



ICAO

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WORKING PAPER

GTE/23 — WP/05

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Twenty-third Meeting of the Working Group on Scrutiny (GTE/23) of the CAR/SAM Regional Planning and Implementation Group (GREPECAS)

Lima, Peru, from September 11 to 15, 2023

Agenda Item 2: Review of the results of the Large Altitude Deviations (LHD) analysis

SAFETY ASSESSMENT OF THE CAR/SAM RVSM AIRSPACE

(Presentada por CARSAMMA)

SUMMARY	
This working paper presents a summary of the Large Altitude Deviation (LHD) reports received by CARSAMMA, and the analysis with the SMS methodology proposed by ICAO and reaffirmed during the GREPECAS meeting as a recommendation for its application by CARSAMMA in the CAR/SAM Regions.	
Action:	Suggested action in Part 4
<i>Objectives Strategic:</i>	<ul style="list-style-type: none">• Safety
<i>References:</i>	<ul style="list-style-type: none">• Doc 9574, Manual on a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410.• Doc 9937, Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive.• Reports of Major Altitude Deviations (LHD) 2022.

1. Introduction

1.1 This report provides a summary of the safety assessment of RVSM airspace in CAR/SAM FIRs. This assessment addresses the events of 2022.

2. Data presentation

2.1 A cumulative series of LHD reports covering a period of 12 months was used in this safety assessment.

3. Summary of LHD occurrences

3.1 **Table 1** summarize the validated LHD occurrences received by CARSAMMA and their duration (in minutes), by month, the median duration for each even, and the median RV-associated with the monthly LHDs. They will be presented to the Scrutiny Working Group at GTE/23.

MONTH	NUMBER of LHDs	NUMBER OF VALIDATED LHD	TOTAL DURATION (min.)	AVERAGE DURATION (min.)	AVERAGE RISK	HIGHEST RISK
January	63	43	28,8	0,67	20,6	39
February	51	39	28,5	0,73	21,3	31
March	65	51	79,5	1,56	19,5	46
April	96	80	55,0	0,69	19,6	46
May	64	50	86,5	1,73	20,9	46
June	72	57	34,0	0,60	19,2	39
July	77	66	81,0	1,23	21,1	39
August	58	52	59,0	1,13	21,8	39
September	87	73	174,0	2,38	23,4	49
October	71	60	62,2	1,04	21,8	39
November	83	73	77,0	1,05	21,8	39
December	75	67	85,5	1,28	21,7	46
TOTAL	862	711	851,0	1,20	21,2	

Tabla 1: Number of LHD, duration (MIN), medium duration, medium risk and higher VR per month.

3.2 In January, there were five (5) situations where the duration of each report was 90 seconds, but only one (1) event had the RV within the values studied ($39 \leq VR \leq 49$ points). This report occurred between the PORT AU PRINCE FIR and the SANTO DOMINGO FIR, in position ETBOD, #10, VR = 39.90 seconds, code E2.

3.3 February does not have events within the values studied ($39 \leq VR \leq 49$ points).

3.4 In March, there were three (3) events that, together, lasted 3,480 seconds or 58 minutes. One (1) report occurred between the AMAZON FIR and PILOT, position OGLAM, #123, VR = 27, 2,040 seconds, code H. Another one between the GUAYAQUIL FIR and the CENTRAL AMERICA FIR, position BUVUL, #164, VR = 46, 2,040 seconds, code E2. The last one is between the LIMA FIR and the LA PAZ FIR, position ORALO, # 165, VR = 46, 720 seconds, code E2.

3.5 In April, one (1) situation lasted 360 seconds or 6 minutes. The total minutes of failures this month was 3,300 seconds.

3.6 In May, there were four (4) situations that, added together, lasted 3,480 seconds or 58 minutes. One (1) report occurred between the ANTOFAGASTA FIR and the LIMA FIR, position SORTA, #229, RV = 46, 480 seconds, code E2. Another between the HOUSTON FIR and the HAVANA FIR, position SHARQ, #311, VR = 34, 180 seconds, code E1. Another between the AMAZON FIR and the AIRCRAFT (PILOT), position 1555S 05041W, # 325, VR = 19, 360 seconds, code L. Another between the PIARCO FIR and the DAKAR FIR, position 1501N 03730W, #337, VR = 29, 2,460 seconds, code E1.

3.7 In June, two (2) situations totaled 180 seconds or 3 minutes. One (1) report occurred between the PORT AU PRINCE FIR and the SANTO DOMINGO FIR, position RETAK, #346, VR = 39, 90 seconds, code E2. The other was between the LA PAZ FIR and the PILOT, position DOBNI, #349, VR = 39, 90 seconds, code D.

3.8 In July, two (2) events lasted 1,680 seconds or 28 minutes. One (1) report occurred in the MÉRIDA FIR itself, which generates and suffers the risk, position NUBAN, #447, VR = 13, 1,500 seconds, code M. The other was between the LA PAZ FIR and the AMAZÓNICA FIR, position RCO, #487, VR = 39, 180 seconds, code E1.

3.9 In August, three (3) situations lasted 1,080 seconds or 18 minutes. One (1) report occurred between the LA PAZ FIR and the AMAZON FIR, RCO position, #489, VR = 31, 120 seconds, code E1. The second happened between the LA PAZ FIR and the CÓRDOBA FIR, PUBUM position, #511, VR = 39, 540 seconds, code E1. The last happened between the SAN JUAN FIR and the MAIQUETIA FIR, MILOK position, #544, VR = 29, 420 seconds, code E1.

3.10 In September, there were four (4) situations that, together, lasted 6,420 seconds or 107 minutes. One (1) report occurred between the LIMA FIR and the GUAYAQUIL FIR, position PABOB, #622, VR = 39, 1,620 seconds, code E1. Another happened between the PIARCO FIR and the SAL FIR, position 1823N 04540W, #562, VR = 34, 3,060 seconds, code E1. The last situation happened between the CURITIBA FIR and the LA PAZ FIR, CUB position, #623, VR = 46, 1,620 seconds, code E2, and the other between the LA PAZ FIR and the PILOT, SALBI position, #569, VR = 23, 120 seconds, code B.

3.11 In October, two (2) situations lasted 523 seconds or 8 minutes and 43 seconds. One (1) report occurred between the SAN JUAN FIR and the MAIQUETIA FIR, position MILOK, #643, VR = 34, 240 seconds, code E1, and the other between the LA PAZ FIR and the CURITIBA FIR, position SIDAK, #383, VR = 39, 283 seconds, code E1.

3.12 In November, two (2) situations lasted 660 seconds or 11 minutes. One (1) report occurred between the MÉRIDA FIR and PILOTO, TUGET position, #747, VR = 34, 420 seconds, code B, and the other between the LA PAZ FIR and the CURITIBA FIR, CUB position, #761, VR = 39, 240 seconds, code E1.

3.13 In December, there were four (4) situations that lasted 1,560 seconds or 26 minutes together. One (1) report occurred between the GUAYAQUIL FIR and the CENTRAL AMERICA FIR, position UGADI, #823, VR = 26, 120 seconds, code E1. Another between the MÉRIDA FIR and the CENTRAL AMERICA FIR, position ALITO, #843, VR = 39,600 seconds, code E1. Another situation happened between the LIMA FIR and the LA PAZ FIR, position JUL, #850, VR = 46, 420 seconds, code E2, and the last one between the LIMA FIR and the LA PAZ FIR, position 1334S 07045W, #851, VR = 46, 420 seconds, code E2.

3.14 **Chart 2** summarizes the number of LHD by code in 2022, the duration (in minutes), and the number of flight levels crossed without authorization.

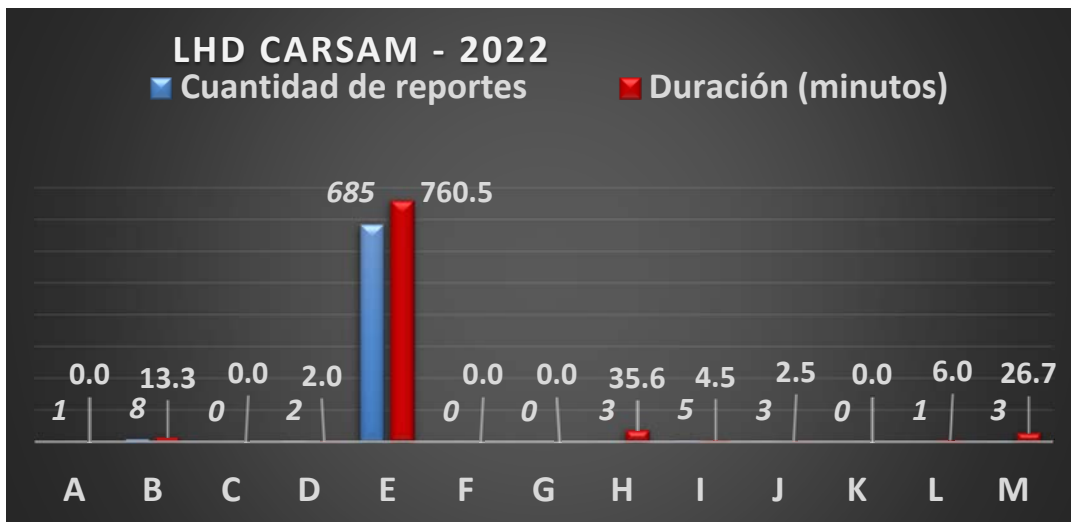


Chart 2

3.15 LHDs with Code "E" (error/coordination failure between ATC providers) were the most frequent in 2022, with 685 events, followed by Codes "B" (8), "I" (5), "H" (3), "J" (3), "M" (3), "D" (2), "A" (1) and "L" (1). The high number of codes "E" demonstrated the need for better coordination between adjacent air traffic services, which could be achieved through awareness and training of the air traffic controller.

3.16 **Figure 4** shows all validated LHDs separated by FIR. In the LIMA FIR, a report occurred with a duration of 3,060 seconds, 51 minutes (#562 - E1), failure of the SAL FIR, the operational risk was 34 points. In PIARCO FIR, a report with a duration of 2,460 seconds, 41 minutes (#337 - E1), failure of the DAKAR FIR, the operational risk was 29 points. In the AMAZON FIR, an LHD of 2,040 seconds, 34 minutes (#123 - H), PILOT/AIRCRAFT failure, leaving two aircraft exposed to an operational risk of 27 points for both. In FIR LIMA, although the duration was only 90 seconds, #630, position DOBNI - E2, the highest operational risk occurred, whose RV was 49 points.

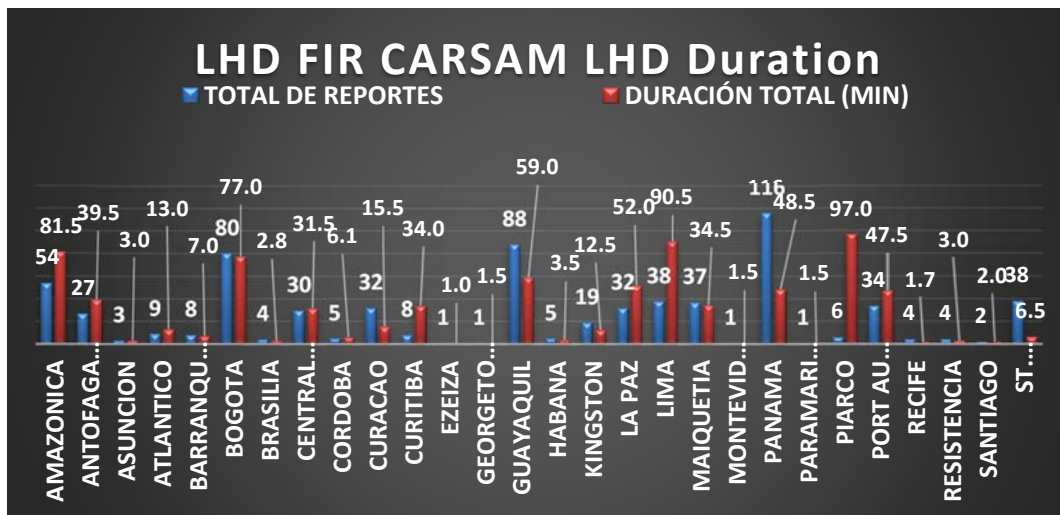
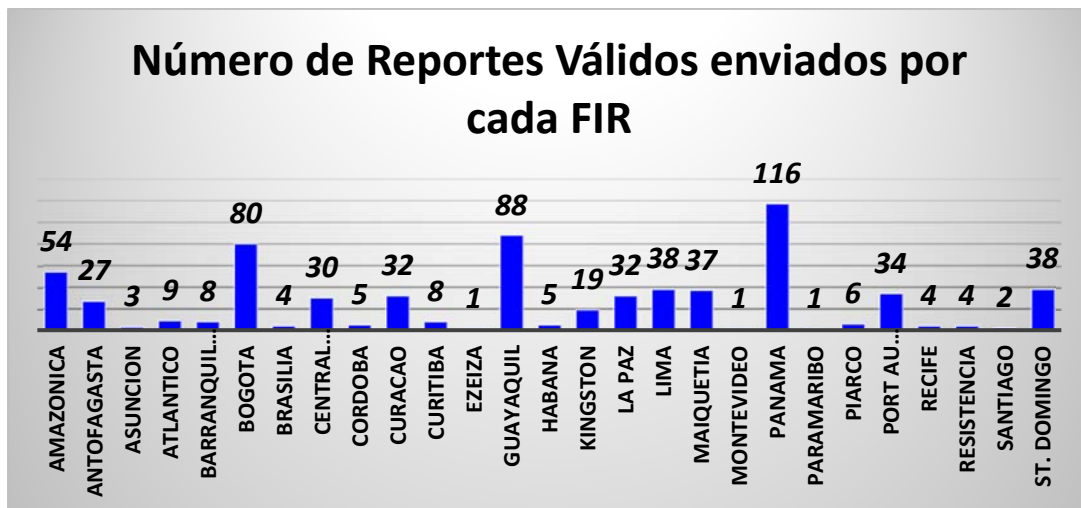


Figure 4: Summary of LHD per FIR CARSAM

3.17 The **graph** below shows the total number of LHD reports validated in 2022, where the FIRs that reported the most in 2022 were FIR PANAMÁ, GUAYAQUIL, BOGOTÁ, AMAZÓNICA, LIMA and SANTO DOMINGO. Those six (6) FIRs represent 414 reports or 58.2% of the total.



Note: The FIRs most exposed to RISK in 2022 were: FIR PIARCO, LIMA, AMAZÓNICA, BOGOTÁ, GUAYAQUIL and LA PAZ. Only with these six (6) FIR we have 53.6% of the overall total.

4. Assessment of risk value (VR)

4.1 Introduction

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

4.2 Estimating risk value parameters

The initial numbers and material for estimating the values of each parameter of the internationally accepted risk value (VR), which were used for the safety assessment of RVSM airspace are summarized in the following formula and described in Table below.

$$VR = (P * D * S) + R + W + T, \text{ donde:}$$

Parameter	Description	Value
VR	Risk value	To be calculated
P	Probability of the position	Varies from 1 to 5
D	Duration of the event	Varies from 1 to 3
S	Severity of the 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
T	Other traffic (if any)	The range varies from 5 (with radar) to 10 (without radar)
	TOTAL	Maximum: 100

4.3 Safety assessment (GSO/SMS) of LHD

4.3.1 The CAR/SAM FIR airspace safety assessment results are shown in **Table 4** and **Graph 5** (FIR with LHD $39 \leq VR \leq 49$).

Months	LoS	SPIM	SEFG	SBAO	SCFZ	SBCW	SKED	SBAZ	SLLF	SVZM	MTEG	MMID	KZNY
JAN	20										39 #10		
FEB	20												
MAR	20	46 #165	46 #164				39 #150						
APR	20			46 #249			39 #214 39 #243	39 #246					
MAY	20				46 #299						39 #282		
JUN	20								39 #349		39 #346		
JUL	20	39 #444			39 #437				39 #487	39 #448			
AUG	20								39 #514		39 #495		39 #502

SET	20	49 #630				46 #623	40 #553				39 #550	
		39 #554										
		39 #609										
		39 #622										
OCT	20						39 #687		39 #683	39 #655		
NOV	20	39 #779					39 #744		39 #761	39 #732		
DEC	20	46 #850								39 #824		39 #843
		46 #851								39 #859		

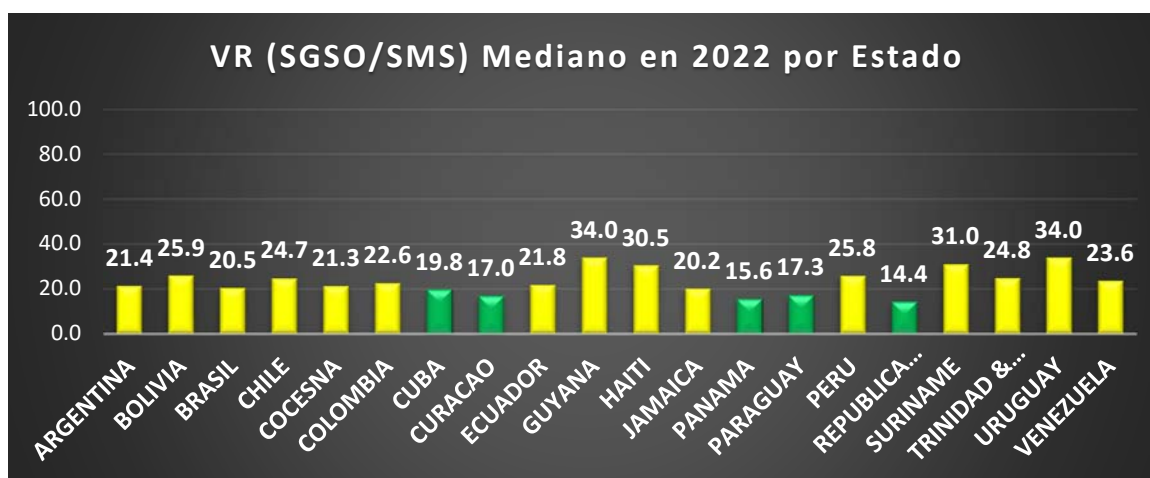
Note: The FIRs with the highest RV in 2022 were GUAYAQUIL FIR (12.7%), PANAMÁ (12.0%), BOGOTÁ (12.0%), AMAZÓNICA (7.1%), PORT AU PRINCE (6.9%), LIMA (6.5%), the percentages refer to the general total and only with those six (6) FIRs we have 57.2% of the total.

4.3.2 Table 6 presents the LHD that CARSAMMA has evaluated, which will be presented to GTE 23, as those with the highest risk than the LoS (20 points) that occurred in 2022. For this analysis, only reports with an RV higher than or equal to 39 were considered.

REPORT	EXPOSED TO RISK	GENERATED RISK	DATE	CÓDE	RV	POSITION
246	AMAZONICA	BOGOTA	18/04/22	E2	39	ASAPA
299	ANTOFAGASTA	LIMA	08/05/22	E2	46	SORTA
437	ANTOFAGASTA	LIMA	10/07/22	E2	39	IREMI
249	ATLANTICO	ABIDJAN	20/04/22	E2	46	1000S 01000W
150	BOGOTA	PANAMA	16/03/22	E2	39	IRASO
214	BOGOTA	PANAMA	11/04/22	E2	39	IRASO
687	BOGOTA	PANAMA	24/10/22	E2	39	TINPA
243	BOGOTA	GUAYAQUIL	17/04/22	E2	39	AKTAB
553	BOGOTA	GUAYAQUIL	02/09/22	E2	40	BOKAN
744	BOGOTA	GUAYAQUIL	11/11/22	E2	39	GAVUT
623	CURITIBA	LA PAZ	28/09/22	E2	46	CUB
164	GUAYAQUIL	CENTRAL AMERICA	22/03/22	E2	46	BUVUL
349	LA PAZ	PILOTO	10/06/22	D	39	DOBN
487	LA PAZ	AMAZONICA	29/07/22	E1	39	RCO
514	LA PAZ	CORDOBA	17/08/22	E1	39	PUBUM
683	LA PAZ	CURITIBA	23/10/22	E1	39	SIDAK
761	LA PAZ	CURITIBA	22/11/22	E1	39	CUB
165	LIMA	LA PAZ	22/03/22	E2	46	ORALO
444	LIMA	LA PAZ	14/07/22	E2	39	OBLIR
554	LIMA	LA PAZ	02/09/22	E2	39	RAXUN
609	LIMA	LA PAZ	23/09/22	E2	39	DOBN
630	LIMA	LA PAZ	29/09/22	E2	49	DOBN
850	LIMA	LA PAZ	25/12/22	E2	46	JUL
851	LIMA	LA PAZ	25/12/22	E2	46	1345S 07045W
622	LIMA	GUAYAQUIL	27/09/22	E1	39	PABOB

<u>779</u>	LIMA	GUAYAQUIL	29/11/22	E2	39	PABOB
<u>448</u>	MAIQUETIA	AMAZONICA	15/07/22	E2	39	VUMPI
<u>655</u>	MAIQUETIA	AMAZONICA	11/10/22	E2	39	UGAGA
<u>824</u>	MAIQUETIA	AMAZONICA	15/12/22	E2	39	VUMPI
<u>859</u>	MAIQUETIA	AMAZONICA	28/12/22	E2	39	VUMPI
<u>732</u>	MAIQUETIA	BOGOTA	08/11/22	E2	39	KIKAS
<u>843</u>	MERIDA	CENTRAL AMERICA	22/12/22	E1	39	ALITO
<u>502</u>	NEW YORK	PIARCO	13/08/22	E2	39	ELIEZ
<u>10</u>	PORT AU PRINCE	ST. DOMINGO	06/01/22	E2	39	ETBOD
<u>282</u>	PORT AU PRINCE	ST. DOMINGO	03/05/22	E2	39	PIGBI
<u>346</u>	PORT AU PRINCE	ST. DOMINGO	08/06/22	E2	39	RETAK
<u>495</u>	PORT AU PRINCE	ST. DOMINGO	08/08/22	E2	39	ETBOD
<u>550</u>	PORT AU PRINCE	ST. DOMINGO	01/09/22	E2	39	ETBOD

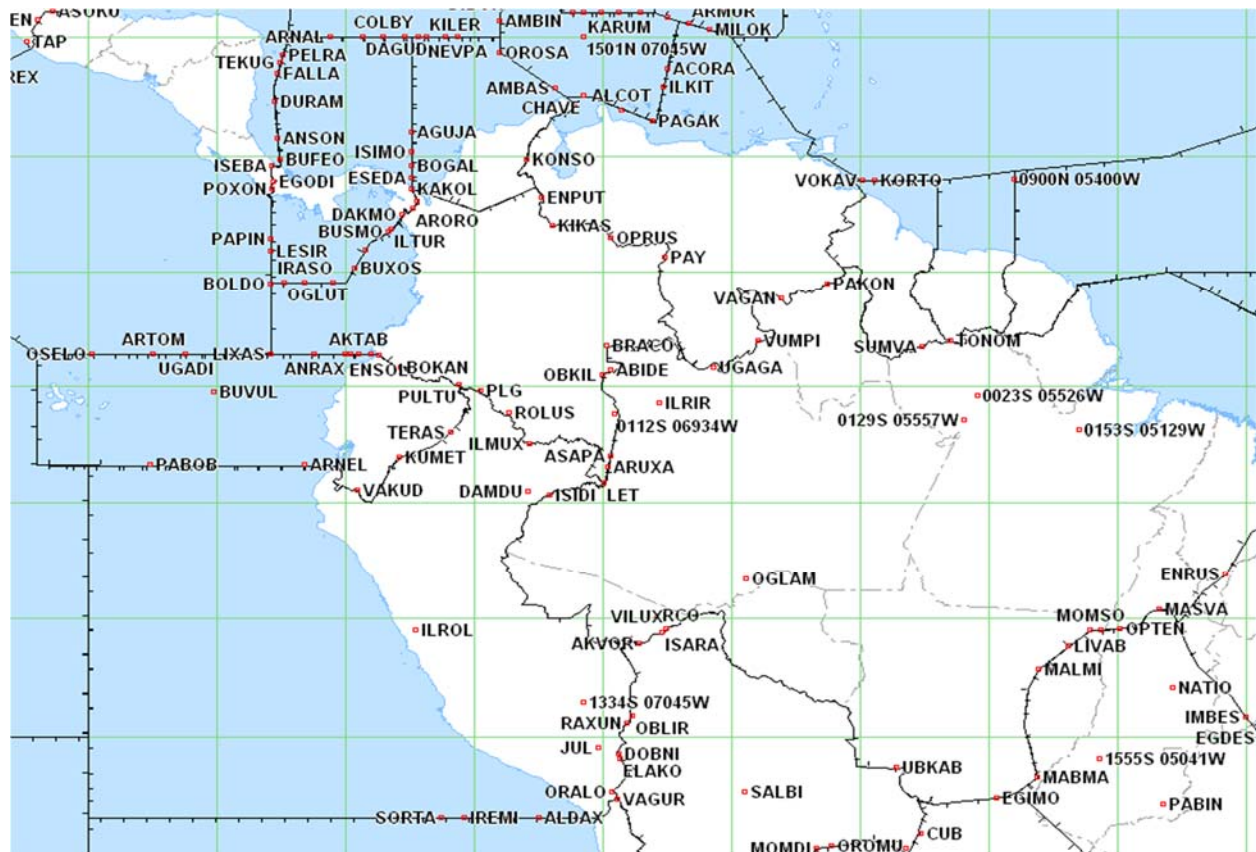
4.3.3 **Chart 8** identifies the results of this analysis with the indication of the risk value related to LHD operational errors in the 2022 analysis.



4.3.4 Figure below presents the geographical indication of the risk points where the reports occurred whose VR \geq 39 of the 2022 CAR/SAM data. Each point is identified with the name and RV. In the case of the point where the highest VR occurred (49), it is identified by an arrow.



4.3.5 LHD, with values lower than 39 points, will be presented in the Figure below. The Figure is intended to identify specific risk points related to RVSM operations.



4. Suggested actions

4.1 The Meeting is invited to:

- a) Take note of the information presented in this working paper;
- b) that States and service providers use the information of this working paper as a reference for the mitigation of LHD; and
- c) present the data for validation and approval.

— END —