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WORKING PAPER

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**Fourth North American, Central American and Caribbean Working Group Meeting
(NACC/WG/4)**

Ottawa, Canada, 24 to 28 March 2014

- Agenda Item 3: Follow-up on the progress of the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (NAM/CAR RPBANIP)**
3.2 NAM/CAR Regional Performance-Based Air Navigation Implementation Plan: Update, review and progress

**LARGE HEIGHT DEVIATIONS (LHD) AND ATS INCIDENTS REPORTS
ASSOCIATED WITH THE RVSM IMPLEMENTATION**

(Presented by the Secretariat)

EXECUTIVE SUMMARY	
This Working paper presents the status of the Large Height Deviation (LHD) and ATS incident reports associated with of Implementation of the Reduced Vertical Separation Minimum (RVSM) a 300m (1000 ft) between FL290 and FL410 inclusive.	
Action:	Suggested in Paragraph 3
<i>Strategic Objectives:</i>	<ul style="list-style-type: none"> • Safety • Air Navigation Capacity and Efficiency • Economic Development of Air Transport • Environmental Protection
<i>References:</i>	<ul style="list-style-type: none"> • <i>ICAO Annex 19, Safety Management</i> • <i>Doc 4444, PANS-ATM</i> • <i>Doc 9574 - Manual on a 300 m (1000 ft) Vertical Separation Minimum between FL 290 and FL 410 Inclusive.</i> • <i>Doc 9859, Safety Management Manual</i> • <i>Doc 9937, Manual of Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1 000 ft) Vertical Separation Minimum above FL 290</i> • <i>Report of the Sixteenth Meeting of the GREPECAS, Punta Cana, Dominican Republic, 28 March to 1st of April 2011</i> • <i>Report of the Meeting RMACG/8, Canberra, Australia, 8-12 April 2013</i> • <i>EMX0842 ICAO NACC Regional Office 18 October 2013</i>

1. Introduction

1.1 The CAR/SAM Regional Planning and Implementation Group (GREPECAS) agreed the implementation of the Reduced Vertical Separation Minimum (RVSM) between FL290 and FL410, at 09:00 UTC on 20 January 2005. RVSM implementation was extended to NAM Region on same date.

1.2 In addition, GREPECAS established the Caribbean and South American Monitoring Agency (CARSAMMA), as a Regional Monitoring Agency (RMA), to maintain a registry of State RVSM operational approvals of aircraft operators in the Caribbean and South American (CAR/SAM) Regions. GREPECAS through its conclusion 13/62, agreed that States should provide monthly Large Height Deviation (LHD) reports to CARSAMMA before the 10th of each month. When no events occurred during a month it should be indicated as *NIL LHD* occurrences.

1.3 The basic Collision Risk Model (CRM) is used to estimate the overall system risk attributable to all causes. In order to estimate the system risk, the CRM requires many parameters which are derived from data sources supplied to CARSAMMA.

1.4 To accurately estimate the collision risk, GREPECAS approved that the Scrutiny Working Group (GTE) conducts the RVSM safety assessment and the CARSAMMA conducts the collision risk assessment (CRM), as established in the ICAO Doc 9574 and Doc 9937.

1.5 During the GREPECAS/16 Meeting, the report of the Tenth Meeting of the Scrutiny Working Group (GTE) was reviewed. It was noted that ATC operational errors cover a range of 94-97% of reported LHD, which were not caused by RVSM operation but rather by the common aircraft handover procedures between ATC units.

2. Discussion

2.1 To avoid duplication by States in registering RVSM approvals, all States are associated with a particular RMA. All CAR and SAM States carry out coordination with CARSAMMA, and Canada, United States and Mexico carry out related coordination with North American Approvals Registry and Monitoring Organization (NAARMO). However, not all States timely meet their respective responsibilities of LHD coordination.

2.2 LHD reports contain details of events resulting in altitude deviations of 300 ft or more, events caused by turbulence or other weather, responses to Airborne collision avoidance system/ Traffic Collision and Avoidance System (ACAS/TCAS) advisories, deviations due to in-flight contingencies and operational errors occurred within the RVSM airspace. The Table Codes established in the Doc 9937 is included in **Appendix A** to this working paper.

2.3 The GTE has fostered bilateral and multilateral discussion among Air Navigation Service Providers (ANSPs) to reduce frequently LHD occurrences and to increase safety within the CAR/SAM Regions, and adjacent regions.

2.4 The GTE has noted that a high number of LHD reports have been received from States and recognized the necessity to increase the review of these reports in a timely manner. Therefore, the GTE proposed virtual meetings using virtual meetings using *Go-To-Meeting* tool to increase the frequency of reviewing LHD reports.

2.5 GTE has identified the reports tendency as well as of the critical points where the majority of LHD errors occurred related to RVSM use on the CAR/SAM airspace. Some these LHD reports also are qualified as ATS incidents. States should organize databases on air safety incident reports and voluntary reporting safety databases which could be possible sources of information concerning incidents in the ATS airspace.

2.6 Boundary points between CAR/SAM FIRs with high rate of LHDs (2012) are included in **Appendix B** to this working paper. The waypoint in the airway segment with the highest rate of LHDs in the CAR region is VESKA/REPIS (UA315) in the Curacao FIR (TNCF). However, the safety assessment conducted by the GTE concludes that the collision risk in CAR/SAM Regions meets the agreed Target Level of Safety (TLS) of 5×10^{-9} fatal accidents per hour of flight.

2.7 After a detailed analysis, the GTE has concluded that errors have been caused by the apparently deficient ATC-ATC radio communication between ATC Units and the aircraft or due to the lack or compliance of the operational agreements, as well as the controllers misunderstanding of the operational agreements between the States.

2.8 The most frequent causes of the LHD reports were due to ATC operational errors between ATC units. These tendencies evidence the necessity that States conduct Safety Assessment within the jurisdiction of their airspace, and take immediate mitigation actions in order to eliminate the LHD occurrences.

2.9 Many bilateral meetings have been held in an attempt to minimize or eliminate ATC operational coordination errors of LHD. However, there were some very important transfer points that still lacked reliable handover procedures.

2.10 Some ANSPs have implemented automated transfers -with the associated costs- but there was still a coordination issue that is not reflected in the Letters of Operational Agreement between adjacent FIRs, especially with respect to the reception of flight plans, duplication of flight plans, or lack of aircraft attitude specifications (climb/descent) for handover purposes.

2.11 Furthermore, the absence of handover had increased significantly, resulting in severe loss of situational awareness, with negative safety impact.

2.12 Therefore, the GTE agreed on the need for ANSPs to conduct a safety assessment of all incidents and ATC operational errors based on the ICAO Safety Management System (SMS) provisions of Doc 9859 - *Safety Management Manual (SMM)*.

2.13 During the Eight Regional Monitoring Agencies Coordination Group (RMACG/8) Meeting (Canberra, Australia, 8 to 12 April 2013), it was evidenced that all RVSM Airspaces problems worldwide are similar. One of these problems for the safety assessment is the operation of non-operational approved aircraft in the RVSM airspace.

2.14 No matter installed infrastructure or the dissemination of how to fill the LHD forms, deficiencies in the notification system of the civil aviation organizations and a lack of awareness among controllers and pilots, in the data collection process were noted.

2.15 GTE has observed that not all States report LHD occurrences accurately neither safety assessments are carried out for the different ATS airspace below FL 290, resulting in an unknown risk level.

2.16 For this matter, the ICAO NACC Regional Office has sent a State of Letter EMX0842 on 18 October 2013, inviting the Civil Aviation Authorities to verify that all aircraft to operate on RVSM airspace count with the accordingly operational approval, sending appropriately the information related with the CARSAMMA.

2.17 Likewise, additional instructions must be provided to aircraft operators to ensure that “W” in item 10 a) from the Flight Plan Form must be well introduced for RVSM flights. For non-RVSM approved aircrafts it must be indicated "STS/NONRVSM" in item 18, without a “W” in item 10 a) of the Flight Plan Form as established in ICAO Doc 4444.

3 Suggested action

3.1 The Meeting is invited to urge States to:

- a) Promote implementation of a Safety Oversight System, and a notification system (Mandatory voluntary and confidential), as part of the State Safety Programme (SSP), according to Annex 19 requirements;
- b) Promote implementation of safety assessment procedures on ATS incidents and LHD occurrences, in accordance with ICAO SMS provisions;
- c) Promote the implementation of autonomous accident and incidents investigation Agencies;
- d) Promote that air operators and service providers comply regulations on filling, presentation and coordination of flight plan data; and
- e) Promote implementation of training programmes on ATS coordination messages for controllers, to reduce operational errors among ATS units.

APPENDIX A

CODES FOR LARGE HEIGHT DEVIATIONS

Code	Cause of Large Height Deviations
A	Flight crew failing to climb/descend the aircraft as cleared.
B	Flight crew climbing/descending without ATC clearance.
C	Incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance, etc.).
D	ATC system loop error (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message).
E	Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of Human Factors (e.g. late or non-existent coordination; incorrect time estimate/actual; flight level, ATS route, etc. not in accordance with agreed parameters).
F	Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of equipment outage or technical issues.
Aircraft contingency event	
G	Deviation due to aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure).
H	Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level.
Deviation due to meteorological conditions	
I	Deviation due to turbulence or other weather-related cause.
Deviation due to TCAS RA	
J	Deviation due to TCAS RA; flight crew correctly following the RA.
K	Deviation due to TCAS RA; flight crew incorrectly following the RA.
Other	
L	An aircraft that is not RVSM approved being provided with RVSM separation (e.g. flight plan indicating RVSM approval but aircraft not approved; ATC misinterpretation of flight plan).
M	Other – this includes flights operating (including climbing/descending) in airspace where flight crews are unable to establish normal air-ground communications with the responsible ATS unit.

APPENDIX / APÉNDICE B

**PUNTOS LÍMITES ENTRE LAS FIR CAR/SAM
CON ALTO PORCENTAJE DE LHDs. (2012) /**

**BOUNDARY POINTS BETWEEN CAR/SAM FIRs
WITH HIGH RATE OF LHDs (2012)**

