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WP/8
26/04/02

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

DEVELOPMENT OF THE RVSM IMPLEMENTATION PROGRAMME

(Presented by Uruguay)

Summary

This working paper proposes that the meeting analyse the advisability of assigning some tasks covering different areas of the basic RVSM Programme approved through Conclusion 10/11 of the Report on the GREPECAS/10 Meeting held in Las Palmas, Canary Islands, Spain, on 23–27 October, 2001, for the development of guides and provide assistance to States during the implementation.

References:

- Report on the Tenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/10); and
- Appendix B to the Report of the Asia/Pacific RVSM Implementation Task Force (RVSM/13).

1 Introduction

1.1 At the GREPECAS/10 meeting, the CAR/SAM States/Territories and COCESNA agreed to implement RVSM in the Flight Information Regions under their jurisdiction.

1.2 They also agreed to carry out this implementation programme in two phases and according to a basic RVSM Programme that appears in Appendix A to this working paper.

1.3 On the other hand, the introduction of an RVSM programme in the domestic airspace of the United States of America makes it necessary to harmonise the programmes with a view to their

harmonious and joint development, so as to avoid, inasmuch as possible, inconsistencies which might put air operations at the boundaries of these regions at risk.

2 Analysis

2.1 GREPECAS has developed an implementation strategy aimed at maintaining an acceptable level of safety in the RVSM airspace system, and which implies analysing repercussions in the areas of air traffic services, airworthiness and monitoring.

2.2 On the one hand, RVSM implementation will enable users to fly at optimum flight profiles, taking advantage of the technological developments designed to meet height-keeping navigation performance requirements, which will result in significant fuel savings.

2.3 On the other hand, air traffic service providers will increase the capacity of their airspace, resulting in a lower occupancy of congested levels and a higher occupancy of unused levels, thus achieving a more harmonious distribution of traffic for the benefit of both parties.

2.4 In order to achieve these benefits, RVSM implementation requirements need to be met without endangering safety. This requires, prior to the implementation, some commitments, coordination and cooperation by all parties involved in the RVSM programme.

2.5 In order to assist States/Territories/service providers with this implementation, it is necessary to adjust and develop guidelines on airworthiness, RVSM aircraft and operator approvals, air traffic management and ATC operations, and monitoring of RVSM operations.

3 Aspects related to airworthiness and RVSM aircraft and operators approval

3.1 In this area, the CARM/SAM Regions should make a decision regarding the adoption or development of suitable guides for RVSM operators and aircraft approval.

3.2 In this sense, material has been prepared within the scope of the region. The FAA has issued Interim Guidance Document 91 – RVSM, whereas in Europe, the Joint Aviation Authorities (JAA) issued Temporary Guidance Leaflet TGL No. 6 Rev. 1.

3.3 Moreover, under Regional Project RLA/99/901, “Regional Cooperation System for Safety Oversight”, the CAR/SAM Regions are drawing up the Latin American Aeronautical Regulations (LAR). This Project could give priority to the development of guides for the approval of aircraft and operators to fly in RVSM scenarios. It is estimated that, if required, this material could be available by late 2002.

3.4 Aspects such as the review of the RVSM-approved fleet, as well as that which can be converted to operate in RVSM environment, or of the fleet that cannot operate in RVSM environments because of its age or design, must be examined with up-to-date data, since this could be decisive when the time comes to choose between a two-phase or a one-phase implementation, in terms of the range of levels that the RVSM scenario would cover, taking into account the operational impact on the entire fleet.

3.5 Another aspect that will need to be considered and which might require guides to assist States is the legal framework that they will need to modify within their legislation to enable RVSM operations.

4 Aspects of the ATM area and ATC operations

4.1 RVSM implementation makes it necessary to restructure the airspace. Exit/entry points to RVSM scenarios, the possible need for airspace sectorization, the review of ATS routes and possible modifications to reach acceptable safety levels, as well as reverting the direction of traffic in levels 310, 350 and 390, are tasks that must be carried out in a harmonious and coordinated manner in the CAR/SAM Regions, as well as between these and adjacent regions.

4.2 Another consequence of RVSM implementation is the need to modify ATC procedures, as well as to analyse air traffic systems in order to evaluate whether or not they support RVSM implementation, and to study the modifications to the equipment and systems that would be required in order to comply with the implementation.

4.3 Dealing with and planning flight data processor systems could be a critical operational requirement. To a large extent, this task has been optimised with the flight plan automated systems data, but not all participants in the programme have this tool available. The impact of RVSM implementation on ATFM is also critical.

4.4 Furthermore, the possible modification of equipment in ATC units should be considered in terms of short- and medium-term conflict prediction warnings, radar data processing, scenario and air traffic simulators, software modifications, etc.

4.5 To supplement the programme, but sufficiently in advance to RVSM operational verifiction, a simulated RVSM training programme should be developed for air traffic controllers, whereby proper training on both normal operations and emergencies, contingencies, adverse weather conditions for RVSM scenarios and on specific phraseology is provided to ensure safe operations in RVSM scenarios.

4.6 With regard to the above, all these changes must be reflected in ATC Operational Handbooks, Regulations, Letters of Operational Agreement and Regional Agreements, and this programme should be disseminated as widely as possible so that all agents involved are aware of the requirements and approved implementation timetables.

4.7 On the other hand, a careful study should be made of the procedures for State aircraft or those in the aeromedical, ferry and military operations.

4.8 As part of the dissemination of the RVSM Programme, the AIC and AIP Supplements required for a safe and orderly RVSM implementation should be developed at regional level.

5 Aspects related to the monitoring of RVSM operations

5.1 The monitoring of RVSM operations includes various safety-related aspects:

a) Height-keeping performance analysis
b) Analysis of safety assessment before, during and after the implementation of RVSM operations
c) Collection of operational data by control centres/pilots for safety assessment purposes
d) Monitoring of the HMU and/or GMU equipment and its operational management.

5.2 Bearing in mind the above, we understand that some of these aspects have already been considered in **Appendix B** to this working paper as regards the role of the Regional RVSM Monitoring Agency approved by GREPECAS/10, and that other aspects have already been channeled by the respective ICAO Regional Offices and IATA to States/Territories/service providers and users.

6 Other matters

6.1 We believe it would be beneficial for RVSM implementation to establish a web page exclusively for RVSM, where all the participants in this programme can be kept informed, not only to gain access to relevant documentation, but also to receive suggestions from different parts.

6.2 An aspect that can facilitate implementation is the translation into Spanish of certain important documents that are only available in English, since RVSM covers various areas of the administrations that do not always have staff fluent in English or who are familiar with the technical phraseology used in such documents.

6.3 The dates of the basic implementation programme shown in **Appendix A** are in keeping with the original plan. Since the launching of the Programme has been delayed, these dates must be adjusted accordingly.

7 Conclusion

7.1 The meeting is invited to discuss this working paper and, if it deems so advisable, to approve the following draft conclusions:

Draft Conclusion XXX - Guidance material for RVSM approval of aircraft and operators

That, as long as regional guidance material is available, CAR/SAM States and Territories adopt the documents issued by the FAA, Interim Guidance 91-RVSM and the JAA Temporary Guidance Leaflet (TGL No. 6), Rev. 1 of 1 October 1999, for the approval of aircraft and operators intending to fly in RVSM airspaces.

Draft Conclusion XXX - Development of regional guidance material for RVSM approval of aircraft and operators

That Regional Project RLA 99/901, Regional Safety Oversight Cooperation System, when drawing up the Latin American Aeronautical Regulations (LAR), give priority to the development of guidance material for the approval of aircraft and operators intending to fly in RVSM airspace.

Draft Conclusion XXX - Assignment of tasks to the RVSM Task Force of the ATM Committee of the GREPECAS ATM/CNS Subgroup

That, pursuant to the GREPECAS mandate, the RVSM Task Force of the ATM Committee:

a) establish three task forces to carry out the tasks on RVSM aircraft and operators approval, air traffic management and ATC operations and monitoring of RVSM operations; and
b) the groups in question take into account the terms of reference that appear in **Appendix C** to this working paper.

- END -

AP/ATM/3- WP/8 -Appendix A Proposed basic work programme for the implementation of RVSM in the CAR/SAM Regions

ID	LIST OF PROOGRAMME TASKS
1	ATM/CNS Subgroup agreement
2	Agree Monitoring Agency
3	Implement Monitoring Agency
4	Data collection for safety assessment
5	Monitoring agreements
6	Agency coordination
7	Study of RVSM areas
8	Operators modify cells
9	Cells monitoring
10	Operators total approval
11	Airspace restructuring
12	Modify ATC procedures
13	ATC System modification
14	ATC training manual
15	ATC Phase 1 Training
16	General Information manuals
17	Safety assessment analysis
18	Regional agreement with safety assessment
19	Complete ATM preparation
20	ATC Phase 2 Training
21	Go/Delay Decision
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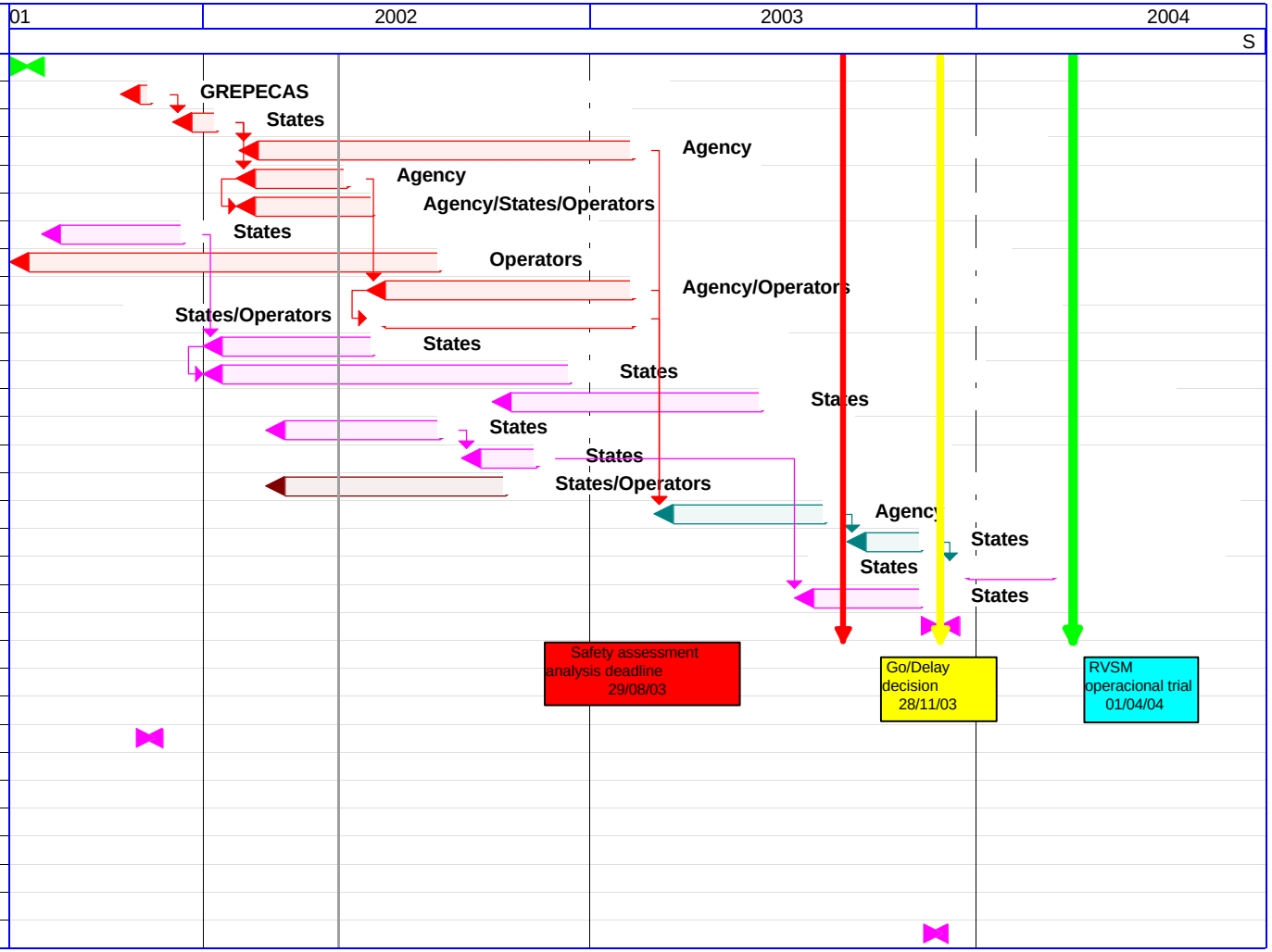

Project: RVSM Project
Start: Mon 02/07/01
End: Mon 12/04/04

Task
Division
Progress
Target
Summary
Summarized task
Summarized division
Summarized target
Summarized Progress
External tasks
Project Summary
External Milestone
Deadline

APPENDIX B

1. Role of the regional monitoring agency in the RVSM area

1.1. Monitoring will be carried out by the regional monitoring agency and will include the monitoring of height-keeping accuracy and vertical errors. The additional duties are as follows:

a) transferring and collating aircraft height-keeping performance data from other monitoring agencies;

b) receiving reports from height monitoring systems of those height deviations which are in magnitude equal to, or greater than, the following criteria:

i) TVE : 300 ft;
ii) ASE : 245 ft; or
iii) AAD : 300 ft;

c) receiving reports from provider States of details of operational errors and large height deviations identified in the region;

Note: The large height deviations can be divided into four main types:

i) operational errors (ATC/Pilots loop error and incorrect clearances),
ii) aircraft contingency events,
iii) deviations due to meteorological effects; and
iv) deviations due to ACAS/TCAS resolution advisories.

d) take necessary action with the relevant State and operator to:

i) determine the likely cause of the height deviation; and
ii) verify the approval status of the relevant operator;

e) recommend, wherever possible, remedial action;

f) analyze data to detect height deviation trends and to take action as in d) above;

g) undertake data collections as required to:

i) investigate height-keeping performance of the aircraft in the core of the distribution;

ii) establish or add to a data base on the height-keeping performance of:
- the aircraft population;
- aircraft types or categories; and
- individual airframes;

iii) provide additional data relevant to height-keeping performance needed to conduct studies which are deemed appropriate. Such studies might include analysis of FTE in the airspace based on the analysis of flight data recording;

h) collect data on all flights entering the region from all provider States. These data should include the aircraft registration numbers to facilitate a check or approval status against a data base of approved users;

i) monitor the level of risk of collision as a consequence of operational and technical errors and emergency procedures as follows:

i) establish a mechanism for receipt of all reports of height deviations of 90 m (300 ft) or more resulting from the above errors and/or procedures;
ii) determine, wherever possible, the root cause of the deviation together with its size and duration;
iii) calculate frequency of occurrence;
iv) assess level of risk in RVSM environment;
v) compare level of risk due to operational errors with the level experienced in the 600 m (2000 ft) environment; and
vi) initiate remedial action;

j) maintain a central data base of approved users and initiate checks on the "approval status" of aircraft operating in the relevant RVSM environment;

k) circulate monthly reports on all height-keeping deviations together with such graphs and tables necessary to illustrate the estimated relation of the system risk to the TLS, and

l) to submit annual reports to the GREPECAS.

1.2. The Regional Monitoring Agency is responsible for the collection, collation and dissemination of data relevant to navigation performance. Additionally, it acts as a focal point for reports of height deviations of 300 feet or more. Although there is a formalized and universally agreed procedure for dealing with gross navigation errors (GNE), no such official procedure yet exists for dealing with height deviations. Accordingly, the regional monitoring agency, during and subsequent to the RVSM verification phase will, in addition to its existing tasks, be responsible for the following:

a) initiation of checks of the approval status of aircraft operating in RVSM through tactical monitoring of the airspace;
b) maintenance of a data base of aircraft approved to operate in RVSM airspace including details of GMS monitored performance;

c) maintenance of a data base of “rogue” aircraft collated from all monitoring sources;

d) maintenance of such other data bases as necessary to monitor the TLS in respect of observed height-keeping performance criteria;

e) taking appropriate measures to ensure the minimum aircraft monitoring targets are met;

f) follow-up action and initiation of investigation of height deviations in excess of a pre-determined magnitude and develop recommendations for remedial action; and

g) production of routine reports and dissemination of monitoring data as required.

APPENDIX C

Working group: **Airworthiness and RVSM - aircraft and operators approval**

Work programme:

a) to examine and harmonise the existing material related to airworthiness and RVSM aircraft and operators approval,

b) to initiate the actions it deems advisable for amending the aeronautical charts to reflect RVSM navigation requirements,

c) to examine and adapt the guidance material on ACAS for use by operators and recommend the equipment upgradings it deems necessary,

d) to review the data provided by the entity made responsible for evaluating the height-keeping performance and make the necessary recommendations,

e) to continuously monitor the RVSM capability of the approved fleet, the percentage of aircraft that fail to meet the requirements and the percentage of State aircraft that would be exempt from RVSM requirements,

f) to prepare the material required by the RVSM web site administrator.

Working group: **Air traffic management and ATC operations**

Work programme:

a) to examine the RVSM scenario in both regions and the material on this matter prepared by other regions, adjust it, harmonise it and make recommendations regarding:

b) to develop turbulence mitigation procedures

c) to establish necessary transition areas and related procedures,

d) to develop contingency procedures,

e) to develop an ATC guidance handbook

f) to develop guidance material for establishing the work load and identifying the need for simulations for specific traffic flows,

g) to recommend guidelines for airspace sectorization

h) to study the impact of RVSM implementation on ATFM,

i) to recommend a mechanism for receiving, collating and analysing information concerning ATC or pilot operational errors,

j) to recommend the minimum requirements for RVSM training of ATC staff and RVSM simulations,

k) to prepare material for aeronautical information publications and AIP supplements related to RVSM implementation,

l) to assist in the development of procedures for the switchover day,

m) to prepare material at the request of the RVSM web site administrator.

Working group: **Monitoring of RVSM operations**

Work programme:

a) to recommend the procedures to be applied for the implementation, use of, download, delivery and analysis of data from the GMU or HMU, or both systems if necessary,

b) to review height-keeping monitoring data before and after implementation,

c) to identify those elements which might be seriously affecting safety assessment,

d) to establish a method for investigating errors that could endanger the target level of safety (TLS) and study and propose solutions for reducing risks,

e) to closely monitor the vertical occupancies level in terms of traffic density, passing frequency, etc.

f) to regularly analyse data to ensure that the mathematical collision risk model remains within the agreed parameters,

g) to design a suitable methodology that takes into account the effects of the estimated traffic increase and the changes in occupancy levels and collision risk,

h) to help prepare the procedures for the switchover day,

i) to prepare the material at the request of the RVSM web site administrator.