

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

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

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

Safety assessment of the airspace

(Presented by the Secretariat)

Summary

This working paper presents for the consideration of the meeting, the methods normally used to carry out an airspace safety assessment and reviews the options to carry out such evaluation.

References:

- Report of the RAN CAR/SAM/3 RAN Meeting
- Doc. 9689-AN 953, Manual on airspace planning methodology for the determination of separation.
- Doc 9574, Manual on implementation of RVSM

1 Introduction

1.1 Among those requirements previous to RVSM implementation, one of the main aspects to be taken into account is airspace safety assessment, issue which was dealt with during the CAR/SAM/3 RAN Meeting, formulating Conclusion 5/29 which indicates that before implementing RVSM and while operations continue in a 2000 ft minimum vertical separation environment, it is verified that the proposed assigned airspace safety level be equal to or better than a TLS of 5×10^{-9} of fatal accidents per flight hour due to the loss of vertical separation for all causes of risk

2 Analysis

2.1 When reviewing the basic work programme for RVSM implementation in the CAR/SAM Regions, we could note that one of the tasks to be developed refers specifically to the airspace safety assessment.

2.2 Chapter 5 of *Manual on airspace planning methodology for the determination of separation* (Doc 9689-AN 953), establishes that the safety of a system shall depend on various characteristics of the airspace and two basic methods are identified to determine whether the safety conditions of the system are acceptable:

- a) Comparison to a referential system; and
- b) Evaluation system risk in relation to a threshold value.

3 **Comparison with a referential system**

3.1 The comparison with a referential system is a relative method, where pertinent characteristics to the proposed system are compared with those corresponding to a referential system which safety has already been established.

3.2 The characteristics of the selected system and those of the proposed system should be likely enough so that the comparison of the safety aspects is valid.

3.3 The minimum requirements to consider the reference system as analogue to the proposed system are established in Chapter 6, para. 6.4 of Doc 9689, and for reference purposes are shown in **Appendix A** to this working paper.

4 **Evaluation of the system risks in relation to a threshold value**

4.1 The evaluation of a system risk by comparing it to a threshold value is an absolute method by which a specific relationship between these characteristics and collision risk is determined, after identifying and quantifying all the characteristics of the system related with safety, and shall be used to estimate the system safety. Then, it is compared to a maximum admissible risk, for example with the target level of safety established by the CAR/SAM/3 RAN Meeting, as shown in paragraph 1.1 of this working paper.

4.2 This is a very complex procedure and shall require ample data about all performance aspects of the system, but it is the only procedure to plan a radical change, which has not been previously subject to trials in other regions, or that, in view that there is no similar reference system to that proposed. You may find more detailed information of this evaluation method in the above-mentioned Doc 9689. Likewise, an organization chart is attached, where the decision-taking process that should be applied to decide the appropriate methodology of safety evaluation, is illustrated (Appendix B).

4.3 While several safety assessments have been carried out in different airspaces, (North Atlantic, Asia Pacific, Europe, South Atlantic, etc) as per the information available, no evaluation has been carried out in an airspace similar to the characteristics of the CAR/SAM regions, reason for which the decision to carry out a risk evaluation of the system by comparing it to a threshold value would perhaps be the most adequate to use in the region.

4.4 If this were the methodology to be adopted, the meeting shall review in detail and in a realistic manner the options available to carry out such evaluation, especially taking into consideration the costs involved:

- a) Assign the responsibility to the CAR/SAM Monitoring Agency (CARSAMMA);
- b) Subcontract a duly qualified agency/company through the CARSAMMA; and
- c) Look for the assistance of a qualified organization, to this end.

4.5 In the two first cases, it is essential to count with the costs associated to the airspace safety assessment to be able to carry out an analysis on this matter. For the third case, it would be essential to establish determined understanding mechanisms and cooperation within the regional environment. Likewise, it should be recalled that the decision on this respect should be taken as soon as possible, in order to permit the region to continue within the schedule programmed for the implementation.

5 **Conclusions**

5.1 It is essential that the meeting take a decision regarding the safety assessment, being this task essential to ensure that the target level of safety in the proposed airspace satisfies the required standards.

5.2 We should agree that now, more than ever, a joint effort is required among all the agents involved, in order to optimize the short economical available resources, optimize the capacities of ATS systems, reduce the operational costs, increase the efficiency in the use of the airspace, increase the safety levels.

5.3 ICAO fosters, encourages, stimulates to achieve agreements in this sense, understanding that a regional strategy of these characteristics shall permit States to comply with all the objectives pursued in the RVSM programme, and there is no doubt that it shall permit that valuable resources of each of the States, are properly used.

6 **Suggested action**

6.1 The meeting is invited to take note of the information provided, review the options suggested to carry out the airspace safety assessment in the CAR/SAM regions, and if such were the case, agree on a decision on this respect.

APPENDIX A

Extracted from
Doc 9689 – *Manual on airspace planning methodology for the determination of separation minima*

Chapter 6

METHODS OF EVALUATION SAFETY

6.3 Whatever reference system is chosen, it must bear a sufficiently close resemblance to the proposed system for any comparison with regard to safety to be valid. The levels of air traffic service provided in the reference and proposed airspaces, as defined by the ICAO airspace classifications, should be examined. The air traffic service in the proposed system should be provided at least the same level of service as the reference system.

6.4 The minimum requirements for a reference system to be considered sufficiently similar to a proposed system are:

- a) separation minima must not be less in the proposed system than in the reference system;
- b) proposed means of communication and surveillance must be no worse in terms of accuracy, reliability, integrity and availability than those of the reference system;
- c) frequency and duration of the application of minimum separation between aircraft must not be greater in the proposed system than in the reference system; and
- d) navigation performance (typical and non-typical) of the population of aircraft in the proposed system should be no worse in its effect on collision risk, in any dimension, than that of the aircraft in the reference system.

APPENDIX B

Extracted from Doc 9689 – *Manual on airspace planning methodology for the determination of separation minima*

**Chapter 5
METHOD TO ASSESS SAFETY ASPECTS IN A SYSTEM PROPOSED**

FIGURE 5-1 – Choice of appropriate method for evaluating safety

