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**International Civil Aviation Organization
South American Regional Office**

**ELEVENTH MEETING/WORKSHOP OF ATM AUTHORITIES AND PLANNERS
IN THE CAR/SAM REGIONS**

(AP/ATM/11)

(Lima, Peru, 28 to 30 September 2005)

**Agenda Item 4: RNAV/RNP issues related with the Safety and Airspace
Monitoring Working Group (SAM/WG)**

**Examination of Large Height Deviation Reports Received by the
Caribbean and South American Monitoring Agency (CARSAMMA) in
Connection with the safe use of the Reduced Vertical Separation
Minimum (RVSM) in the CAR/SAM Regions**

(Presented by CARSAMMA)

Summary

This working paper presents a summary of the large height deviation (LHD) reports received by the CARSAMMA associated with the CAR/SAM RVSM operation, to be analyzed by the SWG.

1. Introduction

1.1. The CARSAMMA serves as a regional monitoring agency (RMA) as is called for in ICAO Doc 9574. Along with maintaining a registry of State RVSM approvals of operators and aircraft using RVSM airspace, the CARSAMMA has produced readiness and safety assessments in conjunction with the Safety and Airspace Monitoring (SAM) Working Group of the RVSM Task Force.

1.2. The CARSAMMA has applied the internationally accepted safety assessment process with the introduction of the RVSM into CAR/SAM airspace. The basic collision risk model (CRM) is used to estimate the overall system risk attributable to all causes prior to implementation of the RVSM. To estimate the system risk, the CRM requires many parameters that are derived from data sources supplied to the CARSAMMA. One of the required parameters for the CRM is the total number of annual flying hours spent at incorrect flight levels. To accurately estimate risk the CARSAMMA requests monthly reports, call Large Height Deviation (LHD) reports from the various Flight Information Regions (FIRs).

The LHD reports contain the information needed to estimate the number of annual flying hours spent at incorrect flight levels in the RVSM airspace.

1.3. At AP/ATM/10, the meeting agreed to create a group to analyze the LHD, to help the CARSAMMA to obtain the correct values of time spent in wrong flight levels, as well as its causes.

1.4. The purpose of this paper is to present a summary of the LHD reports received by the CARSAMMA in connection with the safe use of the RVSM in the CAR/SAM airspace, as material to be analyzed by the SWG.

2. **Discussion**

2.1. Table 1 presents a summary of the LHD reports of 1000ft or more received by the CARSAMMA since January until August 05.

2.2. As part of the safety oversight functions performed by the CARSAMMA, the current 12-month interval of LHD reports is used in the estimation of the system collision risk. For each day - month provided in Table 1, the number of seconds spent at wrong flight levels for the corresponding report should be provided.

Date	Acft type	AWY	Point of observed LHD	FL	LHD	Time (sec)	Type of Error	Twl opp	Twl same	n ^{lc} _{same}	n ^{lc} _{opp}
26/01/05	A320	UA303	GELIS	330	2000	0	M				
29/01/05	B763	UB684	ANKON	380	2000	0	M				
02/03/05	B752	UG436	ARNEL	370	2000	30	M				
01/04/05	B732	UZ5	NELSON	300	1500	420	NIL				
10/04/05	B707	UZ14	BLESS	300	2500	120	NIL				
14/04/05	NIL	UM671	MELO	390	-2000	NIL	M				
06/05/05	MD11	UG427	ENRUT	320	2000	10	M				
06/05/05	C650	UW58	LIBRA	410	-5000	300	A				
11/05/05	E145	UA565	TERAS	260	11000	10	M				
15/05/05	A319	UG436	ARNEL	350	0	NIL	N				
17/05/05	A310	UB891	ETBOD	340	2000	NIL	M				
25/05/05	B738	UW27	BEROX	330	-2000	90	M				
30/05/05	MD11	UL550	GELIS	340	-2000	NIL	M				
01/06/05	A306	UL780	VAKUD	310	2000	30	M				
15/06/05	NIL	NIL	NIL	320	2000	NIL	M				
19/06/05	NIL	NIL	NIL	350	2000	NIL	M				
21/06/05	B737	NIL	PADOX	390	-2000	0	M				
22/06/05	NIL	NIL	NIL	350	2000	NIL	M				
28/06/05	NIL	NIL	NIL	290	4000	NIL	M				
01/07/05	A319	NIL	ENRUT	360	-2000	480	N				
09/07/05	MD88	UL550	GELIS	310	2000	NIL	NIL				
27/07/05	B763	UL780	SORTA	350	2000	0	NIL				
28/07/05	B757	UA315	VESKA	390	0	NIL	N				
29/07/05	B738	UG437	DUXUN	350	2000	60	M				
30/07/05	DC10	UA312	KOXAM	340	-2000	NIL	NIL				
31/07/05	B767	UA315	VESKA	360	0	NIL	N				

Date	Acft type	AWY	Point of observed LHD	FL	LHD	Time (sec)	Type of Error	Twl opp	Twl same	n ^{lc} _{same}	n ^{lc} _{opp}
01/08/05	B752	A315	PIGBI	340	2000	15	M				
01/08/05	B738	A315	VESKA	330	2000	15	M				
01/08/05	B757	A636	RETAK	350	2000	15	M				
01/08/05	DC10	UL337	ARUMU	330	0	NIL	N				
05/08/05	B738	UA324	MINDA	360	-2000	NIL	M				
05/08/05	NIL	UA315	VESKA	320	4000	15	A				
05/08/05	A300	UA315	VESKA	320	4000	15	M				
06/08/05	B738	UG449	ANADA	350	0	NIL	N				
06/08/05	B772	UA312	ANU	380	0	NIL	N				
08/08/05	NIL	W7	BEROX	340	2000	15	M				
10/08/05	A343	UA550	PELMA	350	0	NIL	N				
10/08/05	A320	UR888	MODUX	330	0	NIL	N				
11/08/05	B742	RANDOM	1622N/03730W	320	0	NIL	N				
12/08/05	B744	RANDOM	1507N/03730W	360	0	NIL	N				
12/08/05	B738	UG449	ANADA	350	2000	NIL	M				
13/08/05	B742	RANDOM	1607N/03730W	340	0	NIL	N				
21/08/05	MD88	B646	LENUK	310	2000	NIL	NIL				
24/08/05	B744	UA561	DAREK	330	2000	NIL	M				
29/08/05	MD11	RANDOM	1459N/03730W	340	0	NIL	N				
31/08/05	B763	A315	IRGUT	340	2000	15	A				
Total											

Table 1. Reports of LHD of 1000ft or more received by the CARSAMMA by Month-Year for the CAR/SAM airspace

- 2.3. Table 3 summarizes the details of the non-”NIL” LHD reports shown in Table 1 to be revised by the SWG. The cause of each deviation shall be represented by a letter code for compactness. The letter codes to be shown in Table 3 are defined in Table 2. Table 2 provides the cause of the LHD by assigned letter code.

Code	Cause of Large Height Deviation
A	Failure to climb/descend as cleared
B	Climb/descend without ATC clearance
C	Entry into airspace at an incorrect flight level
D	Deviation due to turbulence or other weather related cause
E	Deviation due to equipment failure
F	Deviation due to collision avoidance system (TCAS) advisory
G	Deviation due to contingency event
H	Aircraft not approved for operation in RVSM restricted airspace
I	ATC system loop error; (e.g. pilot misunderstands clearance message or ATC issues incorrect clearance)
J	Equipment control error encompassing incorrect operation of fully functional FMS or navigation system (e.g. by mistake the pilot incorrectly operates INS equipment)
K	Incorrect transcription of ATC clearance or re-clearance into the FMS
L	Wrong information faithfully transcribed into the FMS (e.g. flight plan followed rather than ATC clearance or original clearance followed instead of re-clearance)
M	Error in ATC-unit-to-ATC-unit transition message
N	Negative transfer received from transitioning ATC-unit
O	Other

Table 2. Codes Used to Define the Cause of Each Reported LHD

Month-Year	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Jan 05	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Feb 05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar 05	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Apr 05	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2
May 05	1	-	-	-	-	-	-	-	-	-	-	-	5	1	-
Jun 05	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-
Jul 05	-	-	-	-	-	-	-	-	-	-	-	-	1	3	3
Aug 05	2	-	-	-	-	-	-	-	-	-	-	-	8	9	1

Table 3. Summary of the Total Number of non-”NIL” LHD Reports by Month and Cause of Deviation for the CAR/SAM airspace

2.4. Table 4 presents the LHD reports received by CARSAMMA by month.

FIR	Jan 05	Feb 05	Mar 05	Apr 05	May 05	Jun 05	Jul 05	Aug 05
Curacao - TNCF								
Ezeiza - SAEU	x	x	x	x	x	x	x	x
Mendoza - SAMV	x	x	x	x	x	x	x	x
Resistência - SARU	x	x	x	x	x	x	x	x
Comodoro Rivadavia – SAVU	x	x	x	x	x	x	x	x
Córdoba - SACU	x	x	x	x	x	x	x	x
La Paz - SLLF				x				
Curitiba- SBCW	x		x	x	x	x		
Brasília - SBBS								
Recife - SBRE	x	x	x	x	x	x	x	x
Amazônica - SBAZ	x	x	x	x	x	x	x	x
Punta Arenas - SCCZ	x	x	x	x	x	x	x	X
Santiago - SCEZ	x	x	x	x	x	x	x	X
Antofagasta - SCFZ	x	x	x	x	x	x	x	x
Isla de Pascua - SCIZ	x	x	x	x	x	x	x	x
Puerto Montt - SCTZ	x	x	x	x	x	x	x	x
Central American - MHTG	x	x	x	x	x	x	x	x
Barranquilla - SKEC								
Bogota – SKED								
Havana - MUFH	x					x		x
Guayaquil – SEGU								
Georgetown - SYGC					x	x	X	
Rochambeau – SOOO	x	x						
Port Au Prince – MTEG	x	x	x	x	x	x	x	x
Kingston – MKJK	x	x	x	x		x	x	
Panama Oceanic – MPZL	x	x	x	x	x	x	x	x
Asunción – SGFA	x	x	x	x	x	x	x	x
Lima - SPIM	x	x	x	x	x	x	x	x
Santo Domingo – MDSD					x		x	x
Paramaribo – SMPM								
Piarco – TTZP	x	x	x	x	x	x	x	x
Montevideo – SUEO	x	x	x	x	x	x	x	x
Maiquetia - SVZM								

Table 4 - Large Height Deviations Reports Received by the CARSAMMA by Month

x = Large Height Deviation report has been received for the specified month (including reports indicating "NIL" events)

3. **Summary and Conclusions**

- 3.1. This paper provides a summary of the LHD reports received by the CARSAMMA in connection with the safe use of the RVSM in CAR/SAM airspace.
- 3.2. The details of the LHD reports received by the CARSAMMA during the month in 2005 were presented.
- 3.3. The total number of minutes spent at incorrect flight levels were presented along with the reported cause of each LHD event, when available.
- 3.4. Starting in January 2005, the most frequent cause of a reported LHD continues to be due to error in ATC-unit to ATC-unit transition message. For this problem remedial action must take place to reduce the frequency of these errors.

4. **Recommended actions**

- 4.1 States are requested to take note of the importance of the LHD reports in the safety assessment process and continue to inform CARSAMMA the LHD reports by the 10th of each month even if no deviation occurs.
- 4.2 States must remember that aircraft flying in wrong flight levels without ATC clearance or due to mistakes in coordination of traffic must be reported to CARSAMMA so the proportion of flight hours spent at incorrect flight levels can be calculated.
- 4.3 The SWG are requested to review and complete tables 1 and 3, to support the definition of the most common cause of LHD and the time spent in wrong flight levels as part of the safety oversight of the RVSM operation in the CAR/SAM Region.
- 4.4 The SWG is requested to define the best form to collect large height deviations.
- 4.5 The SWG is requested to study, in conjunction with CARSAMMA, some remedial actions to the most common causes of LHD.