International Civil Aviation Organization

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Agenda Item 3: Reports from Asia/Pacific RMAs and EMAs

RVSM RISK ASSESSMENT IN THE BRISBANE, HONIARA, MELBOURNE, NAURU, AND PORT MORESBY FLIGHT INFORMATION REGIONS

1 JANUARY 2020 TO 31 DECEMBER 2020

(Presented by AAMA)

SUMMARY

This paper presents an airspace Safety Review of RVSM airspace risk in the Brisbane, Honiara, Melbourne, Nauru, and Port Moresby Flight Information Regions (FIRs) for the period 1 January 2020 to 31 December 2020. The risk meets the Target Level of Safety (TLS) of 5.0 x 10^{-9} fatal accidents per flight hour (fapfh). A brief quantitative assessment of the safety reporting culture is also conducted.

1. INTRODUCTION

1.1 This report provides an airspace Safety Review of RVSM airspace risk in the Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for the period 1 January 2020 to 31 December 2020. The review is undertaken using a 12 month data sample period.

1.2 All airspace safety estimates and TLS values in this report are measured in terms of fatal accidents per flight hour (fapfh).

1.3 The estimated risk is compared to the TLS of no more than 2.5 x 10^{-9} for the technical component of the risk, and 5.0 x 10^{-9} for the total weighted risk.

2. DISCUSSION

Data Sources

2.1 *Traffic Sample Data (TSD):* TSD covering four weeks of the month of December 2020 of aircraft operating in the Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs was used as required by ICAO Regional agreement.

2.2 *Large Height Deviations (LHDs):* A cumulative 12 month data set of LHD reports was used, covering 1 January 2020 to 31 December 2020. All FIRs submitted LHD reports for all 12 months, including nil returns.

Summary of LHD Occurrences

2.3 The number of reported LHD occurrences, non-zero-duration LHDs, total LHD duration (in minutes), and total number of levels crossed for the period 1 January 2020 to 31 December 2020 are shown by month in **Table 1**.

Month	Number of reported LHDs	Number of non-zero-duration LHDs	LHD duration (minutes)	Number of levels crossed
January 2020	10	2	1	0
February 2020	6	1	0	1
March 2020	6	1	0.5	0
April 2020	0	0	0	0
May 2020	3	1	0.5	0
June 2020	3	1	0.5	0
July 2020	3	0	0	0
August 2020	5	2	1	0
September 2020	0	0	0	0
October 2020	2	2	0	2
November 2020	3	2	0.5	1
December 2020	5	2	0.5	1
Total	**46**	**14**	**4.5**	**5**

Table 1: Summary of LHD occurrences by month for the period 1 January 2020 to 31 December 2020.

2.4 The number of non-zero-duration LHDs, their duration in minutes, and the number of levels crossed for the period 1 January 2020 to 31 December 2020 are shown by month in **Figure 1**.

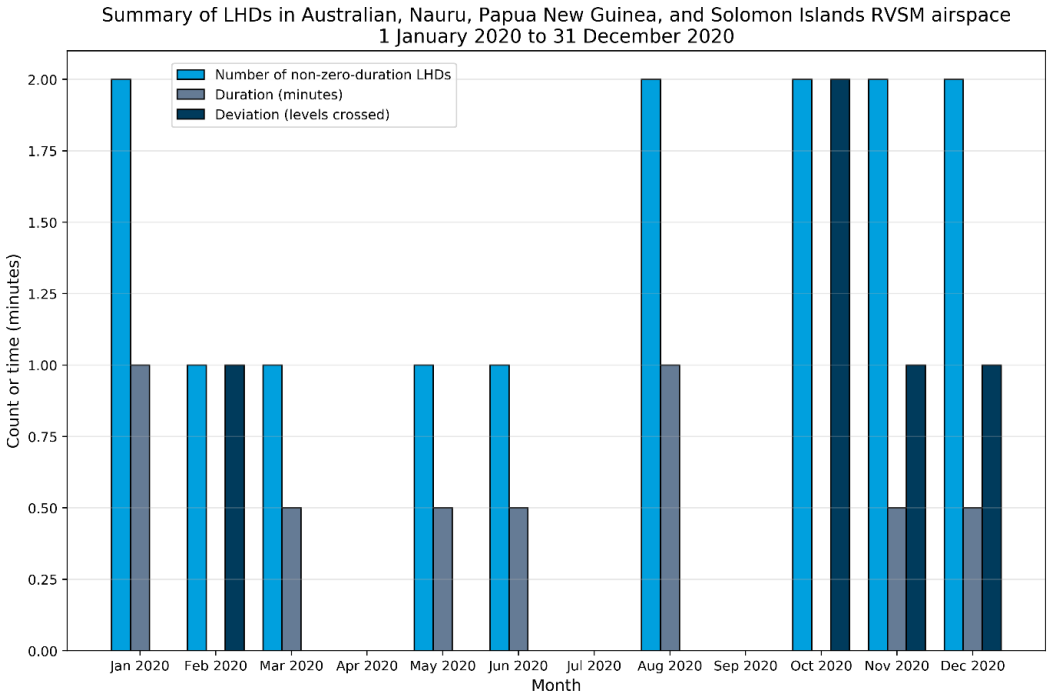

Figure 1: Number of LHDs, duration of LHDs, and number of levels crossed by month for the period 1 January 2020 to 31 December 2020.

2.5 The number of non-zero-duration LHDs, total LHD duration (in minutes), and total number of levels crossed for the period 1 January 2020 to 31 December 2020 are shown by LHD category in **Table 2** and **Figure 2**.

LHD category	LHD category description	Number of non-zero-duration LHDs	Duration of LHDs (minutes)	Number of levels crossed
A	Flight crew failing to climb/descend the aircraft as cleared	1	0	1
B	Flight crew climbing/descending without ATC clearance	7	2	3
C	Incorrect operation or interpretation of airborne equipment	0	0	0
D	ATC system loop error	1	0.5	0
E	Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of human factors issues	2	1	0
F	Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of equipment outage or technical issues	0	0	0
G	Deviation due to aircraft contingency event leading to sudden inability to maintain assigned flight level	1	0.5	0
H	Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level	1	0.5	0
I	Deviation due to turbulence or other weather related cause	1	0	1
J	Deviation due to TCAS resolution advisory; flight crew correctly following the resolution advisory	0	0	0
K	Deviation due to TCAS resolution advisory; flight crew incorrectly following the resolution advisory	0	0	0
L	An aircraft being provided with RVSM separation is not RVSM approved	0	0	0
M	Other	0	0	0
Total		**14**	**4.5**	**5**

Table 2: Summary of LHD occurrences by category for 1 January 2020 to 31 December 2020.

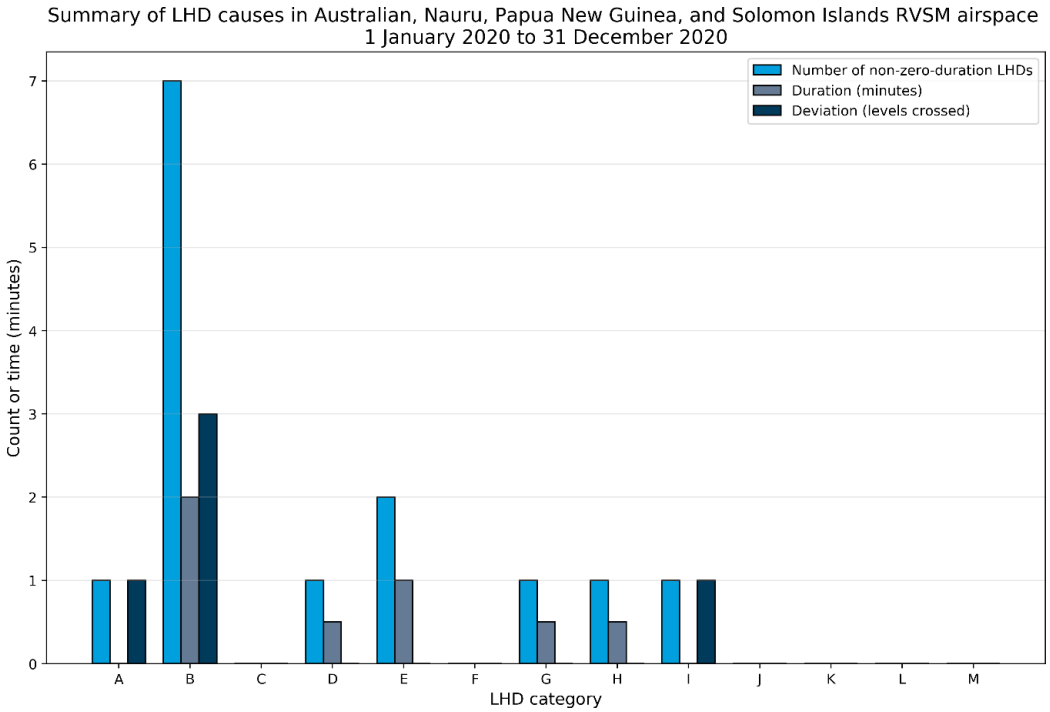

Figure 2: Number of LHDs, duration of LHDs, and number of levels crossed by LHD category for the period 1 January 2020 to 31 December 2020.

Collision Risk Estimate

2.6 The results for the technical, operational, and total risk for the RVSM implementation in Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for 1 January 2020 to 31 December 2020 are detailed in **Table 3**. The technical risk meets the TLS value of no more than 2.5 x 10^{-9}. The operational and weighted total risk meets the specified TLS value for these components of 5.0 x 10^{-9}.

Source of risk	Risk estimate	TLS	Comparison with TLS
Technical risk	0.016 x 10^{-9}	2.5 x 10^{-9}	Below technical TLS
Operational risk	0.001 x 10^{-9}	-	-
Total risk	**0.017 x 10^{-9}**	**5.0 x 10^{-9}**	**Below total TLS**

Table 3: RVSM Risk Estimates for the period 1 January 2020 to 31 December 2020. The number of estimated annual flying hours is 398,424 based on the December 2020 TSD.

2.7 The trends of the technical risk, operational risk, and total risk for the period 1 January 2020 to 31 December 2020 are shown in **Figure 3**.

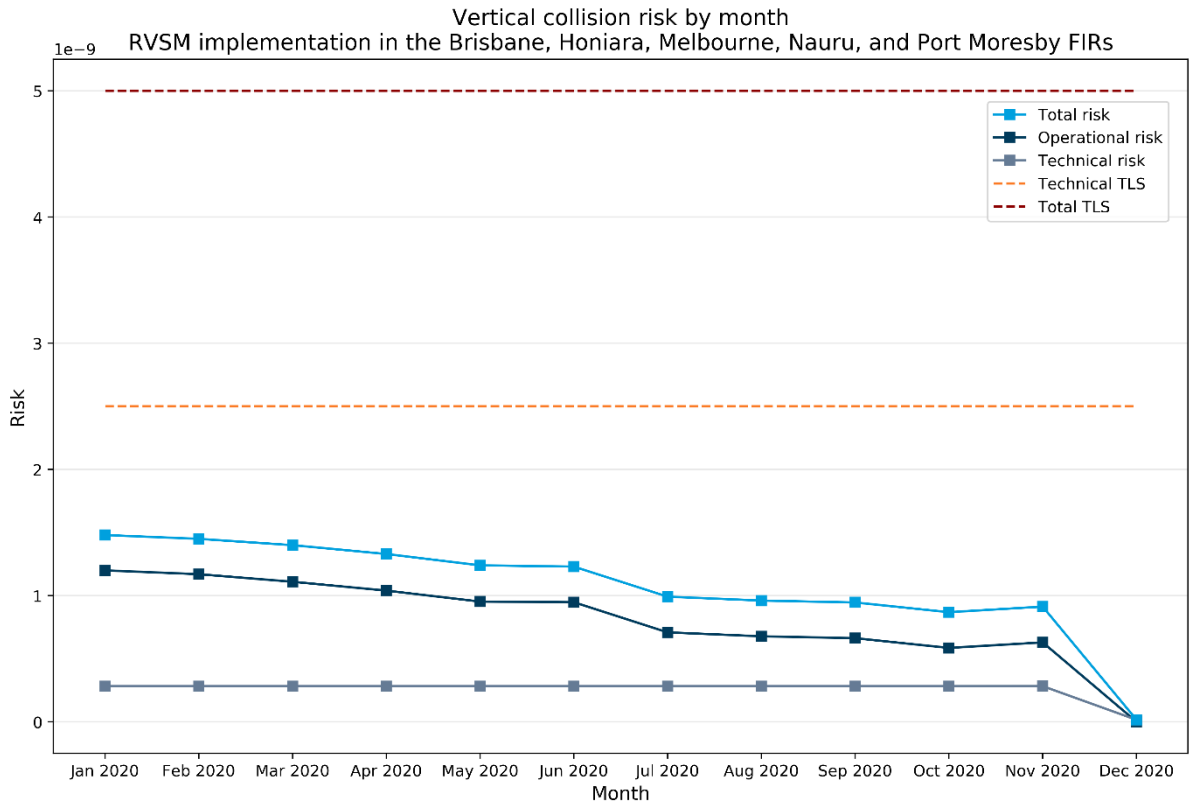

Figure 3: Trends of the technical, operational, and total risk for the period 1 January 2020 to 31 December 2020.

Assessment of Safety Reporting Culture

2.8 The 7th Meeting of the Monitoring Agencies Working Group (MAWG/7) proposed that Regional Monitoring Agencies (RMAs) assess States' reporting culture, since the RVSM risk assessment is dependent on the accuracy and quality of the LHD reports received.

2.9 MAWG/7 proposed that the reporting safety culture metric would be measured by the reporting rate of occurrence per flight hour, with occurrences grouped by attribution: Pilot/Aircrew (category A, B, and C), ATC (category D, E, and F), and others (categories G, H, I, J, K, L, and M). The safety culture metric for Australia, Nauru, Papua New Guinea, and Solomon Islands is shown in **Table 4**.

Table 4: Safety culture metric for Australia, Nauru, Papua New Guinea, and Solomon Islands by LHD attribution for the period 1 January 2020 to 31 December 2020.

Attribution	Number of reports	Flight hours	Number of reports per flight hour (x 10^{-5})
Pilot/Aircrew (A, B, C)	16	398,424	4.02
ATC (D, E, F)	21	398,424	5.27
Other	9	398,424	2.26
Total	**46**	**398,424**	**11.5**

2.10 Reports were consistently made by both pilots and ATC.

2.11 LHDs with ATC attribution were the most widely reported. This is a sign of a positive reporting culture, especially if ATC are comfortable reporting on their own errors as part of a 'Just Culture' framework.

2.12 Of the 21 ATC-attributed reports received, 11 reports corresponded to errors made by neighbouring ATCs, and 10 reports were made concerning internal coordination or system loop errors. This means ATC are only marginally more likely to submit a report when a neighbouring ATC made the error.

Geolocation of LHDs

2.13 A map identifying the geographic location of LHD occurrences for the period 1 January 2020 to 31 December 2020 is shown in **Figure 5**. The occurrences at each location are represented by a coloured circle, with the radius proportional to the total risk at that location. The map is intended to provide a means to identify and visualise risk hot spots related to RVSM operations.

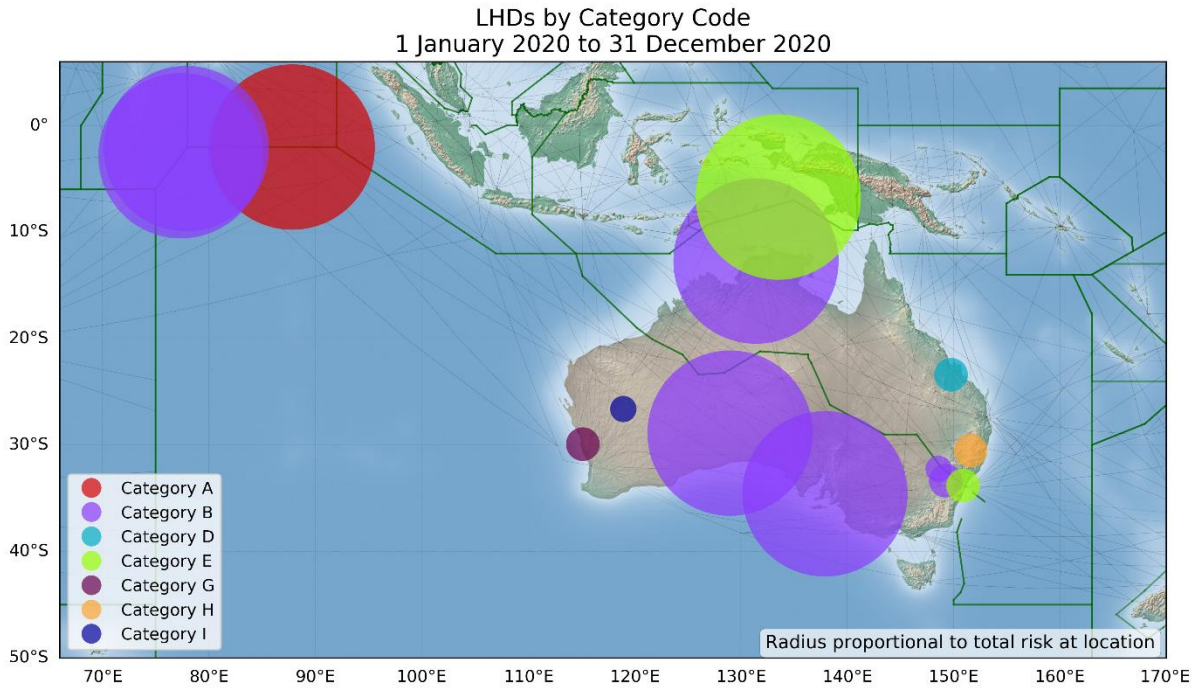

Figure 5: Geolocation of LHDs for Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for the period 1 January 2020 to 31 December 2020.

Summary Discussion

2.14 The risk has decreased significantly since the value reported at 8th Meeting of the Monitoring Agencies Working Group (MAWG/8), for the same time period, because the current risk analysis uses collision risk parameters calculated from the TSD in December 2020. This TSD is more indicative of traffic levels during the COVID-19 pandemic than the TSD used for previous calculations (December 2018 TSD). Although the estimated flight hours have decreased, parameters associated with route occupancy have also decreased significantly, resulting in a decrease in airspace risk.

2.15 The total risk has decreased further in December 2020 because a 95-minute occurrence in December 2019, involving a military formation being provided with RVSM separation while RVSM separation was not approved, is no longer included in the rolling 12 month data set.

2.16 There were nil reports in April and September 2020. In addition, all reports in July 2020 were assessed as zero-duration (**Table 1**). These results are likely due to a decrease in traffic as a result of the COVID-19 pandemic and contribute to the low risk values.

2.17 The majority of LHDs were in the ATC attribution group (category A, B, or C). In particular, seven of a total of 14 occurrences (50%) were category B (Flight crew climbing/descending without ATC clearance).

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

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