GTE/17

INTERNATIONAL CIVIL AVIATION ORGANIZATION

PRELIMINARY REPORT

SEVENTEENTH MEETING OF THE GREPECAS SCRUTINY WORKING GROUP

(GTE/17)

Lima, Peru, 30 October to 03 November 2017

INDEX

HISTORY OF THE MEETING

ii-1 PLACE AND DURATION OF THE MEETING

The Seventeenth Meeting of the GREPECAS Scrutiny Working Group (GTE/17) was held at the premises of the ICAO South American Regional Office in Lima, Peru, from 30 October to 03 November 2017.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Oscar Quesada, Acting Regional Director of the ICAO South American Office, opened the Meeting. He welcomed the participants, and emphasized the importance which the information generated by CARSAMMA and analysed by the GTE has at regional level. This information represents an important input for improving safety in the CAR/SAM Regions.

Mr. Quesada highlighted the good work that CARSAMMA and the GTE have been developing during the last years, which allowed to maintain the performance of RVSM airspace within acceptable levels.

Furthermore, the Meeting acknowledged the presence of CARSAMMA experts, Messrs. Marcio Rodrigues Ribeiro Gladulich, Bernardo Carion and Ricardo Dantas Rocha.

ii-3 SCHEDULE, ORGANIZATION, WORKING METHODS, OFFICERS AND SECRETARIAT

The Meeting agreed to hold its sessions from 0830 to 1500 hours, with appropriate breaks. The work was done with the Meeting as a Single Committee.

Mr. Julio Alexis Lewis Camarena, delegate from Dominican Republic, served as Rapporteur of the Scrutiny Working Group.

Mr. Roberto Sosa España, RO/ANS & SFTY of the ICAO South American Regional Office, Lima, acted as Secretary, assisted by Messrs. Fernando Hermoza Hübner, RO/ATM/SAR of the ICAO South American Regional Office and Eddian Méndez Ramos, RO/ATM/SAR of the ICAO North American, Central American and Caribbean Regional Office.

ii-4 WORKING LANGUAGES

The working languages of the Meeting were Spanish and English, and its relevant documentation was presented in both languages.

ii-5 **AGENDA**

The following Agenda was adopted:

Agenda Item 1: Review of the previous CARSAMMA and Scrutiny Group meetings conclusions and recommendation

a) Results on 2016 safety assessment (CRM) in Reduced Vertical Separation Minimum (RVSM) airspace.
b) Statistics on LHD events in CAR/SAM Regions.
c) Identification of points with highest occurrences of LHD events in CAR/SAM Regions.

Agenda Item 2: Review of Reduced Vertical Separation Minimum (RVSM) airspace safety assessment Project for the CAR and SAM Regions.

a) Composition.
b) Objectives.
c) Deliverables.
d) Statistics.

Agenda Item 3: Large Height Deviation (LHD) analysis.

a) Application of GREPECAS approved methodology for safety assessment of reported LHD events.
b) Identify trends.
c) Lessons learned by CAR/SAM States to reduce the number of LHDs.
d) Creation of safety indicators to measure points with highest number of LHD events.
e) GTE recommendations.

Agenda Item 4: Activities and tasks to be reported to GREPECAS

a) Indicators on points with highest occurrences of LHD events.
b) Actions taken to improve the capture of LHD events data and to improve the capture of RVSM status by States of registry or Operator.
c) CARSAMMA Manual Version 2.0.
d) Training programme to States' Authorities and Air Navigation Services providers POCs concerning LHD events.
e) Results of the Reduced Vertical Separation Minimum (RVSM) airspace safety assessment Project for the CAR and SAM Regions.

Agenda item 5: Other business.

ii-6 **ATTENDANCE**

The Meeting was attended by a total of 28 participants, from 4 States/Territories of the NACC Region (Cuba, Dominican Republic, Trinidad & Tobago and United States) and 10 States of the SAM Region (Argentina, Bolivia, Chile, Guyana, Panama, Paraguay, Peru, Uruguay and Venezuela), as well as 2 International Organizations (CARSAMMA and COCESNA). The list of participants is shown in page iii-1.

ii-7 **DRAFT CONCLUSIONS**

The Meeting recorded its activities as Draft Conclusions as follows:

DRAFT CONCLUSION: Suggested activities requiring endorsement by the CAR/SAM Regional Planning and Implementation Group Meeting (GREPECAS).

LIST OF DRAFT CONCLUSIONS:

LIST OF PARTICIPANTS / LISTA DE PARTICIPANTES

ARGENTINA
1. Noelia Fernández

BOLIVIA, PLURINATIONAL STATE OF
BOLIVIA, ESTADO PLURINACIONAL DE
2. Reynaldo Cusi Mita

CUBA
3. Ricardo Martínez González

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4. Marcela P. Vásquez Flores

DOMINICAN REPUBLIC /
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5. Julio Alexis Lewis Camarena
6. Félix A. Rosa Martínez
7. Manolo A. Abreu Fajardo
8. Bolívar León

GUYANA
9. Mark Anthony Appiah
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11. Iván De León
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15. Francisco Burgos Zavaleta
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18. Ian Raphael Gomez

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19. Christine Falk
20. Jose L. Pérez

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21. Adriana San Germán
22. Rosanna Barú
23. Alberto Abetti Regazzoni

VENEZUELA, BOLIVARIAN REPUBLIC OF /
VENEZUELA, REPÚBLICA BOLIVARIANA
24. Carlos Alberto Armas

CARSAMMA
25. Marcio Rodrígues Ribeiro Gladulich
26. Bernardo Carion
27. Ricardo Dantas Rocha

COCESNA
28. Fernando Soto Mcnab

ICAO / OACI
29. Roberto Sosa España
30. Fernando Hermoza Hübner
31. Eddian Méndez

Agenda Item 1: Review of the previous CARSAMMA and Scrutiny Group meetings conclusions and recommendations

a) Results on 2016 safety assessment (CRM) in Reduced Vertical Separation Minimum (RVSM) airspace.

b) Statistics on LHD events in CAR/SAM Regions.

c) Identification of points with highest occurrences of LHD events in CAR/SAM Regions.

1.1. Under this agenda item, the Meeting reviewed the following papers:

a) WP/02 - *Vertical Collision Risk (CRM) for the year 2016 in the CAR/SAM Regions* (presented by CARSAMMA); and
b) WP/09 - *Review of previous CARSAMMA and Scrutiny Group Meeting conclusions and recommendations* (presented by the Secretariat); and

Vertical Collision Risk (CRM) for the year 2016 in the CAR/SAM Regions

1.2. The Meeting was informed by CARSAMMA of the results of the safety assessment carried out in 2016 in CAR/SAM RVSM airspace. This step is a continuation of the RVSM implementation strategy.

1.3. It was noted that, for the quantitative assessment, the Reich Vertical Collision Risk Model was used, as recommended by ICAO. WP/02 presents details of interest on said model and the calculations associated to the assessment.

1.4. The Meeting took note of the summarised results of the continuous safety assessment of the 300m (1000ft) reduced vertical separation minimum applicable to 2016 in CAR and SAM airspace.

1.5. The following aspects were highlighted:

- All aircraft operating in reduced vertical separation minimum airspace should be RVSM-certified;
- Aircraft certification should be current;
- The target level of safety (TLS) of 5×10^{-9} fatal accidents per flight hour (for tracking height-keeping in a representative sample of aircraft) should continue to be met;
- The use of RVSM should not increase the level of risk due to operational errors and contingency procedures;
- There should be evidence of aircraft altimetry system (ASE) stability;
- The introduction of RVSM should not increase the level of risk due to operational errors and flight contingencies, in accordance with a predefined level of statistical confidence;

- Additional effective safety measures should be adopted to meet safety targets and to reduce collision risk to due to operational errors and contingency procedures;
- There should be evidence of stability of the altimetry system error (ASE);
- Air traffic control procedures should continue to be effective.

CAR/SAM airspace

1.6. CARSAMMA reminded the participants that CAR/SAM airspace consisted of 34 Flight Information Regions (FIRs). Each part of the airspace was treated as an isolated system, with its own statistical parameters.

1.7. A significant portion of the data received from some States could not be used in the CRM for various reasons, including errors in RVSM airspace entry and exit times, incomplete information for the identification and location of fixed routes and reports, or even data sent beyond the deadline. However, all data sent was used in another product of CARSAMMA, *i.e.*, the RVSM airspace audit.

LHD reports

1.8. As to the occurrence of vertical deviations (LHDs) reported in the CAR/SAM Regions, CARSAMMA received a total of 1,280 LHDs in 2016. Following the analysis and validation carried out through teleconferences with representatives of the ICAO Lima and Mexico Offices, the FIRs involved, IATA and CARSAMMA, 1,065 of these LHD were considered valid in the CAR/SAM Regions.

1.9. CARSAMMA informed that during the last RMA Coordination Group meeting (RMACG/12) held in May 2017 in Salvador - Brazil, it was agreed that risk factors should not be considered for LHDs whose causes involved human factors, since they would be assessed in the CARSAMMA Safety Management Systems analysis.

1.10. Therefore, the 1,024 LHDs coded as "E1" or "E2" during the teleconferences would not be considered in this study. Accordingly, based on the guidelines adopted by the RMACG/12, the total number of LHDs analysed by CRM parameters was 58, distributed as follows:

Code	A	B	C	D	F	G	H	I	J	L
LHD	6	8	2	6	16	2	3	11	1	3

1.11. The following table describes the distribution of LHDs, by month:

Month	LHD	Total duration (sec)	Average duration (sec)	Average risk	Highest risk	Highest risk sequence
January	3	155	52	13	19	27
February	3	213	71	17	25	225
March	4	1826	457	19	37	332
April	4	240	60	22	22	343, 344, 352, 433
May	7	335	48	18	22	500, 501, 512, 548
June	7	450	64	18	30	617
July	5	212	42	21	30	670, 676
August	6	360	60	23	30	777, 790, 859
September	9	345	38	19	23	891
October	2	216	108	16	19	1015
November	5	647	129	16	22	1149
December	3	160	53	15	18	1270
Total	**58**	**5159**	**89**	**18**	**37**	**332**

Aircraft movement data collection

1.12. The sample used for estimating pass frequency and physical and dynamic parameters of typical aircraft for the assessment of vertical collision risk was taken from 1 to 31 December 2016 from 32 CAR/SAM FIRs (no data could be obtained from 2 FIRs).

1.13. In terms of flight hours in the samples collected, 1,160,614.66 flight hours were obtained from all the aforementioned FIRs. The following table shows the percentage distribution by Region:

Region	Flight hours	%
CAR	**329,143.16**	**28.36 %**
SAM	**831,471.50**	**71.64 %**
CAR/SAM	**1,160,614.66**	**100.00 %**

1.14. Table 3 of working paper GTE/17-WP/02 lists the 212,985 flights that flew across the CAR/SAM FIRs, separated by aircraft type, dimensions and flight hours, where a "typical aircraft" was used as a dimension (expressed in nautical miles) of the Vertical Risk Calculation Model.

Collision risk safety assessment (CRM)

1.15. The internationally accepted collision risk methodology (CRM) was used for the safety assessment of CAR/SAM RVSM airspace. The Meeting took note of the results of the safety assessment of RVSM airspace in the CAR/SAM FIRs.

1.16. CRM parameter estimates, as well as the technical feasibility of RVSM in the CAR/SAM Regions, system performance specifications and collision risk estimates, are summarised in section 5 and the corresponding tables in working paper GTE/17-WP/02.

Conclusions of the safety assessment (CRM)

1.17. The Meeting was informed about the collision risk - The estimated values of the Operational Error are presented in the following **table**, which result from processing all LHDs received and validated in 2016, together with the files containing aircraft movements in RVSM airspace, as processed using the specific CRM software.

Month	Technical error	Operational error	Risk
January	0.0257×10^{-9}	1.799×10^{-9}	1.825×10^{-9}
February	0.0261×10^{-9}	1.514×10^{-9}	1.540×10^{-9}
March	0.0261×10^{-9}	1.478×10^{-9}	1.504×10^{-9}
April	0.0261×10^{-9}	1.298×10^{-9}	1.324×10^{-9}
May	0.0261×10^{-9}	2.799×10^{-9}	2.825×10^{-9}
June	0.0297×10^{-9}	1.255×10^{-9}	1.285×10^{-9}
July	0.0258×10^{-9}	0.013×10^{-9}	0.039×10^{-9}
August	0.0260×10^{-9}	1.161×10^{-9}	1.187×10^{-9}
September	0.0260×10^{-9}	0.060×10^{-9}	0.086×10^{-9}
October	0.0260×10^{-9}	0.738×10^{-9}	0.764×10^{-9}
November	0.0260×10^{-9}	0.785×10^{-9}	0.811×10^{-9}
December	0.0260×10^{-9}	0.922×10^{-9}	0.948×10^{-9}

Table – Safety assessment

1.18. It was stressed that the technical error in the CAR/SAM FIRs, calculated as 0.0261×10^{-9}, did not exceed the target of 2.5 x 10-9 fatal accidents per flight hour due to loss of standard vertical separation of 1000ft and all other causes. According to ICAO Doc 9574, there was no predetermined limit for operational risk.

1.19. The average risk estimated for the CAR/SAM Regions was 1.2203×10^{-9}, below the TLS of 5.0×10^{-9}, as shown in the following table:

CAR/SAM RVSM airspace Estimated flight hours = 1,160,614.66 hours			
Source of risk	Estimated risk	TLS	Remarks
Technical error	0.0261×10^{-9}	2.5×10^{-9}	Below
Operational error	1.1956×10^{-9}	-	-
Risk	1.2203×10^{-9}	5.0×10^{-9}	Below

1.20. The Secretariat reminded the States and International Organisations participating in the GTE that RVSM airspace performance monitoring was an obligation of all States. Accordingly, CARSAMMA had to be provided with the data it required at the right time and in the proper format in order to analyse airspace performance in the CAR/SAM Regions.

1.21. The Secretariat informed the participants that the ICAO Regional Offices, together with CARSAMMA, would monitor the delivery of aircraft movement and LHD data, and would communicate directly with those States that did not provide the data.

1.22. The participants expressed their concern regarding the fact that the risk analysis would not take into account E1 and E2- coded occurrences. The representatives of COCESNA and the United States emphasised the need to include them in the analysis in order to be consistent with the analyses done to this date. The Meeting unanimously agreed that this was a valid request. In this regard, CARSAMMA agreed to prepare for this Meeting and henceforth a supplementary analysis that included E1 and E2 occurrences. The results of the 2016 supplementary analysis are shown in the report on Agenda Item 3.

1.23. Likewise, CARSAMMA noted that the terms of reference of the Agency did not specify the responsibility for the analysis of longitudinal deviations and, in order to perform such task on a regular basis, the terms of reference had to be modified and resources assigned.

1.24. The participants agreed on the need for CARSAMMA to continue processing data on vertical and longitudinal deviations, since they were an important source of safety information that could be used for analysing and improving safety levels in CAR/SAM airspace.

1.25. In view of the foregoing, the Meeting formulated the following draft conclusion:

DRAFT
CONCLUSION GTE /17/1: REVISION OF CARSAMMA AND GTE TERMS OF REFERENCE

That, having agreed on the importance of continued monitoring of horizontal deviations, the Secretariat request GREPECAS to revise the terms of reference (TORs) of the Regional Monitoring Agency (CARSAMMA) to include such monitoring as part of the functions of the Agency, leading to the exchange of such information with ICAO, the States and international organisations through the appropriate channels.

Accordingly, that GREPECAS be requested to revise the terms of reference of the GTE to account for the expanded functions of CARSAMMA.

Review of conclusions and recommendations of previous meetings of CARSAMMA and the Scrutiny Group

1.26. The Meeting reviewed the valid conclusions. The updated list of conclusions of the GREPECAS Scrutiny Group is shown in **Appendix A** to this part of the report.

1.27. The status and follow-up comments on each conclusion are based on the review carried out by the Secretariat and the representatives of the States and International Organisations.

APPENDIX A

REVIEW OF PREVIOUSCARSAMMA AND SCRUTINY GROUP MEETING CONCLUSIONS AND RECOMMENDATIONS

Conclusion	Title	Text	Responsable of action	Completion date	Deliverable	Status (valid, completed or superseded)
Conclusion GTE/14-1	RVSM AIRSPACE SAFETY ASSESSMENT ENHANCEMENT PROJECT FOR THE CAR AND SAM REGIONS	That ICAO NACC and SAM Regional offices send the CAR and SAM Regions RVSM Airspace Safety Assessment Enhancement Project, attached as Appendix A to this part of the Report, for the GREPECAS Programmes and Projects Review Committee (PPRC) approval, through the *fast track* procedure.	ICAO NACC and SAM Regional Offices			**COMPLETED**
Conclusion GTE/14-2	ORIENTATION HANDBOOK FOR CARSAMMA ACCREDITED POINTS OF CONTACT	That, CAR/SAM Regions States use the Orientation Handbook for CARSAMMA Accredited Points of Contact attached in Appendix B to this part of the Report, with a view to train their Points of Contact (PoC), as well as to improve the submission of the needed data, so that CARSAMMA can perform its responsibilities.	CAR/SAM Regions States			**VALID**

Conclusion	Title	Text	Responsable of action	Completion date	Deliverable	Status (valid, completed or superseded)
Conclusion GTE/14-3	METIGATION MEASURES FOR REDUCTION OF OPERATIONAL RISKS CAUSED BY LHD	That, considering that the CAR/SAM Regions are significantly above the maximum acceptable operational risk values caused by LHD, the following measures to be taken: requesting the correspondent mitigation actions, considering the urgency that risk caused by LHD requires:				**VALID**
		a) that the CAR/SAM States adopt mitigation measures to reduce operational risk caused by LHD as soon as possible, considering the best practices attached as Appendix A to this part of the report.	CAR/SAM States			**VALID**
		b) that the CAR/SAM States present Operational Risk caused by LHD Mitigation National Plans, as well as adopted mitigation measures to the GTE/15 meeting.	CAR/SAM States			**VALID**

Conclusion	Title	Text	Responsable of action	Completion date	Deliverable	Status (valid, completed or superseded)
		c) that the ICAO NACC and SAM Offices send an individual letter to each CAR/SAM State and ANSP informing the situation of LHD that affect operational safety in their airspace, based on detailed data obtained from CARSAMMA, and	States and ANSP			**COMPLETED**
		d) the States and ANSP present a report on mitigation measures implementation progress, based in SMS to ICAO NACC and SAM Regional Offices.	States and ANSP			**VALID**

Conclusion	Title	Text	Responsable of action	Completion date	Deliverable	Status (valid, completed or superseded)
Conclusion GTE/14-4	IMPLEMENTATION OF REGIONAL MONITORING AGENCY (RMA) FOR THE CAR REGION	That, considering infrastructure and qualified personnel, Dominican Republic in coordination with CAR States, develops a project for the implementation of a Regional Monitoring Agency (RMA) venued in Dominican Republic for the CAR Region in accordance with ICAO requirements and provides this Project to GREPECAS by 31 December 2015.			31 December 2015	**COMPLETED**
Conclusion GTE/16-1	USE OF CARSAMMA PROCESS HANDBOOK IN CAR/SAM AREA CONTROL CENTRE (ACCs)	That, States and International Organizations of the CAR/SAM Regions use the CARSAMMA Process Handbook, attached in Appendix B to GTE/16 report, to train ATCOs of ACCs to improve the submission of LHDs data to CARSAMMA.	States and ANSP			**VALID**

Conclusion	Title	Text	Responsable of action	Completion date	Deliverable	Status (valid, completed or superseded)
Conclusion GTE/16-2	USE OF HANDBOOK CERTIFICATION AND OPERATION OF STATE AIRCRAFT IN THE CAR/SAM RVSM AIRSPACE	That, States and International Organizations of the CAR/SAM Regions use the Handbook Certification and Operation of State Aircraft in the CAR/SAM RVSM Airspace attached in Appendix D to GTE/16 report, for certification and approval of height-keeping performance requirement for State aircrafts.	States and ANSP			**VALID**

Conclusion	Title	Text	Responsable of action	Completion date	Deliverable	Status (valid, completed or superseded)
Conclusion GTE/16-3	MITIGATION MEASURES TO IMPROVE TARGET LEVEL OF SAFETY IN THE RVSM AIRSPACE	That, a) States and International Organizations of the CAR/SAM Regions adopt the reactive, proactive and predictive actions related to the implementation of SMS in the RVSM airspace; and b) The ICAO NACC and SAM Regional Offices, in coordination with States and International Organizations, encourage bilateral meetings to analyse and implement measures to reduce LHD events that affect safety in their airspace; the impact of these measures shall be presented in the GTE/17 meeting.	States, ANSP and Regional Offices			**VALID**

Conclusion	Title	Text	Responsable of action	Completion date	Deliverable	Status (valid, completed or superseded)
Conclusion GTE/16-4	URGENT ACTIONS TO IMPROVE FLIGHT PLAN PROCESSING AND COORDINATION IN THE CAR/SAM REGIONS	That, States and International Organizations of the CAR/SAM Regions take urgent measures to require operators the correct use of established standards for timely processing and coordination of flight plans based on ICAO provisions.	States and ANSP			**VALID**
Conclusion GTE/16-5	AGREEMENT BETWEEN MEXICO AND THE NORTH AMERICAN APPROVALS REGISTRY AND MONITORING ORGANIZATION (NAARMO) FOR DATA EXCHANGE REGARDING SAFETY ASSESSMENT IN THE RVSM AIRSPACE	That, Mexico and the NAARMO exchange data information regarding aircraft movement, Large Height Deviations (LHD) reports in the RVSM airspace, as well as register of aircraft with RVSM approval, according to the information of Appendix F to GTE/16 report, and present this activities progress to the next GTE/17 meeting.	Mexico and NAARMO			**VALID**

Agenda Item 2: Review of Reduced Vertical Separation Minimum (RVSM) airspace safety assessment Project for the CAR and SAM Regions

a) Composition.

b) Objectives.

c) Deliverables.

d) Statistic.

2.1 Under this agenda item, the Meeting reviewed the following paper:

a) WP/05 - *RVSM airspace safety assessment improvement Project* (presented by the GTE Rapporteur).

RVSM airspace safety assessment improvement Project

2.2 The Rapporteur recalled the Meeting that during year 2014, the Scrutiny Group developed and approved Draft Conclusion GTE/14-1 on "*RVSM Airspace Safety Assessment improvements for the CAR/SAM Regions*". Likewise he remembered that drafts of deliverables were presented during GTE/15, in order to review final editions at GTE/16. Final deliverables were approved at that meeting.

2.3 The Meeting noted that after reviewing the Project, progress in terms of proposed metrics could be determined, evidencing an increase in data used for quantitative evaluation from 73% in 2012, to 83% in 2016, hoping to reach the established goal of 90%.

2.4 The Rapporteur informed that for these purposes, a training programme for CAR/SAM FIR Points of Contact (POCs) was developed, in order to ensure the correct filling of CARSAMMA Form F0. Likewise, he indicated that the percentage of LHD forms submitted by POCs remained static at 90%. Nevertheless, it would be advisable to schedule training for 2018, in order to meet the goal of 95% of LHD forms received without error.

2.5 The Meeting noted that, with regard to the reduction of LHD events in the CAR/SAM Regions, there is a clear tendency to decrease, although not meeting the goal of 20% annually. With regard to 2014, during year 2015 LHD events were reduced by 15.57% and during 2016, it decreased by 11% in relation to 2015. The issue that has reduced above the target set, is that of non-RVSM aircraft that operated in RVSM airspace in the 2016 sample, reducing from 2967 in 2014 to 197 in 2015 and finally to 17 aircraft during 2016.

2.6 The Meeting was informed that the possibility of modifying LHD events validation methodology should be analyzed, in order not to include lateral nor longitudinal deviations based on time, as the spirit of monitoring RVSM airspace is to verify vertical deviations, being another entity the one responsible for tracking those deviations.

2.7 The Rapporteur indicated that the only part of the Project that to date has not yet been developed is referred to the "*Guide for the development of IT tools for the collection of air traffic movement using ATC systems*". This task was assigned to CARSAMMA. Nevertheless, the difference in ATC Surveillance Systems used in both Regions makes it almost impossible for CARSAMMA to be able

to achieve this goal. In such sense, it was proposed that this task should be removed from the Project or otherwise, be modified in such a way to make its development feasible. The Meeting agreed to eliminate this task from the Project.

2.8 The participants agreed with the Rapporteur on the need to schedule a new training process in CARSAMMA for LHD focal points of the CAR/SAM Regions, taking into account that there were new focal points that would benefit from this training process and it would also serve as a refresher for the other focal points.

Agenda Item 3: Large Height Deviation (LHD) analysis

a) Application of GREPECAS approved methodology for safety assessment of reported LHD events.

b) Identify trends.

c) Lessons learned by CAR/SAM States to reduce the number of LHDs.

d) Creation of safety indicators to measure points with highest number of LHD events.

e) GTE recommendations.

3.1 Under this agenda item, the Meeting reviewed the following papers:

a) WP/04 - *Identification of trends* (presented by CARSAMMA);
b) WP/06 - *Development of LHD Performance Indicators* (presented by the GTE Rapporteur;
c) WP/10 - *Safety assessment of RVSM airspace in CAR/SAM FIRs* (presented by CARSAMMA); and
d) IP/08 - *LHD mitigation measures implementation progress by Trinidad & Tobago based on an SMS approach* (presented by Trinidad & Tobago);

Identification of trends

3.2 The Meeting took note of working paper GTE/17-WP/04 presented by CARSAMMA, the purpose of which was to provide experts with additional information to avoid repeating errors at the specified points, based on the analysis of LHD reports of 2016 and the first half of 2017 (until June), and for the experts of the FIRs involved to take the relevant mitigation measures.

3.3 CARSAMMA stated that some LHD reports in 2016 (first and second semester) and first half of 2017 showed a coordination error in the final flight level: traffic was still climbing or descending when communication was established with ATC services. Table 1 of GTE/17-WP/04 shows the reporting FIRs and the FIRs that generated the error, as well as the points of transfer. WP/04 also lists the FIRs that reported the most and the FIRs most reported, as well as the trends or certain reporting points.

3.4 Some LHD reports of 2016 (first and second semester) and first half of 2017 showed as coordination error a point other than that coordinated: the aircraft was flying on a different airway, changed airway or deviated from the route without the change being coordinated. Table 2 of GTE/17-WP/04 describes the trends in these reports, showing the reporting FIR, the FIR that generated the error, the position coordinated by ATC, and the position at which the aircraft called.

3.5 The Meeting took note that some LHD reports showed errors in coordination of the flight level, flight number, fix, or estimated time, where readback was done with the wrong information, and the transferring ATS unit did not identify the error in the transmission. During the first and second semester of 2016, this type of error was not identified; however, during the first semester of 2017, some events and the FIRs that originated the error were identified as shown in Table 3 of working paper GTE/17-WP/02.

3.6 Some LHD reports of 2016 (first and second semester) and of the first half of 2017 showed as coordination error that related to technical problems with the equipment used for the transfer (AMHS - *ATS Message Handling System* or AIDC - ATS *Inter-facility Data Communication*): traffic called from a flight level other than that coordinated.

3.7 Table 4 of GTE/17-WP/04 shows LHD reports related to this type of condition. WP/04 also shows the reporting FIRs, the FIRs that generated the error, and the reporting points where events occurred repeatedly.

Development of LHD performance indicators

3.8 The Meeting took note that, since airspace operations started being monitored, and after the creation of CARSAMMA, a clear trend has been observed in coordination errors between adjacent control units. These errors accounted for 94% of LHD events, which represented a very large number of events when compared to other Regions. This gave rise to the development of a methodology, based on the safety management system, different from that set forth in ICAO Doc 9574.

3.9 The Meeting recalled that, since the Fourteenth meeting of the Scrutiny Group, the GTE, together with the ICAO Regional Offices, had been continuously encouraging States/International Organisations to submit mitigation measures to reduce the occurrence of LHD events, which had taken place on an on-going basis.

3.10 The Rapporteur of the GTE informed the Meeting that after analysing LHD trends during the period 2012-2016, the conclusion was that the work done had paid off and that there had been an average reduction of 13% in the last two years.

3.11 The Meeting took note of a proposal for the creation of numerical indicators to measure the number of LHD events that occurred at the transfer of control points (*e.g.*, VAKUD, VESKA, etc.) of greater incidence *vs* the number of operations crossing in both directions, and for the development of a target level of safety (TLS) for this methodology.

3.12 With this approach, the FIRs involved would be working together to look for real solutions in order to significantly reduce LHD events.

3.13 The indicators would be included in the Project on *Improved Safety Assessment in RVSM Airspace*, and its results would be posted on the CARSAMMA website.

3.14 It was noted that the use of the methodology would add value to the performance measuring process, allowing for the individual identification of areas of concern. However, proper training would be required for this task.

3.15 In this regard, it was agreed that COCESNA, Panama and Trinidad and Tobago would start using the aforementioned assessment methodology and would report their results to the GTE/18 meeting. The remaining States and the International Organisations, based on the availability of data, would study the possibility of implementing the assessment methodology.

Safety assessment of RVSM airspace in CAR/SAM FIRs

3.16 The Meeting explained that the CAR/SAM Regional Planning and Implementation Group (GREPECAS) had entrusted the Caribbean and South American Monitoring Agency (CARSAMMA) with the implementation of the SMS methodology for analysing LHDs.

3.17 An important new application of the methodology for LHD analysis is the system for risk assessment and quick identification of trends and of the critical points where risks occur, thus reducing system safety calculation time.

3.18 A summary of the safety assessment conducted in RVSM airspace of CAR/SAM FIRs was presented. The safety assessment was conducted for a period of 12 consecutive months between January and December 2016.

3.19 The Meeting took note of a summary of validated LHDs and the duration (in minutes) associated to them, **distributed by month of arrival** to CARSAMMA, showing duration and risk parameters, according to the following **table**;

Month	Number of LHDs	Total duration (min)	Average duration	Average risk	Highest risk
Month	**Number of LHDs**	**Total duration (min)**	**Average duration**	**Average risk**	**Highest risk**
JANUARY	116	107	0.92	22.5	39
FEBRUARY	73	149	2.04	22.8	46
MARCH	93	143	1.54	23.7	49
APRIL	79	111	1.41	25.0	46
MAY	97	491	5.06	23.7	46
JUNE	72	200	2.78	23.8	46
JULY	109	310	2.84	24.3	**51**
AUGUST	107	110	1.03	22.3	39
SEPTEMBER	103	216	2.10	24.4	**51**
OCTOBER	75	74	0.99	20.1	34
NOVEMBER	90	110	1.22	21.8	46
DECEMBER	69	157	2.28	23.8	46
TOTAL	**1,083**	**2,178**	**2.02**	**23.2**	

Table - LHD occurrences, with duration, average duration, average risk and highest risk, by month

3.20 In this regard, GTE/17-WP/10, in section 2.3, lists the most significant reports based on duration.

3.21 The Meeting took note of the summary showing the number of LHDs, their duration (in minutes) and the number of flight levels crossed without authorisation, **by LHD code**, between 1 January and 31 December 2016, according to the following **table**:

LHD code	Description of LHD codes	Number of LHD occurrences	Duration of LHDs (min)	Levels crossed without authorisation
A	The flight crew failed to climb/descend the aircraft as cleared.	6	2.6	10
B	The flight crew climbed/descended without ATC clearance.	8	10.3	9
C	Incorrect operation or interpretation of airborne equipment (*e.g.*, malfunction of operational FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed instead	2	3.1	1

LHD code	Description of LHD codes	Number of LHD occurrences	Duration of LHDs (min)	Levels crossed without authorisation
	of ATC clearance, original clearance followed instead of re-clearance, etc.)			
D	ATC loop error (*e.g.*, ATC issues incorrect clearance or flight crew misunderstands clearance message)	6	30.9	9
E	ATC-to-ATC coordination errors concerning transfer or control responsibility due to human factors (*e.g.*, late or inexistent coordination; incorrect estimated/actual time; flight level, ATS route, etc., in conflict with the agreed parameters).	1,007	2,022.5	1,193
F	ATC-to-ATC coordination errors concerning transfer or control responsibility due to equipment failure or technical issues.	16	14.5	8
G	Deviation due to aircraft contingency leading to sudden inability to maintain assigned flight level (*e.g.*, pressurisation failure, engine failure).	2	2.2	8
H	Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level.	3	12.1	1
I	Deviation due to turbulence or other weather-related cause.	11	5.8	1
J	Deviation due to TCAS resolution advisory; flight crew correctly following a TCAS resolution advisory.	1	1.6	1
K	Deviation due to TCAS resolution advisory; flight crew incorrectly following a TCAS resolution advisory.	0	0.0	0
L	A non-RVSM aircraft is provided with RVSM separation (*e.g.*, flight plan indicating RVSM approval but aircraft not approved; ATC misinterprets flight plan).	3	3.0	0
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.	0	0.0	0
Total	**(Jan 2016 – Dec 2016)**	**1,065**	**2,108.6**	**1,241**

Table 2 - Summary of LHD occurrences and duration, by LHD code

3.22 The Meeting took note that E-coded LHDs (coordination error between ATC units, inexistent and/or bad coordination) were the most frequent in 2016, with 1,007 events, followed by codes "F" (16), "I" (11), "B" (8), "A" (6) and "D" (6). The high number of E-coded LHDs showed the need for better coordination between adjacent ATC units, which could be achieved through sensitisation and training of controllers in coordination issues. It was also noted that the number of reports of F-coded LHDs (coordination errors due to equipment failure or technical problems) had increased.

3.23 Graph 2 of GTE/17-WP/10 shows that, in terms of duration, E-coded LHDs stood out in this analysis, with a total duration of 2,022.5 minutes. This was one of the most significant air traffic incidents, since the aircraft involved were not expected in that position or at that level.

3.24 The Meeting took note of LHDs involving crossing of levels without air traffic control clearance. In this case, E-coded LHDs prevailed, with 1,193 level crossings. More details are shown in Graph 3 of WP/10.

3.25 CARSAMMA showed all validated LHDs, by FIR, where the Comodoro Rivadavia FIR had the highest absolute duration in minutes. There were many reports by Comodoro Rivadavia stating lack of coordination with Mount Pleasant (reports # 151, 454, 463, 472, 551, 566, 706, 901, 932, 950, 978 and 1003). Details are shown in Graph 4 of GTE/17-WP/10.

Risk value (VR) assessment

3.26 The Meeting took note of the results of the airspace safety assessment for FIRs with LHDs having a VR greater than 20. See the following **table**:

	LoS	TNCF	SGFA	SAEU	SCFZ	SKED	SACU	SBAO	SPIM	SAVU
JAN	**20**					**39**	**39**		**39**	
FEB	**20**									**46**
MAR	**20**				**46**			**49**		**46**
APR	**20**					**45**			**39**	**46**
MAY	**20**			**46**				**39**		**46**
JUN	**20**		**46**					**39**		**46**
JUL	**20**						**39**	**39**	**51**	**46**
AUG	**20**								**39**	
SEP	**20**			**51**			**39**			**51**
OCT	**20**									
NOV	**20**					**46**	**39**			
DEC	**20**	**46**			**46**			**46**	**39**	

Estimating the highest risk value for LHDs

3.27 This table shows the highest VRs for each month in the respective FIRs. Since the highest VR in January was 39, the FIRs with VRs equal or greater than 39 were analysed. Graph 5 of GTE/17-WP/10 supplements this information.

3.28 The Meeting took note that the Comodoro Rivadavia FIR (SAVU) and the Ezeiza FIR (SAEU), both in September, and the Lima FIR (SPIM), in July, had the highest VR of 2016, with 51 points. The Comodoro Rivadavia FIR (SAVU) had one of the highest operational risk values for several months in 2016. The LoS (level of safety) limit was established at the eleventh meeting of the Scrutiny Working Group (ICAO GTE/11), held in 2011 (Lima, Peru).

Safety analysis (SMS) of LHDs

3.29 The Meeting took note that Appendix A to GTE/17-WP/10 described the LHD or operational errors considered by the GTE as having the highest risk value (> 20) during the 12 months of 2016. The information contained in this Appendix was distributed in Excel to the participants, as requested.

3.30 The following **table** shows the FIRs that were exposed to the risk and those that generated the risk:

CAR/SAM FIR	Exposed to risk	Generated risk
AMAZONICA	**118**	18
ANTOFAGASTA	46	15
ASUNCION	14	9
ATLANTICO	27	1
BARRANQUILLA	**2**	**48**
BOGOTA	**107**	**154**
BRASILIA	**3**	**19**
CAYENNE	3	3
CENTRAL AMERICA	21	48
COMODORO RIVADAVIA	43	3
CORDOBA	56	30
CURAZAO	66	43
CURITIBA	34	10
EZEIZA	**8**	**43**
GEORGETOWN	1	2
GUAYAQUIL	**120**	**66**
HAVANA	4	2
ISLA DE PASCUA	0	0
KINGSTON	26	10
LA PAZ	13	**61**
LIMA	**91**	**64**
MAIQUETIA	17	**72**
MENDOZA	16	21
MONTEVIDEO	**4**	**32**
PANAMA	28	51
PARAMARIBO	2	10
PIARCO	8	10
PORT AU PRINCE	31	44
PUERTO MONTT	0	0
PUNTA ARENAS	0	0
RECIFE	19	2
RESISTENCIA	38	15
SANTIAGO	2	4
SANTO DOMINGO	**97**	48
OTHER ADJACENT FIRs (*) (**)	**Exposed to risk**	**Generated risk**
ABIDJAN	0	4
AERONAVE (*)	0	9
DAKAR	0	5
EQUIPO (*)	0	1
JOHANNESBURG	0	1
LUANDA	0	1
MEXICO	9	8
MIAMI	0	6
MOUNT PLEASANT (**)	0	41
NEW YORK	4	0

CAR/SAM FIR	Exposed to risk	Generated risk
PILOTO (*)	0	24
SAN JUAN	5	21
SANTA MARIA	0	3

FIRs that were exposed to, and generated, risk (LHDs) in 2016

3.31 The Meeting took note that LHD reports #694, 901, 932, 950, 978, 979 and 1003, which were filed in July (1) and especially in September (6) 2016, accounted for 2.21% of the risk assessment, with a VR = 51, the highest in the sample.

3.32 The Meeting took note that CARSAMMA had assessed the individual operational errors identified in the LHD reports submitted by the 34 FIRs. These results are shown in Graphs 6 and 7 of GTE/17-WP/10. An image was also presented with the geographical location of risk points (hot spots, VR ≥ 39) in LHD reports, with 43 points and 68 reports in the data set for 12 consecutive months in 2016. See Graph 8 of WP/10.

3.33 The Meeting took note that in 2016, there had been some reports with high values, mainly in the Comodoro Rivadavia FIR, due to failures generated by the Mount Pleasant CTR and between the Ezeiza and Montevideo FIRs. Furthermore, there had been several reports, some of which with a high risk value (VR), between the FIRs adjacent to the Bogota, Guayaquil, Lima, Port-Au-Prince, and La Paz FIRs. There was also an increase in the number of reports involving FIRs that were not previously involved, and which generated a VR equal or greater than 41 points.

3.34 Table 6 of GTE/17-WP/10 shows these points and the number of reports with a VR equal or greater than 41 points, the number of times these were reported, maximum VRs, and the FIRs or CTRs involved.

3.35 The Meeting took note of the FIRs that had filed the largest number of reports, and of the total number of reported points. Additionally, information was provided on the FIRs that filed the most reports, and the points reported. See Tables 7 and 8, and Graph 9 of GTE/17-WP/10.

3.36 The Meeting requested CARSAMMA to present, as of 2018, an individual analysis of the points of greatest incidence in the CAR Region and in the SAM Region, in order to analyse in more detail the risk levels of each Region.

3.37 The Meeting agreed that specific coordination measures were required in order to reduce the number of occurrences generated by the lack of coordination between Mount Pleasant and the Comodoro Rivadavia ACC, which in turn involve other FIRs.

LHD mitigation measures promoted by Trinidad and Tobago

3.38 The Meeting took note of the actions being carried out by Trinidad and Tobago at the Piarco FIR to reduce LHD occurrences. It was highlighted that the Piarco FIR was adjoined by nine FIRs and control areas, and that the ANSP had been analysing LHD occurrences for a period of seven years.

3.39 The strategies applied for reducing LHD occurrences were presented, such as LHD data sharing (including airlines), collaboration with various ANSP services, LHD bulletins, etc.

3.40 Furthermore, new strategies were being planned, such as the development of a voluntary reporting programme, reinforcing adherence to procedures, implementation of AIDC, etc.

3.41 Information paper GTE/17-IP/08 provides details and the results of the strategies applied by Trinidad and Tobago, and its appendices B, C, D and E analyse the LHDs produced between 2009 and 2016, observing a significant reduction and a decreasing trend.

Agenda Item 4: Activities and tasks to be reported to GREPECAS

a) Indicators on points with highest occurrences of LHD events.

b) Action taken to improve the capture of LHD events data and to improve the capture of RVSM status by States of registry or Operator.

c) CARSAMMA Manual Version 2.0.

d) Training programme to States' Authorities and Air Navigation Services providers POCs concerning LHD events.

e) Results of the Reduced Vertical Separation Minimum (RVSM) airspace safety assessment Project for the CAR and SAM Regions.

4.1 Under this agenda item, the Meeting reviewed the following papers:

a) WP/03 - *State aircraft RVSM certification and operation in the CAR/SAM Regions* (presented by CARSAMMA);
b) WP/07 - *Large Height Deviation analysis for the Western Atlantic Route System (WATRS) airspace calendar year 2016* (presented by NAARMO/USA); and
c) IP/03 - *CARSAMMA Bulletin - Identification of Non-Approved RVSM airframes* (presented by CARSAMMA).

State aircraft RVSM certification and operation in the CAR/SAM Regions

4.2 CARSAMMA informed the Meeting about the results of the analysis of the incorrect use of RVSM airspace in CAR/SAM Flight Information Regions (FIRs). For this work, advantage was taken of the experience gained in several years of RVSM implementation, especially in the CAR/SAM Regions.

4.3 The Meeting took note that CARSAMMA maintained a database of all operators and aircraft that had been approved to operate with a vertical separation of 1000 feet in RVSM airspace by a State/entity accredited in its Regions. The RVSM approval data of CARSAMMA were exchanged with 12 other RMAs worldwide and the RVSM status of any aircraft could be verified, regardless of the RVSM region in which it was operating.

4.4 CARSAMMA informed that it verified the approval status of the aircraft by comparing the current Flight Plan, the reports of Large Height Deviations (LHD) collected, and the data collected on aircraft movements sent by Air Navigation Service Providers (ANSPs). In case an aircraft was not listed as RVSM approved, CARSAMMA sent a request for clarification of the approval status to the responsible State office or RMA responsible for the region of origin of the aircraft. ICAO member States were required to take appropriate action in case an aircraft was operating in this airspace without a valid approval.

RVSM approval of State aircraft

4.5 The Meeting took note of the information provided by CARSAMMA regarding the use of RVSM airspace by State aircraft that were not RVSM certified and yet filled item 10 of the FPL with a "W", when it was recommended to complete item 18 with "STS / NONRVSM HEAD or STS / NONRVSM STATE".

4.6 The guidance material on certification and operation of State aircraft in RVSM airspace (see Appendix A to GTE/17-WP/03) provides a general reference to the operation of State aircraft flying under general air traffic rules in RVSM airspace.

4.7 The main issues addressed in the document are:

- There is no exemption for State aircraft to operate as General Aviation traffic within the RVSM airspace with a minimum vertical separation of 1000 feet, without RVSM approval. Lack of such approval does not mean that the State aircraft cannot access the designated RVSM airspace, but it requires a separation of 2000ft and filing of a separate flight plan.

- Any aircraft modified for specific functions must be validated with the RVSM MASPs before being granted RVSM approval.

- Training flights are not allowed within RVSM airspace with a minimum vertical separation of 1000 feet.

4.8 The Meeting was informed that in 2016, CARSAMMA had received several reports from other RMAs requesting the RVSM status of State aircraft registered in the CAR/SAM Regions that had filled "W" in the FPL and had flown in RVSM airspace under the responsibility of these RMAs, and these aircraft did not appear in the CARSAMMA RVSM approval database. See details in the following **table**:

Register	Mode S	Type	State	Number of Flights
FAB001	E940FA	F900	Bolivia	3
FAC0001		B737	Colombia	1
FAC1208		B734	Colombia	8
FAE051	E84035	E135	Ecuador	6
FAE052	E84834	FA7X	Ecuador	8
FAH001	0BAFA1	E135L	Honduras	4
FAP356	E8C007	B735	Peru	8
FAV0001		A319	Venezuela	3
				Total: 41

4.9 The representatives of the States and of the international organisations expressed their concern regarding operations that were being carried out in RVSM airspace by State aircraft without proper approval to operate in RVSM airspace. They also expressed that, for these operations to take place, the flight plan had to be properly completed. In view of the foregoing, the Meeting formulated the following draft conclusion:

DRAFT
CONCLUSION GTE/17-2: OPERATION OF STATE AIRCRAFT IN CAR/SAM RVSM AIRSPACE

That the ICAO Regional Offices coordinate with the States under their responsibility to ensure that State aircraft operating in RVSM airspace have the required approval to operate in such airspace, or complete the flight plan as established in the Manual on Certification and Operation of State aircraft in CAR/SAM RVSM airspace.

CARSAMMA will keep the Regional Offices informed of occurrences of State aircraft flying in RVSM airspace.

Large height deviation analysis for the Western Atlantic Route System (WATRS) - 2016

4.10 The Meeting took note of the information presented by the North American Approvals Registry and Monitoring Organization (NAARMO), which showed that there had been a total of 40 LHDs reported for WATRS airspace in 2016 (see GTE/17-WP/07). LHDs could be attributed to operational or technical causes. Of the 40 LHDs reported, 7 were considered as technical risks, and 33 were considered as operational risks. The 7 LHDs attributed to technical risk consisted of 6 reports of turbulence and 1 report of an aircraft that lost RVSM capability and was subsequently provided with 2000ft separation (see Table 1 of GTE/17-WP/07).

4.11 The Meeting took note that LHD occurrences related to ATC coordination errors were the main cause of operational risk in WATRS airspace. The LHD category with the highest number of minutes spent in the incorrect flight level had been 'E', coordination errors in the transfer of control responsibility, as a result of human factor issues.

4.12 The largest contributing LHD event in this category was caused by an error in read-back/hear-back coordination between adjacent ATC units. This event accounted for 45 minutes of the 83 total minutes associated with this category (‘E’). Reported LHD events attributed to ATC system loop errors, LHD category ‘D’, accounted for a total of 36 minutes spent at incorrect flight level in 2016.

4.13 There were two LHD category ‘D’ events that together contributed a total of 27 minutes at incorrect flight level. Both of these events were further complicated by errors involving the ATC automation system. There have since been several changes made to the automation system to prevent similar events in the future.

LHD trends

4.14 The Meeting was informed that a restructuring of airways in WATRS airspace had taken place in June 2008 in an attempt to increase capacity and efficiency. With the reorganization of the WATRS route system the 50-NM lateral separation standard had been introduced. NAARMO had also conducted the safety assessment for the implementation of the 50-NM lateral separation standard.

4.15 In December 2013, the 50-NM longitudinal, 30-NM lateral, and 30-NM longitudinal separation minima had been introduced in the New York Oceanic FIR, including WATRS airspace.

Comparison between estimated vertical risk and the TLS

4.16 The Meeting took note of the information provided by NARMMO regarding the vertical collision risk model, which was highly sensitive to the number of vertical passings in the opposite direction. The risk estimates shown in the following **Table** reflect the sensitivity of the opposite direction vertical occupancy values. The estimated number of hours flown in WATRS airspace in 2016 was 225,617.21 hours.

4.17 The vertical risk estimates provided in the following Table are consistent with previous estimates. For example the 2013 estimate of overall vertical risk was 286.1×10^{-9} fapfh.

Vertical risk estimates - 2016

	Vertical risk estimate (fapfh)
Technical risk	0.84×10^{-9}
Operational risk	218.4×10^{-9}
- Same direction	2.22×10^{-9}
- Opposite direction	216.1×10^{-9}
- Crossings	0.007×10^{-9}
Total risk	219.2×10^{-9}

The representatives of the States and International Organisations acknowledged the presentation made by NARMMO, and encouraged them to continue working in collaboration with CARSAMMA in order to improve RVSM airspace performance in both Regions.

CARSAMMA bulletin – Identification of non-RVSM aircraft

4.18 The Meeting was informed that the last Regional Monitoring Agencies Coordination Meeting (RMACG/12) held in Salvador, in May 2017, had discussed and deemed it necessary to create a bulletin to be issued by RMAs, providing information to the States of Registry of aircraft that had used RVSM airspace without being certified for that purpose. This type of occurrence increased the risk of vertical collision to an unacceptable level, reason why a "Bulletin" was created to include these aircraft.

4.19 CARSAMMA noted that, for this to succeed, all RMAs had to conduct a continuous audit in the RVSM airspace of their competence in order to:

a) Identify possible events of aircraft using this airspace without the necessary RVSM certification;

b) Request information on the "RVSM status" of the aircraft identified to the authorities of the State of Registry of the aircraft;

c) If these authorities did not respond within 30 days of notification or responded that the aircraft in question was NOT RVSM-certified, the RMA would include these aircraft in its "Bulletin";

d) All RMAs would receive and send copies of these bulletins on a monthly basis to the other RMAs in order to disseminate the information contained in the bulletins.

4.20 CARSAMMA reminded the Meeting that RVSM certification was required for the use of this special airspace, and thus requested the States to update the nominal list of points of contact on RVSM certification, in order to reduce the audit response time and avoid incorrect inclusion in the “Bulletin” of an aircraft with a valid RVSM certificate. The “CARSAMMA bulletin” was already available on the restricted website of the Agency.

4.21 The Meeting took note that the latest RVSM approval database maintained by CARSAMMA showed that the total number of RVSM-approved aircraft totalled 2668 as of the end of September 2017.

4.22 It is essential that 100% of the RVSM-approved aircraft fleet meet RVSM requirements. However, in the safety assessment and in all LHDs submitted in 2016, CARSAMMA identified a total of 17 non-RVSM aircraft (4 with Caribbean registry and 13 with South American registry).

4.23 CARSAMMA informed that, according to its research, some of these aircraft had not been RVSM certified by any State, as described in the following **Table**:

State	Non RVSM
Netherlands Antilles	
COCESNA	N747AV
Cuba	
Haiti	
Jamaica	VPCSP
Dominican Republic	
Trinidad & Tobago	
Argentina	LVGOK LVGTQ LVGWL
Bolivia	
Brazil	PRPRE PROBD PROJL PRDEA
Chile	
Colombia	00535A
Ecuador	HP1845 HP1717
Guyana	
French Guiana	
Panama	HP1714 HP1727
Paraguay	
Peru	
Suriname	
Uruguay	
Venezuela	YV3052

4.24 The representatives of the States and International Organisations expressed their concern with respect to the operation of these aircraft in RVSM airspace due to their possible impact on risk levels. Therefore, they requested the Secretariat and CARSAMMA to take measures to address this issue. Accordingly, the Meeting formulated the following draft conclusion:

DRAFT
CONCLUSION GTE/17-3: OPERATION OF NON-CERTIFIED AIRCRAFT IN CAR/SAM RVSM AIRSPACE

That CARSAMMA inform the ICAO Regional Offices, as soon as possible, of any occurrence involving the operation in RVSM airspace of a non-RVSM aircraft with registry of a CAR/SAM State, so that the ICAO Offices may contact the State in order for it to take the necessary measures to ensure that this type of operations are not carried out.

Agenda Item 5: Other business

5.1 Under this agenda item, the Meeting reviewed the following papers:

a) WP/08 - *Proposal for the development of a fair culture framework in a trusted environment* (presented by Uruguay);
b) NI/04 - *Acciones mitigadoras implementadas por República Dominicana para la reducción de los eventos LHD en la FIR Santo Domingo* (presented by Dominican Republic - **Spanish only**);
c) NI/05 - *Participación en Quinta Reunión del Grupo de Trabajo de Norteamérica, Centroamérica y El Caribe* (presented by the GTE Rapporteur - **Spanish only**);
d) IP/06 - *NAARMO-Mexico RVSM safety monitoring activities* (presented by NARMO); and
e) NI/07 - *Análisis y mitigación de LHD* (presented by COCESNA - **Spanish only**).

Proposal for the development of a fair culture framework in a trusted environment

5.2 The delegate of Uruguay informed the representatives of the States and International Organisations of the establishment of a fair culture framework. According to European Union Regulation No. 376/2014: "*Fair culture: is one in which operators and other frontline staff are not punished for their actions, omissions or decisions when they are commensurate with their experience and training, but in which serious negligence, intentional infractions or destructive acts are not tolerated."*

5.3 The Meeting noted that the concept of Fair Culture could also be applied to allow management to address staff actions and honest mistakes in a balanced way that takes into account factors affecting human decision making; some of them correct and some not. No one who is part of the working group can ignore the boundaries between punishable behaviour and that which represents unsafe organizational acts.

5.4 The representatives of Cuba and Venezuela expressed the need to encourage the establishment of the reporting principle, supported by the development of a fair culture.

5.5 The representative of Peru stated that an important element of the reporting culture was the principle of transparency. This has been applied in the relationship with the focal point of Chile, with very positive results

5.6 The Secretariat informed that, as part of the SMS implementation strategy, the Regional Offices would work with the States in the development of a fair culture to encourage reporting. Likewise, as part of these activities, a framework and a policy for the implementation of the fair culture would be developed and made available to the States.

Mitigation measures adopted by the Dominican Republic to reduce LHDs in the Santo Domingo FIR

5.7 The Meeting took note of the action taken by the Dominican Republic for continuous reduction of LHDs.

5.8 The representative of the Dominican Republic informed that, at the GTE/13 meeting, they had undertaken to reduce LHDs by 15% per year. This goal had been exceeded by far, with reductions of 15%, 30.89% and 48% in 2014, 2015 and 2016, respectively. It was foreseen that the

mitigation measures adopted after their participation in the GTE/16 meeting would result in a 35% reduction in 2017 compared to 2016, achieving a reduction from 45 LHDs caused by the Santo Domingo FIR to 23 at present, without considering the data of the last quarter of 2017. This had been possible by:

a) Reinforcing training and oversight at their control units.

b) Identifying those FIRs that generated more errors and raising awareness of the different physical and technological infrastructures such FIRs had in place for the provision of services.

c) Taking measures to double or triple the monitoring responsibilities.

d) Conducting training and sensitisation campaigns for ATC personnel, to raise their awareness and allow them to easily identify possible errors and be able to correct them before they become an operational deviation.

5.9 The Meeting took note of the measures taken by the Dominican Republic to reduce LHDs, which have permitted a significant improvement of the level of safety in the airspace.

Participation at the Fifth Meeting of the North America, Central American and Caribbean Working Group

5.10 The Meeting took note of the participation of the Rapporteur of the GTE at the fifth meeting of the North America, Central America and Caribbean Working Group (NACC/WG/05), held in Port of Spain, Trinidad and Tobago, on 22-26 May of this year. During this meeting, information was presented on the evolution of LHDs in the CAR Region, the methodologies for analysis, the project on *RVSM safety assessment improvements*, the proposed LHD performance indicators, and LHDs in the various CAR FIRs, with emphasis on data on the Havana FIR showing how effective implementation of AIDC had drastically reduced LHD occurrences between this FIR and the Miami, Mérida and COCESNA FIRs.

5.11 The Secretariat highlighted the importance of information sharing between the GTE and the CAR and SAM Implementation Groups. Accordingly, as of 2018, a formal information sharing process would be established between the GTE and the Implementation Groups. This process would take place in coordination with the ICAO Regional Offices, CARSAMMA and the rapporteur of the GTE.

NAARMO-Mexico RVSM safety monitoring activities

5.12 The Meeting took note of the information provided by NAARMO, with an update of the status of implementation of Conclusion GTE/16-5. The DGCA of Mexico was now providing NAARMO with monthly updates of the Mexican RVSM approval database. Previously, the frequency of such updates was every two months. There were currently 767 records of RVSM-approved aircraft for Mexico. Any new aircraft registrations observed in the NAARMO's ground-based height monitoring system (*Aircraft Geometric Height Measurement Element (AGHME) system*) that were not yet in the Mexican RVSM Approvals database, were being provided to the DGCA of Mexico for examination. Also, any Mexican registered aircraft observed squawking an incorrect Mode S address in the AGHME database were being provided to the DGCA of Mexico for investigation.

5.13 NARMOO informed that the DGCA of Mexico provided traffic movement data in accordance with the NAARMO traffic movement data collection template. The DGCA of Mexico and *Servicios a la Navegación en el Espacio Aéreo Mexicano* (SENEAM) were now providing NAARMO

with monthly LHD reports for Mexican airspace. NAARMO had received 32 LHD reports for 2016. **Table 1** provides a summary of qualifying LHD reports for Mexican airspace. There were 15 reports classified as Other, 'M', all of them involving flight crews unable to establish normal air-ground communications for a period of time. In all 15 cases, the proper procedure for radio failure (NORDO) had been followed; therefore, they had not contributed to risk.

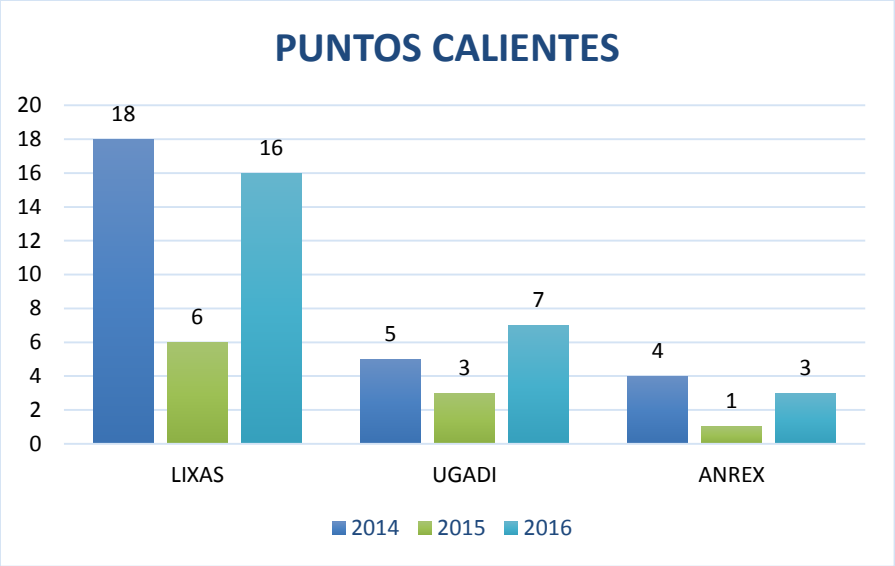
Table 1 - 2016 LHD Report Summary for Mexican airspace

LHD Category Code	LHD Category Description	No. of LHD Occurrences	LHD Duration (Min)	No of FL Transitioned without Clearance
E	Coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility as a result of human factors issues	15	14	0
H	Airborne equipment failure leading to unintentional or undetected change of flight level	2	3	1
M	Other	15	0	0
Totals		32	17	1

5.14 The Meeting noted that the estimated number of annual flying hours had been 800,000 hours in 2016. The 2016 estimate of overall vertical collision risk for Mexican airspace was 4.77×10^{-9} fatal accidents per flight hour (fapfh). This value as lower than the target level of safety (TLS) for RVSM airspace and was slightly lower than the 2015 vertical collision risk estimate of 4.81×10^{-9} fapfh.

5.15 The Meeting was informed by COCESNA that the number of aircraft operations in the Central American FIR had grown by 6.57% per year in the last 5 years, which resulted in increased coordination amongst controllers in adjacent units and within the FIR. It also increased the probability of error. The CENAMER ACC has not been exempt of coordination errors or coordination failures coded E1 and E2. One hundred per cent (100%) of E-coded LHDs in 2015 and 2016 were attributable to CENAMER

5.16 The Meeting took note of the analysis of the hot spots where more problems had been observed in the last 3 years, showing similar results for the three years, as seen in the following **graph**:



5.17 The Meeting took note of the measures taken by COCESNA to reduce LHDs:

a) Implementation of automated coordination based on a plan for the implementation of AIDC channels in the Central America FIR, taking advantage of the installed CNS/ATM capacity in the area;

b) Coordination with airlines through IATA for testing the use of ADS-C / CPDLC. The use of this technology helps the ATCO obtain a better estimate over transfer points with adjacent FIRs;

c) Implementation of ADS-B in Cocos Island to provide ATCOs better coverage and the ability to send time updates to Guayaquil;

d) Coordination with the Guayaquil FIR for radar data sharing;

e) Definition of ATS capacity in order to establish a safety framework;

f) An air traffic flow management (ATFM) service would be implemented in CENAMER airspace, since traffic demand sometimes exceeds the defined ATS capacity;

g) Implementation of a risk management system in air traffic services;

h) An LHD performance indicator was established (LHDs attributed to CENAMER);

i) A performance indicator was quantified using 2014 LHD statistics, with the following result (management indicator = < 8 LHDs per month);

j) A Management Indicator goal was established in order to obtain a 35% reduction of LHDs.

k) Action plans were developed to achieve the goals in three important areas:

- **Training**

  - Induction for filling the LHD form and for identifying LHDs;
  - Induction on the coordination procedures established in the CENAMER Operating Procedures Manual;
  - Simulator training, including real and created LHD scenarios;
  - Refresher courses with emphasis on real LHD scenarios simulating LHD situations.

- **Regulation**

  - Implementation of the ATFM Manual that describes the ATFM measures to be taken for demand/capacity balancing;
  - Analysis and review of operational errors (OE), to serve as input for the review and modification of the CENAMER Operating Procedures Manual;
  - Forums in which controllers from all positions participate to discuss real EO cases and offer ideas to improve procedures;
  - Controllers and/or planners must compare radar label data (Mode C) with the flight level in the flight progress strip many times while the flight is in the control sector so as not to miss any last-minute change.

- **Technology**

  - Incorporation of AIDC functionality into the new surveillance system;
  - Development of a tool for demand/capacity balancing.

5.18 The Meeting took note of the results obtained from the measures taken by COCESNA: from the 117 LHDs caused by CENAMER in 2014, there was a 69% reduction in 2016, significantly reducing LHD occurrences in the FIR under its responsibility.

CARSAMMA Focal Points

5.19 The Meeting updated the information of focal points for aircraft movements and aircraft equipment and operator. The updated information is included in **Appendices A** and **B** of this part of the Report

CARSAMMA FOCAL POINTS –DATA ON AIRCRAFT MOVEMENTS
PUNTOS FOCALES CARSAMMA – DATOS MOVIMIENTOS AERONAVES

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CARSAMMA FOCAL POINTS – EQUIPMENT / AIRCRAFT AND OPERATOR DATA
PUNTOS FOCALES CARSAMMA – EQUIPAMIENTO / DATOS AERONAVES Y OPERADOR

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