International Civil Aviation Organization

Twenty-Eighth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/28)

Bangkok, Thailand, 21 – 24 August 2023

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 2022 TO 31 DECEMBER 2022

(Presented by Australian Airspace Monitoring Agency)

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 2022 to 31 December 2022. 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.

Results show a technical risk of 0.077 x 10^{-9}, an operational risk of 1.42 x 10^{-9} and a total risk of 1.50 x 10^{-9}, all below the TLS.

A large increase in Category E LHDs and an increase in LHDs reported in November and December 2022 were identified.

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 2022 to 31 December 2022. 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.

1.4 The AAMA is revising our process of estimating collision risk modelling (CRM) parameters from the TSD, leading to more accurate results, along with more efficient calculations of the risk. This leads to slightly different risk values as that reported in previous meetings.

1.5 The results indicate risk below the TLS. There is a large increase in Category E LHDs (32) compared with the previous period in 2021 (15).

2. DISCUSSION

Data Sources

2.1 *Traffic Sample Data (TSD):* TSD covering four weeks of the month of December 2021 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 2022 to 31 December 2022. 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 2022 to 31 December 2022 are shown by month in **Table 1** with unusual values highlighted. The number of reported LHDs, duration, and levels crossed are shown in **Figure 1**.

Month	Number of reported LHDs	Number of non-zero-duration LHDs	LHD duration (minutes)	Number of levels crossed
2022				
January	4	1	1	0
February	0	0	0	0
March	6	0	0	0
April	7	5	6.5	0
May	3	2	4	0
June	6	4	4	0
July	3	2	2	0
August	8	4	8	0
September	6	3	2.5	0
October	5	2	2	0
November	14	6	6	0
December	12	4	4	0
Total	**74**	**33**	**40**	**0**

Table 1: Summary of LHD occurrences by month for the period 1 January 2022 to 31 December 2022. Unusual values are highlighted.

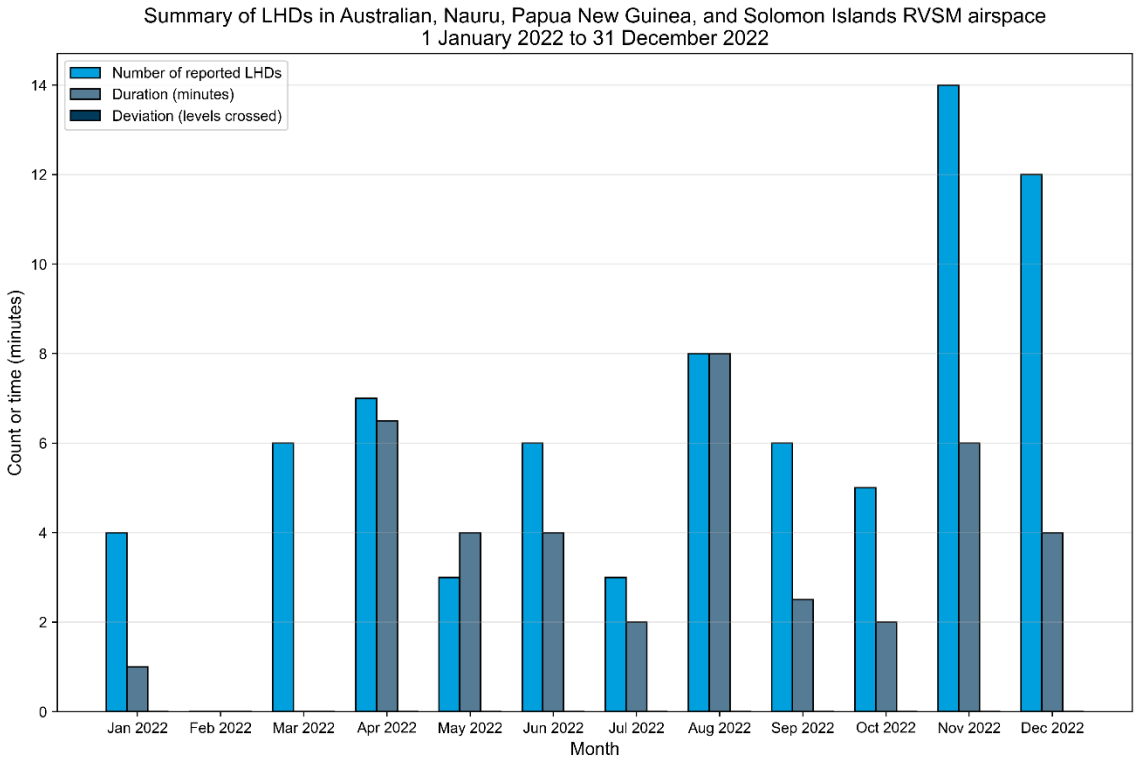

Figure 1: Number of LHDs, duration of LHDs, and number of levels crossed by month for the period 1 January 2022 to 31 December 2022. In this graph, the third category (Deviation, levels crossed) is zero for all months.

2.4 The number of reported LHDs, total LHD duration (in minutes), and total number of levels crossed for the period 1 January 2022 to 31 December 2022 are shown by LHD category in **Table 2** and **Figure 2**.

LHD category	LHD category description	Number of reported LHDs	Duration of LHDs (minutes)	Number of levels crossed
A	Flight crew failing to climb/descend the aircraft as cleared	8	14.5	0
B	Flight crew climbing/descending without ATC clearance	11	10	0
C	Incorrect operation or interpretation of airborne equipment	11	0	0
D	ATC system loop error	5	6	0
E	Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of human factors issues	32	6	0
F	Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of equipment outage or technical issues	1	0	0
G	Deviation due to aircraft contingency event leading to sudden inability to maintain assigned flight level	0	0	0
H	Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level	0	0	0
I	Deviation due to turbulence or other weather-related cause	4	2.5	0
J	Deviation due to TCAS resolution advisory; flight crew correctly following the resolution advisory	2	1	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		**74**	**40**	**0**

Table 2: Summary of LHD occurrences by category for 1 January 2022 to 31 December 2022.

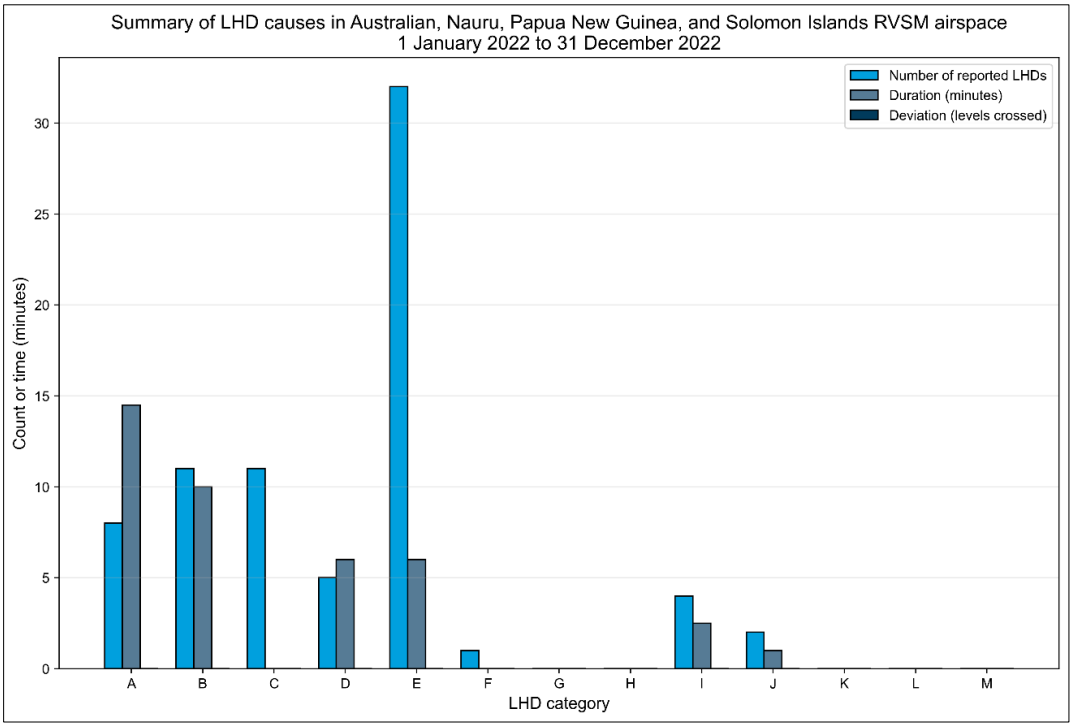

Figure 2: Number of LHDs, duration of LHDs, and number of levels crossed by LHD category for the period 1 January 2022 to 31 December 2022.

Category E LHD Occurrence Trend

2.5 There is a large increase in Category E LHDs (32) compared with the previous period in 2021 (15). The majority of the Category E LHDs (31) primary occurrence type are Information Errors. Approx half (16) are voice delivery information errors. These are spread evenly across the year with spikes in March (5), November (6) and December (7).

2.6 The number of reported Category E LHDs, total Category E LHD duration (in minutes), and total number of levels crossed for the period 1 January 2022 to 31 December 2022 are shown in **Figure 3.**

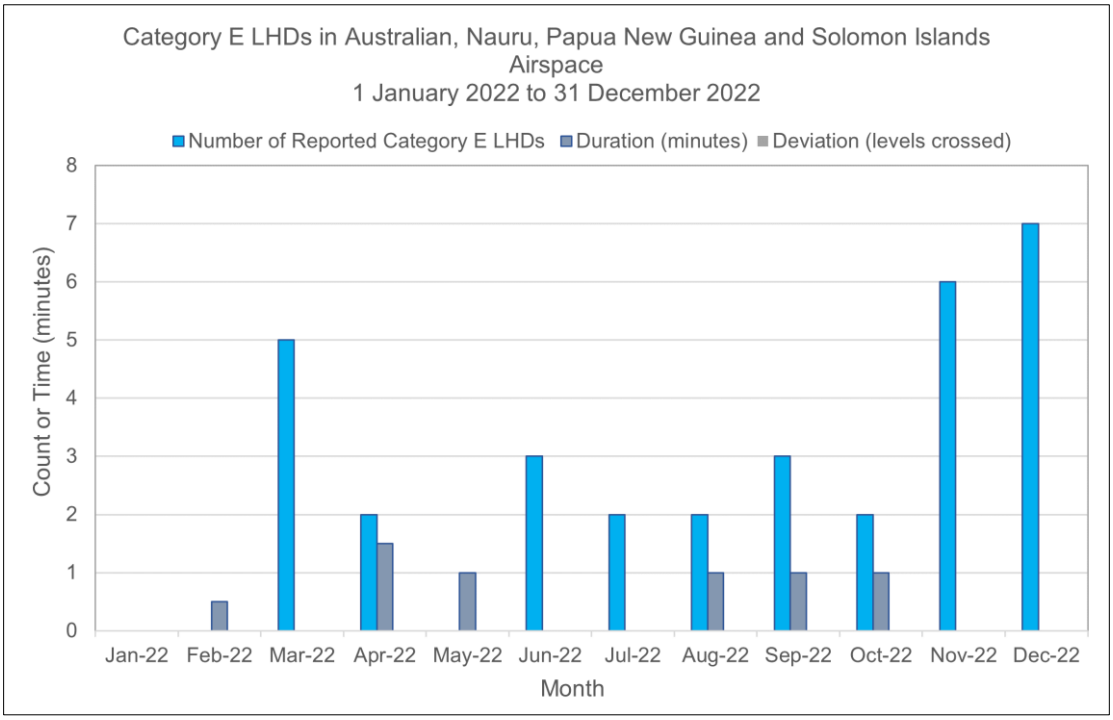

Figure 3: Number of Category E LHDs, duration of Category E LHDs, and number of levels crossed for the period 1 January 2022 to 31 December 2022. In this graph, the third category (Deviation, levels crossed) is zero for all months.

Collision Risk Estimate

2.7 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 2022 to 31 December 2022 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	0.077 x 10^{-9}	2.5 x 10^{-9}	Below technical TLS
Operational risk	1.42 x 10^{-9}	-	-
Total risk	**1.50 x 10^{-9}**	**5.0 x 10^{-9}**	**Below total TLS**

Table 3: RVSM Risk Estimates for the period 1 January 2022 to 31 December 2022. The number of estimated annual flying hours is 443,496 based on the December 2021 TSD.

2.8 The trends of the technical risk, operational risk, and total risk for the period 1 January 2022 to 31 December 2022 are shown in **Figure 4**.

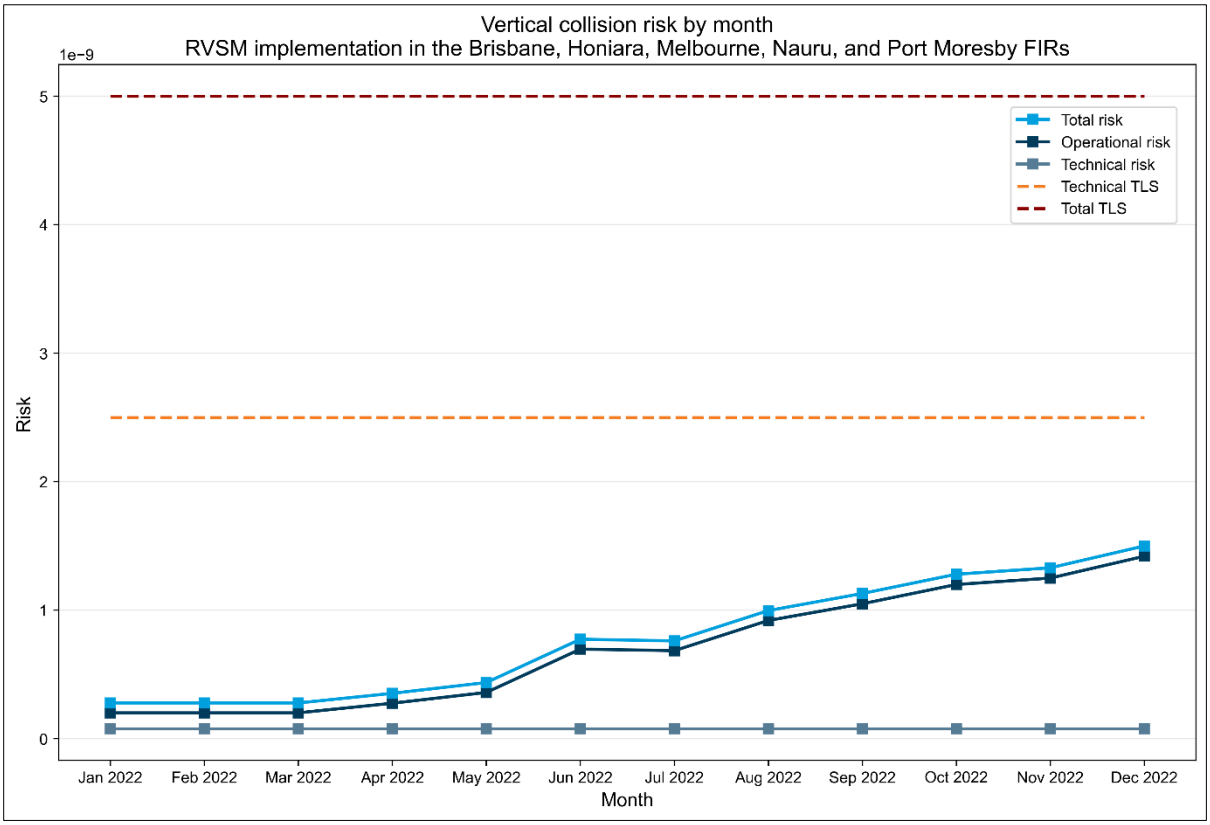

Figure 4: Trends of the technical, operational, and total risk for the period 1 January 2022 to 31 December 2022.

Assessment of Safety Reporting Culture

2.9 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.

2.10 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 (Categories A, B, and C), ATC (Categories 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**. Reports were consistently made by both pilots and ATC.

Attribution	Number of reports	Flight hours	Number of reports per flight hour (x 10^{-5})
Pilot/Aircrew (A, B, C)	30	443,496	6.76
ATC (D, E, F)	38	443,496	8.56
Other	6	443,496	1.35
Total	**74**	**443,496**	**16.7**

Table 4: Safety culture metric for Australia, Nauru, Papua New Guinea, and Solomon Islands by LHD attribution for the period 1 January 2022 to 31 December 2022.

2.11 LHDs with Pilot/Aircrew and ATC attribution were equally reported. A high rate of reporting of occurrences with ATC attribution is an indication 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 38 ATC-attributed reports received, 14 reports corresponded to errors made by neighbouring ATCs, 19 corresponded to errors made by Australian or Port Moresby ATC, and the remaining 5 corresponded to internal coordination or system loop errors. Thus, ATC were roughly equally likely to report an occurrence regardless of which or not the unit making the error was external.

Geolocation of LHDs

2.13 A map identifying the geographic location of LHD occurrences for the period 1 January 2022 to 31 December 2022 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.

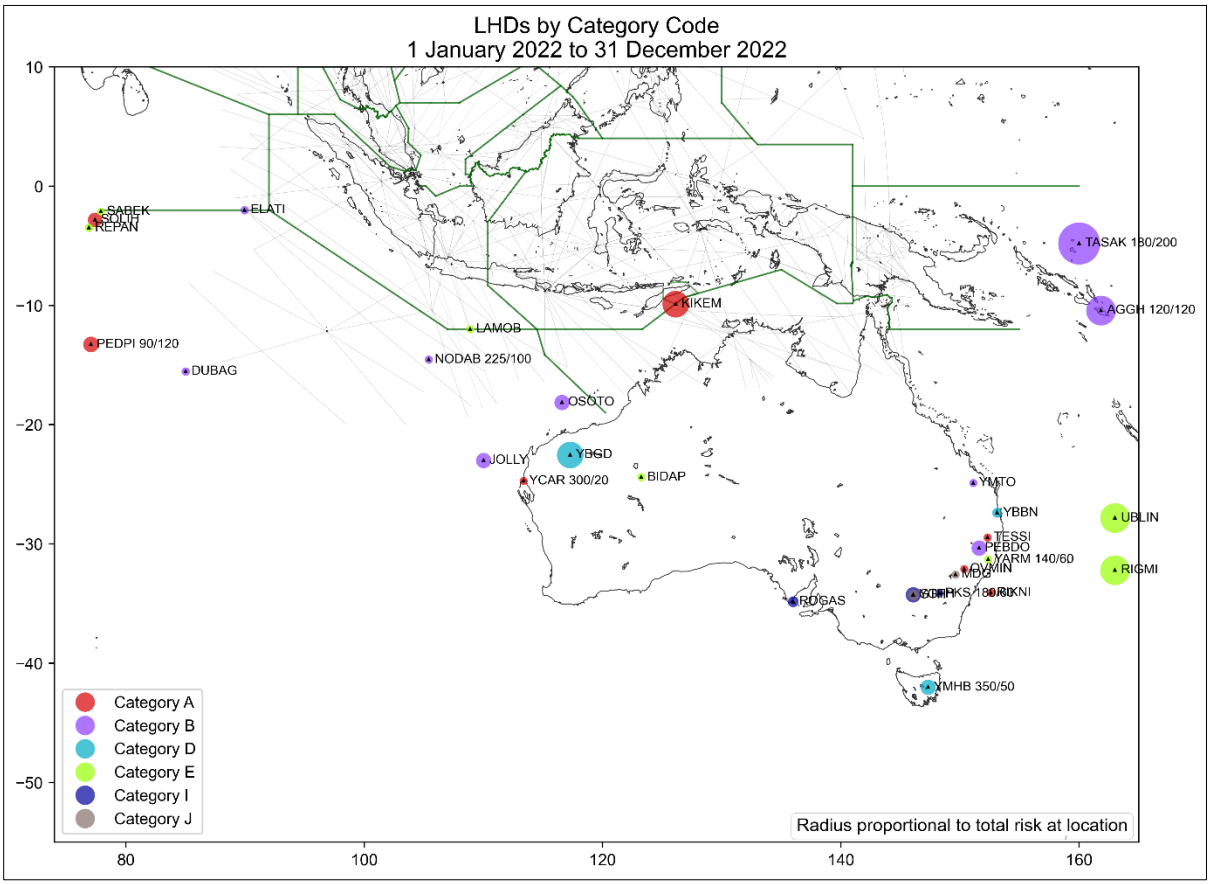

Figure 5: Geolocation of LHDs for Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for the period 1 January 2022 to 31 December 2022.

Summary and Discussion

2.14 The risk has decreased since the value reported for the period 1 January 2020—31 December 2021 at the 27th Meeting of the RASMAG (RASMAG/27) in August 2022. This is partially because AAMA has revised our process of estimating collision risk modelling (CRM) parameters from the TSD, leading to more accurate results. In addition, traffic levels generally increased in 2022 compared to 2020 and early 2021. This is particularly true for domestic traffic in Australia.

2.15 The months of June to December 2022 exhibited a gradual increase in risk, but the total risk was still well below the TLS.

2.16 There is a large increase in Category E LHDs (32) compared with the previous period in 2021 (15). The majority of the Category E LHDs (31) primary occurrence type are Information Errors. Approximately half (16) are voice delivery information errors. These are spread evenly across the year with spikes in November (6) and December (7).

2.17 The highest-risk occurrence in the rolling 12-month sample occurred at TASAK, in June 2022. It involved an international aircraft climbing without a clearance prior to crossing the KZAK FIR. The event was assessed as 2 minutes duration before a resolution was reached between Moresby, Honiara and Oakland ATC.

2.18 In the period 1 January 2022—31 December 2022, the number of LHDs with Aircrew/Pilot attribution, 30, was lower than the number of LHDs with ATC attribution, at 38. Category E occurrences (coordination errors as a result of human factors issues) were most prevalent at 32.

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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