expertise will be available, that the introduction of RVSM airspace will take place simultaneously in all RVSM States in a coordinated manner, etc. These assumptions may change during the life of the program. A delay in the monitoring infrastructure completion could result in insufficient data for the safety assessment that, in turn, could also affect the implementation date. If this happens, the National and AFI RVSM Programs and Master Plans may need to be revised accordingly.

7.2 RVSM Program Dependencies

The RVSM Implementation Program forms a part of the APIRG program. If the timescales of APIRG programs are changed, there may be consequences for the established timescales of the RVSM Program. Key program interdependencies should be identified and monitored to ensure common tracking and the efficient execution of the RVSM Program.

7.3 Program Risk Assessment

A series of RVSM Program risk assessments must be carried out with the cooperation of a large number of stakeholders, to identify the risks and impacts associated with the program.

The most significant RVSM Program risks identified are:

- delay in the national plans of any of the 53 States could significantly affect RVSM implementation;
- insufficient number of aircraft approved for the implement/delay decision will result in delays in the RVSM Program;
- insufficient data available (e.g. delay in monitoring infrastructure completion, late approval of aircraft) to enable assessment of operational and technical aspects of safety objectives;
- insufficient ATC staff trained to handle aircraft flying in RVSM airspace could reduce capacity and increase safety risk;
- national ATC system not modified on time for the agreed implementation date will delay the program; and
- delay to any ACAS programs will result in many aircraft having different versions of ACAS, which could cause problems in the RVSM environment.

8. RVSM PROGRAM COST FORECASTS AND RESOURCES

Following a proposal of the ICAO Review of the General Concept of Separation Panel in the late 1980s, all ICAO Member States have agreed on the feasibility of the implementation of RVSM on a global basis.

8.1 AFI RVSM Cost/Benefit Study

The main benefits arising from the implementation of RVSM in AFI airspace is a significant en-route airspace capacity increase. However, a cost/benefit study for RVSM should be completed for budget purposes. This analysis must take into account:

- ATC capacity enhancements;
- costs for aircraft altimetry upgrades;
- costs for ATM systems upgrades;

- costs for height-monitoring systems and operation;
- fuel efficiency gains, and
- costs of delaying implementation.

8.2   Capacity Requirement

The primary justification for the implementation of RVSM in the AFI airspace is the requirement to provide additional airspace capacity to meet the ever-rising number of aircraft movements. Of the various measures under consideration, the implementation of RVSM is considered to be, in the short term, the most cost-effective means of meeting this need through the provision of six additional flight levels for use in the highly congested airspace from FL 290 to FL 410 inclusive.

8.3   Stakeholder Cost Forecasts and Resource Requirements

The combined cost forecast for RVSM should be determined by means of a cost analysis. It is the responsibility of stakeholders to identify and gain approval for their own budget and resource requirements.

9.   CONCLUSION

APIRG has endorsed the objectives of capacity and potential economy benefits associated with future implementation of a 1 000 ft reduced vertical separation minimum in the AFI Region and, therefore, concluded that such implementation planning should be treated as a priority item. It is recognized that a number of complex issues need to be addressed, including meteorological and topographical considerations, aircraft equipment, and air traffic control questions.

A National RVSM program for implementation in the earliest possible time-frame should be actively pursued, with implementation planning being carried out by the State and the ARPO. The RVSM Program will be fully coordinated for the entire area of future application, and will take full account of the work carried out by the Review of the General Concept of Separation Panel (RGCSP), the North Atlantic Systems Planning Group (NAT SPG), EUROCONTROL and States in the region.

DRAFT NATIONAL RVSM IMPLEMENTATION SCHEDULE														
	2004												**2005**	
DELIVERABLE	**MONTHS**												**M**	
	J	F	M	A	M	J	J	A	S	O	N	D	J	F
PROGRAM MANAGEMENT														
RVSM Committee	▓													
RVSM Master Plan	▓	▓												
RVSM Program Plan	▓	▓												
RVSM Promotion	▓	▓	▓	▓	▓	▓	▓							
AIRCRAFT OPS & AIRWORTHINESS														
Aircraft System	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓			
RVSM Approval	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓			
Monitoring Policy	▓	▓	▓	▓	▓									
Monitoring System	▓	▓	▓	▓										
Monitor Organisation	▓	▓	▓	▓										
Monitor System Ops	▓	▓	▓	▓	▓									
AIR TRAFFIC MANAGEMENT														
Airspace	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓			
ATC Procedures	▓	▓	▓	▓	▓	▓	▓							
ATS Provider Support	▓	▓	▓	▓	▓	▓	▓	▓						
ATC Training	▓	▓	▓	▓	▓	▓	▓							
Flight Planning	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓				
ATFM	▓	▓	▓											
ATS Systems	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	
Military Aviation														
ATS Provider Schedule	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓				
Legislation	▓	▓	▓	▓										
OPS Data Collection	▓	▓	▓	▓	▓									
Post-Implementation														▓
RVSM OPS Performance Review	▓	▓	▓	▓	▓	▓	▓							
SAFETY ASSURANCE														
Safety Policy	▓	▓	▓	▓	▓	▓	▓							
Pre-Implementation	▓	▓	▓											
Post-Implementation														▓
HEIGHT MONITORING														
RVSM Aircraft Database	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	
Height Deviation Reports				▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
Readiness Assessment								▓	▓	▓				

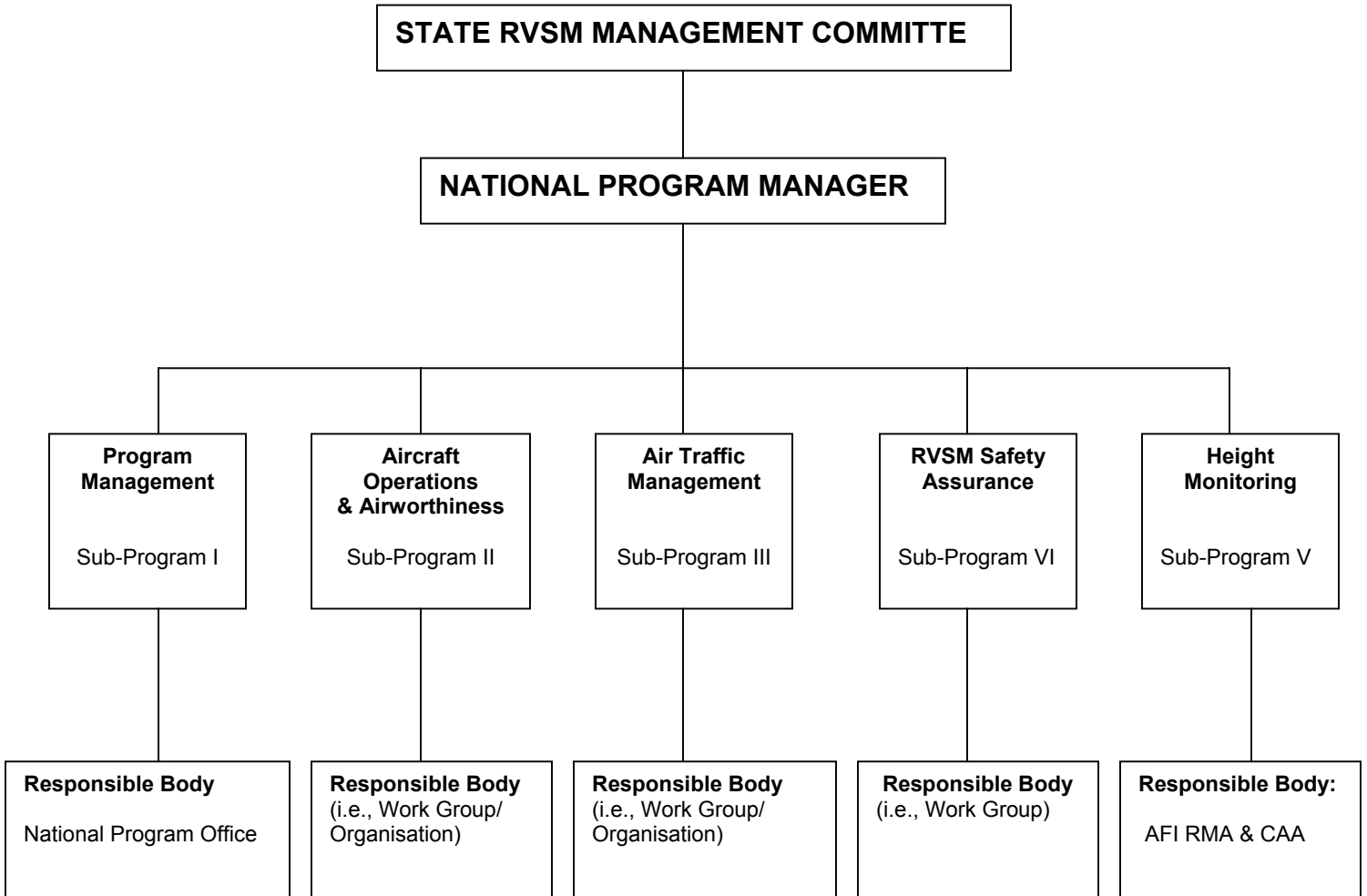| DRAFT NATIONAL RVSM PROGRAM DELIVERABLES			
	AIM	**DESCRIPTION**	**OBJECTIVE**
Sub-Program I - Program Management			
1	Establish National RVSM Implementation Committee	Define tasks for RVSM Implementation Committee and set-up facilities	Provide an Office to support RVSM Implementation
2	Develop RVSM Master Plan	Develop, in consultation with relevant Stakeholders, a RVSM Master Plan with realistic time scales	RVSM Master Plan, endorsed by all Stakeholders and given commitment by State
3	Program Management Activities	Develop an internal National Program Management Plan. Develop Program Management processes to enable effective and proactive management of the RVSM Program. Manage the RVSM Program throughout the required period and provide guidance/informative progress/status reports to Stakeholders. Give progress/status reports to AFI RVSM Program Office (ARPO).	National RVSM Program Management Plan. Program Management Process. Templates for progress monitoring. Progress/ status reports.
4	RVSM Promotion awareness activities undertaken by each State.	Establish information methods and links with all RVSM affected Stakeholders in order to provide support to the RVSM Program via advance information and collaborative actions. Increasing the levels of awareness throughout the industry and within each State will reduce risk of the program failing to attain objectives	Develop, deliver and coordinate an awareness program through actions, products and packages supporting RVSM milestones
Sub-Program II – Aircraft Operations and Airworthiness This Phase will ensure technical, operational and regulatory means will be available for airspace users and States to enable RVSM approvals. Any sub-programs must also assist and monitor the approval process. Aircraft Height Keeping accuracy will be verified through operation of a height-monitoring infrastructure. The monitoring system must provide technical data to confirm that safety objectives are met.			
5	Aircraft System Development	Prepare the necessary regulatory and guidance material. Establish a database of affected aircraft to ensure that all affected aircraft are suitably prepared for RVSM. Establish contact with operators to ensure they undertake the necessary actions for timely RVSM readiness.	Necessary regulatory material is issued to enable Operators to complete necessary modifications. The issue of reports to ARPO confirming ability to modify aircraft and to meet required target dates.
6	RVSM Approval Achievement	Ensuring that all actions are taken to ensure operators can achieve approval for RVSM. This includes establishing contact with relevant stakeholders, preparing the necessary notification material and the monitoring of progress of operators towards meeting the RVSM requirements	Operators ready for RVSM. Issue of periodic reports on the state of preparation of operators
7	Monitor Policy and System Architecture	ARPO to establish agreed means by which the monitoring policy is attained. Define the roles of all stakeholders for monitoring purposes. Define management criteria for GMU. Define monitoring system organisation.	All specifications and contracts in place to enable monitoring system development and operation.
8	Monitor System Development	Development and installation of identified number of GMUs.	Monitoring equipment (GMU) developed and available.
9	Monitor Organisation Development	RMA to manage identified GMUs. Construct required Operational Data management system.	Operation Ready Monitoring System.
10	Monitor System Operation	Monitoring system Application to obtain ASE data. Analysis of performance and dispatch of data to sub programs for further analysis. Follow-up action for aircraft, which appears not to be meet MASPS.	Obtain Technical data for consideration in Safety Assessment
11	Post RVSM Implementation Technical Enhancements	Follow-up monitoring after RVSM implementation to provide observations of performance together with the analysis of causes for any degradation of performance. This process will involve the follow-up of any anomalies, the notification of common causes for any problems observed and recommendation for enhancements	Performance reports and recommendations for appropriate system enhancements.

	AIM	DESCRIPTION	OBJECTIVE
Sub-Program III - ATM Preparation			
This Phase must ensure ATS service provider units are well prepared and ready for RVSM Implementation at the agreed date. Sub-Programs to identity tasks, which should allow States to make airspace changes, introduce RVSM Procedures, modify ATC systems, provide ATC Training and resolve legal issues.			
12	Airspace Structure	Assessment of RVSM on Transition/Non-Transition airspace simulation studies to validate airspace structure and any sectorisation changes. Develop ATS Route network improvements and sectorisation changes.	Provide assessment report for all ACCs in RVSM area. Complete RVSM simulation reports. Provide agreed proposals for ATS Route Network changes. Provide agreed plans for appropriate sectorisation changes.
13	ATC Procedures	Develop ATM Procedures for RVSM implementation.	Develop National RVSM ATC Manual.
14	ATS Providers Support	Provide support for site-specific implementation of RVSM ATS Procedures	Develop Site-specific ATS Procedures, as required
15	ATC Training	Provide RVSM ATC training syllabus - transition and non-transition areas. RVSM training for ATC Instructors. All controllers prepared for RVSM	Develop ATC training syllabus. Train ATC Instructors. Define National training programs. Train ATCs for RVSM Operations.
16	Flight Planning IFPS	Provide software and procedures in IFPS to ensure the correct handling and distribution of FPLs in respect of RVSM requirements	Develop Software and Procedures to fulfil FPL requirements.
17	RVSM impact on ATFM (where applicable)	Provide software and procedures for CFMU systems, to ensure the correct sector loading indications and flight handling for ATFM purposes	Develop Software and procedures to fulfil the requirement
18	ATS System Modification	Identify required ATS system modifications to meet operational requirements, amend existing interface specifications, and provide guidance for **HMI**, follow-up modifications to systems in all concerned ACCs.	Develop Operational Agreed Requirements for System Support and Interface Specifications (OLDI). Provide Support/advice during system modification.
19	Military Aviation Preparation	Identify military requirements related to RVSM implementation	Develop applicable Operational requirements
20	ATS Providers Countdown Schedule	Provide an aeronautical publication schedule and a countdown plan/schedule. Monitor readiness of States in executing the plan/schedule	Develop an Aeronautical Publication Schedule and a Countdown Plan/Schedule to implement RVSM.
21	Legislation	Create sub-group to identify legal issues and propose solutions	Sub-Group to provide legal Report and draft legal texts or guidelines to be implemented by States
22	Operational Data Collection for Safety Assurance	Establish process for collection and analysis of information concerning operational ATC and pilot errors - at minimum, operational incidents/ occurrences relevant to RVSM/height keeping.	Provide ATC/pilot operational error Report.
23	Post Implementation Operational Enhancements.	Assess RVSM operations and develop revised procedures, airspace structure and sectorisation to improve the utilisation of RVSM in RVSM airspace.	Publish Revised procedures of ATS Route Network improvements
24	RVSM Operational Performance Review	Assess ATM capacity before and after RVSM implementation and with specific reference to changes directly related to RVSM	Provide Assessment report on achieved operational benefits arising from RVSM.

	AIM	DESCRIPTION	OBJECTIVE
	Sub-Program IV - RSM Safety Assurance		
	This Phase constitutes the Safety assessments necessary prior to implementation, just after implementation and at the end of the RVSM Program to ensure that the agreed safety objectives are met. Sub-Programs to include the development of an agreed RVSM Safety policy and identify need for States to prepare RVSM Safety Cases.		
25	Develop Agreed Safety Policy	Develop a National RVSM Safety Policy, in compliance with existing Safety Policies, in consultation relevant stakeholders	Provide a State RVSM Safety Policy
26	Pre-Implementation Safety Assessment	Identify required activities to ensure that safety objectives are met when RVSM is implemented.	Provide Go/No-go advice to ARPO from a safety point of view
27	Post Implementation Safety Assessment	Identify required activities to ensure that safety objectives are met when RVSM is implemented.	Report risk levels to ARPO, as basis for decision making to implement risk reducing measures

	AIM	TASK	OBJECTIVE
	Sub-Program 5 - Height Monitoring		
	The RMA is an APIRG authorised body to provide Safety Oversight services in connection with implementation and continued safe use of RVSM within designated airspace. States are required to approve aircraft for RVSM operations and provide safety oversight.		
28	RMA	RMA was established to monitor aircraft height and recommend aircraft for RVSM approval.	Provide safety oversight
29	RVSM Aircraft Database	CAA to establish Aircraft RVSM Approval database	Monitor operator RVSM compliance
30	Height Deviation	RMA to provide CAA with height deviation reports	Ensure safety oversight
31	Readiness Assessment	CAA to conduct safety readiness assessment	Meet RVSM Implementation Date

NATIONAL RVSM IMPLEMENTATION DELIVERABLES & RESPONSIBLE BODY				
Description	**Responsible Body**	**Start Date**	**Target Date**	**Status**
PROGRAM MANAGEMENT				
RVSM Committee	i.e. CAA			
RVSM Master Plan	Program Office			
RVSM Program Plan	Program Office			
RVSM Promotion	Program Office			
AIRCRAFT OPS & AIRWORTHINESS				
Aircraft System	i.e. CAA, Airline,			
RVSM Approval	i.e. CAA			
Monitoring Policy				
Monitoring System				
Monitor Organisation				
Monitor System Ops				
AIR TRAFFIC MANAGEMENT				
Airspace	i.e. ATS Provider			
ATC Procedures				
ATS Provider Support				
ATC Training				
Flight Planning				
ATFM				
ATS Systems				
Military Aviation				
ATS Provider Schedule				
Legislation				
OPS Data Collection				
Post-Implementation				
RVSM OPS Performance Review				
SAFETY ASSURANCE				
Safety Policy	i.e. CAA			
Pre-Implementation				
Post-Implementation				
HEIGHT MONITORING				
RVSM Aircraft Database	CAA			
Height Deviation Reports	RMA & CAA			
Readiness Assessment	CAA			

DRAFT NATIONAL RVSM PROGRAM

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│     STATE RVSM MANAGEMENT COMMITTE       │
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│        NATIONAL PROGRAM MANAGER          │
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Program Management	Aircraft Operations & Airworthiness	Air Traffic Management	RVSM Safety Assurance	Height Monitoring
Sub-Program I	Sub-Program II	Sub-Program III	Sub-Program VI	Sub-Program V

Responsible Body National Program Office	**Responsible Body** (i.e., Work Group/ Organisation)	**Responsible Body** (i.e., Work Group/ Organisation)	**Responsible Body** (i.e., Work Group)	**Responsible Body:** AFI RMA & CAA

DRAFT AIR TRAFFIC CONTROL OPERATIONS MANUAL FOR IMPLEMENTATION REDUCED VERTICAL SEPARATION MINIMUM

(State Name)

(Date)

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11.2   ATC Sectorisation
11.3   ATM Options for RVSM Transition
11.4   Laterally Spaced, Uni-Directional ATS Routes
11.5   Flight Level Allocation Scheme
11.6   ATC Clearances
11.7   Inter-Centre Letters of Agreement
11.8   Inter-Centre Coordination

12   AIRCRAFT COLLISION AVOIDANCE SYSTEM

DRAFT AIR TRAFFIC CONTROL OPERATIONS MANUAL FOR IMPLEMENTATION OF REDUCED VERTICAL SEPARATION MINIMUM

1   INTRODUCTION

In the late 1970s, the International Civil Aviation Organization (ICAO) initiated a comprehensive program of studies to examine the feasibility of reducing the 2000 ft vertical separation minimum (VSM) applied above flight level (FL) 290 to the 1000 ft VSM as used below FL 290. Throughout the 1980s, various studies were conducted under the auspices of ICAO in Canada, Europe, Japan and the United States.

The studies demonstrated that the global reduction of vertical separation was safe, feasible and without the imposition of unduly demanding technical requirements and would be cost-beneficial. The studies also showed that the North Atlantic (NAT) minimum navigation performance specification (MNPS) airspace was an ideal area for the introduction of a reduced vertical separation minimum (RVSM) because of the types of aircraft and the essentially unidirectional tidal flow of traffic. Planning for RVSM in the NAT Region commenced in 1990. The first stage of the Operational Evaluation phase, using the 1000 ft RVSM (between FL 330 and FL 370 inclusive), began in March 1997. A second stage extended RVSM to between FL 310 and FL 390 inclusive in October 1998.

NAT Region implementation involves the application of RVSM in the transition area of States within the European Region. In an early stage of the studies, it was determined that the introduction of RVSM in upper European airspace would have considerable benefits. However, from the outset, it was clear that the complex nature of the European air traffic services (ATS) route structure, its wide variety of aircraft types and high traffic density, as well as the high percentage of aircraft climbing and descending, would be a more demanding environment than the NAT Region. Therefore, the introduction of RVSM in the European environment addressed all aspects of en-route operations such as the safety implications of European traffic complexity, the mix of aircraft types, the many stakeholders involved (39 RVSM participating States, industry, aircraft operators), etc.

2   AFI RVSM BACKGROUND

APIRG has endorse the objectives of capacity and potential economy benefits associated with future implementation of a 1 000 ft reduced vertical separation minimum in the AFI Region and, therefore, conclude that such implementation planning should be progressed as a priority item. It is recognized that a number of complex issues need to be addressed, including meteorological and topographical considerations, aircraft equipment and air traffic control questions.

3   THE NEED FOR RVSM

It is accepted that major changes to the AFI ATM systems will be necessary in order to cope with the continued traffic growth. The implementation of RVSM is considered to be the most cost effective means of meeting this need through the provision of six additional flight levels for use in the AFI airspace from FL 290 to FL 410 inclusive.

4   AFI RVSM AIRSPACE DESCRIPTION

4.1   AFI RVSM Airspace
RVSM shall be applicable in that volume of airspace between FL 290 and FL 410 inclusive all AFI Flight Information Regions (FIRs)/Upper Information Regions (UIRs). ***See Appendix …(Airspace/Route Chart Required)***

4.2.1 AFI RVSM Transition Airspace
Transition tasks associated with the application of a 1 000 ft vertical separation minimum within the AFI RVSM Airspace shall be carried out in all, or parts of identified FIRs/UIRs.

ATC units on the interface of AFI RVSM Airspace shall:
- establish RVSM approved & non-RVSM approved State aircraft entering RVSM Airspace at the appropriate RVSM FL
- apply 1,000 ft VSM between RVSM approved aircraft, otherwise apply 2,000 ft VSM;
- establish non-RVSM approved civil aircraft below FL 290 if landing at an aerodrome below the RVSM Airspace;
- establish non-RVSM approved civil aircraft above FL 410 if transiting above the RVSM Airspace & landing at an aerodrome outside AFI RVSM Airspace;
- for aircraft leaving AFI RVSM Airspace, apply 2,000ft VSM and establish them at the appropriate non-RVSM levels.

4.3   AFI Interface with Adjacent Regions
ACCs/UACs providing air traffic control service within the airspace designated for the purpose of transitioning non-RVSM approved civil aircraft operating to/from the adjacent Regions (ie. Europe) may clear such non-RVSM approved civil aircraft to climb/descend through RVSM Airspace. Such climbs/descents through RVSM Airspace shall be achieved before the aircraft passes the transfer of control point to the adjacent ACC/UAC, if applicable, unless otherwise specified in an Inter-Centre Letter of Agreement.

4.4   ICAO Table of Cruising Levels for AFI RVSM Airspace
With the implementation of AFI RVSM, cruising levels within AFI Airspace will be organised in accordance with the Table of Cruising Levels contained in ICAO Annex 2, Appendix 3, a). The cruising levels appropriate to direction of flight within the AFI Region with the implementation of RVSM are **illustrated below**:

4.3   FLIGHT OPERATIONS WITHIN THE AFI RVSM AIRSPACE

Except for designated airspace where RVSM transition tasks are carried out, only RVSM approved aircraft and non-RVSM approved State aircraft shall be permitted to operate within the AFI RVSM Airspace. It should be noted that within the AFI RVSM Airspace all cruising levels are equally assignable by ATC to either RVSM approved or non-RVSM approved aircraft, provided that the applicable vertical separation minimum is applied.

ATC shall:
- except in transition airspace, only clear IFR RVSM approved aircraft & State aircraft into AFI RVSM Airspace;
- provide a 1,000 ft vertical separation minimum (VSM) between RVSM approved aircraft;
- provide a 2,000 ft VSM between non-RVSM approved aircraft and any other aircraft;
- provide 2,000 ft VSM between all military formation flights and any other aircraft.

7   RVSM PROCEDURES

7.1   General
- Only approved State aircraft shall be entitled to operate within the AFI RVSM Airspace, regardless of the RVSM status of the aircraft.

- The Integrated Initial Flight Plan Processing System (IFPS) shall disseminate Item 8 flight plan information to the flight data processing systems (FDPS) concerned for the purpose of providing a clear indication to ATC that where such non-RVSM approved flights are "State aircraft", they are permitted to operate

- All operators filing Repetitive Flight Plans (RPLs) shall include in Item Q of the RPL all equipment and capability information in conformity with Item 10 of the ICAO Flight Plan.

- If a change of aircraft operated in accordance with a repetitive flight plan results in a modification of the RVSM approval status as stated in Item Q, a modification message (CHG) shall be submitted by the operator.

- Operators of RVSM approved aircraft shall indicate the approval status by inserting the letter **"W"** in Item 10 of the ICAO Flight Plan, and in Item Q of the Repetitive Flight Plan (RPL), regardless of the requested flight level.

- Operators of non-RVSM approved State aircraft with a requested flight level of FL 290 or above shall insert "**STS/NONRVSM"** in Item 18 of the ICAO Flight Plan.

- Operators of RVSM approved aircraft and non-RVSM approved State aircraft intending to operate within the AFI RVSM Airspace shall include the following in Item 15 of the ICAO Flight Plan:
  (i) the **entry point** at the lateral limits of the AFI RVSM Airspace, and the requested flight level for that portion of the route commencing immediately after the RVSM entry point; and
  (ii) the **exit point** at the lateral limits of the AFI RVSM Airspace, and the requested flight level for that portion of the route commencing immediately after the RVSM exit point.

- Operators of non-RVSM approved civil aircraft shall flight plan to operate outside of the AFI RVSM Airspace.

7.2   State Aircraft operating Within AFI RVSM Airspace

All State aircraft operating in AFI RVSM Airspace will be considered as non-RVSM MASPS compliant and therefore non- RVSM approved. Therefore, the VSM required between State and other traffic shall be 2,000 ft. State aircraft, i.e. military aircraft, might be exempted from AFI RVSM requirements and where applicable, the indication that a non-RVSM approved aircraft is a State aircraft should be displayed. However, evidence from NAT and EUR RVSM indicates that a large proportion of military transport aircraft are RVSM approved.

The requirement for ATC to accommodate non-RVSM approved State aircraft within the AFI RVSM Airspace imposes significant increases in controller workload result from the requirement of having to selectively apply two distinct vertical separation minima (VSM) within the same volume of airspace,

7.3   Transition of Aircraft Operating To/From the AFI RVSM Airspace.

ACCs/UACs whose area of responsibility includes airspace where RVSM transition tasks are carried out shall ensure that:
- both RVSM approved and non-RVSM approved aircraft entering the AFI RVSM Airspace from adjacent non-RVSM airspace are accommodated within the AFI RVSM Transition Airspace;
- the appropriate vertical separation minimum is applied, based on the RVSM approval status of the aircraft;
- aircraft are established at cruising levels appropriate for the AFI RVSM

Airspace or adjacent non-RVSM airspace, as applicable, and that the appropriate vertical separation minimum is achieved before the aircraft passes the transfer of control point to the adjacent ACC/UAC; and

- non-RVSM approved civil aircraft operating from an adjacent non-RVSM environment to the AFI RVSM Airspace are established at a cruising level outside the vertical dimensions of the AFI RVSM Airspace before the aircraft passes the transfer of control point to the adjacent ACC/UAC.

7.4   Cruising Levels Appropriate to Direction of Flight
The cruising levels appropriate to direction of flight for RVSM and non-RVSM environments are contained in ICAO Annex 2, Appendix 3.

7.5   In-Flight Contingency Procedures
An in-flight contingency affecting flight in the AFI RVSM Airspace pertains to unforeseen circumstances which directly impact on the ability of one or more aircraft to operate in accordance with the vertical navigation performance requirements of the AFI RVSM Airspace.

- The pilot shall inform ATC as soon as possible of any circumstances where the vertical navigation performance requirements for the AFI RVSM Airspace cannot be maintained.
- In above mentioned case, the pilot shall obtain a revised air traffic control clearance prior to initiating any deviation from the cleared route and/or flight level, whenever possible. Where a revised ATC clearance could not be obtained prior to such a deviation, the pilot shall obtain a revised clearance as soon as possible thereafter.
- Air traffic control actions will be based on the intentions of the pilot, the overall air traffic situation, and the real-time dynamics.
- Suspension of RVSM refers to a discontinuance of the use of a vertical separation minimum of 1 000 ft between RVSM approved aircraft operating within the AFI RVSM Airspace.
- A vertical separation minimum of 2 000 ft shall be applied between all aircraft operating within the portion of the AFI RVSM Airspace where RVSM has been suspended, regardless of the RVSM approval status of the aircraft.

7.5.1 Degradation of Aircraft Equipment
- The failure in flight of any component of the Minimum Equipment List (MEL) required for RVSM operations shall render the aircraft non-RVSM approved.
- Where an aircraft's Mode C displayed level differs from the cleared flight level by 300 ft (the allowable tolerance for Mode C readout) or more, the controller shall inform the pilot accordingly and the pilot shall be requested to check the pressure setting and confirm the aircraft's level.

- When the pilot of an RVSM approved aircraft confirms that the aircraft's equipment no longer meets the RVSM MASPS, the controller shall consider the aircraft as non-RVSM approved and take action immediately to provide a minimum vertical separation of 2 000 ft, or an appropriate horizontal separation minimum, from all other aircraft concerned.
- An aircraft rendered non-RVSM approved shall be cleared out of the AFI RVSM Airspace by air traffic control and the ACC/UAC to co-ordinate with adjacent ACCs/UACs.
- ATC shall manually apply the display of the a RVSM approved aircraft's associated radar label and/or radar position symbol, in accordance with established local radar display features applicable to non-RVSM approved aircraft in case of required RVSM equipment failure

7.5.2 Severe Turbulence – Not Forecast (single aircraft)
- When an aircraft operating in the AFI RVSM Airspace encounters severe turbulence due to weather or wake vortex which the pilot believes will impact the aircraft's capability to maintain its cleared flight level, the pilot shall inform ATC. ATC is required to establish either an appropriate horizontal separation minimum, or an increased vertical separation minimum of 2 000 ft.

- ATC shall co-ordinate the circumstances of an RVSM approved aircraft that is unable to maintain its cleared flight level due to severe turbulence by verbally supplementing the estimate message with: **"UNABLE RVSM DUE TURBULENCE".**

- ATC shall manually apply the distinguishing feature of the radar label associated with non-RVSM approved aircraft and/or the radar position symbol to such an aircraft until such time as the pilot reports ready to resume RVSM.

- An aircraft experiencing severe turbulence while operating within the AFI RVSM Airspace need not be cleared out of RVSM airspace. If the pilot has informed ATC that the severe turbulence will impact the aircraft's capability to maintain the cleared flight level, the establishment of an appropriate horizontal separation minimum, or an increased vertical separation minimum may be accomplished within the AFI RVSM Airspace, traffic permitting.

7.5.3 Severe Turbulence – Not Forecast (multiple aircraft)
- When a controller receives pilot reports of severe turbulence which had not been forecast, and which could impact multiple aircraft with regards to their ability to maintain cleared flight level within the AFI RVSM Airspace, the controller shall provide for an increased vertical separation minimum or an appropriate horizontal separation minimum.

7.5.4 Severe Turbulence – Forecast

- Where a meteorological forecast is predicting severe turbulence within the AFI RVSM Airspace, ATC shall determine whether RVSM should be suspended, and, if so, the period of time, and specific flight level(s) and/or area.
- Consideration should be given to the development of a contingency FLAS to supplement any existing FLAS between ACCs/UACs.
- The importance of obtaining timely accurate forecasts of severe turbulence should be stressed within agreements with the appropriate meteorological services office responsible for the dissemination of such information for the area

7.6   Phraseology

RVSM R/T Phraseology must be developed. A few examples are:

- ATC wish to know RVSM status of flight - **CONFIRM RVSM APPROVED**
- Pilot indication that flight is RVSM approved - **AFFIRM RVSM**
- Pilot indication that flight is NON RVSM approved - **NEGATIVE RVSM**
- Pilot of State aircraft indicating that flight id NON RVSM approved - **NEGATIVE RVSM STATE AIRCRAFT**
- ATC refuse clearance into RVSM Airspace - **UNABLE CLEARANCE INTO RVSM AIRSPACE, MAINTAIN [or DESCEND TO, or CLIMB TO] FL …**
- Pilot reporting severe turbulence / weather affecting ability to maintain RVSM height keeping requirements - **UNABLE RVSM DUE TURBULENCE**
- Pilot reporting equipment degraded below RVSM requirements - **UNABLE RVSM DUE EQUIPMENT**
- ATC requesting pilot to report when able to resume RVSM - **REPORT ABLE TO RESUME RVSM**
- Pilot ready to resume RVSM after equipment/weather contingency - **READY TO RESUME RVSM**

8   VERTICAL SEPARATION

8.1   The applicable vertical separation minimum between RVSM approved aircraft operating within the AFI RVSM Airspace shall be 1 000 ft.

8.2   The applicable vertical separation minimum between non-RVSM approved State aircraft and any other aircraft operating within the AFI RVSM Airspace shall be 2 000 ft.

8.3   Within the designated airspace where RVSM transition tasks are carried out, the applicable vertical separation minimum shall be 1 000 ft between RVSM approved aircraft, and 2 000 ft between any non-RVSM approved aircraft and any other aircraft.

8.4   The applicable vertical separation minimum between all formation flights of State aircraft and any other aircraft operating within the AFI RVSM Airspace shall be 2 000 ft.

8.5   The applicable vertical separation minimum between an aircraft experiencing a communication failure in flight and any other aircraft, where both aircraft are operating within the AFI RVSM Airspace, shall be 2 000 ft, unless an appropriate horizontal separation minimum exists.

8.6   All activities occurring within restricted or danger airspaces are to be considered as being non-RVSM approved. Consequently, the minimum vertical spacing required between the vertical limits of the activities contained within such airspaces non-participating aircraft operating within the RVSM airspace is 2,000 ft, above the upper and below the lower limits of such airspaces.

10 COMMUNICATION FAILURE

10.1 Communication Failure Procedures

The ICAO Regional Supplementary Procedures for AFI will specify that the applicable vertical separation minimum between an aircraft experiencing a communication failure in flight and any other aircraft, where both aircraft are operating within the AFI RVSM Airspace, shall be 2 000 ft, unless an appropriate horizontal separation minimum exists.

10.2 Compulsory Reporting Points

- One means used to determine that two-way communication between an aircraft and ATC has failed is the aircraft's failure to report its position over a compulsory reporting point. These points should be strategically located so as to enhance ATC's ability to detect air-ground communication failures on a timely basis, taking into account ATC separation and co-ordination requirements.

- There is a requirement to establish RVSM entry/exit points at or near the boundaries between the AFI RVSM Airspace and adjacent Regions for all ATS routes which cross the lateral limits of the AFI RVSM Airspace. The designation of these points as compulsory reporting points could also enhance ATC's ability to detect air-ground communication failures.

10.3 Laterally-Spaced, Uni-Directional ATS Routes

The use of laterally-spaced, uni-directional ATS routes as a means of strategically separating opposite-direction traffic operating to/from the AFIRVSM Airspace should be addressed.. In the context of air-ground communication failure procedures, laterally-spaced, uni-directional ATS routes between AFI RVSM Airspace and adjacent Regions could help mitigate the differences between cruising levels appropriate for direction of flight within the AFI RVSM Airspace versus the cruising levels applicable within adjacent Regions.

10.4 **Flight Level Allocation Schemes (FLAS)**

The strategic use of Flight Level Allocation Schemes should be considered and could also be used in the context of air-ground communication failure procedures.

11 ATS SYSTEMS SUPPORT

It is essential that ATC be aware as to the RVSM approval status of all aircraft operating within, outside of and in close proximity to the AFI RVSM Airspace if they are required to accommodate non-RVSM approved State aircraft.

11.1 Flight Data Processing Systems (FDPS).

In order to ensure RVSM separation between approved aircraft, it is important that ACCs/UACs receive the support of IFPS for the purpose of rejecting flight plans filed with for aircraft which do not qualify for operation within the AFI RVSM Airspace.

11.2 Radar Display Systems.

Radar display systems must provide controllers with continuous and unambiguous information on the RVSM approval status of all flights under their responsibility;

- In a radar environment, the radar position symbols and/or radar labels associated with aircraft operating within the AFI RVSM Airspace **shall** provide a clear indication of the current non-RVSM approval status.
- Where radar is used as the primary tool for applying separation, the radar position symbols and/or radar labels **should** provide a clear indication of the current non-RVSM approval status of aircraft operating within such level bands above and below the AFI RVSM Airspace.
- The means by which the distinguishing feature is applied to the radar position symbols and/or radar labels of the aircraft concerned **shall** be automatic.
- The possibility for the manual manipulation of the radar position symbols and/or radar labels of aircraft **shall** be available.

11.3 Flight Strips

Flight strips must display the non-RVSM approved status of all civil and State aircraft to controllers.

- Local FDPS shall indicate on all flight strips (paper, electronic or, in the absence of either, extended label) for non-RVSM approved aircraft the information filed by operators in respect of both their RVSM approval status and their status as that of a State aircraft (if applicable).
- Information regarding a State or civil aircraft's current non-RVSM approval status **shall** be displayed on the flight strip. (Message example: **NONRVSM**).

- Where applicable, the indication that a non-RVSM approved aircraft is a State aircraft **shall** be displayed on the flight strip. (Message example: **STATE AIRCRAFT**)

11.4 On-Line Data Interchange (OLDI)

OLDI should:

- include the current RVSM approval status of an aircraft, as well as the information regarding an aircraft's status as being a "State" aircraft, where applicable.
- support the systematic transfer of information related to requests for "Special Handling" in the AFI RVSM Airspace, in Item 18 of the ICAO Flight Plan (Item 18 message: **STS/NONRVSM**).

11.5 Short Term Conflict Alert (STCA), and Medium Term Conflict Detection (MTCD)

Automatic conflict alert systems should be modified to use the RVSM approval or non-approval status of aircraft and apply the appropriate VSM of 1,000/2,000 ft.

- STCA systems of ACCs/UACs applying RVSM **should** be able to selectively assess the applicable vertical separation minimum of either 1 000 ft or 2 000 ft, as determined by the current RVSM approval or non-approval status of the aircraft concerned, operating in the level band between FL 290 to FL 410 inclusive.
- Medium Term Conflict Detection (MTCD) systems of ACCs/UACs applying RVSM **shall** be able to assess the selective application of a vertical separation minimum of either 1 000 ft or 600 m 2 000 ft, as determined by the current RVSM approval or non-approval status of the aircraft concerned operating in the level band between FL 290 to FL 410 inclusive.

11.6   Flight Planning Requirements

Specific Flight Planning procedures might be developed for AFI RVSM in ICAO Doc 7030/4 AFI Regional Supplementary Procedures. The flight plan (FPL) shall include:

- the entry point at the lateral limit of AFI RVSM airspace and requested flight level after the entry point;
- the exit point at the lateral limit of the RVSM airspace and the requested flight level after the exit point;
- operators of RVSM approved aircraft shall insert "W" in Item 10 of the FPL regardless of requested FL;
- operators of non-RVSM approved State aircraft with a requested flight level of 290 or above shall insert "STS/NONRVSM" in Item 18 of the FPL;
- operators of formation flights of RVSM-approved State aircraft shall <u>NOT</u> insert "W" in Item 10 of the FPL;
- operators filing Repetitive Flight Plans (RPLs) shall include in Item Q of the RPL the RVSM approval status "**<u>EQPT/W</u>**" for RVSM approved aircraft, & "EQPT/ " for non-RVSM approved aircraft;

- if a change of aircraft on an RPL results in a modification of the RVSM approval status in Item Q, the operator shall submit a modification message (CHG).

12 AIR TRAFFIC MANAGEMENT CONSIDERATIONS

The introduction of RVSM will require that individual ACCs/UACs undertake a critical evaluation of operating practices so as to identify areas where adjustments and/or changes are required. Individual ACCs/UACs may wish to take the opportunity to maximise the operational benefits to be gained from the introduction of RVSM by undertaking an extensive critical operational analysis.

12.1 Optimisation of the ATS Route Network

- It is expected that the optimisation of the existing ATS route network will be realised through a combination of Flight Level Allocation Schemes, sectorisation, and, to a lesser extent, changes to the ATS route network itself.

- On bi-directional ATS routes, climbing and descending aircraft will cross more cruising levels in an RVSM environment than in a non-RVSM environment. Therefore, consideration should be given to the potential benefit of expanding the use of uni-directional ATS routes.

- The introduction of AFI RVSM will permit Flight Level Allocation Schemes (FLAS) through the designation of new flight levels for specified ATS route segments. Strategic de-confliction at major crossing points will be facilitated through the availability of the additional cruising levels.

- The implementation of AFI RVSM may require an analysis of the optimal levels to be used for delineating the vertical limits of control sectors within ACCs/UACs.

- States shall ensure that the vertical limits of control sectors within ACCs/UACs also facilitate the requirement to provide a vertical separation minimum of 2,000 ft between a. non-RVSM approved aircraft and any other aircraft operating within the AFI RVSM Airspace;

- Consideration should be given to the impact on ATC co-ordination workload resulting from the requirement to provide a 2,000 ft vertical separation minimum for such aircraft operating at levels immediately above or below vertical sector boundaries within the AFI RVSM Airspace.

12.2 ATC Sectorisation

- The implementation of AFI RVSM will require an analysis of the optimal levels to be used for delineating the vertical limits of control sectors within ACCs/UACs. Operational experts should evaluate the requirement to re-define such vertical limits as a function of adaptations to FLAS, or

predicted changes in the vertical profiles of major traffic flows expected from the implementation of RVSM.

- The vertical limits of control sectors within the AFI RVSM Airspace should also facilitate the requirement to provide a vertical separation minimum of 2 000 ft between RVSM approved and non-approved aircraft.

- The impact on ATC co-ordination workload resulting from the requirement to provide a 2,000 ft vertical separation minimum, for such aircraft operating at levels immediately above or below vertical sector boundaries within the AFI RVSM Airspace should be determined.

- Inter-Centre Letters of Agreement must be amended to reflect any changes to sector boundaries, where applicable.

12.3 Air Traffic Management Options for AFI RVSM Transition
- States responsible for AFI RVSM Transition Airspace should evaluate the potential increase in controller workload on busy bi-directional ATS routes which cross the RVSM/non-RVSM boundary.
- Controllers will have to adjust the cruising levels for aircraft operating from the AFI RVSM Airspace to adjacent non-RVSM airspace and vice-versa, due to the different cruising levels.

12.4 Laterally- Spaced, Uni-Directional ATS Routes
States whose area of responsibility includes AFI RVSM Transition Airspace should consider the establishment of laterally-spaced, uni-directional ATS routes to facilitate the transition of traffic operating to/from the AFI RVSM Airspace.

12.5   Flight Level Allocation Schemes (FLAS)
States should consider a Flight Level Allocation Scheme whereby specific flight levels are applied to specific segments within the ATS route network. Organizing the use and non-use of flight levels on specific route segments could avoid potential traffic conflicts.

A Strategy could therefore be developed as to when to discontinue the use of FL 310, FL 350, and FL 390 as eastbound cruising levels taking into account different traffic scenarios at these flight levels.

12.6 *ATC Clearances*
- only RVSM approved aircraft and non-RVSM approved State aircraft shall be issued an air traffic control clearance into the AFI RVSM Airspace.
- Formation flights of aircraft shall **not** be issued an air traffic control clearance into the AFI RVSM controlled airspace.
- ATC shall assign flight levels to non-RVSM approved aircraft in accordance with a published table.

12.7 Inter-Centre Letters of Agreement

ACCs/UACs should review existing Inter-Centre Letters of Agreement for the purpose of updating the content to include RVSM-related changes prior to the implementation of AFI RVSM.

12.8 Inter-Centre Co-Ordination

12.8.1 Flight Plans

 If the receiving unit has not received a flight plan, the sending air traffic control unit shall verbally inform the receiving unit of whether or not the aircraft is RVSM approved.

12.8.2 Computer-assisted Co-ordination of Estimate Messages

The On-Line Data Interchange (OLDI) System should support the co-ordination of requests for special handling (i.e. STS) as filed in Item 18 of the ICAO Flight Plan. When an automated message does not contain the information filed in Item 18 of the ICAO flight plan relevant to RVSM operations, the sending ATC unit shall inform the receiving ATC unit of that information by supplementing the ACT message verbally, using the term "Negative RVSM' or "Negative RVSM State Aircraft", as applicable.

12.8.3 *Verbal Co-ordination of Estimate Messages*

* When a verbal co-ordination process is being used, the sending ATC unit shall include the information filed in Item 18 of the ICAO flight plan relevant to RVSM operations at the end of the verbal estimate message, using the term "Negative RVSM" or "Negative RVSM State Aircraft", as applicable.

* When a single aircraft is experiencing an in-flight contingency which impacts on RVSM operations, the associated co-ordination messages shall be supplemented verbally by a description of the cause of the contingency.

13   AIRBORNE COLLISION AVOIDANCE SYSTEMS (ACAS)

The provisions of the ICAO Regional Supplementary Procedures, Doc 7030/4 (AFI), Chapter 14, titled "Use of Airborne Collision Avoidance System (ACAS)", mandates the carriage and operation of ACAS II in the AFI Region (including FIR Canaries) from 20 February 2002 for all civil fixed-wing turbine-engine aircraft having a maximum take-off mass exceeding 15000 kg or maximum approved passenger seating configuration of more than 30.

It is relevant to note that TCAS II, Version 6.04A (or earlier), is **not** ICAO ACAS II SARPs compliant, and, as such, will require upgrading to TCAS II, Version 7. TCAS II, Version 6.04A (or earlier) models, were designed for an operating

environment where a minimum vertical separation of 2 000 ft is applied above FL 290. TCAS II, Version 7, includes modifications intended to address operational issues, including its compatibility for operations within RVSM Airspace.

LIST OF ABBREVIATIONS

ACAS	Airborne Collision Avoidance System
ATC	Air Traffic Control
ACC	Area Control Centre
ACT	Activation Message
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
ASE	Altimetry System Error
ATM	Air Traffic Management
ATS	Air Traffic Services
CDB	Central Data Base
CFL	Cleared Flight Level
CFMU	Central Flow Management Unit
CHG	Modification Message (IFPS
CMA	Central Monitoring Agency (NAT)
CVSM	Conventional Vertical Separation Minimum
FAA	Federal Aviation Administration (USA)
FDPS	Flight Data Processing System
FIR	Flight Information Region
FL	Flight Level
FLAS	Flight Level Allocation Scheme
FPL	Flight Plan
GA	General Air Traffic
GMU	GPS Height Monitoring Unit
GPS	Global Positioning System
HMU	Height Monitoring Unit
IFPS	Integrated Initial Flight Plan
IFR	Instrument Flight Rules
JAA	Joint Aviation Authorities
JAA AMC	JAA Acceptable Means of Compliance
JAR	Joint Aviation Requirements
LoA	Letter of Agreement
MASPS	Minimum Aircraft System Performance Specifications
MEL	Minimum Equipment List
MNPS	Minimum Navigation Performance Specifications
MTCD	Medium Term Conflict Detection
NAT	North Atlantic
NAT CMA	North Atlantic Region Central Monitoring Agency
NATSPG	North Atlantic Systems Planning Group
NOTAM	Notice to Airmen
OAT	Operational Air Traffic
OLDI	On-Line Data Interchange
RA	Resolution Advisory (ACAS
RFL	Requested Flight Level
RGCSP	Review of the General Concept of Separation Panel
RNAV	Area Navigation

RNP	Required Navigation Performance
RPL	Repetitive Flight Plan
RTF	Radiotelephony
RVSM	Reduced Vertical Separation Minimum of 1 000 ft between FL 290 and FL 410 Inclusive
SARPs	Standards and Recommended Practices
SDB	State Data Base
SSEC	Static Source Error Correction
SSR	Secondary Surveillance Radar
STCA	Short Term Conflict Alert
TA	Traffic Advisory (ACAS)
TGL	Temporary Guidance Leaflet (JAA)
TLS	Target Level of Safety
TSE	Total System Error
TVE	Total Vertical Error
VFR	Visual Flight Rules
VSM	Vertical Separation Minimum
UAC	Upper Area Control Centre
UIR	Upper Flight Information Region

RVSM REFERENCE DOCUMENTS

- ICAO

- Eurocontrol - RVSM

- NAT RVSM

- FAA