INTERNATIONAL CIVIL AVIATION ORGANIZATION

AFI PLANNING AND IMPLEMENTATION REGIONAL GROUP
TWENTIETH MEETING (APIRG/20)
(Yamoussoukro, Cote d'Ivoire, 30 November - 2 December 2015)

Agenda Item 2: **Performance Framework for AFI Regional Air Navigation Planning and Implementation**

2.3: **Air Traffic Management and Search and Rescue (ATM/SAR) - AFI Regional Monitoring Agency**

OUTCOME OF ATM/AIM/SAR SG/14 MEETING AND AFI RVSM COLLISION RISK ASSESSMENT (CRA) NO 8

(Presented by ARMA)

SUMMARY
This working paper presents the outcome of the Fourteenth Meeting of the Air Traffic Management/Aeronautical Information Management/Search and Rescue (ATM/AIM/SAR SG/14) with respect to Reduced Vertical Separation Minimum (RVSM) operations in the AFI Region, for endorsement by the APIRG. In addition, the paper discusses the 4th post implementation RVSM CRA in the AFI Region. Two of the AFI RVSM Safety Policy objectives are addressed, i.e. an assessment of the Technical Vertical Collision risk and the Total Vertical Collision risk that reflects a deterioration on the previous assessment. State authorities will hereby be informed of the AFI RVSM system risk and requested to act on improving overall performance. Action by the Meeting is in paragraph 3.

REFRENCES:

- APIRG/19 Report
- ATM/AIM/SAR SG/14 Report
- ICAO Doc 9574
- ICAO Doc 9937
- AFI RVSM Safety Policy
- AFI RVSM CRA 8

Strategic objective(s)	This working paper related to the Strategic Objective**s A, B and E.**

1. INTRODUCTION

1.1 The Fourteenth Meeting of the Air Traffic Management/Aeronautical Information Management/Search and Rescue (ATM/AIM/SAR SG/14) was held at the ICAO WACAF Regional Office in Dakar, Senegal from 11 to 14 May 2015.

1.2 The Sub-Group reviewed report of the AFI Regional Monitoring Agency (ARMA) and discussed specific issues regarding the maintenance and enhancement of safety in the AFI RVSM operations.

1.3 The AFI Regional Monitoring Agency, monitoring the AFI RVSM system, is required by the provisions of ICAO Document 9937, Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive, to provide APIRG with an annual overview relating to RVSM risk within the AFI Region based on the annual quantitative Collision Risk Assessment.

1.4 The meeting should recall that AFI CRA's are, inter alia, calculated by making use of the monthly RVSM safety assessment traffic data which is collected by Area Control Centers and submitted to the ARMA to monitor RVSM system safety and risk. Further to this Unsatisfactory Condition Reports (UCR) deposited into the central depository database managed by the ICAO TAG are reviewed and where applicable processed into the CRA.

1.5 CRA 8 presents the 4th post-implementation CRA for RVSM in the AFI Region. The assessment addresses two of the AFI RVSM Safety Policy objectives, i.e. an assessment of the Technical Vertical Collision risk evaluated against the agreed to TLS of 2.5 × 10-9 fatal accidents per flight hour, and an assessment of the Total Vertical Collision risk evaluated against a TLS of 5 × 10-9 fatal accidents per flight hour.

1.6 CRA 9 for 2014 is currently under construction and will be presented at APIRG 21 however an indication of the risk tendency will be provided during the short power point presentation.

1.7 The meeting should recall that an overview of CRA 6 was presented at APIRG 19. Due to the time period between APIRG 19 and APIRG 20 an overview of CRA 7 was distributed via email to each States RVSM National Program Manager.

2. DISCUSSION

Outcome of the ATM/AIM/SAR SG/14

ARMA general report

2.1 The ATM/AIM/SAR SG/14 meeting recalled the following five primary functions that are expected to be carried out by the ARMA in accordance with ICAO Doc 9574 and the AFI RMA Manual:

a) Maintain a data base of AFI RVSM approvals
b) Monitor aircraft height-keeping performance and the occurrence of large height deviations and report results appropriately
c) Conduct Safety Assessments and report results appropriately
d) Monitor operator compliance with State approval requirements
e) Initiate necessary remedial actions if RVSM requirements are not met

2.2 *RVSM Approvals* – The Sub-Group noted that States listed in the Table hereunder have been included in the dataset as the data was of the minimum standard required by ICAO for distribution. It was recommended that all States (regulatory authorities), aircraft operators and ANSPs consult the table on a regular basis to ensure that the data was correct, and send amendments to ARMA as necessary.

Algeria (All)	Djibouti (Unsure)	Mali (All)	Seychelles (All)
Angola (All)	Eritrea (All)	Mauritius (All)	Senegal (All)
Botswana (All)	Ethiopia (All)	Mozambique (All)	Sudan (All)
Burkina Faso(All)	Gabon (All)	Namibia (All)	Swaziland (All)
Cameroon (All)	Gambia (All)	Niger (All)	Togo (All)
Cabo Verde (All)	Ghana (All)	Nigeria (All)	Uganda (All)
Chad (All)	Kenya (All)	Reunion (All)	Zambia (All)
Congo (All)	Libya (Unsure)	RSA (All)	Zimbabwe (All)
Côte d'Ivoire (All)	Madagascar (All)	Rwanda (All)	
DRC (Limited)	Malawi (All)	Sao Tome (Unsure)	

2.3 Up to date AFI RVSM Approvals lists may be viewed at the following ARMA webpage: www.atns.co.za/afi-rvsm .

2.4 *RVSM Operations approval survey.* The Sub-Group reviewed the outcome of the aircraft RVSM approval survey for December 2014, carried out as per ICAO Regional Monitoring Agency Coordination Group (RMACG) tasking. It was noted that the ARMA was unable to conduct surveys by flight plans due to limited access to such information. As such, surveys were conducted by scrutinizing RVSM safety assessment traffic flow data per FIR and establishing RVSM status per aircraft with reference to the *AFI RVSM Approvals* database and those of other regions. In most cases, flight plans were also requested from Area Control Centres (ACCs) to support the non-approval and UCR findings. Nominally 30 AFI FIR's were monitored. However, only 20 FIR's were assessed; four less FIRs than in the 2013 assessment. It was noted that 64367 flights were assessed and 10 aircraft were found to be non-RVSM approved, a reduction from 204 aircraft in from the 2013 assessment. However, the 10 aircraft conducted multiple flights in the AFI RVSM airspace during December 2014 and operated without a State RVSM Approval, exposing the airspace to significant risk.

2.5 The Sub-Group recalled that all FIRs should submit traffic data in order for the assessment to successfully include all the FIRs, and accordingly urged States and ANSPs to take action as necessary.

2.6 *Monitoring Height Keeping Performance.* The Sub-Group noted that the ARMA Height Monitoring Program had since been fully established and the AFI States (regulatory authorities) were expected to ensure cooperation with ARMA by parties concerned, in order to maintain the height monitoring targets for each operator's fleet. Obligations of States in this regard are clearly provided for in Annex 6 the Chicago Convention.

2.7 It was noted that the ARMA monitoring load was 575 aircraft. Of these, 224 still required monitoring, which is 38% as opposed to the 48% in 2013. Reluctance by some regulatory authorities (CAAs) to comply with Annex 6 provisions had been observed. Accordingly CAAs were urged to ensure compliance with the Annex 6 standards and to cooperate with the ARMA, noting that lack of compliance could result in unnecessary inconvenience to operations, such as withdrawn aircraft RVSM approvals.

2.8 *RVSM Safety Assessments*. The Sub-Group noted that safety assessments were continuously being undertaken pursuant to the RVSM Safety Policy. While the data for the 2015 safety assessment showed an encouraging trend, States/ANSPs were urged to improve on their submission of the data in order to improve the quality of the assessment results.

2.9 *AFI RVSM National Programme Managers (NPSs)* – The Sub-Group recalled the important role fulfilled by the NPMs in continuing the success in RVSM monitoring and operations, and urged States and ANSPs to provide updated information on the NPMs and their contact details, to the ARMA at regular intervals.

Other RVSM issues

2.10 *ATS coordination failures and Separation breakdown*. The Sub-Group noted that during the course of 2013 and 2014 it had become evident that one of the RVSM system risks which needed to be addressed with increased emphasis was that of ATS coordination failures (non-coordination, errors in coordination, etc.). It was noted that this situation was being addressed by AFI TAG. ANSPs were urged to continue reporting traffic coordination failures, so that the incident hotspots could be identified and remedial action proposed for implementation by concerned parties. It was acknowledged from outcome of both the ATS Incident Analysis Group (AIAG) meetings and the AFI RVSM Collision Risk Assessments by the ARMA, that loss of separation at ATS route crossing points was a system risk that needed to be addressed.

2.11 *RVSM Deficiencies* – The Sub-Group recalled that the RVSM deficiency list, which was presented for the first time at its Thirteenth meeting, had been endorsed by the APIRG/18 in Kampala, Uganda in March 2012. It was also recalled that the safety of the RVSM system relies on the full participation of all AFI States, in accordance with the commitments they made during the RVSM implementation phase. In this case, it was imperative that States listed in the deficiency lists (*RVSM Safety Assessment Data Deficiency List, RVSM Height Monitoring Deficiency List, and RVSM Operations Approval Deficiency List*) at **Appendixes 7A, 7B and 7C** respectively, to this working paper, should take all necessary action to ensure that remedial measures are identified and effectively implemented with minimum delay, and to provide updates on the resolution of the deficiencies to the ARMA as necessary.

2.12 While it remained imperative for States and ANSPs to honour their obligations with regard to RVSM safety, it was noted that that there has been a big improvement in kerbing the operation of non-RVSM approved aircraft in AFI RVSM airspace

2.13 *Change in ARMA Responsibility – Libya and Sudan*. The Sub-Group noted that the RVSM responsibilities of Libya and Sudan had both been transferred to the MIDRMA, to align the responsibilities with the implementation of the 12th Air Navigation Conference. Recommendation 6/11 *(Regional performance framework–Alignment of air navigation plans and regional supplementary procedures)*, which resulted in the transfer of seven of FIRs Alger, Cairo, Canarias, Casablanca, Khartoum, Tripoli and Tunis FIRs, to EUR and MID ANPs. RVSM monitoring of Alger, Casablanca and Tunis FIRs however, still remains in AFI.

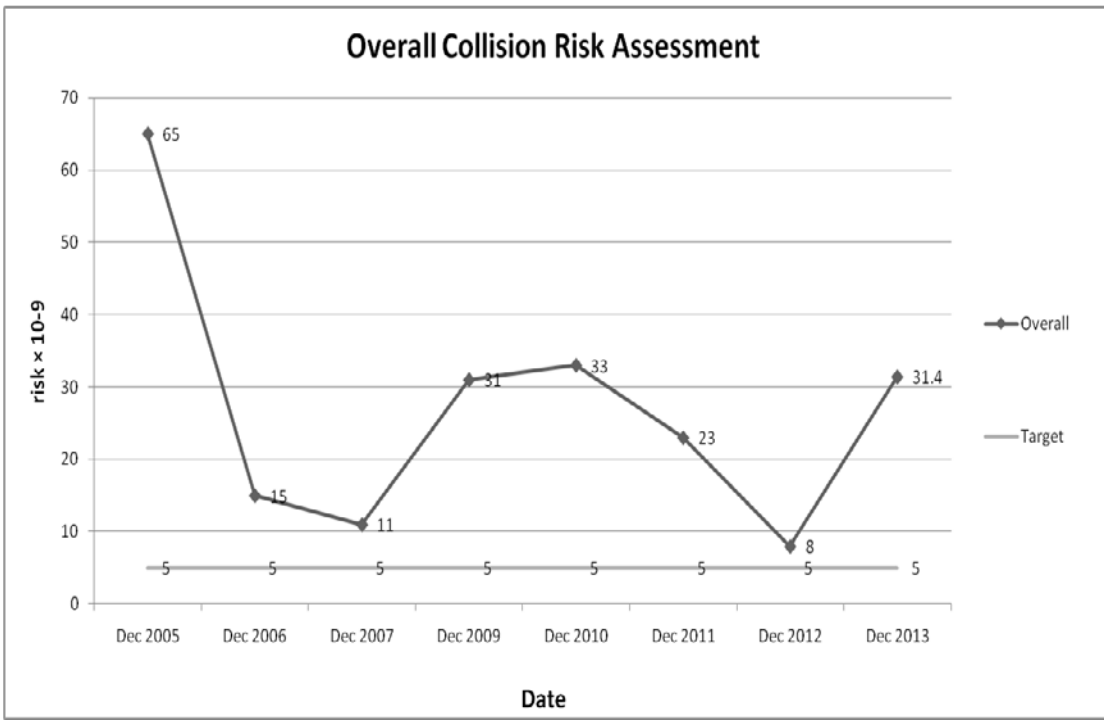
AFI RVSM Collision Risk Assessment (CRA) No 8

2.14 Collision Risk Assessment 8 (CRA 8) provides an assessment incorporating all aspects of the RVSM system elements which are monitored. The final result is presented as the Total Vertical Collision Risk estimate which should be noted by the meeting and evaluated against the Target Level of Safety 5 × 10-9 fatal accidents per flight hour.

2.15 The estimate of the Technical Vertical Collision risk was once again calculated to be below the agreed to Technical Vertical TLS of 2.5×10-9 fatal accidents per flight hour however the estimate of the agreed to Total Vertical collision risk does not meet the Total Vertical TLS of 5 × 10-9 fatal accidents per flight hour.

2.16 The estimate of the Technical Vertical Collision risk was found to be met by a factor of approximately 1.2 below the agreed to TLS. This estimate is moving up towards the TLS with the accuracy of GNSS navigation significantly contributing hence the urgency for the completion of the implementation of SLOP in FIR's where applicable.

2.17 The two main components affecting the Total Vertical Collision Risk is the risk due to flight levels being crossed without an ATC clearance and due to flying at an incorrect flight level. The current CRA 8 estimates for both components were considerably higher than CRA 7 estimates. The increase in the probability of lateral overlap for aircraft on the same track resulting from an increased assumed proportion of GNSS navigation accuracy also increased the risk which could be counter acted by SLOP. Improper crossings at waypoints or navigational facilities where air craft are at the correct same semi-circular rule flight level with standard RVSM separation being broken has increased. The meeting should recall that TCAS is not a separation tool and does not support RVSM.



2.18 The precision of lateral navigation is an important factor with regard to vertical collision risk. It has been assumed that 65% of the flying time in AFI RVSM airspace would be made with GNSS navigation and the remaining 35% with VOR/DME navigation. The risk mitigating effect of strategic lateral offsets has not been incorporated therefore the benefits or lost.

2.19 The immediate processing of UCR's and high RVSM vigilance whilst providing an ATM service and operating in RVSM airspace cannot be over emphasized in order to arrest and bring the Total Vertical Risk back towards the agreed to TLS. Greater emphasis needs to be placed on coordination failures and breakdown of separation at crossing points which are creating an environment for greater RVSM risk.

2.20 The root causes that contribute towards the high Total Vertical Risk estimate not meeting the Target Level of Safety remain as follows:

a) Generically Human Factors, either ATC or flight deck originated or a combination of the two.

b) The lack of or improper coordination between ATC sectors and FIRs continues to be dominant cause of Safety events leading to UCR's.

c) The lack of or non-adherence to procedures.

2.21 The CRA is in general an indication of the successes, failures, errors and remedial actions required. Further remedial action debate and implementation towards eliminating coordination failures and the breakdown of separation at ATS route crossing points will be imperative to reducing the risk.

2.22 Continuous RVSM vigilance should be embedded in all RVSM system elements.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

(a) Take note and review the contents of this working paper;

(b) Support and urge all State Civil Aviation Authorities to diligently manage all the RVSM system elements towards reducing the Total Vertical Collision Risk; and

(c) Support the efforts to complete SLOP implementation.
