



WORKING PAPER

**SPECIAL AFRICA-INDIAN OCEAN (AFI)
REGIONAL AIR NAVIGATION (RAN) MEETING**

Durban, South Africa, 24 to 29 November 2008

Agenda Item 6: Development of a set of comprehensive work programmes in the air navigation field, aimed at improving efficiency of the air navigation system (Efficiency Committee)

OPERATIONAL SAFETY ASSESSMENT METHODOLOGY

(Presented by the Secretariat)

SUMMARY

This paper proposes a programme to ensure an effective approach to RVSM safety monitoring of operations in a post-implementation environment in the AFI Region.

Action by the meeting is in paragraph 4.

1. INTRODUCTION

1.1 Reduced vertical separation minimum (RVSM) has been safely and successfully implemented in almost every region of the world. The introduction of RVSM has served to enhance efficiency, reduce workloads on the flight deck and in air traffic services (ATS) units, has enabled improved flight profiles resulting in fuel and economic savings while at the same time reducing CO² emissions by facilitating the use of more efficient flight levels and more direct routes. The AFI Planning and Implementation Regional Group (APIRG) during its thirteenth meeting in 2001 endorsed the introduction of RVSM in the Africa-Indian Ocean (AFI) Region.

2. BACKGROUND

2.1 There are only a few ICAO Standards and Recommended Practices (SARPs) related to RVSM. These are contained in Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* paragraphs 7.2.4, 7.2.5, 7.2.6, 7.2.7 and 7.2.8 and in Appendix 4, Part II — *International General Aviation — Aeroplanes*, Appendix 2 and paragraphs 7.2.4 to 7.2.8, and in Annex 11 — *Air Traffic Services*, paragraph 3.3.5.1 and 3.3.5.2.

2.2 Annex 6 SARPs are related to States' obligations to establish requirements for monitoring flight crew procedures, unapproved operators and altimetry system performance. RVSM-related SARPs in Annex 11 address the requirement for States to monitor RVSM operations. The remaining RVSM related documentation is contained as guidance material in the *Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive* (Doc 9574).

2.3 Annex 11, paragraph, 2.27.5 states that any significant safety-related change to the ATS system, including the implementation of a reduced separation minimum, shall only be effected after a safety assessment demonstrates that an acceptable level of safety will be met. In addition, Doc 9574 recommends that a collision risk methodology (CRM) should be included and satisfied in order to implement RVSM. The guidance material contained in Doc 9574 further suggests that in order to implement RVSM, safety objectives for technical risk as well as for overall risk need to be attained.

2.4 Technical Risk is associated with the probability of collision linked to the degradation of an aircraft's height-keeping performance or failure of an aircraft's height-keeping system. Risk associated with loss of vertical separation due to operational errors (e.g. controller/pilot errors) and operational contingencies are not included. Doc 9574 states that the RVSM safety objective for technical risk is a target level of safety (TLS) of 2.5×10^{-9} fatal accidents per aircraft flight hour.

2.5 Overall risk is the probability of collision due to all causes, which includes technical risk in addition to operational risk due to errors and in-flight contingencies such as height deviations due to emergency procedures and turbulence. Doc 9574 also states that "the RVSM safety objective for overall risk should be set by regional agreement.

2.6 Subsequent to the implementation of RVSM in the North Atlantic (NAT) Region using the TLS of 5×10^{-9} for overall risk, other regions began implementing RVSM using the same TLS. The Pacific (PAC) Region implemented RVSM in 2000, Australia in 2001, Europe in 2002, Western Pacific/South China Sea in 2002, Northern Canada 2002, Middle East (MID) Region 2003, North American/Caribbean/South American (NAM/CAR/SAM) in 2005 and China domestically in 2007.

2.7 Following the NAT implementation and as collision risk data on operations where RVSM was being used began to accumulate, yearly follow-up safety assessments, principally in the NAT Region, showed that the overall collision risk was exceeding the TLS of 5×10^{-9} .

2.8 However, it was concluded that RVSM is not the main causal agent for exceeding the TLS and that the higher collision risk was being caused by controller/pilot errors and other contingencies that would occur at the same rates whether RVSM was implemented or not. In light of this, and after lengthy deliberations, the AFI regional experts agreed that a different approach should be followed by the Region for the implementation of the RVSM and monitoring of operations in a 1000 ft vertical separation environment.

2.9 Based on the above and also on the fact that collection of data in the AFI Region has proven to be challenging, AFI opted for a more comprehensive approach to RVSM implementation than had been used in the past by other regions.

2.10 The AFI RVSM implementation model utilized the best practices of other regions as well as safety management principles contained in the *Safety Management Manual (SMM)* (Doc 9859) and other related guidance.

3. DISCUSSION

3.1 RVSM pre-implementation safety case

3.1.1 In the AFI Region, RVSM implementation planning has been conducted under the framework of a comprehensive plan known as the RVSM pre-implementation safety case (PISC) with the active participation of the AFI Regional Monitoring Agency (ARMA) for managing the PISC and maintaining the RVSM database and other activities.

3.1.2 The PISC has been the cornerstone of work carried out in the region in order to allow RVSM implementation. The PISC is made up of three components which are described below:

1. Functional hazard assessment
2. National safety plans
3. Collision risk assessment

3.2 Regional experts are of the opinion that in carrying out the elements of the PISC, AFI has engaged in a significant and successful aviation infrastructure improvement process.

3.3 It is the opinion of the regional experts that the PISC with its three pronged approach, constitutes an improved process for implementation. It was therefore, felt that operational judgement, based on the outcomes of the three activities of PISC, provided a solid basis to recommend RVSM implementation in Africa in September 2008.

3.4 As a result of the foregoing, it is envisioned that in order to provide continuous monitoring and regular assessment of the safety level in RVSM airspace after implementation, a structured approach needs to be implemented. On this basis, the meeting is invited to adopt the following recommendation to guide the work of APIRG.

Recommendation 6/x — Operational safety assessment methodology

That the AFI Planning and Implementation Regional Group (APIRG) adopt the ATM Performance Objective: Operational Safety Assessment Methodology as contained in the Performance Framework Form in the Appendix to this paper as its strategy for implementation of the new methodology.

4. ACTION BY THE MEETING

4.1 The meeting is invited to approve the draft Recommendation at paragraph 3.4 above.

— — — — —

APPENDIX

ATM PERFORMANCE OBJECTIVES

OPERATIONAL SAFETY ASSESSMENT METHODOLOGY				
Benefits				
Environment	• reductions in fuel consumption			
Efficiency	• ability of aircraft to conduct flight more closely to preferred trajectories			
	• facilitate utilization of advanced technologies (e.g. improved altimetry systems) thereby increasing efficiency			
Safety	• enhance safety by wider distribution of aircraft in a given airspace			
Strategy				
Short term (2010)				
Medium term (2011 - 2015)				
ATM OC COMPONENTS	TASKS	TIMEFRAME START-END	RESPONSIBILITY	STATUS
AOM	<i>En-route airspace</i> • create a scrutiny group to monitor and analyze the safety of operations in the AFI region in a formal basis. The scrutiny group will utilize safety management principles outlined in Doc 9859 in order to analyze operational errors and deviations and propose mitigation measures to control them • that AFI States’ use Safety Programmes and SMS methodologies in the control and mitigation of risks in the region • that a yearly CRA be conducted by the RMA for analysis by the scrutiny group. The CRA will be used as a relative reference from year to year. The initial acceptability of a collision risk to be determined by experts of the scrutiny group. Meeting the TLS of 2.5×10^{-9} fatal accidents per aircraft flying hour for technical risk be maintained as a requirement to continue with RVSM operations • the Scrutiny Group provide yearly report to APIRG about the status of operations safety in the region	2009-....		
		2009		
		2009		
		ongoing		
		ongoing		
linkage to GPIs	GPI/02: Support implementation of RVSM			