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Monitoring Advisory Group (RASMAG/27)

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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 2021 TO 31 DECEMBER 2021**

(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 2021 to 31 December 2021. The risk meets the Target Level of Safety (TLS) of  $5.0 \times 10^{-9}$  fatal accidents per flight hour (fafh). A brief quantitative assessment of the safety reporting culture is also conducted.

Results show a technical risk of  $0.091 \times 10^{-9}$ , an operational risk of  $1.64 \times 10^{-9}$  and a total risk of  $1.73 \times 10^{-9}$ , all below the TLS.

A single LHD of 60 minutes duration in December was identified but calculated to not contribute significantly to the risk.

**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 2021 to 31 December 2021. 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 (fafh).

1.3 The estimated risk is compared to the TLS of no more than  $2.5 \times 10^{-9}$  for the technical component of the risk, and  $5.0 \times 10^{-9}$  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. A large increase in LHD duration for December 2021 was due to one LHD assessed as Category L (aircraft being provided with RVSM separation is not RVSM approved), which was assessed as 60 minutes duration. The event involved a domestic aircraft correctly flight planning with negative RVSM. When the pilot was questioned by ATC, they incorrectly advised that the aircraft was RVSM approved. The aircraft was subsequently provided with RVSM separation for 60 minutes, including an incorrect handover between internal sectors.

## 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.

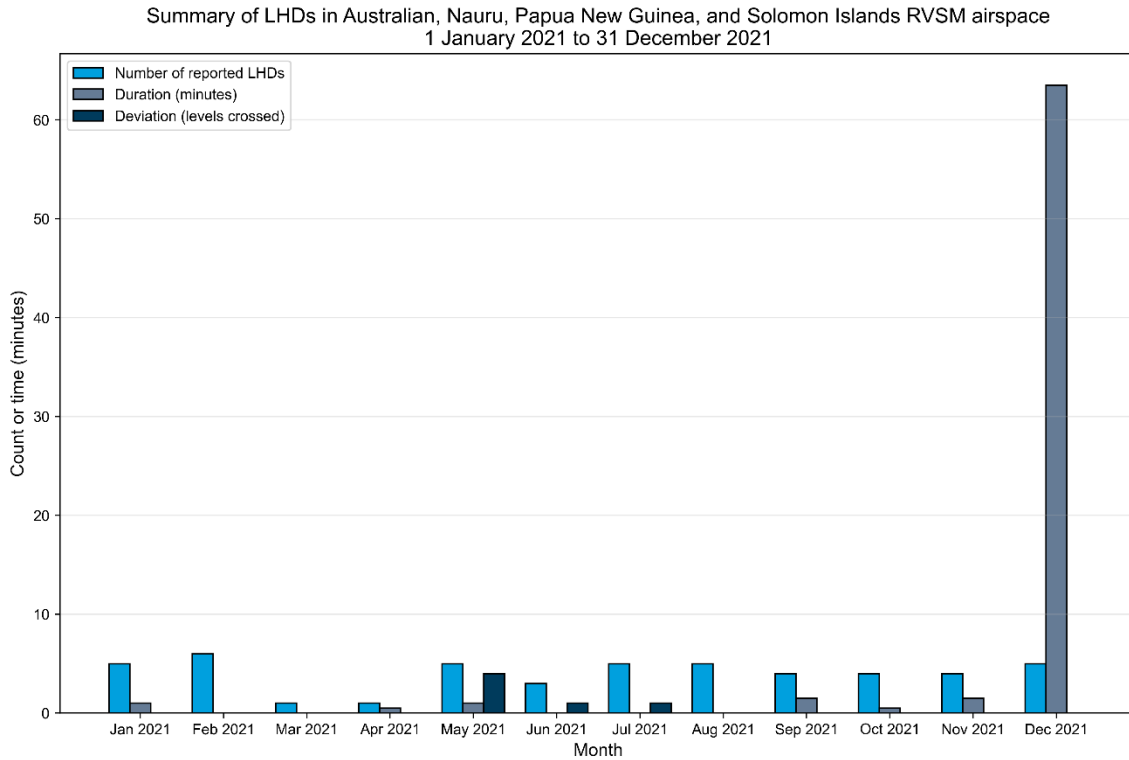
2.2 *Large Height Deviations (LHDs)*: A cumulative 12 month data set of LHD reports was used, covering 1 January 2021 to 31 December 2021. All FIRs submitted LHD reports for all 12 months, including nil returns.

### 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 2021 to 31 December 2021 are shown by month in **Table 1**. 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 |
|--------------|-------------------------|----------------------------------|------------------------|--------------------------|
| <b>2021</b>  |                         |                                  |                        |                          |
| January      | 5                       | 2                                | 1                      | 0                        |
| February     | 6                       | 0                                | 0                      | 0                        |
| March        | 1                       | 0                                | 0                      | 0                        |
| April        | 1                       | 1                                | 0.5                    | 0                        |
| May          | 5                       | 4                                | 1                      | 4                        |
| June         | 3                       | 1                                | 0                      | 1                        |
| July         | 5                       | 1                                | 0                      | 1                        |
| August       | 5                       | 0                                | 0                      | 0                        |
| September    | 4                       | 3                                | 1.5                    | 0                        |
| October      | 4                       | 1                                | 0.5                    | 0                        |
| November     | 4                       | 2                                | 1.5                    | 0                        |
| December     | 5                       | 3                                | 63.5                   | 0                        |
| <b>Total</b> | <b>48</b>               | <b>18</b>                        | <b>69.5</b>            | <b>6</b>                 |

**Table 1:** Summary of LHD occurrences by month for the period 1 January 2021 to 31 December 2021.



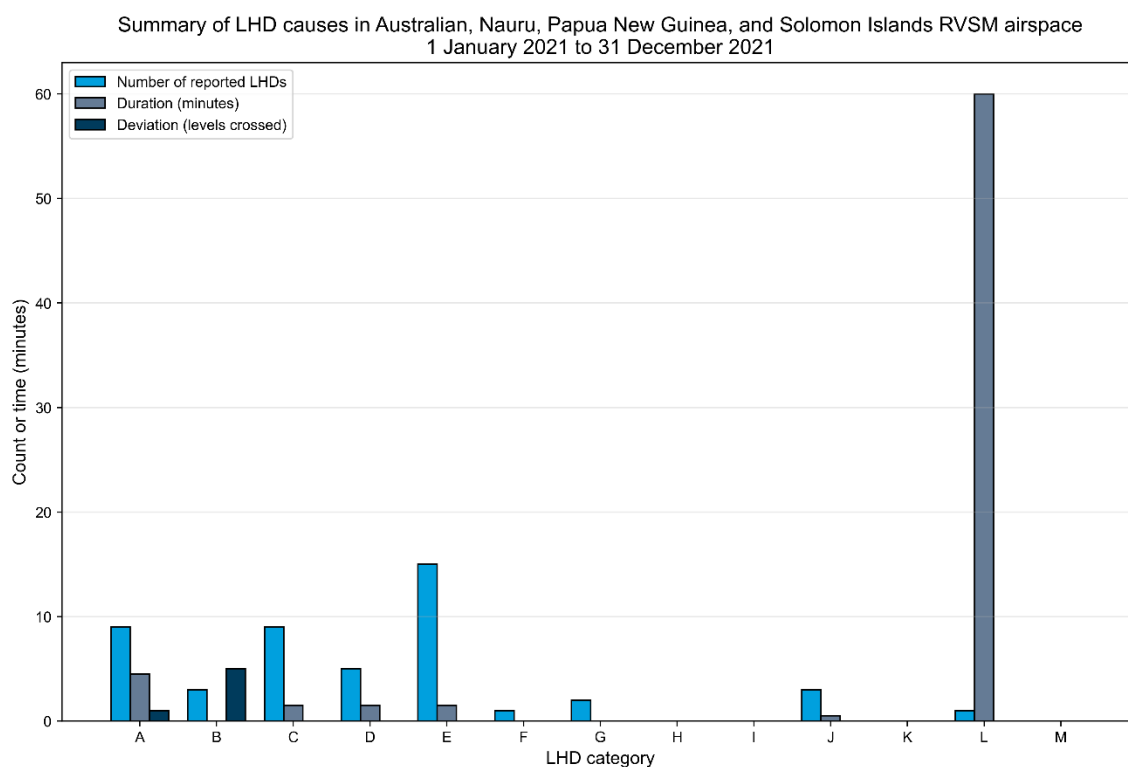
**Figure 1:** Number of LHDs, duration of LHDs, and number of levels crossed by month for the period 1 January 2021 to 31 December 2021.

2.4 The number of reported LHDs, total LHD duration (in minutes), and total number of levels crossed for the period 1 January 2021 to 31 December 2021 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   | 9                       | 4.5                        | 1                        |
| B            | Flight crew climbing/descending without ATC clearance  | 3                       | 0                          | 5                        |
| C            | Incorrect operation or interpretation of airborne equipment  | 9                       | 1.5                        | 0                        |
| D            | ATC system loop error  | 5                       | 1.5                        | 0                        |
| E            | Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of human factors issues                 | 15                      | 1.5                        | 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                    | 2                       | 0                          | 0                        |
| H            | Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level                    | 0                       | 0                          | 0                        |

| LHD category | LHD category description   | Number of reported LHDs | Duration of LHDs (minutes) | Number of levels crossed |
|--------------|--|-------------------------|----------------------------|--------------------------|
| I            | Deviation due to turbulence or other weather related cause   | 0                       | 0                          | 0                        |
| J            | Deviation due to TCAS resolution advisory; flight crew correctly following the resolution advisory   | 3                       | 0.5                        | 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                                 | 1                       | 60                         | 0                        |
| M            | Other  | 0                       | 0                          | 0                        |
| <b>Total</b> |  | <b>48</b>               | <b>69.5</b>                | <b>6</b>                 |

**Table 2:** Summary of LHD occurrences by category for 1 January 2021 to 31 December 2021.



**Figure 2:** Number of LHDs, duration of LHDs, and number of levels crossed by LHD category for the period 1 January 2021 to 31 December 2021.

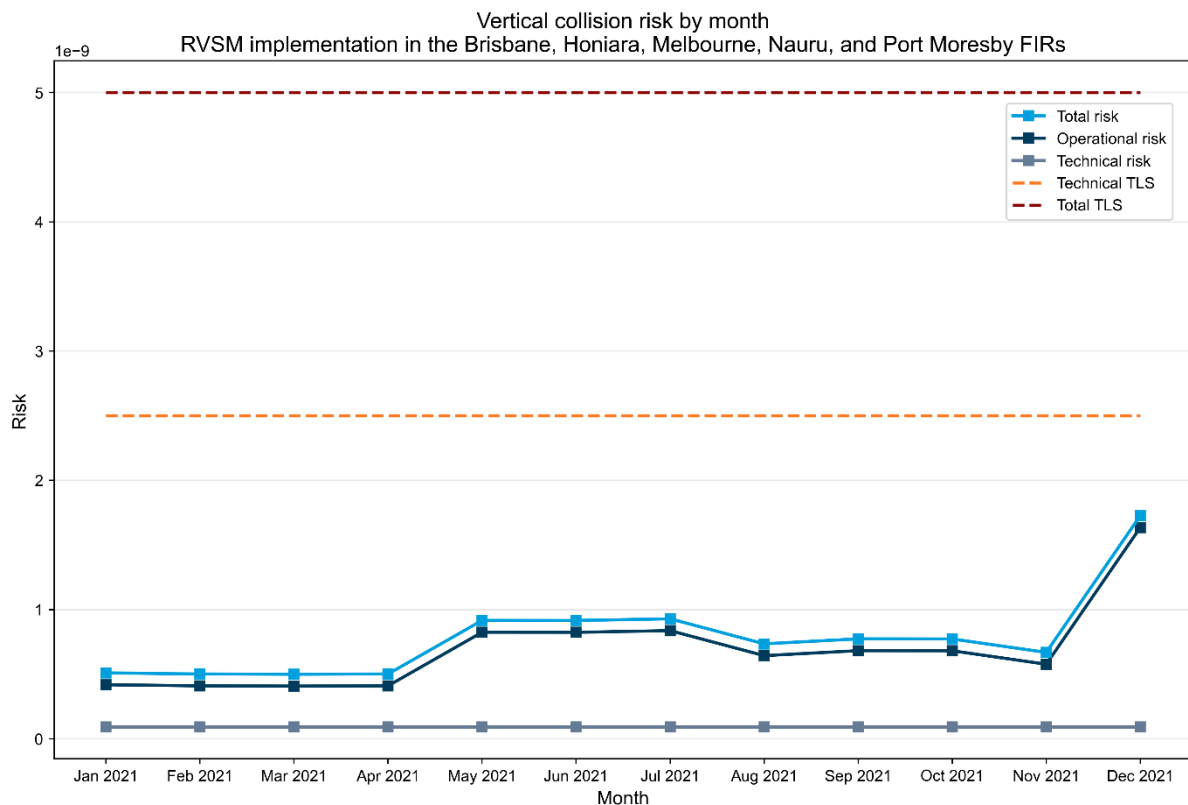
Collision Risk Estimate

2.5 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 2021 to 31 December 2021 are detailed in **Table 3**. The technical risk meets the TLS value of no more than  $2.5 \times 10^{-9}$ . The operational and weighted total risk meets the specified TLS value for these components of  $5.0 \times 10^{-9}$ .

| Source of risk    | Risk estimate                           | TLS                                    | Comparison with TLS    |
|-------------------|---|--|------------------------|
| Technical risk    | $0.091 \times 10^{-9}$                  | $2.5 \times 10^{-9}$                   | Below technical TLS    |
| Operational risk  | $1.64 \times 10^{-9}$                   | -                                      | -                      |
| <b>Total risk</b> | <b><math>1.73 \times 10^{-9}</math></b> | <b><math>5.0 \times 10^{-9}</math></b> | <b>Below total TLS</b> |

**Table 3:** RVSM Risk Estimates for the period 1 January 2021 to 31 December 2021. The number of estimated annual flying hours is 443,496 based on the December 2020 TSD.

2.6 The trends of the technical risk, operational risk, and total risk for the period 1 January 2021 to 31 December 2021 are shown in **Figure 3**.



**Figure 3:** Trends of the technical, operational, and total risk for the period 1 January 2021 to 31 December 2021.

Assessment of Safety Reporting Culture

2.7 The 7<sup>th</sup> 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.

2.8 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**.

**Table 4:** Safety culture metric for Australia, Nauru, Papua New Guinea, and Solomon Islands by LHD attribution for the period 1 January 2021 to 31 December 2021.

| <b>Attribution</b>      | <b>Number of reports</b> | <b>Flight hours</b> | <b>Number of reports per flight hour (x 10<sup>-5</sup>)</b> |
|-------------------------|--------------------------|---------------------|--|
| Pilot/Aircrew (A, B, C) | 21                       | 443,496             | 4.74   |
| ATC (D, E, F)           | 21                       | 443,496             | 4.74   |
| Other                   | 6                        | 443,496             | 1.35   |
| <b>Total</b>            | <b>48</b>                | <b>443,496</b>      | <b>10.8</b>  |

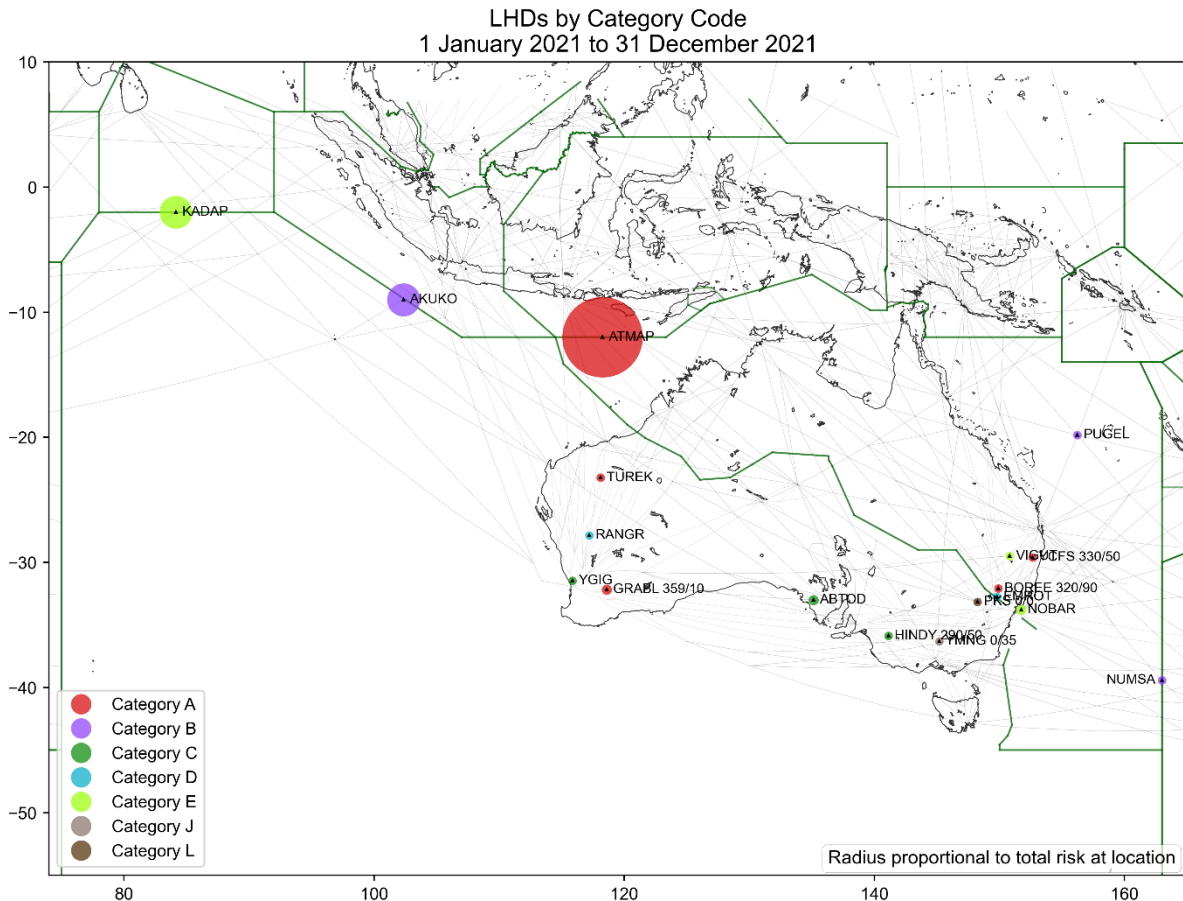
2.9 Reports were consistently made by both pilots and ATC.

2.10 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.

2.11 Of the 21 ATC-attributed reports received, 10 reports corresponded to errors made by neighbouring ATCs, three corresponded to errors made by Australian or Port Moresby ATC, and the remaining eight 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

2.12 A map identifying the geographic location of LHD occurrences for the period 1 January 2021 to 31 December 2021 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 2021 to 31 December 2021.

### Summary and Discussion

2.13 The risk has increased since the value reported for the period 1 January 2020—31 December 2020 at the 26<sup>th</sup> Meeting of the RASMAG (RASMAG/26) in September 2021. 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 the latter part of 2021 compared to 2020 and early 2021. This is particularly true for domestic traffic in Australia.

2.14 The month of December 2021 exhibited a spike in risk, but the total risk was still well below the TLS.

2.15 In December 2021, there was one LHD assessed as Category L (aircraft being provided with RVSM separation is not RVSM approved), which was assessed as 60 minutes duration. The event involved a domestic aircraft correctly flight planning with negative RVSM. When the pilot was questioned by ATC, they incorrectly advised that the aircraft was RVSM approved. The aircraft was subsequently provided with RVSM separation for 60 minutes, including an incorrect handover between internal sectors.

2.16 Despite being long duration, this occurrence did not contribute significantly to the overall risk value because the impact factor associated with a non-RVSM approved aircraft being provided with RVSM separation is small. As a result, the individual risk for this occurrence was relatively low.

2.17 The highest-risk occurrence in the rolling 12 month sample occurred at ATMAP, also in December 2021. It involved an international aircraft failing to meet a height requirement prior to crossing the Ujung Pandang—Brisbane FIR boundary and failing to contact ATC via datalink. The event was assessed as 3 minutes duration before a resolution was reached between Ujung Pandang ACC and Brisbane ATC.

2.18 In the period 1 January 2021—31 December 2021, the number of LHDs with Aircrew/Pilot attribution was equal to the number of LHDs with ATC attribution, both at 21. Category E occurrences (coordination errors as a result of human factors issues) were most prevalent at 15.

### **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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