ICAO International Civil Aviation Organization
South American Regional Office

INFORMATION PAPER

GTE/19 — IP/12
11/11/19

CAR/SAM Planning and Implementation Regional Group (GREPECAS) Nineteenth Scrutiny Working Group Meeting
(GTE/19)
Barranquilla, Colombia, 18 to 22 November 2019

Agenda Item 5: Other Business

b) Some matters related to GTE

RISK MANAGEMENT OF LARGE HEIGHT DEVIATIONS - AN EXPERIMENTAL ANALYSIS

(Presented by Trinidad and Tobago)

EXECUTIVE SUMMARY

An examination of data associated with Large Height Deviations occurring in the Piarco's airspace for the last 9 years revealed the need for a method of risk management that is suitable for local operations. Elements of the analysis included the most susceptible waypoints, the most vulnerable times to expect an occurrence and the risk factors that made the largest contribution. The study focused on the classification and assessment risks. The results obtained from the simplified version of the analysis corroborated the results of the GTE/18-WP/10 on regional LHD Analysis and is therefore reliable as a guide for localized operations. The role of residual risk at the local level and mitigation strategies opened the way for further investigation.

Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• CARSAMMA Large Height Deviation Form • GTE/18-WP/10 • GTE/12-IP/02 • ICAO Doc 9859

1. Introduction

1.1 Risk management is about reducing or avoiding events that either threaten the safety of operations or magnify the effect of hazards, such as Large Height Deviations (LHDs). Using GTE/12-IP/02 as reference, an attempt was made to take a risk-based approach to the LHD data collected by Trinidad and Tobago from 2009 to 2018 in accordance with the theme of the Workshop. An examination

of the data collected via the CARSAMMA LHD Form revealed the need for a risk methodology that realistically captured the frequency of the deviations and the impact upon Controller workload.

2. Background

2.1 The reference paper (GTE/12-IP/02) classified risks based on the source of the events or the causes of the deviation. It also assessed the likelihood of the risks according to the frequency of the occurrence: from once every 30 years to once daily. Then, a combination of parameters for weather, radar and traffic are added to determine a risk value. But applying these same criteria on a localized level resulted in the minimization of the risks due to the non-availability of data, incomplete reports and sporadic recurrences. The desirable scenario was: a simple way of identifying and assessing risk based on the available data, results that reflected a more comprehensive picture, as well as a method that could be quickly followed and easily repeated. The objective of this experimental study was to develop and demonstrate a risk-based approach to the treatment of LHDs that can be utilized as a starting point and as a stepping stone to finding data-driven solutions.

2.2 Risk events are classified by the type of enterprise and either their sources, or their outcomes. The risk categories for a financial institution will be different for a service oriented organization. The risk categories for a civil aviation regulatory body will differ in comparison to those of an ANSP. Among ANSPs it is possible to have a varying number of risk categories due to differences in scope of functions. For Piarco Area Control Centre (ACC), grouping the LHD scenarios according to the sources of the events yielded at least five possible risk categories:

- **Operational risk -**

  Any unauthorized climb/descent by the pilot.

- **Technical risk -**

  The status of the CNS/ATM equipment at the time of the LHD such as loss of or disruption in service: surveillance or communications due to actual fault, weather effect or other natural disaster.

- **Systemic risk -**

  What situations of the Operational Unit may have contributed to the LHD? (Systemic refers to the sum effect of a combination of risk factors upon the system of operations).

  From Piarco's data, the following have been categorized as Systemic risks: training, handovers, combined sectors, and traffic levels.

- **Non Systemic risk -**

  This term can be used to describe the risk factors that are associated with human resources. We are familiar with the LHD human factors: hear-back, read-back and incomplete or lapsed coordination. From the data, other human factors included non-standard use of equipment.

- **Unusual/ Other -**

  This category comprised reports with unusual weather, and malfunction of a component of pilot instruments.

2.3 Before setting mitigation strategies to avoid or reduce risks, the situation must be assessed to determine the levels of risk present. These levels are quantified according to the objectives of the study. They have been represented by actual numbers or comparative values indicating the likelihood of occurrence based on the severity of the risk. Severity usually comprises a range of outcomes depending on the scope of functions.

2.4 For Piarco ACC, the number of days between each reported occurrence determined the levels of frequency or the likelihood of the LHD recurring. The extent of the compromise to the safety of air traffic control operations represented the severity of the risks so as to maintain the simplicity of the analysis and to remain within the limits of the data that was available.

2.5 Consideration was also given to the number of risk categories present at the time of the LHD, as well as the presence of conflicting traffic plus the density of traffic. The risk level was quantified as the product of the frequency and severity of the risks.

2.6 LHDs associated with Piarco FIR have been on a steady decline with a recurrence rate of 5-9 LHDs every 6 months (Graph I on **Appendix A**) for the period 2009 to 2018.

2.7 Positions TRAPP, ANADA and MINDA seemed more susceptible to deviations (Graph II) which corroborated the results of the regional analysis for the last period (GTE/18-WP/10).

2.8 The most vulnerable time for LHD occurrences was just after the handover for the evening shift (Graph III).

2.9 The risk classification showed the distribution of LHDs (Graph IV) by risk category; while the assessment matrix (Graph V) displayed the spread and quantification of the risk levels based on the number of risk factors present and the yearly recurrence.

2.10 The box plot in Graph VI was an indirect evaluation of the mitigation efforts by examining the number of days between LHDs. The "waxing and waning effect" is typified for service oriented organizations and represented the impact of residual risk.

2.11 The tree in **Appendix B** summarized the steps for a simplified risk analysis that an ANSP may follow consistently and use as a stepping stone to advance levels of risk management.

2.12 The results of this study paves the way for further research and interesting conversations - a step in the direction of truly walking the path of risk management toward creating a data-driven Safety system.

3. Suggested Actions

3.1 The Meeting is invited to note the information contained in this Information Paper.

APPENDIX A

Graph I

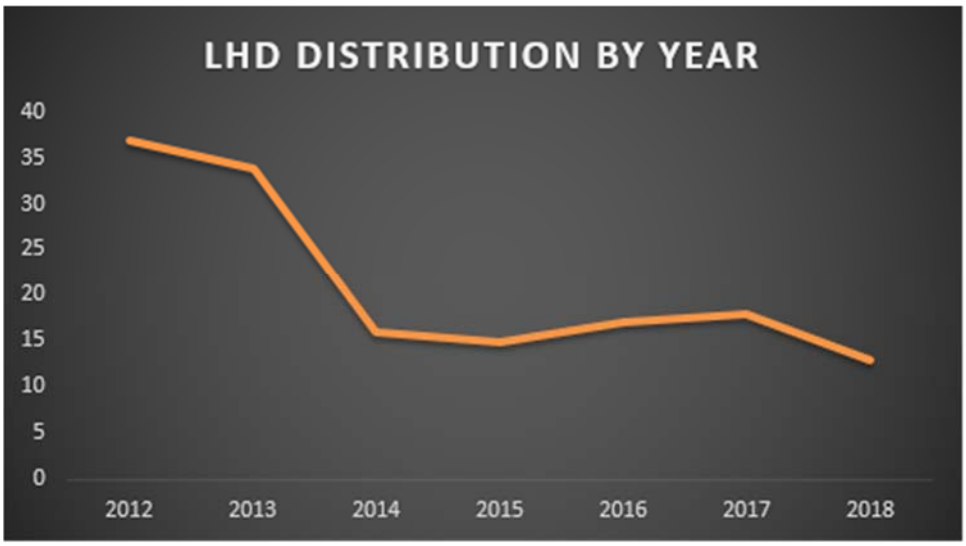


Figure 1: LHD Occurrences generated and suffered by Piarco ACC from 2012 to 2018

Graph II

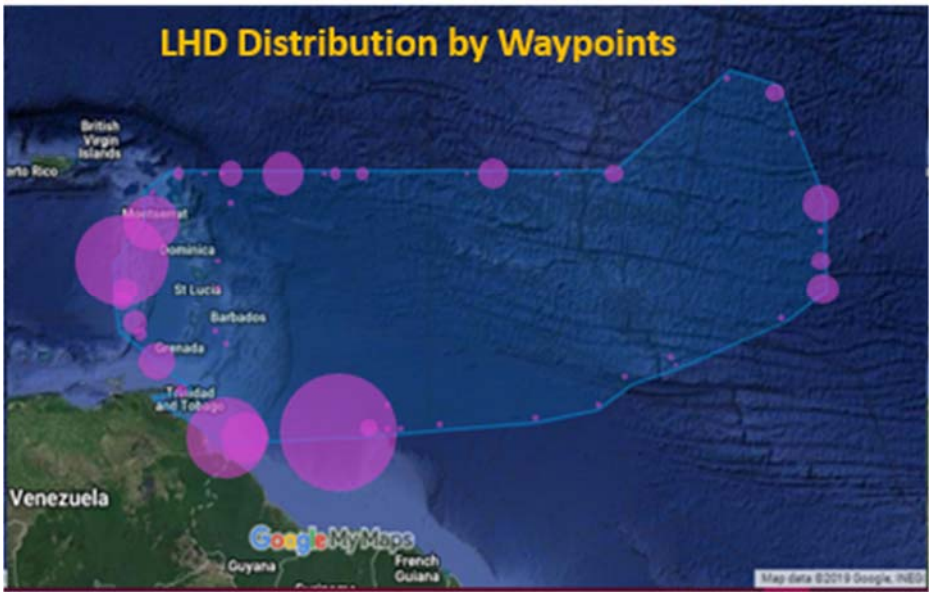


Figure 2: Most susceptible Positions. Figure not drawn to scale
***Note:** The intent is to show hot spots of LHD Occurrences on the Piarco FIR boundary from 2012 to 2018*

Graph III

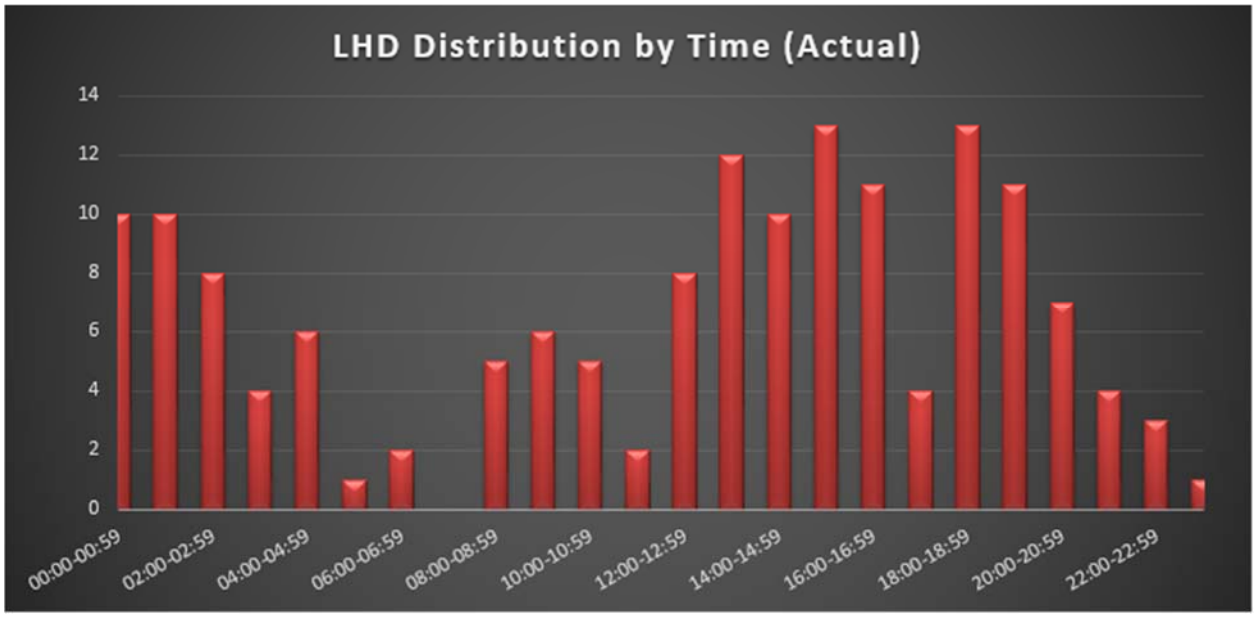


Figure 3: Most vulnerable times of LHD Occurrences during a 24 hour period

Graph IV

Figure 4: Risk classification for the ANSP

Graph V

RISK ASSESSMENT MATRIX - LHDS							
Risk Frequency		Risk Severity - Compromise to Safe Operations					Total (=%)
		Highly Significant	Less Significant	Major	Moderate	Minor/Lack of Info	
		>3 risks present with conflicting Tfx	>3 risks present no conflicting Tfx	3 risks present	2 risks present	0-1 risk present	
		A	B	C	D	E	
Once weekly or 5-7 days	5	9	7	19	42	6	26
Twice monthly or once in 10 days	4	1	3	11	24	1	
Once monthly or every 3 weeks	3	1	0	6	12	1	68
Once in 2 months or 6-8 weeks	2	1	1	1	3	1	
Quarterly or less per year	1	0	1	3	2	0	6

Figure 5: Risk assessment

Graph VI

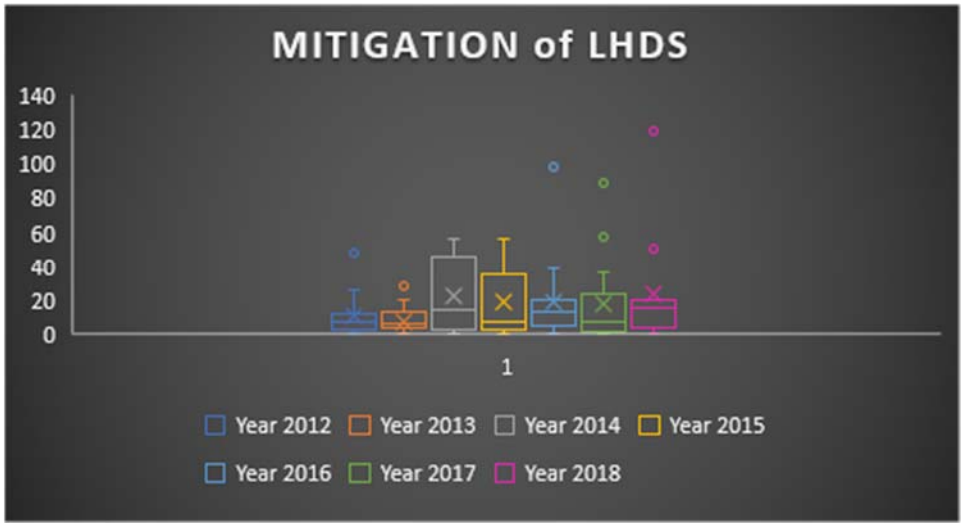
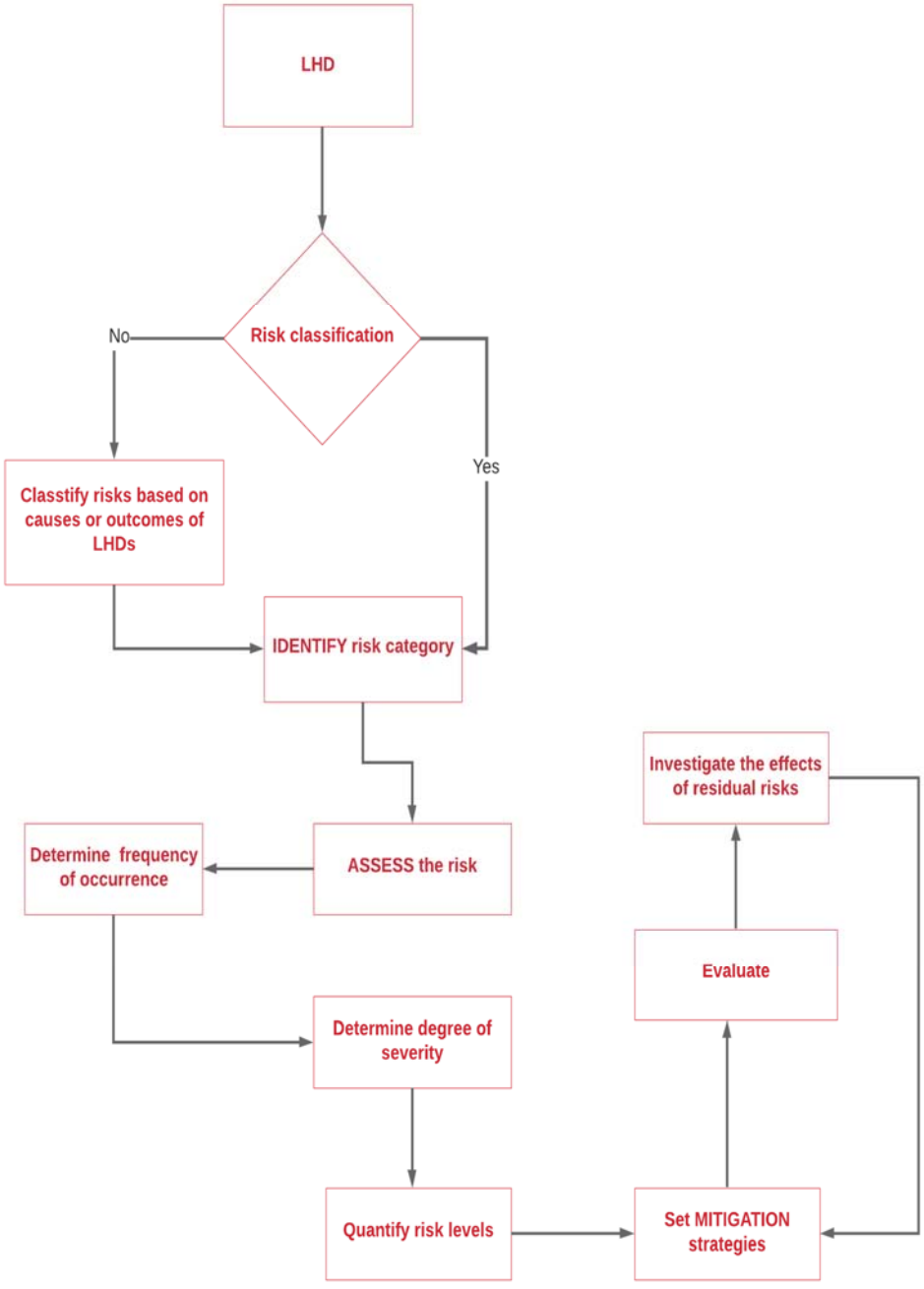


Figure 6: Effects of mitigation

APPENDIX B

Risk Analysis Tree



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