GTE/13

INTERNATIONAL CIVIL AVIATION ORGANIZATION

FINAL REPORT

THIRTEENTH MEETING OF THE GREPECAS SCRUTINY WORKING GROUP

(GTE/13)

Lima, Peru, 09 to 13 September 2013

INDEX

HISTORY OF THE MEETING

ii-1 PLACE AND DURATION OF THE MEETING

The Thirteenth Meeting of the GREPECAS Scrutiny Working Group (GTE/13) was held in Lima, Peru, from 09 to 13 September 2013.

ii-2 OPENING CEREMONY AND OTHER MATTERS

Mr. Franklin Hoyer, Regional Director of the ICAO South American Office, opened the Meeting after welcoming the participants, and highlighting the importance of reviewing the topics at the regional level, focusing on the need to reduce M- N-coded LHD reports mainly related to ATC to ATC transfer procedures, in order to enhance safety in the two Regions.

In addition, Mr. Johann Estrada of the Dominican Republic, Rapporteur of the GTE Group, CARSAMMA experts Messrs. Ricardo Dantas Rocha, Reinaldo Brandão Taveira and Gilmar Bento Machado, Mr. Víctor Hernández, RO/ATM/SAR of the ICAO NACC Office and Mr. Roberto Arca, RO/ATM/SAR of the ICAO SAM Office, acted as the Secretariat for the Meeting.

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

The Meeting agreed to hold its sessions from 0830 to 1545 hours, with appropriate breaks. The work was done with the Meeting as a Single Committee.

Mr. Johann Estrada, delegate from Dominican Republic, served as Chairman of the Meeting and Rapporteur of the Scrutiny Working Group.

Mr. Roberto Arca, RO/ATM/SAR/AIM of the ICAO South American Regional Office, Lima, acted as Secretary. He was assisted by Mr. Víctor Hernández, RO/ATM/SAR of the ICAO North American, Central American & Caribbean Regional Office, Mexico.

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: Safety assessment of RVSM airspace in the CAR/SAM FIRs

Agenda Item 2: Activities carried out by CARSAMMA.
- Review of analytical parameters for LHD validation.

Agenda Item 3: Quantitative Vertical Collision Risk Calculation (CRM).

Agenda Item 4: Analysis of Large Height Deviations (LHDs).
- Evolution of M and N-coded LHDs in RVSM airspace of CAR/SAM FIRs.

Agenda Item 5: Other business.

ii-6 **ATTENDANCE**

The meeting was attended by a total of 27 participants, from 4 States of the NACC Region (Cuba, Dominican Republic, Haiti and Mexico) and 6 States of the SAM Region (Argentina, Bolivia, Colombia, Chile, Paraguay and Peru), as well as 3 International Organizations (ARINC, CARSAMMA and COCESNA). The list of participants is shown in page iii-1.

ii-7 **LIST OF CONCLUSIONS**

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Agenda Item 1: Safety assessment of RVSM airspace in the CAR/SAM FIRs

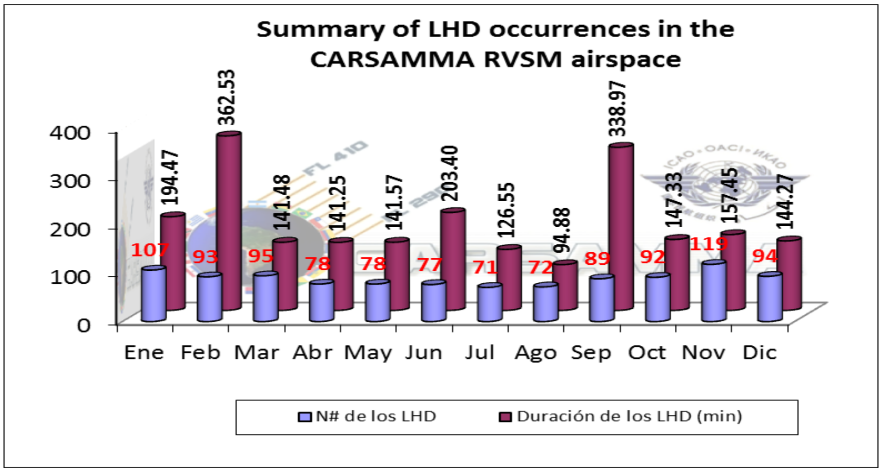
1.1. Under this item, the Scrutiny Group analysed LHD reports between January and December 2012, which were used for this safety assessment. According to Doc 9859 table of risks which was adapted for the LHD risk value calculation, colour codes are the following:

- risks from 1 to 20 - green;
- risks from 21 to 74 - yellow;
- risks from 75 to 100 - red.

1.2. Table 1 and Graph 1 summarise LHD occurrences validated by the Scrutiny Working Group (GTE) and the duration (in minutes) associated to the LHD, by month.

YEAR 2012					
MONTH	NUMBER of LHDs	DURATION Total (min.)	DURATION Mean (min.)	Mean RISK	Highest RISK
JANUARY	107	194,47	0,55	20,38	55
FEBRUARY	93	362,53	0,26	19,56	46
MARCH	95	141,48	0,67	19,35	55
APRIL	78	141,25	0,55	19,26	46
MAY	78	141,57	0,55	19,83	40
JUNE	77	203,40	0,38	25,56	46
JULY	71	126,55	0,56	21,89	46
AUGUST	72	94,88	0,76	22,14	55
SEPTEMBER	89	338,97	0,26	15,72	46
OCTOBER	92	147,33	0,62	20,77	46
NOVEMBER	119	157,45	0,76	21,05	46
DECEMBER	94	144,27	0,76	23,13	60
TOTAL	**1065**	**2194,15**	**0,49**	**20,72**	

Table 1: LHD occurrences, with total duration, mean duration, mean risk and highest risk, by month



Graph 1: LDH occurrences/duration, by month

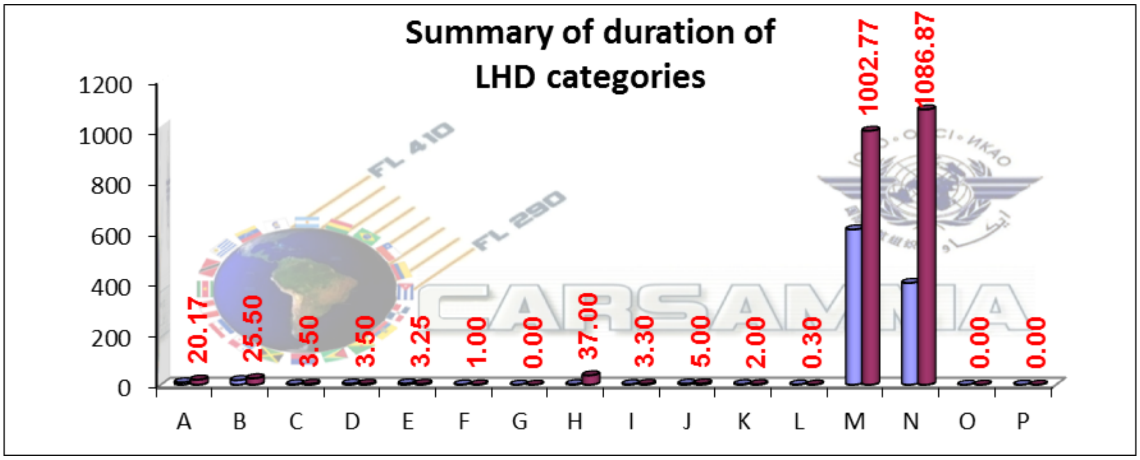
1.3. Table 2 and Graph 2 summarise the number of LHD occurrences, the duration (in minutes) associated to the LHD, and the number of flight level crossings without clearance, by LHD code, from 1 January to 31 December 2012, inclusive.

LHD category	Description of LHD code	N° of LHD occurrences	Duration of LHD (min)	Levels crossings without clearance
A	Failure to climb/descend as cleared.	9	20,17	4
B	Climb/descent without ATC clearance.	18	25,50	33
C	Entry into airspace at an incorrect flight level.	2	3,50	1
D	Deviation due to turbulence or other weather-related cause.	4	3,50	5
E	Deviation due to equipment failure.	5	3,25	1
F	Deviation due to collision avoidance system (ACAS/TCAS) advisory.	1	1,00	1
G	Deviation due to unexpected event - contingency (engine failure, pressurisation failure).	0	0,00	0
H	Aircraft not approved for operation in RVSM restricted airspace.	2	37,00	0
I	ATC system loop error.	2	3,30	3
J	Equipment control error, encompassing incorrect operation of fully functional FMS or navigation system.	4	5,00	4
K	Incorrect transcription of ATC clearance or re-clearance into the FMS.	2	2,00	3
L	Wrong information faithfully transcribed into the FMS.	1	0,30	1
M	Error in ATC-unit-to-ATC-unit transition message (coordination error).	613	1002,77	1007
N	Negative transfer received from transitioning ATC unit (lack of coordination)	402	1086,87	52
O	Other	0	0,00	0
P	Unknown	0	0,00	0
Total	(Jan 12 – Dec 12)	**1065**	**2194,15**	**1115**

Table 2: Summary of LHD occurrences and duration, by LHD category

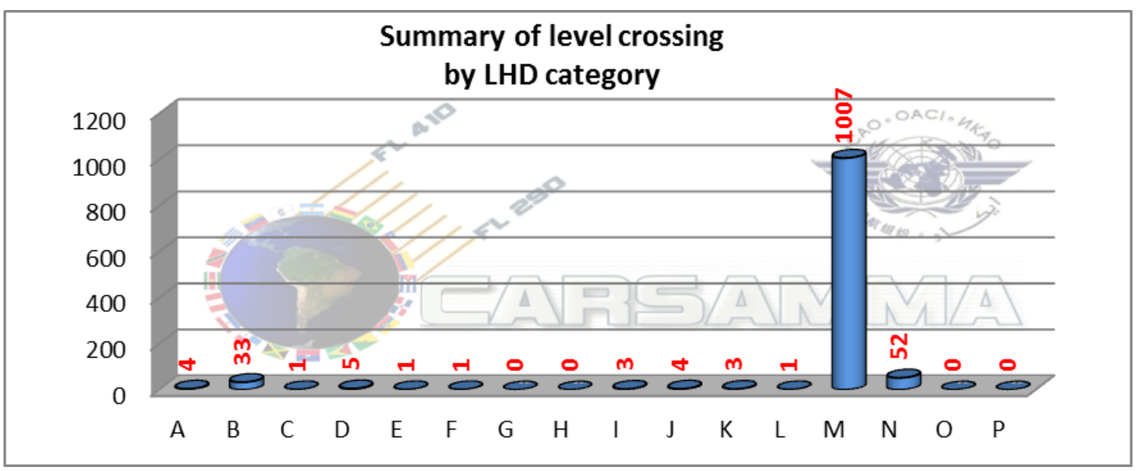
1.4. M-coded LHDs (error in ATC-unit-to-ATC-unit transition message) were the most frequent in 2012, with 613 events, followed by Code N (402), B (18) and A (9). The high number of M-coded LHDs points to the need to improve coordination between adjacent air traffic control centres, which might be achieved by sensitising and providing controllers with training in coordination.

1.5. Likewise, Graph 2 shows that, regarding duration, N-coded LHDs ranked first in this analysis, with a total duration of 1086,87 minutes. This is one of the worst air traffic incidents, since the aircraft involved were not expected in that position, at that level, or at the time of occurrence.



Graph 2: Summary of the duration of LHD occurrences, by category

1.6. Graph 3 shows LHDs with level crossings without air traffic control clearance. In this case, M-coded occurrences were most frequent, with 1007 level crossings. It may also be noted that, in the case of N-coded LHDs, the controller is not aware of the traffic and consequently, of the level cleared by the adjacent sector.



Graph 3: Summary of LHD occurrences by level crossing

Risk Value (RV) assessment

1.7. This section updates the results of the RVSM airspace safety assessment in CAR/SAM FIRs. Accordingly, the risk value assessment methodology (SMS) was applied to the internationally accepted safety assessment of this airspace.

1.8. ***RV parameter estimates*** – The amount and initial material for estimating the value of each parameter inherent to the internationally-accepted Risk Value (VR) that were used to conduct the RVSM airspace safety assessment are summarised in the following formula and described in Table 3.

VR=(PxDxS)+R+W+T, where:

Parameter	Description	Value
VR	Risk value	**To be calculated**
P	Position probability	**Varies from 1 to 5**
D	Duration of event	**Varies from 1 to 3**
S	Severity of event	**Varies from 1 to 5**
R	With or without radar/ADS	**With=5 or without=10**
W	Weather conditions	**VMC=0 or IMC=5 if there is another aircraft**
T	Other traffic (if any)	**Ranges from 1 to 10 (of separation)**
	TOTAL	**Maximum 100**

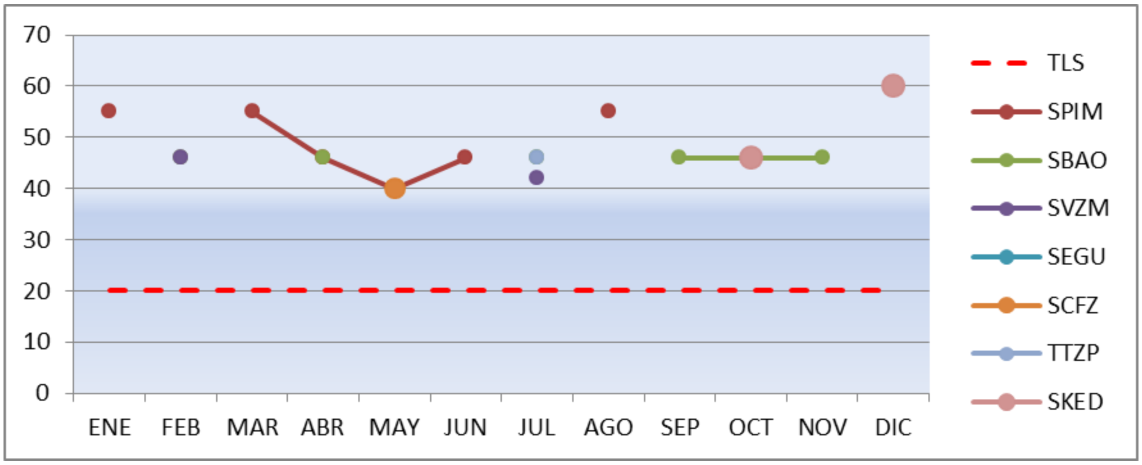
Table 3: Calculation of Risk Value parameters

1.9. ***Safety assessment*** – The results of the monthly assessment of airspace safety in the CAR/SAM FIRs are detailed in Table 4 and Graph 4 (FIRs with LHDs with a RV greater than 20).

	TLS	SPIM	SBAO	SVZM	SEGU	SCFZ	TTZP	SKED
JAN	20	55						
FEB	20		46	46				
MAR	20	55						
APR	20	46	46					
MAY	20	40			40	40		
JUN	20	46						
JUL	20		46	42			46	
AUG	20	55						
SEP	20		46					
OCT	20		46					46
NOV	20		46					
DEC	20							60

Table 4: Highest risk value estimates for LHDs

1.10. Graph 4 shows the major risk value estimates for all months, based on LHD reports, from 1 January to 31 December 2012.

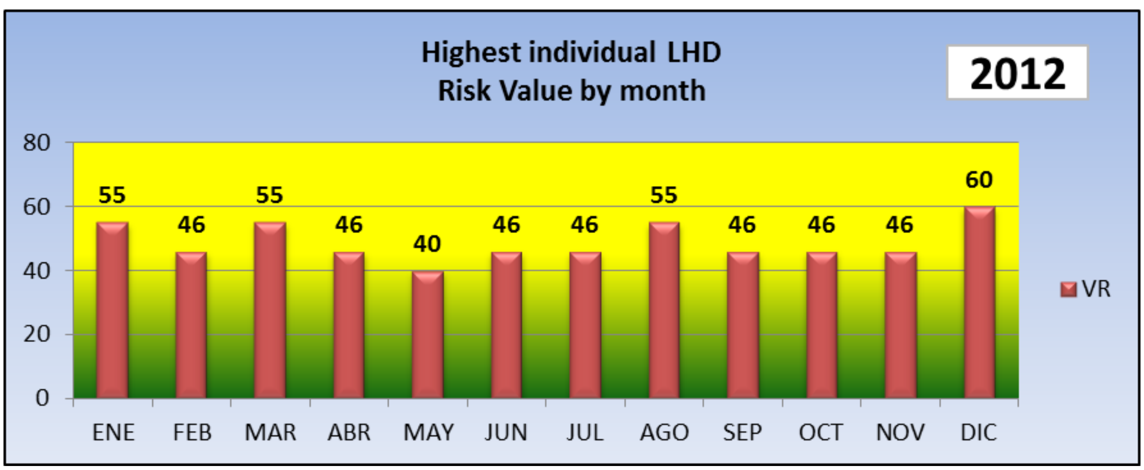


Graph 4: Highest Risk Value for FIRs in CAR/SAM RVSM airspace. The red line is TLS RV (20)

1.11. The safety Risk Value in the Lima FIR during 2012 was above the target level of safety (TLS – red line in Graph 4), that is, more than 20 points on six occasions. The Bogota FIR had the highest RV (60) in December, exceeding the TLS. The TLS was established at the Eleventh Meeting of the Scrutiny Working Group (ICAO GTE/11), held in 2011 (Lima, Peru).

1.12. CARSAMMA has assessed LHD occurrences (specific operational error) in the CAR/SAM RVSM airspace from the point of view of the contribution of the individual LHD occurrence to total risk in the FIR. Furthermore, a monthly Risk Value was defined in an attempt to provide real-time information on risk.

1.13. Graph 5 shows LHDs with the highest individual RV in 2012.



Graph 5: Highest individual LHD Risk Value, by month in 2012

LHD safety analysis (SMS)

1.14. Table 5 details LHDs or operational errors assessed by the GTE as those having the highest Risk Value (RV> 46) in 2012.

1.15. LHD 1158, which occurred in December 2012, accounted for 2.592% of the risk assessed for that month, and had an RV = 60, the highest for the sample.

1.16. The Lima FIR appears 11 times with LHD reports from adjacent FIRs, since it contributed to the generation of risk in their RVSM airspace.

1.17. In turn, the Guayaquil FIR appears 8 times in terms of risk generation.

Sequence	FIR subject to risk	FIR generating the risk	GTE code	Risk Value
7	ATLANTICO	MONTEVIDEO	N	46
59	ATLANTICO	ABIDJAN	N	46
150	ATLANTICO	MONTEVIDEO	N	46
408	ATLANTICO	MONTEVIDEO	N	46
592	ATLANTICO	DAKAR	N	46
657	ATLANTICO	MONTEVIDEO	N	46
839	ATLANTICO	ABIDJAN	N	46
884	ATLANTICO	MONTEVIDEO	N	46
1054	ATLANTICO	DAKAR	N	46
933	BOGOTA	GUAYAQUIL	N	46
1125	BOGOTA	AMAZONICA	N	51
1158	BOGOTA	GUAYAQUIL	N	60
3	LIMA	GUAYAQUIL	N	46
27	LIMA	GUAYAQUIL	N	55
64	LIMA	GUAYAQUIL	N	46
91	LIMA	LA PAZ	N	46
232	LIMA	LA PAZ	N	46
275	LIMA	AMAZONICA	N	46
281	LIMA	GUAYAQUIL	N	55
419	LIMA	AMAZONICA	N	46
534	LIMA	BOGOTA	N	46
694	LIMA	GUAYAQUIL	N	46
714	LIMA	GUAYAQUIL	N	55
188	MAIQUETIA	AMAZONICA	N	46
291	PIARCO	ROCHAMBEAU	N	46
602	PIARCO	DAKAR	N	46
1156	ROCHAMBEAU	PIARCO	N	46

Table 5: LHDs assessed as having the highest risk value in 2012

1.18. The analysis includes a detailed review of certain operating errors in order to identify contributing factors and make sure that procedures and processes are executed by the safety authorities of the CAR/SAM FIRs with a view to reducing the possibility of recurrence of the same errors.

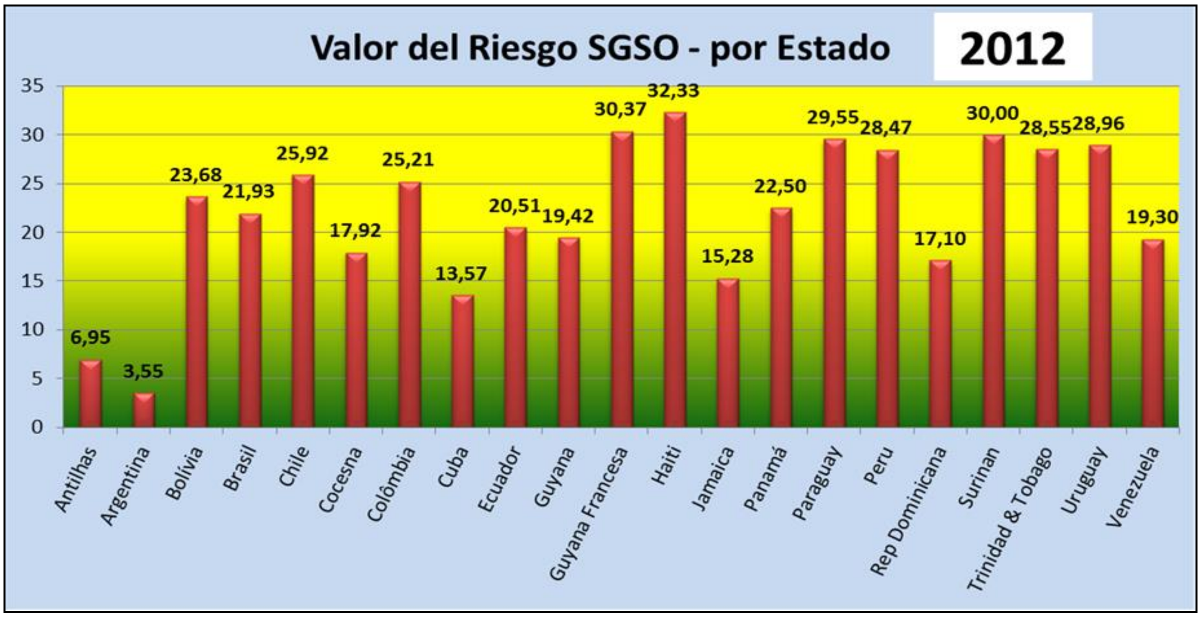
1.19. In the case of RVSM airspace, CARSAMMA assessed the individual operational errors identified in LHD reports submitted by the 34 FIRs within its geographical coverage are, grouping them by FIR and then by State, using the following statistical tools:

Mean risk value ⟹ M = ∑VR / n; and

Standard deviations ⟹

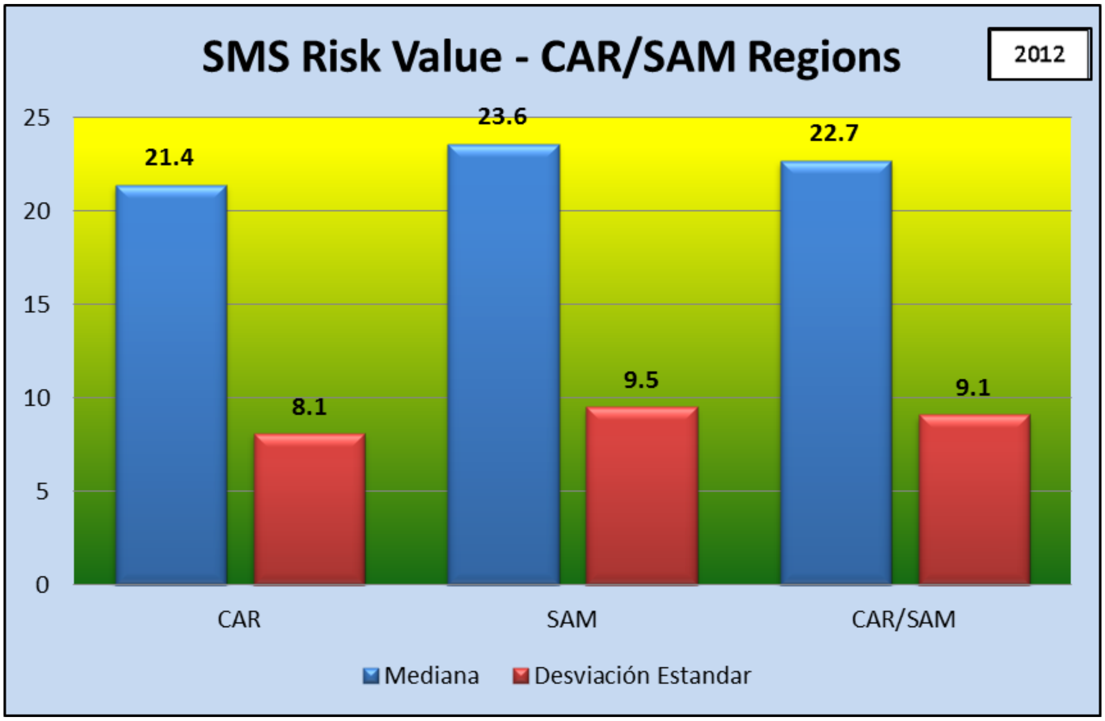
$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x-\bar{x})^2}$$

1.20. Graph 6 identifies the results of this analysis, showing the Risk Value assigned by the State to operational errors involved in large height deviations in the 2012 data analysis.



Graph 6: Contribution to risk value, by State

1.21. Graph 7 shows the results of the analysis conducted in the CAR, SAM and CAR/SAM Regions. It should be recalled that M-coded LHDs are the most frequent, accounting for 57.55% (613 LHDs) of the total number of LHDs, followed by Code N, with 37.74% (402 LHDs).



Graph 7: Contribution of CAR, SAM and CAR/SAM Regions to the Risk Value

1.22. Graph 8 illustrates the geographical location of the (hot) risk points cited in LHD reports issued by CAR/SAM FIRs with 45 points or more in the data set of 12 consecutive months. Each LHD is identified with a yellow dot. The LHDs assessed with a risk value of 55 or more are identified with a red triangle. The graph is intended to offer a way of identifying specific risk points related to RVSM operations.

1.23. The Bogota FIR appears in two LHDs (UGUPI and LET positions) with a Risk Value of 60 and 51 respectively, and the Lima FIR appears in three LHDs (VAKUD position) with a Risk Value of 55 each, all related to N-coded errors (lack of coordination).

Graph 8: CAR/SAM FIRs - RVSM risk points in Large Height Deviations (LHDs)
January – December 2012

1.24. The Meeting considered that the analytical data presented by CARSAMMA was of great value and they should be used by the States for the identification of occurrences to which the SMS methodology should be applied for reducing risk.

1.25. Finally, taking into account that the new coding used by Monitoring Agencies involves changes to be taken into account for the quantitative assessment, it was felt advisable to adjust the Document on safety assessment in RVSM airspace of the CAR/SAM FIRs in order to assess the qualitative risk applying the methodology used in the CAR/SAM Regions.

1.26. In this sense, CARSAMMA is charged with drafting a proposal to be circulated to the States and International Organisations through the respective Regional Offices for their feedback on the modifications to the Document on safety assessment in RVSM airspace of the CAR/SAM FIRs, effective on 1 January 2014. In view of the foregoing, the Meeting agreed to formulate the following conclusion:

CONCLUSION GTE 13/1 DOCUMENT ON SAFETY ASSESSMENT IN RVSM AIRSPACE OF THE CAR/SAM FIRs

That CAR/SAM States and International Organisations apply the methodology described in the Document on safety assessment in RVSM airspace of the CAR/SAM FIRs starting on 1 January 2014 for the LHDs generated within the FIRs under their responsibility.

Methodology for calculating LHD's level of risk in the Dominican Republic

1.27. The Meeting took note of the analyses conducted by the Dominican Republic applying the SMS system approved by GTE/11 for the analysis of height deviations (LHDs), which creates a parameter to calculate the Risk Value resulting from the reports and thus obtain their Level of Risk.

1.28. After using this methodology for the analysis of the reports sent to CARSAMMA in 2011, the Dominican Republic proposed a modification to the formula for calculating the level of risk of LHDs, with the aim of increasing the number of reports that require documentation and management by the States, which was approved during the GTE/12 Meeting.

1.29. After analyzing LHD reports for 2011 based on the methodology approved at that time, the Dominican Republican found out that the resulting level of risk for 95.07% of LHDs in the CAR/SAM Region did not require management but only that they be documented by the States, which does not solve the need to create specific plans for reducing these events.

1.30. In the specific case of the Dominican Republic, the total of LHDs reported and validated by CARSAMMA in 2011 (47) were within the range that required no management, only documentation.

1.31. After modifying the formula for calculating the level of risk as approved in the GTE/12, it was noted that the number of LHDs that required management by States increased (49%), which allows States to take concrete actions to reduce occurrences, and gives ICAO Regional Offices a valuable tool to require the implementation of specific plans for these purposes.

1.32. In the specific case of the Dominican Republic, after modifying the formula for calculating the level of risk, it was noted that, out of 74 LHD reports validated by CARSAMMA for 2012, 72 reports (97.3%) required management and documentation, and only two reports (2.7%) required documentation alone.

1.33. This information has been very valuable for the Dominican Republic in making decisions on improvements needed to reduce the number of occurrences in the Santo Domingo FIR. Likewise, the Meeting took note that the Dominican Republic had plans to implement a new Control Center, which will be operational by January 2014. This center will have the necessary tools to streamline coordination, resulting in a reduction of LHDs within Santo Domingo FIR.

1.34. The Meeting was also informed that a meeting had been coordinated with adjacent FIRs to be held in October in the Dominican Republic, with the purpose of reviewing the Letters of Operational Agreements and introducing new coordination procedures based on the technology that will be available.

1.35. The Meeting encouraged the other States to follow the example of the Dominican Republic in the treatment of LHDs based on the SMS.

Agenda Item 2: Activities carried out by CARSAMMA

2.1 Under this agenda item, CARSAMMA presented the results of the last two Special Regional Meetings of Monitoring Agencies held in Beijing, China, on 28 May to 1 June 2012 (Seventh) and in Canberra, Australia, on 2 to 6 November 2012 (Eighth).

2.2 The Meeting took note that those meetings agreed that any Regional Monitoring Agency (RMA) could modify the LHD form for use in its region only for ease of understanding and thus optimising the number of large height deviations reported.

2.3 Accordingly, CARSAMMA has started to analyse the advantages and disadvantages of changing the title of the cited form in the CAR/SAM Regions. It should be noted that this Agency has already modified some fields in the form to facilitate the investigation of large height deviations; for example, additional information on the registration of aircraft involved in the report is required in Field 4, and Field 6, on Mode C display, now requires information on whether or not it was displayed on the ADS, and indication of level/altitude.

2.4 CARSAMMA noted that more intensive training was needed for the States, since some of them continued sending data with errors in the same columns of the template, which had to be corrected again by the Agency, consuming human resources and software, to achieve consistency in the data to be used in mathematical risk calculation.

2.5 CARSAMMA presented the GTE/13 with an analysis of the advantages and disadvantages of changing the name of the LHD form in the CAR/SAM Regions, with a view to arriving at a decision regarding this modification.

2.6 CARSAMMA presented the GTE/13 with a more harmonised LHD coding table (shown in **Appendix A** to this part of the report), emphasising that its adoption by the CAR/SAM Regions will further contribute to the standardisation of methods used by the RMAs. It should be noted that this standardisation was one of the objectives most highly emphasised at the most recent Special Meetings of Monitoring Agencies, and shall be applied in all Regions for harmonising quantitative calculations.

2.7 Based on the above, the Meeting formulated the following conclusion:

CONCLUSION GTE/13-2 NEW LHD CODES TABLE

That CARSAMMA adopt the new Codes Table agreed worldwide for the Regional Monitoring Agencies that appears in Appendix A to this part of the report and apply it for quantitative assessment (CRM) as of 1 January 2014.

Review of analytical parameters for LHD validation

2.8 The Meeting analysed some LHDs reported in 2012 that were finally coded **NON LHD** since they occurred in the same air traffic control sector.

2.9 Table 1 shows all LHD reports that meet this condition: traffic is coordinated at one position but the aircraft calls from a different position.

Report	Description	Radar/ADS coverage
286	TAE507 - MPTO/SEGU – reported on 18/03/12 by the GUAYAQUIL ACC. Aircraft is transferred by the BOGOTA ACC at ENSOL (UG426), but calls from UGUPI (UL780).	NO
413	PPCRC - SPIM/SEGU – reported on 27/04/12 by the GUAYAQUIL ACC. Aircraft is transferred by the LIMA ACC at PAGUR (UB696), but calls from VAKUD (UL780).	NO
465	CWC4853 - EHAM/SBGR – reported on 15/05/12 by the ATLANTICO ACC. Aircraft is transferred by the DAKAR ACC at KODOS (UL206), but calls from coordinates 0423N 03035W, close to TASIL (UN873).	NO
512	N133VP - SVMG/KIMB – reported on 04/06/12 by the SAN JUAN ACC. Aircraft is transferred by the MAIQUETIA ACC at ARMUR (UG432), but calls from KIKER (UA300).	YES
921	AAL967 - KJFK/SBGR – reported on 15/10/12 by the AMAZONICO ACC. Aircraft is transferred by the MAIQUETIA ACC at UGAGA (UL793), but calls from VUMPI (UL795).	YES
1001	ROI1220 - SVBC/KMIA – reported on 08/11/12 by the STO. DOMINGO ACC. Aircraft is transferred by the CURAZAO ACC at VESKA (UA315), but calls from IRGUT (UL304).	YES
1035	TAE505 - MPTO/SEGU – reported on 14/11/12 by the GUAYAQUIL ACC. Aircraft is transferred by the BOGOTA ACC at UGUPI (UL780), but calls from ENSOL (UG426).	NO

Table 1: LHD reports where aircraft were transferred at one point but called from another point

2.10 In Report 286, the controller was aware that an aircraft would call and was ready to receive it at ENSOL. Since the aircraft called from UGUPI, he might have been not as ready to receive it, and the risk was greater because there is no radar coverage in either position. Consequently, CARSAMMA assigned an M code (error in ATC-unit-to-ATC-unit transition message) to this report.

2.11 In Report 413, the controller was aware that an aircraft would call and was ready to receive it at PAGUR. Since the aircraft called from VAKUD, he might have been not as ready to receive it, and the risk was greater because there is no radar coverage in either position. Consequently, CARSAMMA assigned an M code (error in ATC-unit-to-ATC-unit transition message) to this report.

2.12 In Report 465, the controller was aware that an aircraft would call and was ready to receive it at KODOS. Since the aircraft called from a coordinate close to TASIL, he might have been not as ready to receive it, and the risk was greater because there is no radar coverage -and sometimes, no ADS, which was not the case, in either position. Consequently, CARSAMMA assigned an M code (error in ATC-unit-to-ATC-unit transition message) to this report.

2.13 In Report 512, the controller was aware that an aircraft would call and was ready to receive it at ARMUR. Since the aircraft called from KIKER, he might have been not as ready to receive it, but the risk was lesser because there is radar coverage in these two positions. Consequently, CARSAMMA decided to keep a NON LHD code for this report.

2.14 In Report 921, the controller was aware that an aircraft would call and was ready to receive it at UGAGA. Since the aircraft called from VUMPI, he might have been not as ready to receive it, but the risk was lesser because there is radar coverage in both positions. Consequently, CARSAMMA decided to keep a NON LHD code in this report.

2.15 In Report 1001, the controller was aware that an aircraft would call and was ready to receive it at VESKA. Since the aircraft called from IRGUT, he might have been not as ready to receive it, but the risk was lower because there is radar coverage in both positions. Consequently, CARSAMMA decided to keep a NON LHD code in this report.

2.16 In Report 1035, the controller was aware that an aircraft would call and was ready to receive it at UGUPI. Since the aircraft called from ENSOL, he might have been not as ready to receive it, and the risk was greater because there is no radar coverage in either position. Consequently, CARSAMMA assigned an M code (error in ATC-unit-to-ATC-unit transition message) to this report.

2.17 The Meeting approved the categories suggested by CARSAMMA for the aforementioned LHDs.

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.

-END-

Agenda Item 3: Quantitative Vertical Collision Risk Calculation (CRM)

Calculation of vertical collision risk in RVSM airspace in CAR/SAM FIRs

3.1 The Meeting took note of the quantitative assessment, in which CARSAMMA uses the REICH Vertical Collision Model recommended by ICAO. This is a math-intensive model whereby, after processing the data on aircraft movement in the FIRs (spreadsheets containing data on flights conducted in RVSM airspace), the target level of safety (TLS) for the flight region concerned is calculated. Several calculation tools and databases are used for conducting various calculations during the process, employing many expert hours in the analysis.

3.2 The RVSM safety assessment was carried out continuously over a period of twelve months, between 1 January 2012 and 31 December 2012.

3.3 The following was taken into account:

- All aircraft operating in airspace with reduced vertical separation minima are RVSM-certified;
- The aircraft certification is still valid;
- The target level of safety (TLS) of $5x10^{-9}$ fatal accidents per flight hour (to monitor height-keeping in a representative sample of aircraft) is being met;
- The use of RVSM does not increase the level of risk due to operational errors and contingency procedures;
- There is evidence of aircraft altimetry system stability (ASE);
- The introduction of RVSM does not increase risk factors due to operational errors and flight contingencies, in accordance with a predetermined level of statistical confidence;
- Possible additional effective safety measures are adopted to reduce the risk of collision and to meet safety objectives;
- There is evidence of altimetry system error stability (ASE);
- Air traffic control procedures continue to be effective.

3.4 It was noted that the methodological procedures used are based on standards recommended by ICAO and internationally accepted as the most appropriate for assessing RVSM airspace. The assessment of data, the conclusions and resulting recommendations are shown in paragraph 3.55.

CAR/SAM RVSM airspace

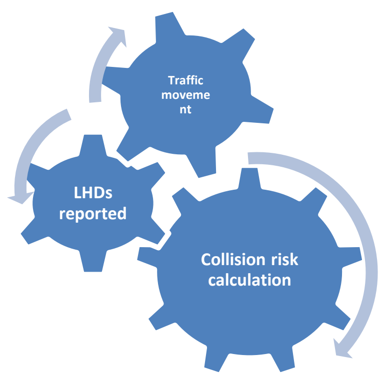
3.5 CAR/SAM RVSM airspace is made up by 34 Flight Information Regions (FIRs) that cover the following States: Antigua, Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Saint Barthélemy, Saint Kitts and Nevis, Saint Lucia, Saint Vincent, Suriname, Trinidad and Tobago, Uruguay and Venezuela.

3.6 Each part of the airspace was treated as an isolated system, with its own statistical parameters.

3.7 Data from 4,276,427.20 flight hours were analysed, corresponding to in-transit aircraft that used segments of 506 airways of the 34 (thirty four) CAR/SAM FIRs, between flight levels 290 and 410.

3.8 Regarding vertical deviations (LHDs) reported in the CAR/SAM Regions, CARSAMMA received a total of 1,204 LHDs in 2012. Following the analysis and validation via teleconference with the participation of representatives of the ICAO Lima and Mexico Offices, the FIRs involved, IATA, and CARSAMMA, 1,065 LHDs were considered valid for use in vertical collision risk model (CRM) calculations.

DATA FLOW FOR CALCULATING VERTICAL COLLISION RISK



Aircraft movement data collection

3.9 Sample data for estimating passing frequency, and the physical parameters and dynamics of a typical aircraft in a vertical collision risk assessment were collected between 1 and 31 December 2012.

3.10 Aircraft movement data received from the 35 CAR/SAM FIRs were processed and used for assessing RVSM airspace safety, as recommended by ICAO. The number of flight hours in each FIR is shown in Table 1.

State	FIR	Flight hours	%
Netherlands Antilles	Curaçao - TNCF	261887,4	6,1%
COCESNA	Central America - MHTG	381303,7	8,9%
Cuba	Havana – MUFH*	239056,4	5,6%
Haiti	Port-au-Prince – MTEG	54972,3	1,3%
Jamaica	Kingston – MKJK*	109622,2	2,6%
Dominican Republic	Santo Domingo – MDCS*	15742,1	0,4%
Trinidad and Tobago	Piarco – TTZP*	26268,5	0,6%
	Subtotal CAR	**1.088.852,6**	**25,5%**
Argentina	Cordoba – SACU*	44678,0	1,0%
	Ezeiza – SAEU*	10370,4	0,2%
	Mendoza – SAME*	24462,6	0,6%
	Resistencia – SARU*	10687,4	0,2%
	Comodoro Rivadavia – SAVU*	2122,0	0,0%
Bolivia	La Paz - SLLF	53421,5	1,2%
Brazil	Atlantico - SBAO	125775,4	2,9%
	Amazonica - SBAZ	465886,9	10,9%
	Brasilia – SBBS*	267551,1	6,3%
	Curitiba - SBCW	226002,5	5,3%
	Recife - SBRE	468795,4	11,0%
Chile	Punta Arenas - SCCZ	6188,4	0,1%
	Santiago - SCEZ	54272,6	1,3%
	Antofagasta - SCFZ	77660,7	1,8%
	Isla de Pascua - SCIZ	57523,5	1,3%
	Puerto Montt - SCTZ	626,.3	0,0%
Colombia	Barranquilla - SKEC	85131,5	2,0%
	Bogota - SKED	243719,5	5,7%
Ecuador	Guayaquil – SEGU*	57693,1	1,3%
Guyana	Georgetown – SYGC*	8154,4	0,2%
French Guiana	Rochambeau – SOOO*	15798,1	0,4%
Panama	Panama Oceanic – MPZL*	125547,9	2,9%
Paraguay	Asuncion - SGFA	32733,3	0,8%
Peru	Lima - SPIM	521339,4	12,2%
Suriname	Paramaribo – SMPM*	7531,5	0,2%
Uruguay	Montevideo - SUEO	59945,4	1,4%
Venezuela	Maiquetía – SVZM*	134582,1	3,1%
	Subtotal SAM	**3.187.574,6**	**74,3%**
Total CAR/SAM Regions		**4.276.427,2**	**99,8%**

Table 1 - Total flight hours in the CAR/SAM Regions
***In the FIRs marked with an *(asterisk), data from previous collection exercises were used, updated at a rate of 4.5% per year*.**

Aircraft fleet

3.11 It is critical that 100% of the RVSM-approved aircraft fleet meet RVSM requirements. However, during this safety assessment, CARSAMMA identified some aircraft that were not included in its RVSM database and that had used this airspace in 2012.

3.12 This led to a global research conducted with the support of monitoring agencies from other ICAO Regions, crossing information contained in their databases. This study revealed that some of these aircraft had not been RVSM certified by any State.

3.13 The reports containing the list of non-approved aircraft were sent to the ICAO Lima and Mexico Offices and to civil aviation authorities responsible for aircraft registration for making the respective corrections, and were also presented at international meetings attended by CARSAMMA. This parameter was taken into account in the Vertical Risk Calculation Model.

3.14 After receiving aircraft movement data, CARSAMMA refined and processed the data. Table 2 shows the aircraft fleet that flew in the CAR/SAM FIRs, with their dimensions and the percentage of flight hours, including a typical aircraft used as a dimension based on the Vertical Risk Calculation Model.

Type of ACFT	Length	Width	Height	Flight hours	Number of flights	% of ACFT
B737	0.018898	0.018521	0.006749	9271.1	79648	29.06%
A320	0.020286	0.018413	0.000635	8036.3	69040	25.19%
B767	0.033153	0.028024	0.009071	3452.0	26910	9.82%
E190	0.019568	0.015507	0.057073	3067.5	26353	9.62%
B777	0.034395	0.034989	0.010043	2159.3	18551	6.77%
A330	0.034341	0.032559	0.090874	1388.5	11929	4.35%
A340	0.040659	0.03426	0.009341	1042.1	8953	3.27%
B757	0.029428	0.020545	0.007343	970.3	8336	3.04%
B747	0.038153	0.034795	0.010481	258.8	2223	0.81%
MD11	0.033261	0.028077	0.009465	256.1	2200	0.80%
B727	0.02521	0.017765	0.005562	129.0	1108	0.40%
F100	0.019184	0.015161	0.045896	125.4	1077	0.39%
E135	0.014217	0.01082	0.036501	104.6	899	0.33%
H25B	0.084233	0.089632	0.029697	100.0	859	0.31%
Other	**0.031785**	**0.028505**	**0.023481**	**1540**	**15840**	**5.83%**
Typical	**0.024699**	**0.022407**	**0.015605**			
Total				**31901**	**273926**	**100.00%**

Table 2 – Aircraft flying at RVSM levels in the CAR/SAM FIRs, which include levels between 290 and 410
(measured in nautical miles)

3.15 The data used for calculating risk show the number of LHD occurrences and the characteristics of the aircraft fleet that uses the RVSM airways.

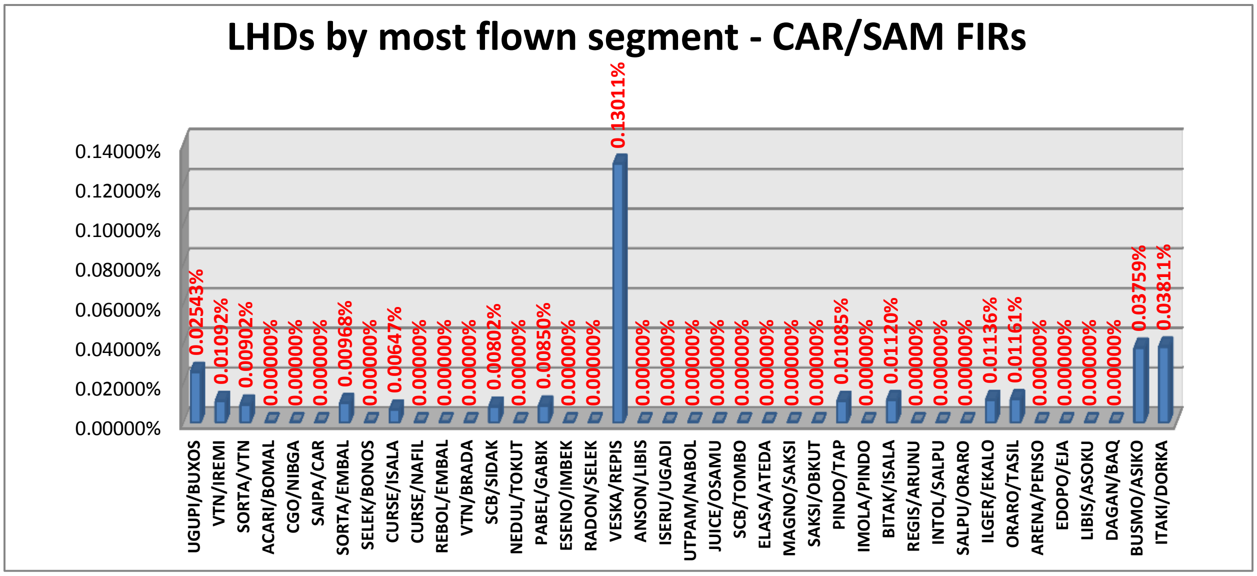
Segments most frequently flown in the CAR/SAM FIRs

3.16 Graph 1 shows an index obtained by dividing the number of LHDs occurred in a segment of the airway by the total movement of aircraft on the same route.

3.17 The graph only shows an index estimated for the 40 airway segments flown in the CAR/SAM Regions, but calculations were based on all airway segments flown. The airway segments with the highest rates are the following:

- VESKA / REPIS - UA315 - CURAÇAO FIR (TNCF) ANTILLES
- BUSMO / ASIKO - UA321 - BOGOTA FIR (SKED) COLOMBIA
- ITAKI / DORKA - UL550 - ANTOFAGASTA FIR (SCFZ) CHILE
- UGUPI / BUXOS - UL780 - BOGOTA FIR (SKED) COLOMBIA

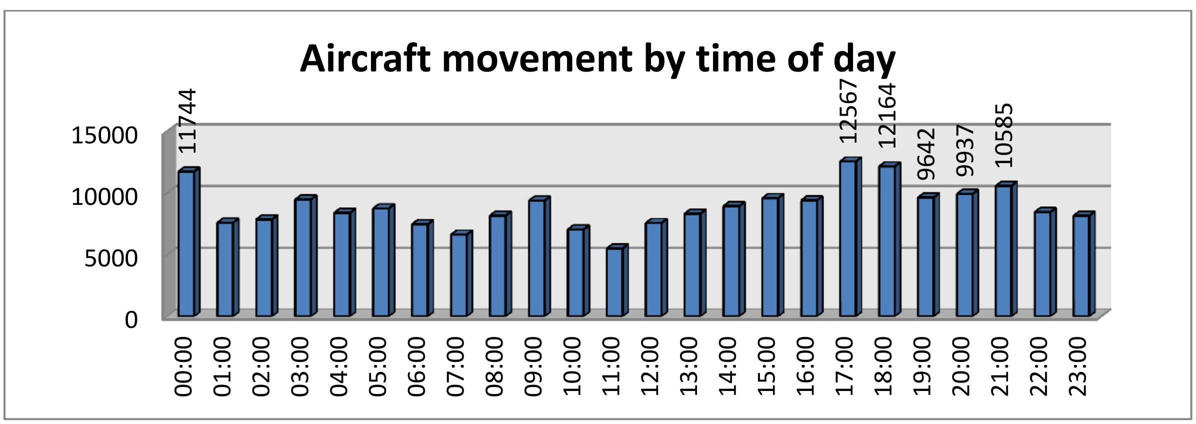
3.18 The indices reveal a higher occurrence of LHDs in these segments, not necessarily caused by the FIR where the event occurred.



Graph 1: LHDs by most frequently flown segment in the CAR/SAM FIRs in 2012.

Times of the day with more LHDs in the CAR/SAM FIRs

3.19 Two graphs are shown in this regard. The first is Graph 2a, showing the distribution of aircraft movement throughout the day.



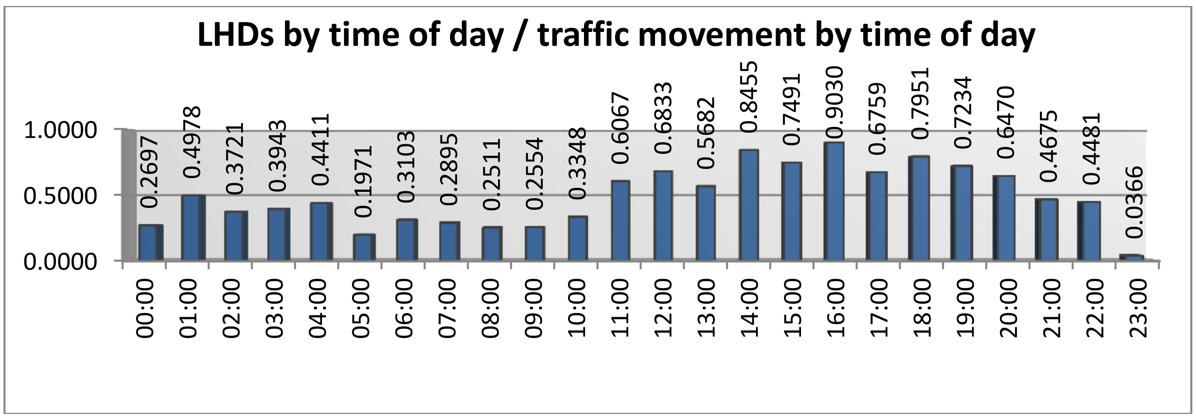
Graph 2a – LHDs by time of day (UTC)

3.20 The second one is Graph 2b, containing a table that compares the number of LHDs occurred at a given point in time and the number of aircraft movements during that same period of time.

3.21 The higher the index, the higher the number of LHDs occurred at that time of the day. The times of the day with more LHDs were:

- 16:00-17:00 ... 0.9030
- 14:00-15:00 ... 0.8455
- 18:00-19:00 ... 0.7951
- 15:00-16:00 ... 0.7491

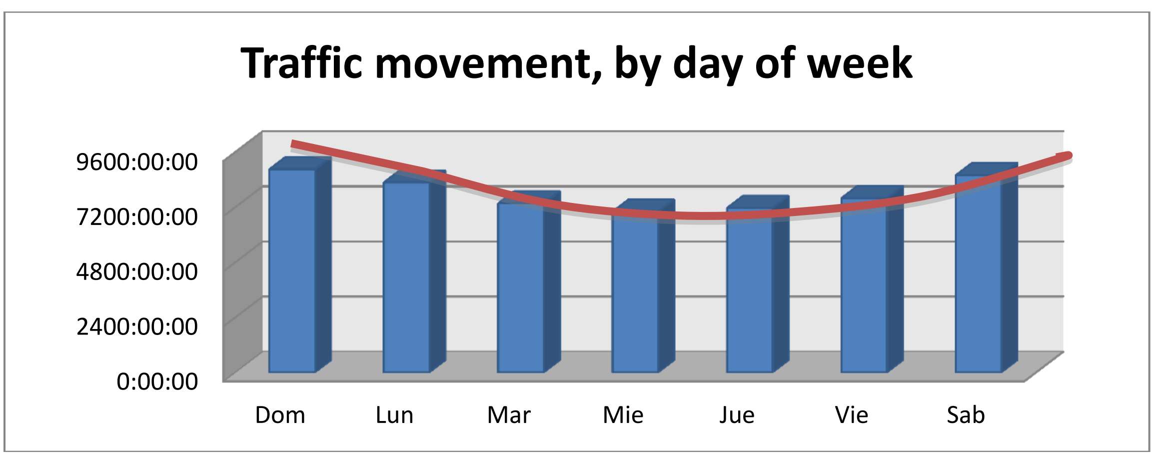
3.22 In order to reduce these rates, attention must be paid to traffic coordination handover and timely communication.



Graph 2b – Index of LHDs by time of day

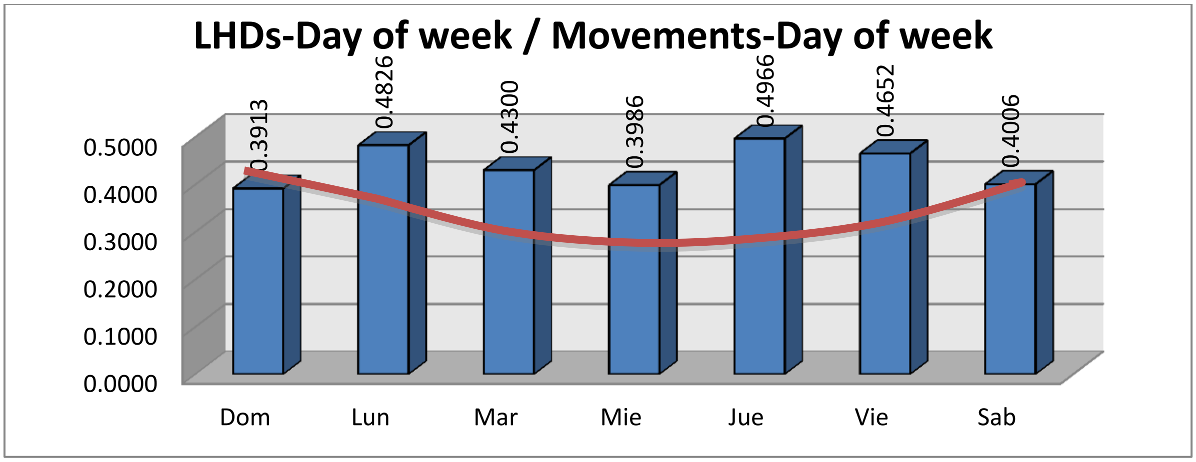
Days of the week with more LHDs in the CAR/SAM FIRs

3.23 Aircraft movement data submitted to CARSAMMA shows that the highest volume of traffic occurs on weekends, starting to drop on Sundays and reaching a trough on Wednesdays, when it starts increasing again until Saturdays, as shown in Graph 3a.



Graph 3a – Traffic movement, by day of week

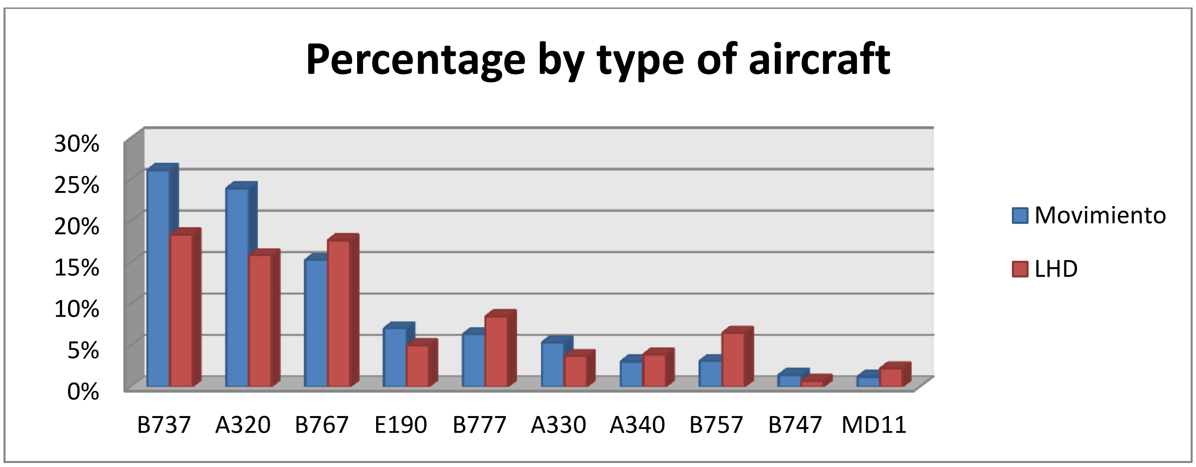
3.24 The distribution of LHD events by weekday does not follow the expected aircraft movement flow reflected in Graph 3b, which shows less number of LHDs on weekends.



Graph 3b – LHD indices by weekday

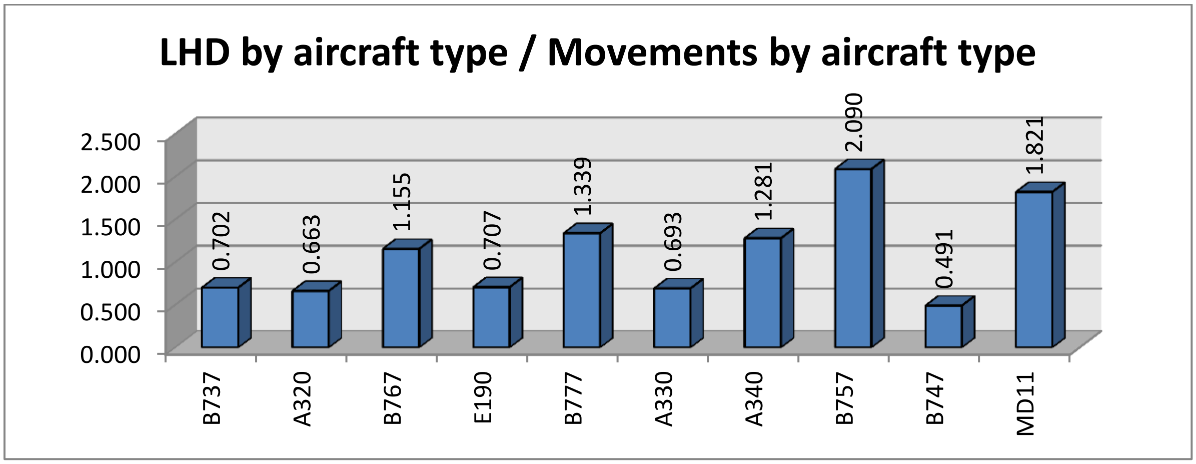
Indices of aircraft types with higher number of LHDs in CAR/SAM FIRs

3.25 The types of aircraft that flew most over the CAR/SAM FIRs are the following families: B737, A320, B767, E190, B777, A330, A340, B757, B747 and MD11.



Graph 4a – Percentage of LHDs by type of aircraft

3.26 As shown in Graph 4b below, the LHD index by aircraft movement and type of aircraft does not follow the expected distribution. The higher the index, the higher the number of LHDs by type of aircraft.

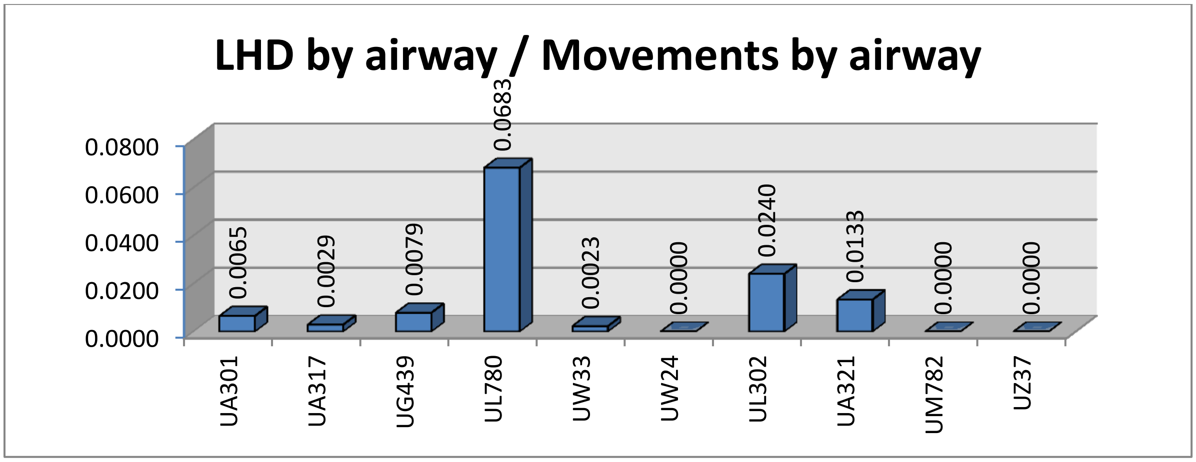


Graph 4b – LHD index by type of aircraft

LHD index by most frequently flown airways in the CAR/SAM FIRs

3.27 In the aircraft movement sample, the ten (10) airways most frequently flown in the CAR/SAM FIRs are: UA301, UA317, UG439, UL780, UW33, UW24, UL302, UA321, UM782 and UZ37.

3.28 After identifying the LHDs that occurred in these airways, LHDs were segregated by aircraft movement, resulting in the index shown in Graph 5.



Graph 5 – LHD index by airway

3.29 It should be recalled that the higher the index, the higher the number of occurrences. Noteworthy is the 0,0683 index attributed to airway UL780, where special attention to traffic movement is advised.

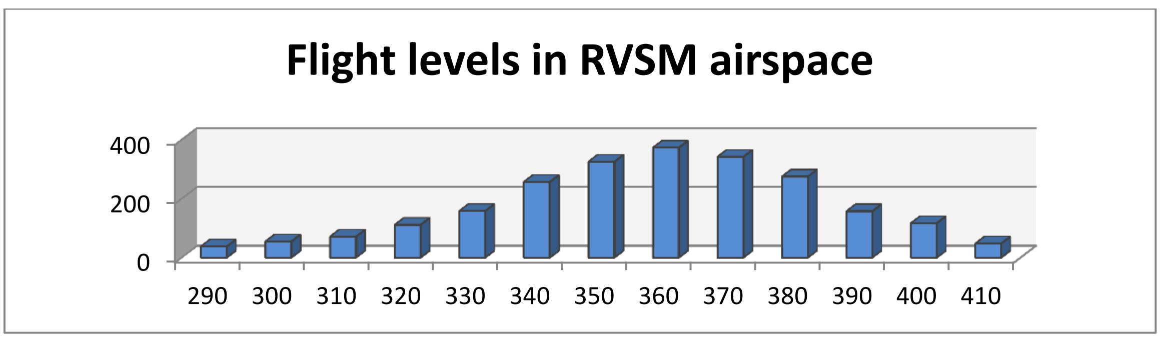
3.30 This is illustrated in Table 3, with reflects the figures obtained in the analysis.

Airway	Mov	LHD
UA301	1689	11
UA317	1383	4
UG439	1018	8
UL780	952	65
UW33	877	2
UW24	832	0
UL302	832	20
UA321	825	11
UM782	749	0
UZ37	725	0

Table 3 – Movement on airways and number of LHDs

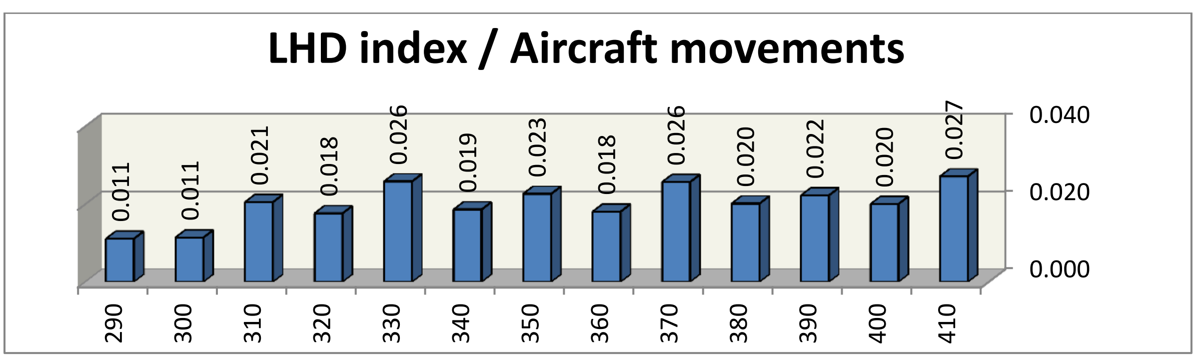
LHD index by flight level, and flight levels most frequently flown in RVSM airspace

3.31 Based on the distribution of flight levels in the sample, Graph 6a shows flight level 360 as the one most frequently flown in RVSM airspace.



Graph 6a – Use of RVSM flight levels

3.32 Taking into account the number of LHDs by flight level of occurrence, divided by the number of aircraft movements in their respective levels, the indices shown in Graph 6b are derived.



Graph 6b - LHD index by RVSM flight level

3.33 For various reasons, most aircraft are built calculating an optimal cruise level between FL350 and FL370.

3.34 However, it should be noted that this implies occupancy rates and passing frequencies at these levels that are to the detriment of other levels available in RVSM airspace.

3.35 It is recommended that aircraft manufacturers understand and analyse the problem and, if possible, find an alternative, since traffic build-up around these levels has a direct effect on collision risk and air traffic flow management.

Collision risk safety assessment (CRM)

3.36 This section shows the results of the RVSM airspace safety assessment in the CAR/SAM FIRs.

3.37 Accordingly, the internationally accepted collision risk methodology (CRM) has been used for assessing RVSM airspace safety in the Caribbean and South America.

3.38 In the data analysis phase, information technologies are intensively used for obtaining the final results from the collision risk model. A brief description follows of how the data derived from the aircraft movement sample and the validated LHD data are used and combined.

3.39 The processed aircraft movement data were combined with 2012 data on Large Height Deviations (LHDs) in the FIR in question, and then analysed by experts from the FIR, officials from the ICAO Lima and Mexico Regional Offices, and CARSAMMA at monthly teleconferences. IATA also participates in these teleconferences as guest consultant.

3.40 At the conference, LHDs are validated, and parameter values are merged and fed into the REICH collision risk model formula shown in the following chapter.

3.41 Figure1 provides a geometric description of RVSM airspace where two aircraft fly with a separation of 1000 ft within their safety envelope.

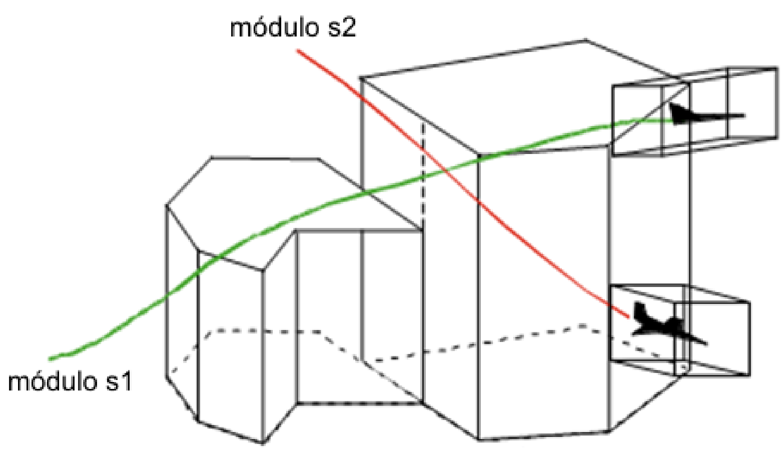


Figure 1 – Geometric representation of the Collision Risk Model (CRM)

CRM parameter estimates

$$N_{az}^{T} = P_z(S_z)P_y(0)\left\{N_x(mismo)\left[1+\frac{\lambda_x\overline{|\dot{y}|}}{\lambda_y\overline{|\Delta V|}}+\frac{\lambda_x\overline{|\dot{z}|}}{\overline{|\Delta V|}\lambda_z}\right]+N_x(op)\left[1+\frac{\lambda_x\overline{|\dot{y}|}}{2\lambda_y\overline{|V|}}+\frac{\lambda_x\overline{|\dot{z}|}}{2\overline{|V|}\lambda_z}\right]\right\}.$$

Figure 2 – REICH collision risk model formula

3.42 Table 4 summarises the amounts and basic material used for estimating each parameter of the internationally accepted collision risk model (CRM) that is used for RVSM airspace safety assessment.

Parameter	Description	Value
λ_x	The mean length of aircraft sample.	**0.024699 nm**
λ_y	The mean width of aircraft sample.	**0.022407 nm**
λ_z	The mean height of aircraft sample.	**0.015605 nm**
$\overline{\lvert V\rvert}$	The average ground speed of aircraft sample.	**441.92 kt/h**
$\overline{\lvert \Delta V\rvert}$	The average velocity in the same direction of aircraft sample.	**36.96 kt/h**
$\overline{\lvert \dot{y}\rvert}$	The average velocity relative to cross-track approach in aircraft sample.	**13 kts**
$\overline{\lvert \dot{z}\rvert}$	The average vertical velocity during loss of relative vertical separation in aircraft sample.	**1,5 kts**
$P_z(0)$	The probability of vertical overlap of two aircraft flying on the same level in aircraft sample.	**0,398840**

Table 4: CRM parameter estimates

Demonstration of technical feasibility of RVSM in the CAR/SAM Regions

3.43 The following REICH collision risk model parameters are assessed:

- Passing frequency ***(Nx)***;
- Probability of vertical overlap ***P (SZ);*** and
- Probability of lateral overlap ***Py (0).***

The demonstration had the following objectives:

- Ensure compliance with the technical TLS; and
- Verify the stability of the ASE.

Total system performance specifications

Passing frequency, *Nx*

3.44 This is a parameter related to aircraft exposure to vertical collision risk in the airspace. Passing frequency was estimated taking into account equivalent aircraft flying in the same direction and in opposite direction, as shown in Table 5.

FIR Region	Passing frequency Same direction	 Opposite direction	 Equivalent	Flight time Hours
CAR Region				
Curaçao - TNCF	0,024044	0,011425	**0,004336**	261887,4
Central America - MHTG	0,038108	0,002754	**0,039457**	381303,7
Havana - MUFH	0,110520	0,029532	**0,057007**	239056,4
Port au Prince - MTEG	0,018274	0,000922	**0,117081**	54972,3
Kingston - MKJK	0,020314	0,004873	**0,049474**	109622,2
Santo Domingo - MDCS	0,039699	0,001619	**0,082836**	15742,1
Piarco - TTZP	0,117636	0,026668	**0,024274**	26268,5
SAM Region				
Córdoba - SACU	0,017626	0,001630	**0,029310**	44678,0
Ezeiza - SAEU	0,008824	0,012425	**0,097932**	10370,4
Mendoza - SAME	0,079313	0,004619	**0,008839**	24462,6
Resistencia - SARU	0,029489	0,024363	**0,030814**	10687,4
Comodoro Rivadavia - SAVU	0,061578	0,030721	**0,042071**	2122,0
La Paz - SLLF	0,044173	0,006366	**0,064891**	53421,5
Atlántico - SBAO	0,040483	0,037007	**0,054395**	125775,4
Amazónica - SBAZ	0,021164	0,004075	**0,032771**	465886,9
Brasilia - SBBS	0,065161	0,008970	**0,043621**	267551,1
Curitiba - SBCW	0,040441	0,008619	**0,031262**	226002,5
Recife - SBRE	0,038304	0,001341	**0,019926**	468795,4
Punta Arenas - SCCZ	0,006334	0,001730	**0,047845**	6188,4
Santiago - SCEZ	0,042159	0,039532	**0,017739**	54272,6
Antofagasta - SCFZ	0,051411	0,005873	**0,028543**	77660,7
Isla de Pascua - SCIZ	0,000381	0,002320	**0,005336**	57523,5
Puerto Montt - SCTZ	0,088626	0,050821	**0,016696**	626,3
SAM Region				
Barranquilla - SKEC	0,031446	0,001564	**0,048437**	85131,5
Bogota - SKED	0,027635	0,001619	**0,039079**	243719,5
Guayaquil - SEGU	0,036594	0,023206	**0,055791**	57693,1
Georgetown - SYGC	0,032933	0,028708	**0,031749**	8154,4
Rochambeau - SOOO	0,037253	0,009715	**0,061991**	15798,1
Panama Oceanic - MPZL	0,034550	0,029543	**0,051922**	125547,9
Asunción - SGFA	0,019023	0,004873	**0,014106**	32733,3
Lima - SPIM	0,020871	0,001491	**0,046225**	521339,4
Paramaribo - SMPM	0,042259	0,035079	**0,010640**	7531,5
Montevideo - SUEO	0,024592	0,015808	**0,027409**	59945,4
Maiquetia - SVZM	0,057762	0,032294	0,042071	134582,1
Total				**4.276.427,2**

Table 5 – Passing frequency in the CAR/SAM FIRs

3.45 Values are related to the CAR/SAM airspace, where 34 FIRs have been considered. The maximum passing frequency indicates places with a higher potential collision risk. It should be noted that passing frequencies shown in Table 5 were calculated based on total flight hours in the CAR/SAM Regions. Some observations follow:

- The equivalent passing frequency peak, which represents the highest exposure to vertical collision risk, occurs in the Port-au-Prince FIR - MTEG, which ranks 18th with a total flight time of 54,972.3h;

- The Lima FIR - SPIM has the highest number of flight hours (521,339.4h), but only ranks 13th in terms of passing frequency;

- The Curaçao FIR - TNCF has the lowest passing frequency, and ranks 6th in terms of total number of flight hours (261,887.4 h); and

- The Puerto Montt FIR - SCTZ has the lowest number of flight hours (626.3h), and ranks 29th in terms of passing frequency.

Probability of vertical overlap, *Pz (1000)*

3.46 The software used by CARSAMMA for the follow up of total vertical errors (TVE) was kindly provided by the RMA of Australia (AAMA). The FAA (United States) originally developed the software used.

3.47 The estimated value of Pz (1000) used in CARSAMMA calculations was 2.46×10^{-8}, according to the aforementioned software.

Probability of lateral overlay, *Py (0)*

3.48 According to Doc 9574, the probability of lateral overlay must be periodically assessed.

3.49 In order to assess the operational collision risk, it was assumed that Py (0) would not exceed a value of 0.058, in accordance with Doc 9574.

Total collision risk estimates

3.50 Table 6 contains the set of physical and dynamic parameters estimated using the REICH Collision Risk Model, as well as key monitoring parameters, by FIR.

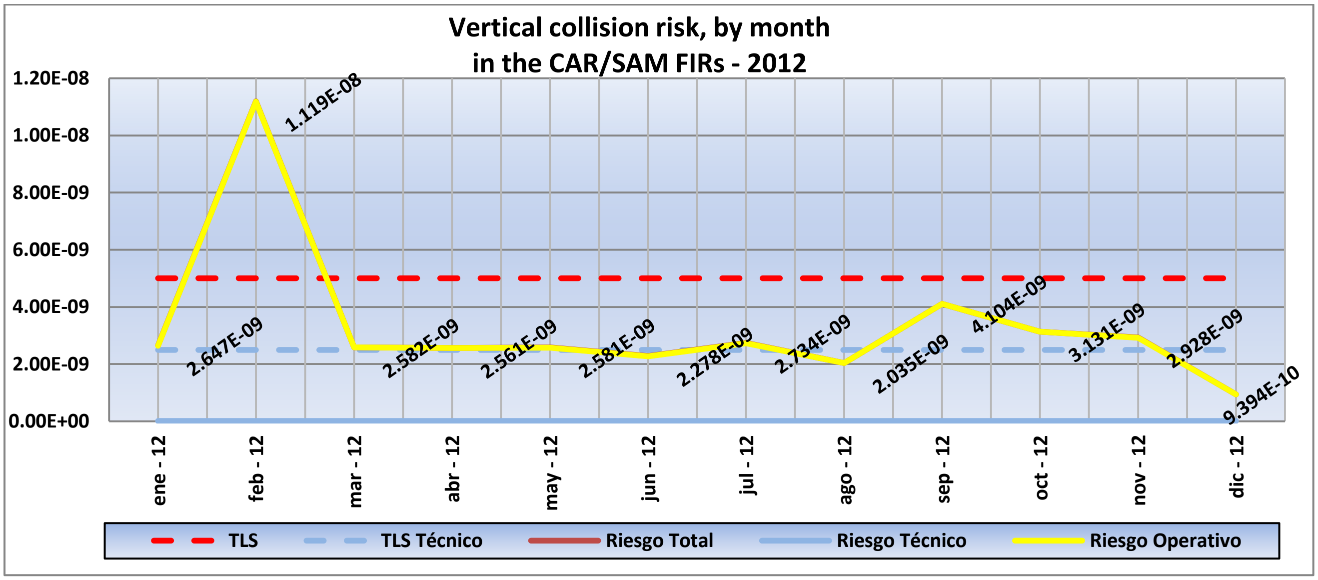
3.51 All parameters are defined based on the airspace of each Region, as an isolated system.

FIR	Ez(same)	ΔV(same)	Ez(op)	ΔV(op)	Ez(cross)	V
TNCF	0,024044	32,7920784	0,011425	745,8876	0,004336	446,4603
SACU	0,038108	20,3980840	0,002754	773,2106	0,039457	457,9589
SAEU	0,11052	18,7151208	0,029532	720,7874	0,057007	424,4376
SAMV	0,018274	32,0485215	0,000922	0	0,117081	449,2757
SARU	0,020314	32,2620879	0,004873	727,6941	0,049474	437,2073
SAVU	0,039699	30,3197728	0,001619	0	0,082836	427,6777
SLLF	0,117636	44,0907429	0,026668	740,3905	0,024274	445,9972
SBAO	0,017626	43,5924565	0,00163	766,4929	0,02931	452,1522
SBAZ	0,008824	36,1706131	0,012425	730,3422	0,097932	436,8739
SBBS	0,079313	34,9274625	0,004619	715,5527	0,008839	421,2162
SBCW	0,029489	40,5096000	0,024363	694,6865	0,030814	374,3227
SBRE	0,061578	24,0313240	0,030721	748,4618	0,042071	435,0341
SCCZ	0,044173	34,4827580	0,006366	744,8582	0,064891	435,6851
SCEZ	0,040483	59,5626021	0,037007	0	0,054395	408,8836
SCFZ	0,021164	19,2924965	0,004075	808,6304	0,032771	433,6195
SCIZ	0,065161	38,1231600	0,00897	823,1373	0,043621	473,1188
SCTZ	0,040441	33,9622640	0,008619	0	0,031262	572,7655
MHTG	0,038304	10,0791209	0,001341	789,1645	0,019926	460,9762
SKEC	0,006334	20,6620171	0,00173	768,2203	0,047845	466,8695
SKED	0,042159	26,5693414	0,039532	787,2296	0,017739	458,388
MUFH	0,051411	12,2695355	0,005873	757,4365	0,028543	447,1952
SEGU	0,000381	72,5207544	0,00232	797,4456	0,005336	456,2195
SYGC	0,088626	40,2439020	0,050821	783,2017	0,016696	457,3999
SOOO	0,031446	34,1296920	0,001564	837,4134	0,048437	485,221
MTEG	0,027635	1,6309600	0,001619	631,8305	0,039079	383,6303
MKJK	0,036594	9,8873674	0,023206	761,8324	0,055791	452,8507
MPZL	0,032933	28,0766388	0,028708	725,2353	0,031749	431,3895
SGFA	0,037253	38,6951724	0,009715	606,8332	0,061991	383,7195
SPIM	0,03455	28,5799246	0,029543	781,7613	0,051922	457,1201
MDCS	0,019023	30,7812320	0,004873	691,0607	0,014106	433,7309
SMPM	0,020871	24,7667801	0,001491	816,9272	0,046225	455,6119
TTZP	0,042259	31,0312619	0,035079	797,8035	0,01064	433,0915
SUEO	0,024592	28,3135467	0,015808	823,1415	0,027409	449,854
SVZM	0,057762	47,5936158	0,032294	812,1153	0,042071	469,7325

Table 6: Physical and dynamic parameters used in the REICH collision risk model

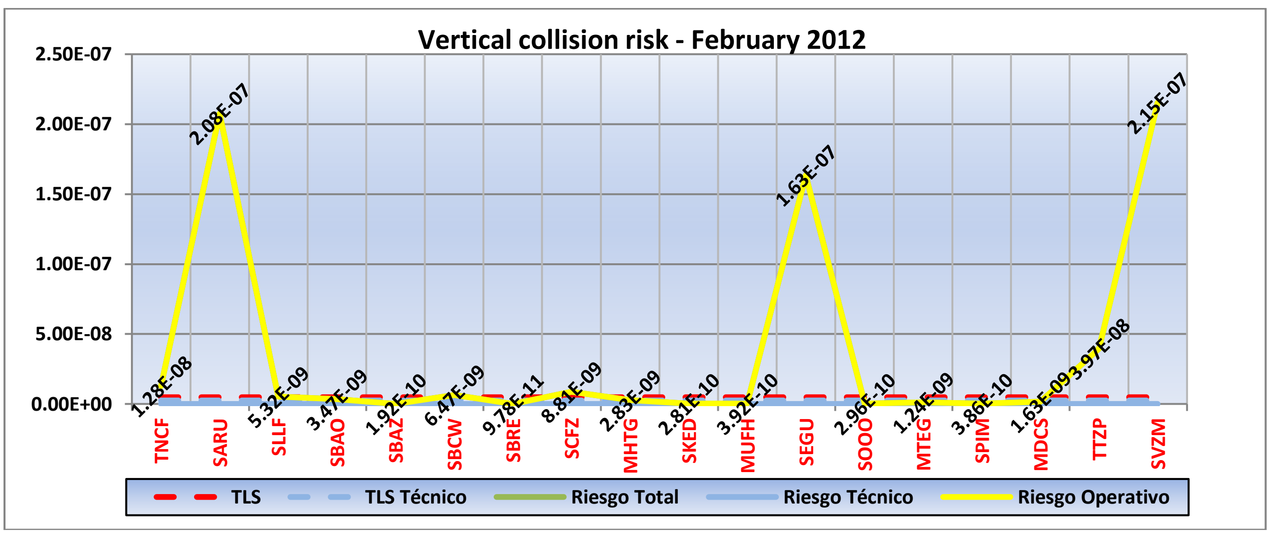
Graphical illustration of vertical collision risk in the CAR/SAM FIRs

3.52 Graph 4a illustrates the vertical collision risk, by month, in the CAR/SAM FIRs, for 2012. In February, the risk was 1,159E-08, much above the TLS.



Graph 4a: Vertical collision risk – 2012

3.53 In Graph 4b, this same table was expanded to show which FIR had its highest risk in February. This increase in risk was due to LHDs reported by the Piarco, Maiquetia, Guayaquil, and Resistencia FIRs. It should be noted that the FIR that submitted the LHD reports was exposed to a higher risk, but the risk was caused by failures in the adjacent FIRs.



Graph 4b: Vertical collision risk in February 2012

3.54 Figures **3abcd** below summarise some LHD reports for February 2012 that contributed to an increased operational risk that exceeded the TLS.

Report #: 171	POSITION: MINDA		MINDA	MODE C: NO	HT LHD: 2,000
DATE: 02/16/12	HOUR: 5:56	FLIGHT ID: AAL992	REGISTRATION: N353AA	CLRD FL: 360	DURATION: 180
ROUTE: SBCF (Confins) UA324 POS UL337 KMIA (Miami)			ACFT TYPE: B763	EVENT FL: 380	CODE: M
REPORTING UNIT: PIARCO	FIR ERROR : GEORGETOWN		IMC / VMC: V	XFL SAME: 1	XFL OPS 1
OTHER ACFT (2ª): 0			DISTANCE: 80	POSITION 2ª ACFT: 0	FL 2ª ACFT: 0
CAUSE: ATC LOOP ERROR				GTE TIME: 180	GTE CODE: M

1. AT TIME 05:22 GEORGETOWN ACC COORDINATED NA ESTIMATE ON AAL992 WITH PIARCO ACC AT MINDA AT 05:52 FL360. 2. PIARCO ACC APPROVED FL360 ON AAL992. 3. AT 05:56 GEORGETOWN ACC REQUESTED A CONFIRMATION ON THE LEVEL APPROVED BY PIARCO ACC ON AAL992 AT MINDA AND WAS ADVISED THE LEVEL APPROVED. 4. GEORGETOWN ACC THEN ADVISED PIARCO ACC THAT AAL992 CROSSED POSITION MINDA AT 05:53 AND WAS AT FL380. (THREE MINUTES INTO PIARCO FIR AT FL380) GEORGETOWN ACC THEN REQUESTED APPROVAL OF FL380 FOR AAL992. 5. PIARCO ACC WAS UNABLE TO APPROVE AAL992 MAINTAINING FL380 AND THE A/C WAS DESCENDED TO FL360. 6. NO OTHER A/C IN PIARCO FIR WAS AFFECTED BY THIS ERROR.

LHD submitted by the Piarco FIR reporting an error by the Georgetown FIR. The flight level was different for 3 minutes

Report #: 188	POSITION: VUMPI		VUMPI	MODE C: NO	HT LHD: 0
DATE: 02/19/12	HOUR: 18:44	FLIGHT ID: ANS614	REGISTRATION: 0	CLRD FL:	DURATION: 2,460
ROUTE: UL304			ACFT TYPE: A320	EVENT FL: 340	CODE: N
REPORTING UNIT: MAIQUETIA	FIR ERROR : AMAZONICA		IMC / VMC: V	XFL SAME: 0	XFL OPS 0
OTHER ACFT (2ª): 0			DISTANCE: 80	POSITION 2ª ACFT: 0	FL 2ª ACFT: 0
CAUSE: ERROR OPERACIONAL EN EL CICLO DE LAS COORDINACIONES ATC				GTE TIME: 2,460	GTE CODE: N

EL ACC AMAZONICO NO EFECTUO LA COORDINACIÓN NI ESTIMADO DEL ANS614 CON FL340 SOBRE LA POSICION VUMPI. ANS614 REPORTO AL ACC DE MAIQUETIA EN LA POSICION LOGON, 328 NM PASADA LA POSICION VUMPI QUE ES EL PUNTO DE TRANSFERENCIA DE CONTROL. EN LA POSICION VUMPI COBERTURA RADAR INOPERATIVA.
***CARSAMMA: DE VUMPI HASTA LOGON SON 328 = 41 MINUTOS = 2460 SEGUNDOS. ***

LHD submitted by the Maiquetía FIR reporting total lack of coordination by the Amazonica FIR. Duration: 41 minutes

Report #: 207	POSITION: UGADI		UGADI	MODE C: NO	HT LHD: 2,000
DATE: 02/25/12	HOUR: 8:22	FLIGHT ID: AMX028	REGISTRATION: XAMAT	CLRD FL: 350	DURATION: 1,020
ROUTE: MMMX (Ciudad de México) UL308 UGADI AMPAL SAEZ (Buenos Aires)			ACFT TYPE: B763	EVENT FL: 370	CODE: M
REPORTING UNIT: GUAYAQUIL - (CENTRAL AMERICA	FIR ERROR : CENTRAL AMERICA		IMC / VMC: V	XFL SAME: 1	XFL OPS 1
OTHER ACFT (2ª): 0			DISTANCE: 80	POSITION 2ª ACFT: 0	FL 2ª ACFT: 0
CAUSE: ERROR OPERACIONAL EN EL CICLO DE LAS COORDINACIONES ATC				GTE TIME: 1,020	GTE CODE: M

ACC CENAMER PASO ESTIMADO UGADI 08:22 FL350 A GUAYAQUIL. 17 MINUTOS DESPUES DE LA HORA DE PASO POR PUNTO DE TRANSFERENCIA, GUAYAQUIL RECLAMA PORQUE DICE HABER RECIBIDO DE CENAMER CAMBIO DEFL370, PERO NUNCA SE DIO REVISADO DE NIVEL.

Self-report submitted by the CENAMER FIR. The flight level was different from the coordinated level

Report #: 210	POSITION: KUBIR		KUBIR	MODE C: NO	HT LHD: 2,000
DATE: 02/25/12	HOUR: 15:25	FLIGHT ID: LVCCO	REGISTRATION: LVCCO	CLRD FL: 370	DURATION: 90
ROUTE: UL793			ACFT TYPE: LJ60	EVENT FL: 390	CODE: M
REPORTING UNIT: RESISTENCIA	FIR ERROR : ASUNCION		IMC / VMC: V	XFL SAME: 1	XFL OPS 1
OTHER ACFT (2ª): 0			DISTANCE: 80	POSITION 2ª ACFT: 0	FL 2ª ACFT: 0
CAUSE: ERROR OPERACIONAL EN EL CICLO DE LAS COORDINACIONES ATC				GTE TIME: 90	GTE CODE: M

ASUNCION ACC COORDINO LVCCO SLVR / SABE (Buenos Aires) KUBIR 15:25 FL370. LVCCO LLAMA KUBIR CON FL390.

LHD submitted by the Resistencia FIR; the Asunción FIR coordinated a different flight level. Duration: 3 minutes

Figures 3abcd: LHDs in February 2012

Conclusions of the safety assessment (CRM)

3.55 The operational risk was estimated by FIR, and the values shown in Table 7 were obtained after processing all the data received, compiled and processed using the specific CRM software.

FIR	Total risk	Technical risk	Operational risk
TNCF	7,71E-09	8,31E-12	7,7011E-09
SACU	7,55E-10	6,80E-13	7,5435E-10
SAEU	3,79E-12	6,80E-13	3,1053E-12
SAME	6,34E-10	3,21E-11	6,0170E-10
SARU	1,90E-07	6,80E-13	1,9043E-07
SAVU	2,53E-10	2,53E-10	0,0000E+00
SLLF	1,11E-09	5,56E-12	1,1092E-09
SBAO	2,24E-09	1,34E-11	2,2249E-09
SBAZ	2,04E-10	1,24E-11	1,9145E-10
SBBS	1,42E-11	6,80E-13	1,3522E-11
SBCW	6,74E-10	1,06E-11	6,6379E-10
SBRE	2,34E-10	1,58E-11	2,1835E-10
SCCZ	6,80E-13	6,80E-13	0,0000E+00
SCEZ	2,93E-10	2,15E-11	2,7189E-10
SCFZ	3,29E-09	3,84E-11	3,2542E-09
SCIZ	3,95E-12	6,80E-13	3,2736E-12
SCTZ	2,18E-09	1,05E-11	2,1706E-09
MHTG	6,77E-10	1,26E-11	6,6412E-10
SKEC	4,03E-10	6,80E-13	4,0222E-10
SKED	4,14E-10	6,80E-13	4,1355E-10
MUFH	1,65E-09	6,80E-13	1,6536E-09
SEGU	3,22E-08	6,80E-13	3,2202E-08
SYGC	1,69E-08	6,80E-13	1,6936E-08
SOOO	7,61E-09	6,80E-13	7,6099E-09
MTEG	3,23E-10	6,80E-13	3,2264E-10
MKJK	3,98E-11	6,80E-13	3,9074E-11
MPZL	3,79E-11	6,80E-13	3,7178E-11
SGFA	1,44E-09	6,80E-13	1,4367E-09
SPIM	6,56E-10	6,80E-13	6,5516E-10
MDCS	2,06E-09	6,80E-13	2,0587E-09
SMPM	4,19E-11	6,80E-13	4,1248E-11
TTZP	6,19E-08	6,80E-13	6,1935E-08
SUEO	1,60E-08	6,80E-13	1,5949E-08
SVZM	3,02E-08	6,80E-13	3,0210E-08
Weighted total	**3,39E-09**	**7,48E-12**	**3,378E-09**

Table 7: Estimated operational risk, by FIR

*** The apparently repeated sequence of values in the technical risk column is due, inter alia, to a small incidence of two-way airways or intersections in the FIR concerned.*

3.56 The technical risk **meets** the TLS of no more than 2.5 x 10^{-9} fatal accidents per flight hour due to loss of 1,000-ft vertical separation and all other causes.

3.57 The operational risk has no predetermined limit value, in accordance with Doc 9574.

3.58 For the FIRs under consideration, total risk is **3.39 x 10^{-9}** fatal accidents per flight hour, which is below the accepted TLS of **5.0 x 10^{-9}** fatal accidents per flight hour.

CAR/SAM RVSM Airspace **Estimated annual flight hours = 4,276,427.2 hours** ***(Note: Time estimated based on December 2012 sample)***			
Source of risk	**Estimated risk**	**TLS**	**Observation**
Technical risk	**7,48 x 10^{-12}**	**2,5 x 10^{-9}**	**Below**
Operational risk	**3,38 x 10^{-9}**	-	-
Total risk	**3,39 x 10^{-9}**	**5,0 x 10^{-9}**	**Below**

Table 8: Annual risk estimates for CAR/SAM RVSM airspace

3.59 The Meeting concluded that the estimated annual vertical collision risk for 2012 in CAR/SAM RVSM airspace had been below the TLS recommended by ICAO (TLS = 5 x 10^{-9} fatal accidents per flight hours), based on the CRM methodology. Accordingly, it could be said that it had been a safe airspace during 2012 (Table 8).

New collection of data on aircraft movement in RVSM airspace of the CAR/SAM Regions

3.60 The Meeting took note that the worldwide meeting of Monitoring Agencies had agreed that the collection of data on aircraft movement in RVSM airspace of the regions should be carried out on dates that were feasible for data collection.

3.61 In this regard, the Scrutiny Group formulated the following conclusion:

CONCLUSION GTE/13-3 COLLECTION OF DATA ON AIRCRAFT MOVEMENT IN RVSM AIRSPACE OF THE CAR/SAM REGIONS

That CAR/SAM States and International Organisations collect data on aircraft movement in RVSM airspace between 1 and 30 November 2013 and send the corresponding data in CARSAMMA Form F0 to that body with copy to ICAO NACC and SAM Regional Offices before 31 January 2014.

Agenda Item 4: Analysis of Large Height Deviations (LHDs)
- Evolution of M and N-coded LHDs in RVSM airspace of CAR/SAM FIRs

4.1 The Meeting recalled that the CAR/SAM Regional Planning and Implementation Group (GREPECAS) had delegated the implementation of the SMS methodology for LHD analysis to the Caribbean and South American Monitoring Agency (CARSAMMA). CARSAMMA is an administrative agency of the *Departamento de Controle do Espaço Aéreo* (DECEA), an entity that belongs to the Brazilian Airspace Control System (SISCEAB).

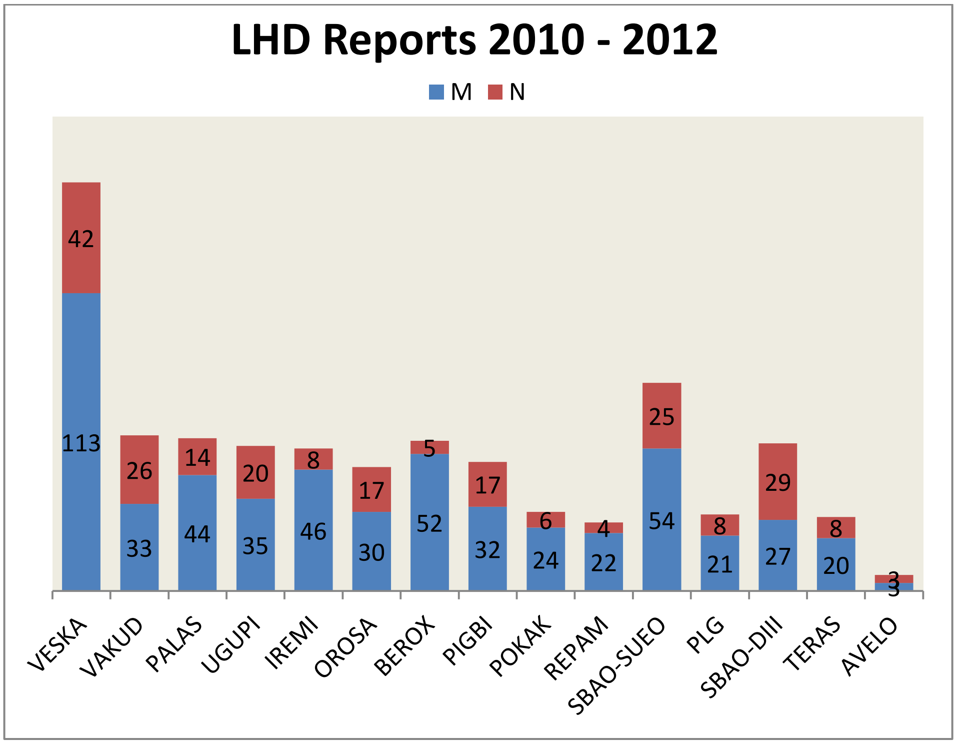
4.2 Under this item, CARSAMMA presented a summary of the evolution of RVSM airspace safety in the CAR/SAM FIRs.

4.3 A set of LHD reports collected over a period of three years between 2010 and 2012 was used in this safety evolution analysis.

4.4 Table 1 and Graph 1 summarise LHD reports at the most risky positions for the 2010-2012 period.

Point	M	N
VESKA	113	42
VAKUD	33	26
PALAS	44	14
UGUPI	35	20
IREMI	46	8
OROSA	30	17
BEROX	52	5
PIGBI	32	17
POKAK	24	6
REPAM	22	4
SBAO-SUEO	54	25
PLG	21	8
SBAO-DIII	27	29
TERAS	20	8
AVELO	3	3

Table 1: Report of M- and N-coded LHDs at the points of most frequent occurrence



Graph 1: M- and N-coded LHD occurrences

4.5 The Meeting noted that M-coded LHDs (error in ATC-unit-to-ATC-unit transfer message) were the most frequent during the 2010-2012 period, with 486 events, followed by N-coded LHDs (lack of coordination) with 232 events.

4.6 It also noted that M-coded LHDs were the most frequent in almost all positions, except in the SBAO-SUEO and SBAO-DIII boundaries, where N-coded LHDs prevailed because of traffic management between the Falkland Islands and the Ascension Islands in the South Atlantic.

4.7 The Meeting recalled that N-coded LHDs constituted one of the worst incidents in air traffic, since the aircraft concerned are not expected in that position, at that level, or at the time of occurrence. In summary, situational awareness of traffic is significantly impaired.

4.8 The high number of M- and N-coded LHDs showed the need for better coordination between adjacent air traffic control centres, which could be achieved by sensitising and training controllers in coordination aspects.

4.9 Graph 2 provides a geographical distribution of cumulative points of M- and N-coded LHDs between 2010 and 2012.

4.10 During the Meeting, 122 LHD were analysed and 116 LHD were validated.

Graph 2: Image of M- and N-coded LHDs between 2010 and 2012

LHDs in the South Atlantic

4.11 The Meeting took note of the efforts being made by Uruguay to complete the coverage of the Montevideo FIR with ADS-C information. It was estimated that the provider, SITA, would implement this functionality before the end of 2013.

4.12 Likewise, the Meeting took note of the lack of flight plans or communication with aircraft flying this route, making it difficult to estimate traffic or, at least, to be aware of it.

4.13 The Meeting urges the Administrations of Argentina and Uruguay to strengthen their efforts to substantially reduce LHD reports in the South Atlantic, in the Comodoro Rivadavia, Ezeiza, and Montevideo FIRs, and thus reduce safety risk.

Measures to reduce M- and N-coded LHDs in RVSM airspace

4.14 The Secretariat pointed out that throughout the period following RVSM implementation, many bilateral meetings have been held in an attempt to minimize or eliminate operational errors that fall within the M and N LHD categories. However, there were some very important transfer points that still lacked reliable handover procedures.

4.15 Some FIRs 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 transfer purposes.

4.16 Furthermore, the absence of handover had increased significantly, resulting in severe loss of situational awareness, seriously affecting safety.

Review of Letters of Operational Agreement to improve coordination procedures

4.17 The Meeting considered it necessary for the States of both Regions to modify their Letters of Operational Agreement in order to include the necessary procedures to make sure that traffic is transferred with no errors, thus minimizing M- and N- coded LHD reports. It also recognized that the application of the SMS methodology for LHD analysis revealed the weak points in the transfer of traffic between ATS units, and that these data could be used to enhance coordination procedures established in the Letters of Operational Agreement.

Agenda Item 5: Other business

Study for cleaning aircraft movement data sent to CARSAMMA during the data collection, preparation and analysis phases

5.1 The Meeting took note of the shortcomings of aircraft movement data sent to CARSAMMA in 2012, and reviewed a summary of the study on the need to clean these data during the collection, preparation, and analysis phases.

5.2 The Meeting also noted that, given the large amount of incorrect data, CARSAMMA had to use resources that could be employed in other safety processes. It was emphasised that the letter requesting the delivery of these data contains detailed instructions for each specific case.

5.3 Examples are given in alphabetical order by name of State, and by title or heading:

FIR IDENTIFICATION:											
DATE	CALL SIGN	TYPE OF ACFT	AD OF ORIGIN	AD OF DESTINATION	POINT OF ENTRY INTO RVSM AIRSPACE	TIME AT POINT OF ENTRY	FL AT THE POINT OF ENTRY	AIRWAY AT POINT OF ENTRY	POINT OF EXIT OF RVSM AIRSPACE	TIME AT POINT OF EXIT	FL AT THE POINT OF EXIT

Examples of spreadsheets received by CARSAMMA

- **Netherlands Antilles**
  One spreadsheet was received from the TNCF FIR. The following example is a record.

TNCF

02/12/12	N275HZ	N275HZ	LJ60	KBCT	SVMI	VESKA	23:57	390	A315	REPIS	0:38	230

Note that the airway and the level are not RVSM. Must be reviewed.

- **Argentina**
  5 spreadsheets were received from the SACU, SAEU, SAMV, SARU, and SAVU FIRs. They were all sent past the deadline. Some examples follow:

SACU

Dic 1 2012 12:00	DSM4135	LVCKV	A320	SASA	SABE	PONPI	2322	222		ROKER	0016	370

Date, level and time other than requested. Must be reviewed.

SAEU

01-12-12 01:52:00	GLO7681	B738	SABE	SBGR			390					0358	SID13	14	0152	WYDFIKLORX

Date, time, and fix other than requested. Must be reviewed.

SAMV

29-12-12	LAN480	A320	SABE	SCEL	TOSOR	00:42	380	UA306	UMKAL	01:26	260

Date and level other than requested. Must be reviewed.

SARU

01/12/12	LAN756	A320	SCEL	SBGR	SIKOB	0021	370	UM400	ARULA	0051	370

Only time is not as requested. Requires little revision.

SAVU

01-Dec	ARG 1845	S/D	B737	SAWE	SABE	ERUPO	00:24	390	UT662	PUGLI	01:48	390

Only date is not as requested. Requires little revision.

- **Bolivia**

One spreadsheet from the SLLF FIR was received. The following example is a record.

SLLF

01/12/2012	TPU924	A320	SLVR	SPIM	SALBI	12:13	320	UA304	ELAKO	12:52	320

The file was sent as PDF. An Excel software converter is required.

- **Brazil**

5 spreadsheets were received from the SBAO, SBAZ, SBBS, SBCW, and SBRE FIRs. Some examples follow:

SBAO

01/12/12	TAP074	NULL	A332	SBGL	LPPT	MAGNO	7	390	UN866	DEKON	106	390	S01

Record, time, and fix other than requested. Must be reviewed.

SBAZ

01/12/12		AAL954	B772	SAEZ	KJFK	UDIDI	04:14	380	UL793	UGAGA	05:04:00	380

Only the record is missing. Requires little revision.

SBBS

1	12	2012	S09	0001	0023	GLO1634	SBGL	SBEG	B737	MONBI	1602S04706W	380	380	UM409

Issued after the deadline. Date, time, and fix other than requested. Must be reviewed.

SBCW

12/01/12	PTSKW	E135	W	SBKP	SEGU	OROKA	1:12	380	UZ21/UL655/UL655	EGIMO	2:30	380

No revision was required. The data were immediately processed.

SBRE

12/01/12	TAM3316	NULL	A320	SBGR	SBNT	BSREK	23:52	370	1339S04040W		0:14	370

The record is other than requested. Requires little revision.

- **Chile**

5 spreadsheets were received from the SCCZ, SCEZ, SCFZ, SCIZ, and SCTZ FIRs. They were all sent after the deadline. Some examples follow:

SCCZ

04/05/13	LXP283		A320	SCTE	SCCI	SATIN	19:56	19:56	270	UT100	PNT	20:44	20:44	270

Record and level other than requested. Must be reviewed.

SCEZ

01/08/12	SKU162	A320	SCEL	SCCF	DILOK	0:00	250	UL309	CEPAM	1:16	250

Record and level other than requested. Must be reviewed.

SCFZ

This spreadsheet was delivered as SCEZ /SCFZ, with mixed data. Requires significant review.

SCIZ

01/08/12	AMX010	B762	MMMX	SCEL	ESDIN	11:17	F370	UL401	2732S075W	12:31	F370

Record other than requested. Requires little revision.

SCTZ

01/05/13	LXP271	A319	SCEL	SCBA	LENOS	13:28		370	UT106	ARGOS	13:20	290

Record other than requested. Requires little revision.

- **COCESNA**

One spreadsheet was received from the MHTG FIR. The following example is a record.

MHTG

12/01/12	CMP796	HP1531	B737	MROC	MPTO	CACHI	0:11	163	TIO UG440 ISEBA DCT PUDOS	ISEBA	0:19	365

Airway and level other than requested. Must be reviewed.

- **Colombia**

One spreadsheet was received from the SKEC and SKED FIRs. The model follows:

SKEC

1/12/2012 00:00:00.00	CMP-1534	B738	MDSD	MPTO	OROSA	0005	400.0	AGUJA	0044	400.0	UA319	0005	400.0

Level, record, and date other than requested. Must be reviewed.

SKED

This spreadsheet was delivered as SKEC/SKED, with combined data. Must be reviewed.

- **Ecuador**

No spreadsheet was received from the SEGU FIR.

- **Guyana**

One spreadsheet was received from the SYGC FIR. The model follows:

SYGC

03/07/09	UAL843	B763	KORD	SBGR	MINDA	8:55	330	UA324/UA312	KOXAM	9:29	330

Issued after the deadline. Record other than requested. Requires little revision.

- **French Guiana**

No spreadsheet was sent from the SOOO FIR.

- **Haiti**
  One spreadsheet was received from the MTEG FIR. The model follows:

MTEG

01/12/12	INC907	MD82	TNCB	KMIA	PIGBI	16:57	320	A315	JOSES	17:19	320

Record other than requested. Requires little revision.

- **Jamaica**
  No spreadsheet was sent from the MKJK FIR.

- **Panama**
  One spreadsheet was received from the MPZL FIR. The model follows:

MPZL

12/01/12	AAL2142	N698AN	B752	SPIM	KMIA	BUXOS	15:58	360	UL780	ARNAL	17:52	360

Issued after the deadline.

- **Paraguay**
  One spreadsheet was received from the SGFA FIR. The model follows:

SGFA

12/01/12	LAN704	A343	SCEL	LEMD	1:30	310	UR554	VAS	UM403	1:53

Record other than requested. Requires little revision.

- **Peru**
  One spreadsheet was received from the SPIM FIR. The model follows:

SPIM

01.12.12	CMP175	B738	MPTO	SCEL	VAKUD	01:25	350	UL780	SORTA	03:13	370	TRU	01:52	370

Record and date other than requested. Requires little revision.

- **Dominican Republic**
  No spreadsheet was submitted from the MDCS FIR.

- **Suriname**
  No spreadsheet was submitted for the SMPM FIR.

- **Trinidad and Tobago**
  One spreadsheet was received from the TTZP FIR. The model follows:

TTZP

01:12:12	AJT855	N741AX	B762	KMIA	TTPP	ANADA	0:03	370	UG449	PERGA	0:34	290

Issued after the deadline. Requires little revision.

- **Uruguay**
  One spreadsheet was received from the SUEO FIR. The model follows:

SUEO

12/01/12	DLH510	B744	EDDF	SAEZ	ELAMO	10:23	380	UL324	ENSAS	10:39	340

Record other than requested. Requires little revision.

- **Venezuela**
  No spreadsheet was submitted for the SVZM FIR.

5.4 The Meeting concluded that the effort involved (approximately one month) in cleaning the aircraft movement data sent to CARSAMMA by our flight information regions (FIRs) could be avoided if the procedures described in the instructions for completing the CARSAMMA F0 form were followed.

5.5 Concern was expressed for the absence of data collection in some FIRs, since the quantitative safety assessment (CRM) would not be complete if an FIR failed to send its aircraft movement data.

5.6 Based on the above, the Meeting considered that States should be requested to properly follow the procedures for completing the air traffic data collection templates in their respective FIRs, and to submit such data to CARSAMMA in a timely fashion.

Activities carried out by Colombia

5.7 Colombia made a presentation of the activities it is carrying out with respect to the dissemination and sensitisation of the importance of reporting LHDs, which appears in GTE/13-IP/4 posted on the website of the Meeting.

Activities carried out by Cuba

5.8 The Meeting took note of the measures implemented by Cuba to mitigate the occurrence of LHD events.

5.9 During the research of events in the Havana FIR, PABEL and SELEK positions were identified as those with the largest number of LHDs. The statistical information on operations and ATS capacity reflected that the demand in Giron sector required of an increased capacity during traffic peak schedules, thus bringing difficulties for coordination with CENAMER ACC.

5.10 In such sense, technical conditions were created and measures were adopted immediately to implement an additional ATCO, as well as communication facilities on increased traffic. Moreover, ACC Havana controllers were instructed on LHD events and the ATC simulator training plan was duly revised and adapted in order to mitigate effects of this gap in the system.

5.11 The Automatic Data Exchange (ADE) with ARTCC Miami, which had been previously implemented, released Giron sector assistant of a large workload, avoiding undertaking an average of 230 daily estimates coordination to and from ARTCC Miami. This allows having more time for other activities and coordination with dependencies without automated systems implemented. In a third phase, it is expected to implement ADE system with the remaining ACC and use for the coordination with ARTCC Miami, revised FL and ETO automated messages. The results are the following:

2012: Until July 21 LHD events were recorded.
2013: Until July 7 LHD events were recorded.

Practical training in CARSAMMA

5.12 Taking into account that its new facilities have more space for conducting its work, CARSAMMA has offered CAR/SAM States the possibility of providing 90-day training in its facilities to 1 expert from each region. This training would have no cost. Travel and lodging expenses of these experts would be covered by the State. Coordination would be through the ICAO Regional Offices.

Administrative issues

5.13 The Meeting was informed that Mr. Johan Estrada, rapporteur of the GREPECAS Scrutiny Group, had taken on new commitments in the management of major projects in his States and therefore could not continue discharging his duties as rapporteur of the GTE.

5.14 In this regard, the Meeting regretted his resignation, since Mr. Johan Estrada had done an extraordinary job as rapporteur of the Scrutiny Group and his extensive experience had facilitated the work of this Group. Accordingly, it expressed its unanimous recognition.

5.15 Furthermore, the Meeting deemed it advisable to give continuity to the task and unanimously elected Mr. Julio Alexis Lewis, of the Dominican Republic, as new rapporteur of the Scrutiny Group, who would be supported by Mr. Estrada as required.