International Civil Aviation Organization
NORTH AMERICAN, CENTRAL AMERICAN AND CARIBBEAN OFFICE
Fourth Central Caribbean Working Group Meeting (C/CAR WG/4)
Santo Domingo, Dominican Republic, 9 to 13 February 2004

Agenda Item 2:   **General Air Navigation Matters**
                            2.3   CNS/ATM Systems

**NEED FOR IMPROVEMENT AND IMPLEMENTATION OF ATM AUTOMATED SYSTEMS
FURTHER TO ATM AND CNS DEVELOPMENTS IN THE CENTRAL CARIBBEAN**

(Presented by the Secretariat)

SUMMARY
This Working Paper presents a proposal to identify and coordinate the implementation of the operational and technical requirements in the Central Caribbean ATM automated systems, taking into account the relevant conclusions of the Eleventh Air Navigation Conference, GREPECAS/11, NACC/DCA/1 and AP/ATM/6, as well as the knowledge and experience obtained by the States and Territories.
References:
• Report of the First North American, Central American and Caribbean Directors of Civil Aviation Meeting (Grand Cayman, Cayman Islands, 8 – 11 October 2002)   • Report of the Eleventh Meeting of the CAR/SAM Regional Planning and Implementation Group (Manaus, Brazil, 3 – 7 December 2002)   • Report of the Sixth Meeting/Workshop of Air Traffic Management Authorities and Planners for the transition to the CNS/ATM Systems in the CAR/SAM Regions (AP/ATM/6) (San Jose, Costa Rica, 29 September – 3 October 2003)   • Report of the Third Central Caribbean Working Group Meeting (Curaçao, Netherlands Antilles, 24 to 28 March 2003).   • Report of the Eleventh Air Navigation Conference (Montreal, Canada, 23 September - 3 October 2003)

1.   Introduction

1.1   The Third Central Caribbean Working Group Meeting (C/CAR WG/3), held in Curaçao, Netherlands Antilles, from 24 to 28 March 2003, when considering scenarios for the study and implementation of CNS/ATM systems in the Central Caribbean and neighbouring airspace, agreed that the Central Caribbean area should be considered as a sole homogeneous scenario from the CNS/ATM implementation viewpoint.

1.2   The Eleventh Air Navigation Conference held in Montreal, Canada, from 23 September to 3 October 2003 agreed to foster in the ICAO Regions the harmonious and seamless collaborative decision making (CDM), interoperability of systems and airspace management, through the following recommendations:

- **Recommendation 1/13** Harmonization of air navigation systems
- **Recommendation 4/1** Harmonization of air navigation systems between regions
- **Recommendation 4/3** Collaborative-decision-making and global demand/capacity balancing.

1.3   The Eleventh Meeting of the CAR/SAM Regional Planning and Implementation Group, GREPECAS/11, held in Manaus, Brazil, from 3 to 7 December 2002 adopted, amongst others, the following conclusions/decisions concerning ATS automation systems:

- **Conclusion 11/23** RVSM Implementation in the CAR/SAM Regions
- **Conclusion 11/25** ATC Simulations (on RVSM implementation impact)
- **Conclusion 11/28** Air Traffic Control Automated Systems
- **Conclusion 11/32** Participation in the RVSM Task Force
- **Conclusion 11/47** Regional Guidelines for the Exchange of SSR Radar Data
- **Conclusion 11/48** Use of the Minimum Safe Altitude Warning (MSAW)
- **Conclusion 11/49** Regional Guidelines on the Planning and Implementation of Radar Surveillance Systems
- **Conclusion 11/50** Preliminary Regional Guidelines on Automatic Dependent Surveillance Systems
- **Decision 11/51** Terms of Reference of the ATM Automation Task Force
- **Decision 11/52** Actions for the Development of ATM Automation
- **Conclusion 11/53** Request for Support from Project RLA/98/003 in the Work of the ATM Automation Development Task Force

1.4   The First North American, Central American and Caribbean Directors of Civil Aviation Meeting (NACC/DCA/1) held in Grand Cayman, Cayman Islands, from 8 to 11 October 2002, agreed to foster ATM automation activities through the following conclusions:

- **Conclusion 1/11** Development of a National RVSM Implementation Plan in the States/Territories/COCESNA in the CAR Region
- **Conclusion 1/14** Support for the Continuing Development and Implementation of the CAR Region CNS Systems
- **Conclusion 1/15** Support for the Continuing Development and Implementation of CNS/ATM Systems in the CAR Region

1.5   With regard to the Sixth Meeting/Workshop of Air Traffic Management Authorities and Planners for the transition to the CNS/ATM Systems in the CAR/SAM Regions (AP/ATM/6) held in San Jose, Costa Rica, from 29 September to 3 October 2003, as part of the ICAO/UNDP RLA/98/003 Regional Project, the activities schedule was amended so that all the States/Territories/International Organizations comply with all the tasks of the RVSM programme by the end of 2004; RVSM implementation in the CAR/SAM Regions is therefore foreseen to be in harmony with RVSM implementation in the NAM Region by 20 January 2005.

1.6   Within the framework of the agreements reached for RVSM implementation in the CAR/SAM Regions, the States/Territories/International Organizations have carried out several international cooperation tasks and activities to study and identify the different scenarios that may have an impact on ATC services, resulting in important inputs for the implementation and improvement of multinational facilities of the CNS/ATM systems, which will mean an increase in the airspace capacity and ATM safety oversight, fuel savings for airspace users, as well as improvements to the efficiency and regularity of flights.

1.7   When studying the RVSM simulation scenarios, the States/Territories/International Organizations have identified different aspects that impact RVSM implementation, such as RVSM-certified aircraft data gathering, phraseology, performance of tasks carried out and ATC workload, ATC-applicable procedures, possibility of ATS incidents occurrence, contingency procedures, updating requirements to Letters of Agreement among ATS units, RVSM training requirements, requirements for the modification to ATS airspace organization, excluding and non-excluding transition airspace, ATS communication requirements, among others, including RVSM operational requirements for ATC automated systems.

1.8   When studying RVSM simulation, the States/Territories/International Organizations have detected some RVSM operational requirements, as presented in the **Appendix** to this Working Paper, for the processing and coordination of the flight plan of aircraft which directly impact the use of ATC automated systems for data exchange among ATS units (AIDC), flight plan data visualization in ATC screens, automatic alerts, RVSM status, etc.

1.9   As part of the RVSM implementation activities in the FIRs of the NAM/CAR/SAM Regions, the ICAO NACC and SAM Regional Offices carry out a case by case follow-up of the work done by the States/Territories/International Organizations, as well as on queries and NOTAM publication and AIC amendments containing changes or additions to air navigation services.

2   Discussion

2.1   ATM approach

2.1.1   Bearing in mind the background expressed in paragraphs 1.1 to 1.9 of this paper, the Meeting is suggested to develop a strategy to carry out the study of different implementation scenarios to identify the operational requirements of ATM automated systems of the Central Caribbean.

2.1.2   This strategy should have a gradual, harmonious and evolutionary vision for interoperability among systems that allow ATS inter-facility data communications (AIDC) and collaborative decision-making (CDM), as well as reaching a flexible, transparent, seamless and optimum airspace management, increasing the ATM safety oversight required levels at the same time.

2.1.3   When studying RVSM simulation, the Central Caribbean ATM Task Force should consider the analysis of the guidance material for the study of RVSM operational requirements in ATM automated systems pointed out in the Appendix to this Working Paper, in order to develop and recommend an action plan for the implementation of improvements to the Central Caribbean ATM automated systems, allowing the States/Territories/International Organizations to define other ATM automation requirements at the same time.

2.1.4   To this end, among other aspects, the Meeting should note the information presented in this Working Paper on the Central Caribbean ATM Automated Systems.

2.2   Impact on CNS systems

2.2.1   The ATM developments that are being implemented, such as RNAV and RNP routes, RVSM and others, generally impose more requirements to improve and develop the air-ground VHF and HF communication systems, navigation systems and radar surveillance systems, and therefore, they imply the need for resolution of the existing CNS-systems deficiencies, and they demand the implementation of new CNS multinational systems as well, which have an important influence on ATM automation.

2.2.2   Based on the considerations expressed above, the Meeting is suggested to recommend actions to emphasize the development of CNS systems, following ATM development stages in the Central Caribbean, in order to ensure a successful implementation of RVSM and other ATM developments. Among the new communication systems, the following stand out: ATM ground-ground applications, such as AMHS and AIDC, radar data exchange, ADS and others, as well as their impact on ATM automation.

3   Conclusion

3.1   It is expected that GREPECAS, based on the work of its contributory bodies and of RLA/98/003 Project, will soon issue more guidance on ATM automation implementation as one of the aspects for the development and implementation of CNS/ATM systems.

3.2   Nevertheless, and considering the RVSM implementation and other ATM developments in the Central Caribbean, and bearing in mind what was pointed out in the paragraphs above, it is necessary to establish an immediate action plan in order to contribute to the successful implementation of the aforementioned ATM automation elements. Therefore, the Meeting is suggested to adopt the following Draft Conclusion and Decision:

DRAFT
CONCLUSION 4/XX   DEVELOPMENT OF ATM AUTOMATION IN THE CENTRAL CARIBBEAN

That States/Territories of the Central Caribbean,

a)   evaluate the impact of RVSM implementation in the Central Caribbean;

b)   further to the RVSM implementation work, identify the operational requirements for their ATM automated systems;

c)   plan and implement as soon as possible the necessary modifications and/or improvements in their ATM automated systems;

d)   apply other suitable measures to solve the difficulties encountered and achieve the implantation of the new requirements in their ATM automated systems;

e) collaborate and exchange know-how and experiences with other States/Territories/International Organizations to introduce improvements to the automated systems in the CAR Region;

f) present the results of their assessment to the next Meeting of the Central Caribbean WG; and

g) send, at the request of the ICAO NACC Office, the results obtained from the RVSM simulations and evaluations of their ATM automated systems.

DRAFT
DECISION 4/XX **COORDINATION OF ACTIVITIES FOR THE DEVELOPMENT OF ATM AUTOMATION IN THE CENTRAL CARIBBEAN**

That the Central Caribbean Working Group (C/CAR WG),

a) follow-up the actions of the States and Territories and the recommendations of GREPECAS on ATM automation development, contributing to the coordination and implementation of those actions; and

b) assess and summarize the know-how and experience acquired by the States/Territories on the aforementioned developments, to be sent to the GREPECAS ATM/CNS/SG/4 Meeting through the ICAO NACC Office.

4. **Suggested actions**

4.1 The Meeting is invited to:

a) note the information contained in this working paper;

b) review and approve the Draft Conclusion and Draft Decision mentioned in paragraph 3.1; and

c) adopt other actions as deemed appropriate.

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APPENDIX

**GUIDANCE FOR THE STUDY OF RVSM OPERATIONAL REQUIREMENTS
IN ATM AUTOMATED SYSTEMS**

Objectives

a) Evaluate the impact of RVSM implementation on ATS airspace, comparing the parameters of ATM automated systems obtained in RVSM scenarios simulation.

b) Provide information to facilitate ATM automation in the Central Caribbean.

c) Propose actions and recommendations for the implementation and/or improvement of ATM automated systems.

d) Evaluate and identify other operational requirements of ATM automated systems through the conduction of studies on other de ATM implementation simulated scenarios.

1. **Flight Plans Data Processing**

1.1 All the flight plan data processing programmes should be designed to facilitate the access to the repetitive flight plan (RPL), the filed flight plan (FPL) and the current flight plan (CPL), which includes the access of messages of the flight plan sent via AFTN by the users of air navigation services, as well as the development in the ATC unit of flight plans when these are presented on behalf of the in-flight pilots, so that the controller may have the opportunity to access them to the automated system.

1.2 It must also be considered that flight plans sent erroneously that are not processed will be sent to rejected messages windows so that the controller may take the corresponding action.

1.3 Modifications to the ATC automated system for RVSM implementation or other ATM requirements should be considered from the viewpoint of an interoperability of CNS systems for the exchange of accurate and timely information, with the aim of facilitating the collaborative decision-making process and a transparent harmony in ATS airspace management.

1.4 The operation functions of the ATC automated system should facilitate that the controller may climb/descend within the RVSM airspace to the non-RVSM aircraft or to those non approved which, in the controller's opinion, may be authorized at some point.

2. **Flight plans templates**

2.1 In order to reduce human errors during all the processing of flight plans data in ATC automated systems, a friendly version of the flight plans templates of ATS units should be designed.

2.2 It should be considered that the ATC automated systems programme accept the flight plans of RVSM or NON RVSM aircraft pretending to operate in different ATS airspace between FL 290 and FL 410; for instance, letter W in field 10 and/or the legend STS/NON RVSM (non-RVSM aircraft) in field 18 of the form of the flight plan indicated in Appendix 2 to ICAO Doc 4444, PANS-ATM.

4. **Automated ATS messages**

4.1   The processing of change automated messages (CHG) should be foreseen, as it is useful for users and controllers who require to notify a change to the aircraft' RVSM status.

4.2   It is deemed suitable to analyze the requirements of operational messages in the ATC automated systems in a long-term ATM environment, such as messages exchange among adjacent FIRs.

5   **FPL or CPL messages**

5.1   FPL or CPL information exchange among adjacent ATC units should facilitate the coordination of the aircraft updated RVSM status.

5.2   CPL messages transmitted to the ACC adjacent to that from which the logical acknowledge receipt (LAM message) will only be modified through oral coordination between controllers.

6.   **Colors and altitude filters in radar visualization**

6.1   In the visualization screen, colors should be chosen to differentiate the several applications of operational functions in an RVSM environment; for instance, in order for the controller to be able to apply 2,000 ft separation any time between RVSM non-approved aircraft and RVSM-approved aircraft from a level that might be FL 290 or any other, it is necessary that the position symbol and the corresponding label of the RVSM non-approved aircraft appear in a color that stands out in the visualization screen. Yellow might attract the cautionary attention of the controller on the performance of the aircraft in question.

6.2   Likewise, the application of an altitude filter, for instance at FL 200, would allow to watch in a timely manner the movements of the RVSM non-approved aircraft that might request to enter a non-exclusive RVSM airspace.

7.   **Flight progression strips**

7.1   It should be foreseen that electronic strips be visualized with the same color of NON RVSM aircraft as presented on the radar control position screen. The field can be any one that the controller may easily visualize.

7.2   With regard to printed strips, in the field corresponding to the flight level or any other, the acronyms STSNONRVSM or NONRVSM should be noted down to indicate the radar controller and/or the non-radar controller that the aircraft is not RVSM-approved.

8.   **Conflict alert**

8.1   The short term conflict alert (STCA) between traffic should respond to the reduction of the separation from 1,000 ft to 2,000 ft within the RVSM airspace in the following cases:

> - **RVSM vs. RVSM (1,000 ft)**
> - **RVSM vs. STS/NONRVSM (2,000 ft)**
> - **RVSM vs. NONRVSM (2,000 ft)**

8.2   Likewise, the Mode C visual alert should be programmed on a permanent basis when an aircraft does not comply with the maximum 200 ft parameter referenced to the authorized flight level.

9.   **RVSM status changes during the flight**

9.1   In an automated system, the controllers should have the opportunity to change manually the RVSM status of the aircraft in flight, due to possible failures or contingencies that might arise (RVSM to NON/RVSM).

9.2   The suppression of letter **W** in field 10 of the form of the flight plan may provoke the automatic process to change the color of the position symbol and label.

9.3   On the other hand, the controller might note down in field 18 any additional information concerning the status of the aircraft, such as differentiating a flight plan presented by the in-flight pilot.

10.   **Radar simulators with automated functions**

10.1   It is advisable that the changes related with an ATC automated system be also applied to radar simulators with automated functions in order to allow simulations more in line to a foreseen actual/real RVSM environment.

10.2   Likewise, ATC personnel training in radar simulators should be taught in a period close to RVSM implementation.

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