International Civil Aviation Organization
Fifteenth Meeting of the GREPECAS
Scrutiny Working Group (GTE/15)
Lima, Peru, 16 to 20 November 2015

GTE/15-WP/06
27/10/15

Agenda Item 2: Large Height Deviation (LHD) analysis

b) Trend identification

RECURRENT IDENTIFICATION IN THE HAVANA FIR OF LHDs CAUSED BY TURBULENCE, IMPACT ON SAFETY, AND RECOMMENDATIONS FOR CAR/SAM ANSPs TO MITIGATE THEIR OCCURRENCE

(Presented by the ANSP of the Havana FIR)

SUMMARY

The purpose of this working paper is to present a summary of LHD events registered in 2014 and until July 2015, caused by turbulence, as well as an analysis of their impact on safety, and the methodology being used by the GTE to calculate their VR. It also highlights the low rate of reporting by CAR/SAM States, and proposes actions to mitigate their occurrence.

References:

- GTE/14 final report
- Conclusions of the CARSAMMA Points of Contact (PoC) Meeting (Río de Janeiro, 11-13 August 2014).
- Reporting of data on large height deviations (LHDs) by air navigation service providers (ANSPs) and other reporting sources, years 2014 and 2015.

ICAO strategic objectives:	*A - Safety*

1. Background

1.1 The GTE/14 meeting analysed the conclusions reached by the Meeting of CARSAMMA LHD PoCs (Rio de Janeiro, 11-13 August 2014), amongst them, the need for LHD PoCs to periodically verify other means of obtaining data for completing the LHD form (especially errors other than E-coded errors), emphasizing how important LHD events caused by errors other than ATC coordination errors are for CRM analysis.

1.2 Another recommendation of this meeting was to use LHD data to prioritise the implementation of mitigation measures, new concepts and equipment/systems.

1.3 Based on the summarised information on LHD events in the CAR/SAM Regions collected by CARSAMMA for 2014, as well as on the reports validated until the end of July 2015,

information is available on the number of LHD events caused by weather conditions (type "I" events) and especially, those in which the vertical deviation of the aircraft was caused by turbulence.

2 **Discussion**

2.1 LHDs caused by turbulence and reported by CAR/SAM FIRs in 2014/2015 are listed below:

DATE	REPOR FIR	ACFT	BRIEF DESCRIPTION	OTHER ACFT	VR
09/06/2014	CURITIBA	A321	CLIMBED 500 FT	NO	18
28/08/2014	CENAMER	BE40	DESCENDED 1100 FT	NO	14
10/09/2014	CURITIBA	LJ60	DESCENDED 700 FT	NO	14
24/10/2014	HAVANA	B738	DESCENDED 500 FT	NO	14
05/12/2014	CURITIBA	A320	CLIMBED 1000 FT	NO	14
20/01/2015	CURITIBA	E190	CLIMBED 600 FT	NO	14
25/01/2015	CURITIBA	E135	CLIMBED AND DESCENDED 500 FT	NO	14
03/02/2015	CURITIBA	A320	DESCENDED 900 FT	NO	14
09/03/2015	CURITIBA	C680	CLIMBED 500 FT	NO	14
14/03/2015	BRASILIA	A319	DESCENDED 400 FT	YES (TA)	19
07/04/2015	RECIFE	A320	DESCENDED 500 FT	NO	9
11/05/2015	HAVANA	A319	CLIMBED 400 AND DESCENDED 500 FT	NO (PAN)	18
16/05/2015	CURITIBA	BE40	DESCENDED 4000 FT	NO	14
04/06/2015	HAVANA	B738	DESCENDED 800 FT	NO	14

2.2 The statistical information shows the following important elements:

a) Out of the 34 FIRs that make up the CAR/SAM Regions, only 5 have reported LHDs due to turbulence in 2014 and 2015, for 11.7% of all the FIRs in the Region.
b) Occurrences in 2015 doubled those of the previous year, even though the end of the year is still 5 months away.
c) The average VR for these events, considering both 2014 and 2015, is 14.57.

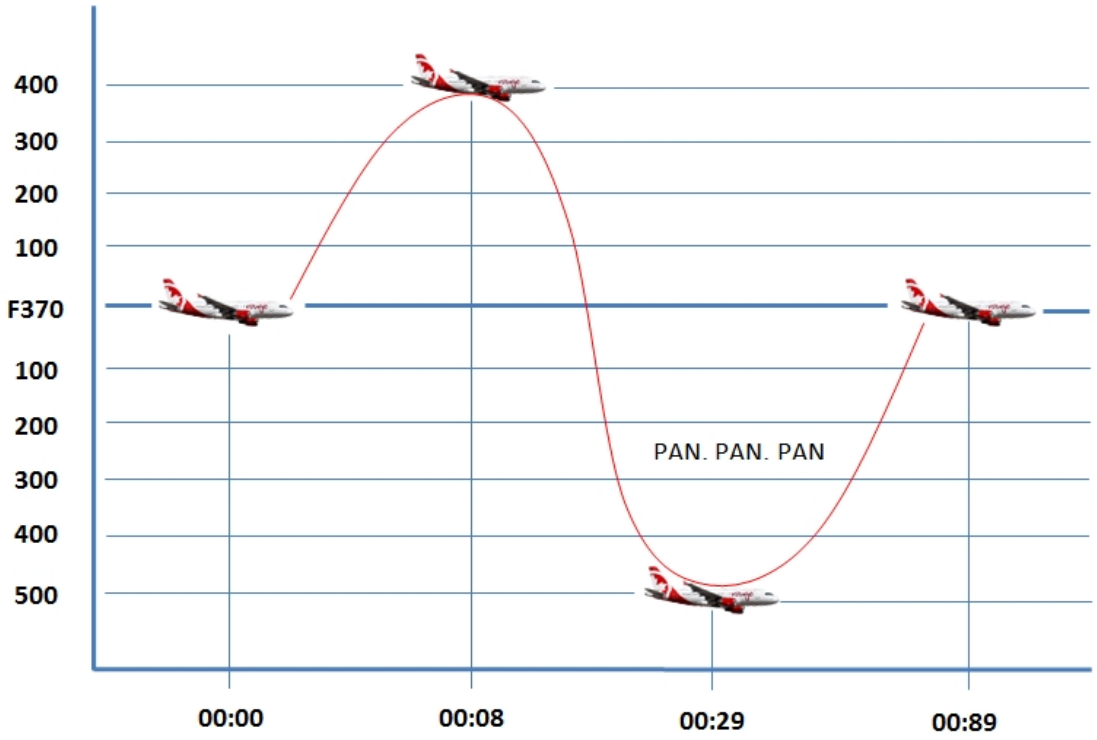
2.3 In none of the reported events did the crew quickly report their vertical deviation to the air traffic control service (SCTA); the latter became aware and advised the crew of the deviation based on the surveillance systems used for the provision of air traffic control services.

2.4 Likewise, in none of the reported events did the VR exceed a value of 20, even in those cases in which another aircraft was involved and in conflict with the deviating aircraft, causing the collision avoidance system (ACARS) to issue a traffic advisory (TA). Likewise, the events in which the aircraft executed very steep vertical deviations (more than 1000 and up to 4000 ft) did not exceed the risk value of 14. According to the current procedure, none of these events has required the implementation of measures, reason why they have only been documented.

2.5 The analysis of the reported events shows that both general aviation and the large airlines of the Region have been affected by these occurrences, and that there are several types of aircraft involved, which shows that this type of LHD event threatens all aircraft and operators that operate in the RVSM airspace of the Region.

2.6 The increasing occurrence of extreme meteorological phenomena caused by climate change that is affecting our planet, poses a serious risk for the safety of air operations and, in these

specific cases, the result is the vertical deviation of aircraft operating in RVSM airspace. As an example, mention is made of the event occurred in the Havana FIR on 11 May 2015, where an A319 aircraft, with registration CGKOB, operated by Air Canada Rouge as flight ROU1804, underwent the following vertical deviation:



2.7 It may be seen how the manoeuvre led the aircraft to first climb and then to descend 300 ft from its cleared flight level (F370), creating a possible conflict with aircraft both above and below, doubling the risk of occurrence of a collision. The fact that the crew reported an "urgent" condition confirms that, if there had been conflicting traffic, this situation would have caused serious difficulties for the execution of an evasive manoeuvre. (For this event, a VR of 18 was calculated).

3 Measures taken

3.1 In view of the foregoing, the ANSP of Cuba decided to adopt the following measures:

- Sharing of LHD experiences among supervisory personnel and controllers of the Havana ACC.
- Publication of safety bulletins with information on LHD events and other safety-related events, where weather was a serious contributing factor.
- Improved coordination procedures between the Havana ACC and the MET services of the Cuban ANSP.
- Training of supervisory personnel and controllers of the Havana ACC on the issuance and decoding of PIREP and SIGMET messages.
- Improved forecasting and surveillance processes of the MET services of the Cuban ANSP.
- Establish the exchange of safety information with aircraft operators involved in I-coded LHDs through the State representative and IATA.

- Pre-planning and adoption of ATFM management measures to guide the flow of aircraft, avoiding bad weather areas.
- Plan the acquisition of a meteorological radar for the Cuban ANSP and to increase the sources in order to obtain updated meteorological information in graphical format.

4 Results obtained

4.1 The implementation of the aforementioned measures resulting in the following:

- Significant increase in the number of I-coded LHDs reported in 2015, providing important information for the analysis of this risk.
- Improved quality and frequency of SIGMETs and PIREPs issued by the Cuban ANSP on meteorological services in the Havana FIR, offering crews the possibility of protecting their aircraft from the hazards of severe meteorological phenomena.

5 Conclusions

5.1 The analysis conducted reveals that in our Region, where air operations have grown in a sustained manner in the last 5 years, and despite the increasing number of increasingly severe meteorological phenomena, the reports of I-coded LHD, especially those related to deviations due to turbulence, are very few and only issued by a few FIRs of the Region.

5.2 Likewise, the method for calculating the VR of these events does not reflect the actual value, since the collision risk is significant because these aircraft, without reporting to the SCTA, deviate from their cleared flight level, and in many occasions, their crews are unable to control the aircraft and thus cannot perform an evasive manoeuvre to avoid any conflicting traffic.

5.3 The experience gained by the Cuban ANSP reveals the importance of having an efficient and highly precise forecasting system, as well as of exchanging and updating meteorological information and its evolution, issuing advisories and alerts as soon as possible, making sure that this information reaches the SCTAs and aircraft operators as soon as possible, so that they can adopt the proper measures to avoid the occurrence of an LHD event.

6 Suggested action

6.1 The Meeting is invited to:

a) Take note of the content of this working paper.

b) Suggest the conduction of training and motivation activities for SCTA personnel and the LHD PoCs of CAR/SAM ANSPs, in order to increase the number of I-coded LHD reports.

c) Suggest to the CARSAMMA RMA that an analysis be conducted and to propose that the VR calculation of I-coded LHDs related to vertical deviations be modified, especially the value of the probability (P), in such a way that its risk value may lead to the adoption of mitigation measures.

d) Suggest to CAR/SAM ANSPs the analysis of their weather forecasting and updating systems to enhance their precision and expedite the issuance of information, and of the

operational coordination procedures between MET and ATS services in order to optimise the exchange of meteorological information.

e) Suggest CAR/SAM ANSPs to provide surveillance-based control services and to ensure that their automated data processing and display systems are equipped with visual and sound alarm systems to alert air traffic controllers when an aircraft leaves the cleared altitude or flight level without permission.

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