



*International Civil Aviation Organization*

**ICAO**

**Thirtieth Meeting of the Regional Airspace Safety Monitoring  
Advisory Group (RASMAG/30)**

Bangkok, Thailand, 29 June – 03 July 2026

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

**RVSM RISK ASSESSMENT IN THE JAKARTA AND UJUNG PANDANG FLIGHT  
INFORMATION REGIONS**

**1 JANUARY 2025 TO 31 DECEMBER 2025**

(Presented by AAMA)

**SUMMARY**

This paper presents an airspace Safety Review of RVSM airspace risk in the Indonesian Flight Information Regions (FIR) for the period 1 January 2025 to 31 December 2025. Results show a technical risk of  $0.147 \times 10^{-9}$ , an operational risk of  $2.03 \times 10^{-9}$  and a total risk of  $2.17 \times 10^{-9}$ . The technical risk is below the Target Level of Safety (TLS) of  $2.5 \times 10^{-9}$  fatal accidents per flight hour (fapfh), and the total risk is below the relevant TLS ( $5.0 \times 10^{-9}$  fapfh). One hot spot is identified along the Jakarta/Ujung Pandang FIR boundary between fix RUPKA and ANY VOR (just north of the island of Java).

**1. INTRODUCTION**

1.1 This report provides an airspace Safety Review of RVSM airspace risk in the Jakarta and Ujung Pandang FIRs for calendar year 2025. The review is undertaken using a 12-month data sample period and is based on data supplied from AirNav Indonesia.

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  $2.5 \times 10^{-9}$  for the technical component of the risk, and  $5.0 \times 10^{-9}$  for the total weighted risk. Some 108 out of the 196 occurrences present non-zero risk (55.1% of occurrences).

1.4 The results indicate risk is below the TLS. The LHD presenting the most operational risk involved a Category B error (flight crew climbing/descending without ATC clearance) which occurred on a two-way route at BUNKU fix. The LHD involved an aircraft that – after having difficulty contacting ATC – descended 6 levels without clearance.

1.5 174 of the 196 LHDs (57%) involved Category E errors (ATC-to-ATC coordination errors as a result of human factors issues), and approximately 49% of the operational risk was contributed by Category E LHDs.

1.6 A hot spot was identified along the Jakarta / Ujung Pandang FIR boundary. Along an approximately 90 NM length between RUPKA fix and ANY VOR there were 38 LHDs, which – while they only contributed 1% to total operational risk – constituted almost 20% of all LHDs.

## 2. DISCUSSION

### Data Sources

2.1 Traffic Sample Data (TSD): TSD covering four weeks of the month of December 2025 of aircraft operating in the Jakarta and Ujung Pandang FIRs was used as required by ICAO Regional agreement.

2.2 Large Height Deviations (LHDs): a cumulative 12-month data set of 2025 LHD reports was assessed.

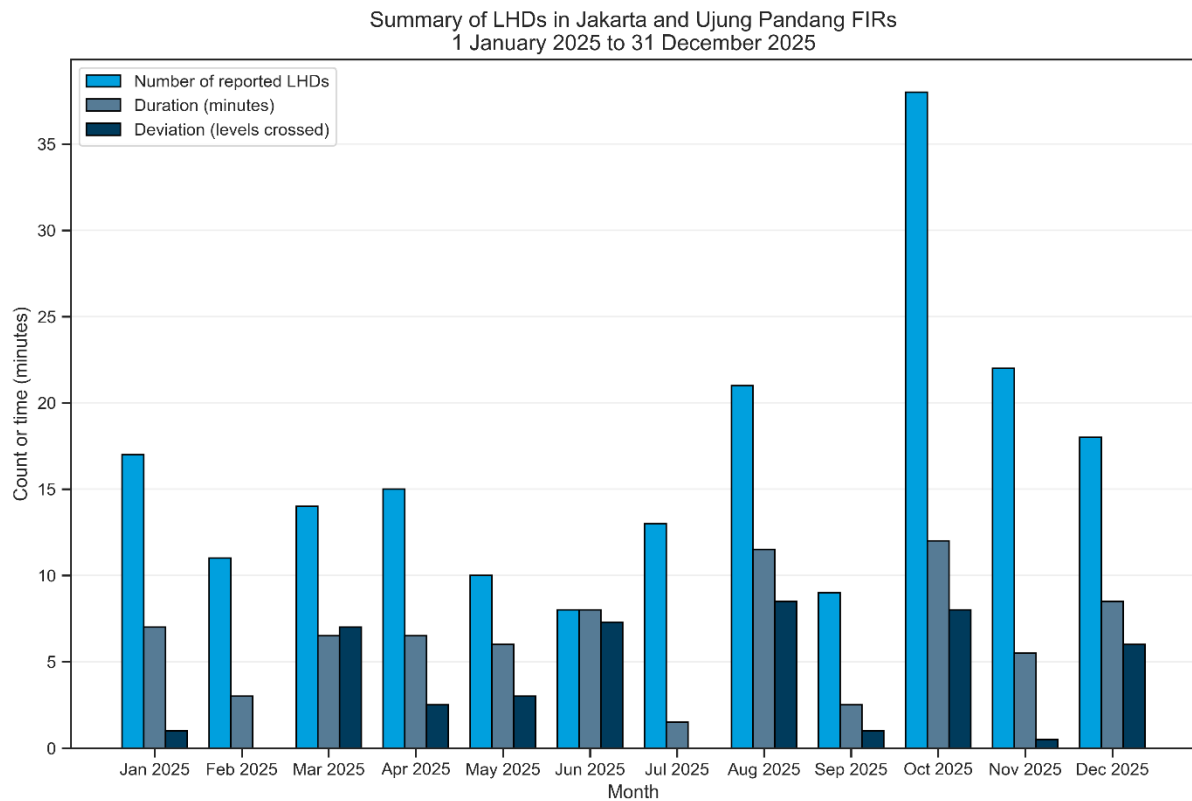
### Summary of LHD Occurrences

2.3 The number of reported LHD occurrences, risk-bearing LHDs, total LHD duration (in minutes), and total number of levels crossed are shown by month in **Table 1**. The number of reported LHDs, duration, and levels crossed are shown in **Figure 1**. Results for 2024 are Illustrated for Comparison.

**Table 1.** Summary of LHD Occurrences by Month for 2025

| Month               | Number of Reported LHDs | Number of Risk-bearing LHDs | LHD Duration (minutes) | Number of Levels Crossed |
|---------------------|-------------------------|-----------------------------|------------------------|--------------------------|
| January             | 17                      | 13                          | 7                      | 1                        |
| February            | 11                      | 6                           | 3                      | 0                        |
| March               | 14                      | 11                          | 6.5                    | 7                        |
| April               | 15                      | 12                          | 6.5                    | 2.5                      |
| May                 | 10                      | 9                           | 6                      | 3                        |
| June                | 8                       | 5                           | 8                      | 7.3                      |
| July                | 13                      | 3                           | 1.5                    | 0                        |
| August              | 21                      | 10                          | 11.5                   | 8.5                      |
| September           | 9                       | 4                           | 2.5                    | 1                        |
| October             | 38                      | 17                          | 12                     | 8                        |
| November            | 22                      | 11                          | 5.5                    | 0.5                      |
| December            | 18                      | 6                           | 8.5                    | 6                        |
| <b>2025</b>         | <b>196</b>              | <b>107</b>                  | <b>78.5</b>            | <b>44.8*</b>             |
| <b>Total (2024)</b> | <b>102</b>              | <b>72</b>                   | <b>33</b>              | <b>90.7</b>              |

*\*Please note a discrepancy in summing 'flight levels crossed' for some Category E LHDs in previous years has been corrected in analysing 2025 LHDs to align with other Regional Monitoring Agency practice.*



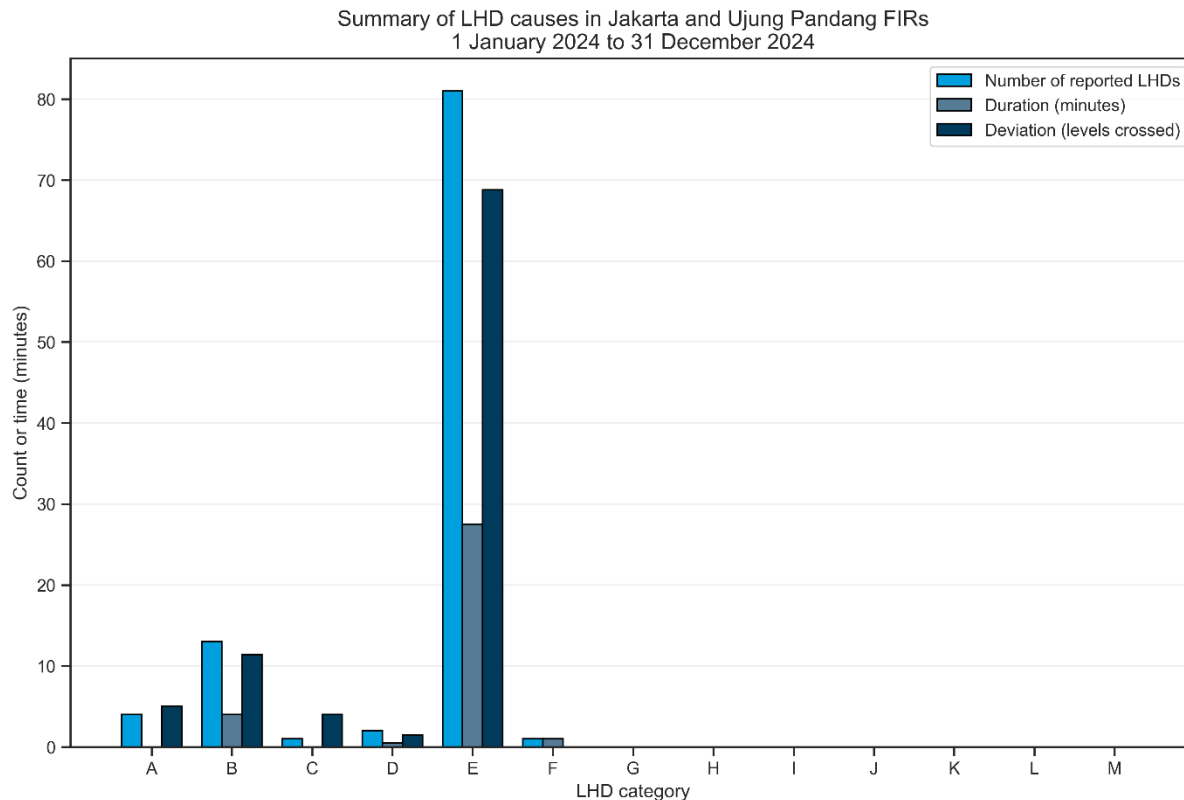
**Figure 1.** Number of LHDs, Duration of LHDs, and Number of Levels Crossed by Month for Calendar Year 2025

2.4 The number of reported LHDs, total LHD duration (in minutes), and total number of levels crossed are shown by LHD category in **Table 2** and **Figure 2**. Results for 2024 are also shown.

**Table 2.** Summary of LHD Occurrences by Category

| LHD category | LHD category description                                                                                                     | 2025        |                            |                          | 2024        |                            |                          |
|--------------|------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|--------------------------|-------------|----------------------------|--------------------------|
|              |                                                                                                                              | Number LHDs | Duration of LHDs (minutes) | Number of levels crossed | Number LHDs | Duration of LHDs (minutes) | Number of levels crossed |
| A            | Flight crew failing to climb/descend the aircraft as cleared                                                                 | 10          | 14.5                       | 17.5                     | 4           | 0                          | 5                        |
| B            | Flight crew climbing/descending without ATC clearance                                                                        | 8           | 17                         | 18                       | 13          | 4                          | 11.4                     |
| C            | Incorrect operation or interpretation of airborne equipment                                                                  | 0           | 0                          | 0                        | 1           | 0                          | 4                        |
| D            | ATC system loop error                                                                                                        | 0           | 0                          | 0                        | 2           | 0.5                        | 1.5                      |
| E            | Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of human factors issues                 | 174         | 43                         | 5.3                      | 81          | 27.5                       | 68.8                     |
| F            | Coordination errors in the ATC-to-ATC transfer or control responsibility as a result of equipment outage or technical issues | 0           | 0                          | 0                        | 1           | 1                          | 0                        |

| LHD category | LHD category description                                                                                  | 2025        |                            |                          | 2024        |                            |                          |
|--------------|-----------------------------------------------------------------------------------------------------------|-------------|----------------------------|--------------------------|-------------|----------------------------|--------------------------|
|              |                                                                                                           | Number LHDs | Duration of LHDs (minutes) | Number of levels crossed | Number LHDs | Duration of LHDs (minutes) | Number of levels crossed |
| G            | Deviation due to aircraft contingency event leading to sudden inability to maintain assigned flight level | 0           | 0                          | 0                        | 0           | 0                          | 0                        |
| H            | Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level | 0           | 0                          | 0                        | 0           | 0                          | 0                        |
| I            | Deviation due to turbulence or other weather-related cause                                                | 1           | 2                          | 2                        | 0           | 0                          | 0                        |
| J            | Deviation due to TCAS resolution advisory; flight crew correctly following the resolution advisory        | 2           | 1                          | 1                        | 0           | 0                          | 0                        |
| K            | Deviation due to TCAS resolution advisory; flight crew incorrectly following the resolution advisory      | 0           | 0                          | 0                        | 0           | 0                          | 0                        |
| L            | An aircraft being provided with RVSM separation is not RVSM approved                                      | 0           | 0                          | 0                        | 0           | 0                          | 0                        |
| M            | Other                                                                                                     | 1           | 1                          | 1                        | 0           | 0                          | 0                        |
| R            | GNSS Radio Frequency Interference                                                                         | 0           | 0                          | 0                        | -           | -                          | -                        |
| <b>Total</b> |                                                                                                           | <b>196</b>  | <b>78.5</b>                | <b>44.8</b>              | <b>102</b>  | <b>33</b>                  | <b>90.7</b>              |



**Figure 2.** Number of LHDs, Duration of LHDs, and Number of Levels Crossed by LHD Category for Calendar Year 2025

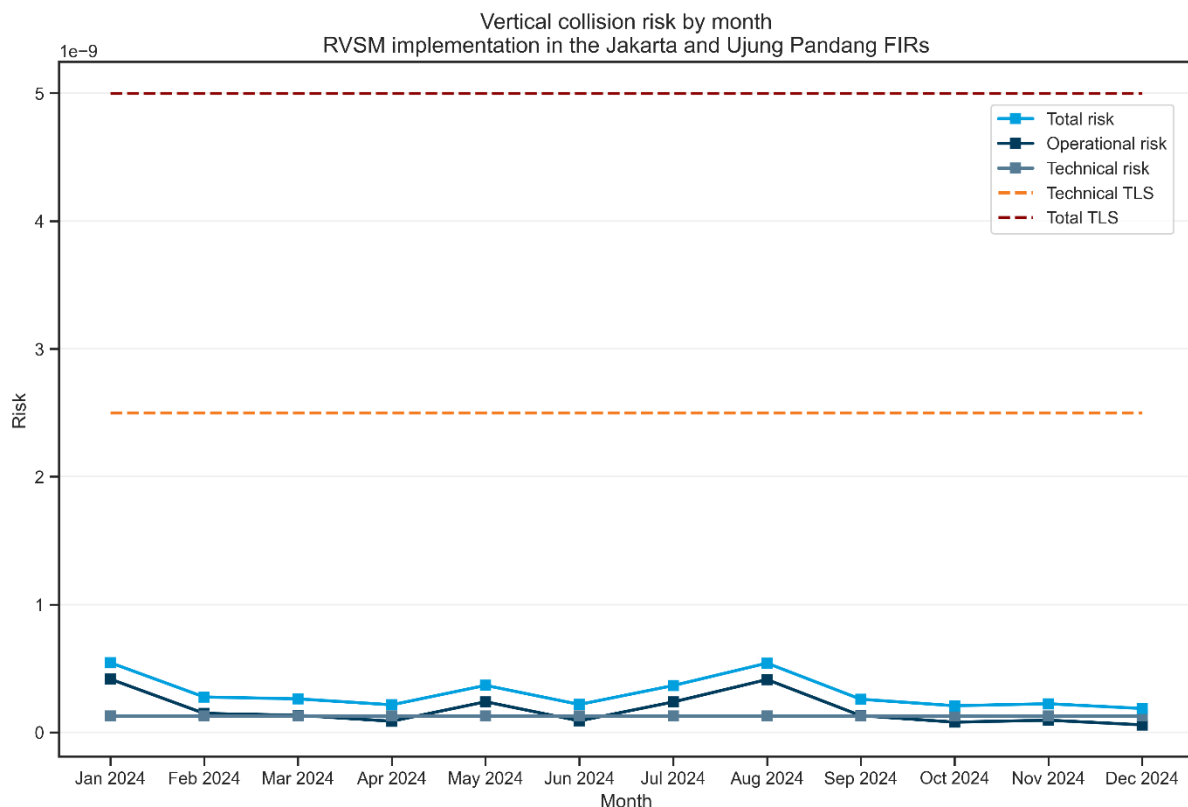
### Collision Risk Estimate

2.5 The results for the technical, operational, and total risk for the RVSM implementation in the Jakarta and Ujung Pandang FIRs are detailed in **Table 3**. The technical risk meets the TLS value of no more than  $2.5 \times 10^{-9}$ . The weighted total risk exceeds the specified TLS value for these components of  $5.0 \times 10^{-9}$ . The number of estimated annual flying hours is 852,382 based on the December 2025 TSD.

**Table 3.** RVSM Risk Estimates for Calendar Year 2025.

| Source of risk   | Risk estimate 2025    | TLS                  | Comparison with TLS |
|------------------|-----------------------|----------------------|---------------------|
| Technical risk   | $0.15 \times 10^{-9}$ | $2.5 \times 10^{-9}$ | Below technical TLS |
| Operational risk | $2.03 \times 10^{-9}$ | -                    | -                   |
| Total risk       | $2.17 \times 10^{-9}$ | $5.0 \times 10^{-9}$ | Below total TLS     |

2.6 The trends of the technical risk, operational risk, and total risk for calendar year 2025 are shown in **Figure 3**.



**Figure 3.** Trends of the Technical, Operational, and Total Risk

### Category E Sub-categorisation

2.7 During the Twelfth Meeting of the RASMAG Monitoring Agencies Working Group (MAWG), the Asia Pacific RMAs agreed to apply sub-categorisation to Category E LHDs. These LHDs involve coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues. These sub-categories include:

- a) E-NT: No Transfer or Negative Transfer;

- b) E-LT: Late Transfer;
- c) E-RI: No or Late Revision of Transfer Information; and
- d) E-OT: Any Other Types

2.8 AAMA applied the sub-categorisation system to 2025 LHDs for the FIRs for which it is the responsible RMA. **Table 4** summarizes the results of the sub-categorisation for Jakarta and Ujung Pandang FIRs.

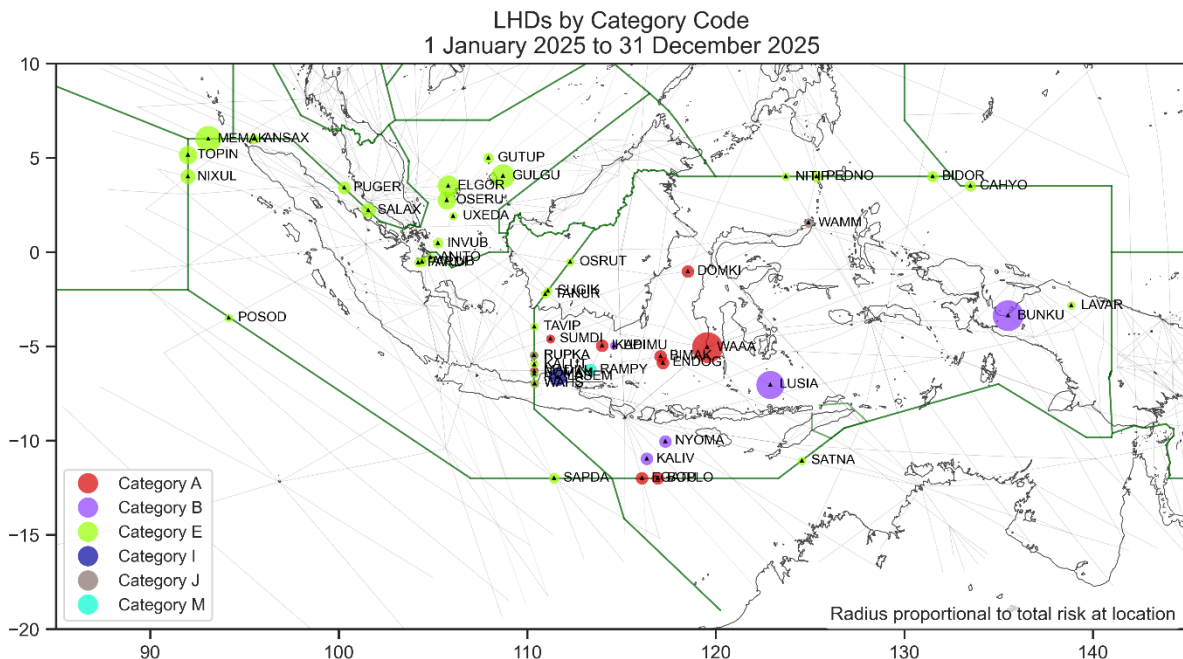
2.9 Some 49% of Category E LHDs contributed to total operational risk in Jakarta and Ujung Pandang FIRs. The majority of E LHDs belonged to E-RI sub-category (98), and of those 59% contributed to RVSM risk. Some 68% of E-NT LHDs also contributed to vertical risk.

**Table 4.** Category E LHD Subcategories for Jakarta and Ujung Pandang FIRs

| E subcategories | Non-risk bearing LHDs | Risk-bearing LHDs | Total      |
|-----------------|-----------------------|-------------------|------------|
| E-NT            | 13                    | 27                | 40         |
| E-LT            | 30                    | 0                 | 30         |
| E-RI            | 41                    | 57                | 98         |
| E-OT            | 5                     | 1                 | 6          |
| <b>Total</b>    | <b>89</b>             | <b>85</b>         | <b>174</b> |

#### Hot Spot Identification

2.10 A map identifying the geographic location of LHD occurrences for calendar year 2025 is shown in **Figure 4**. 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.

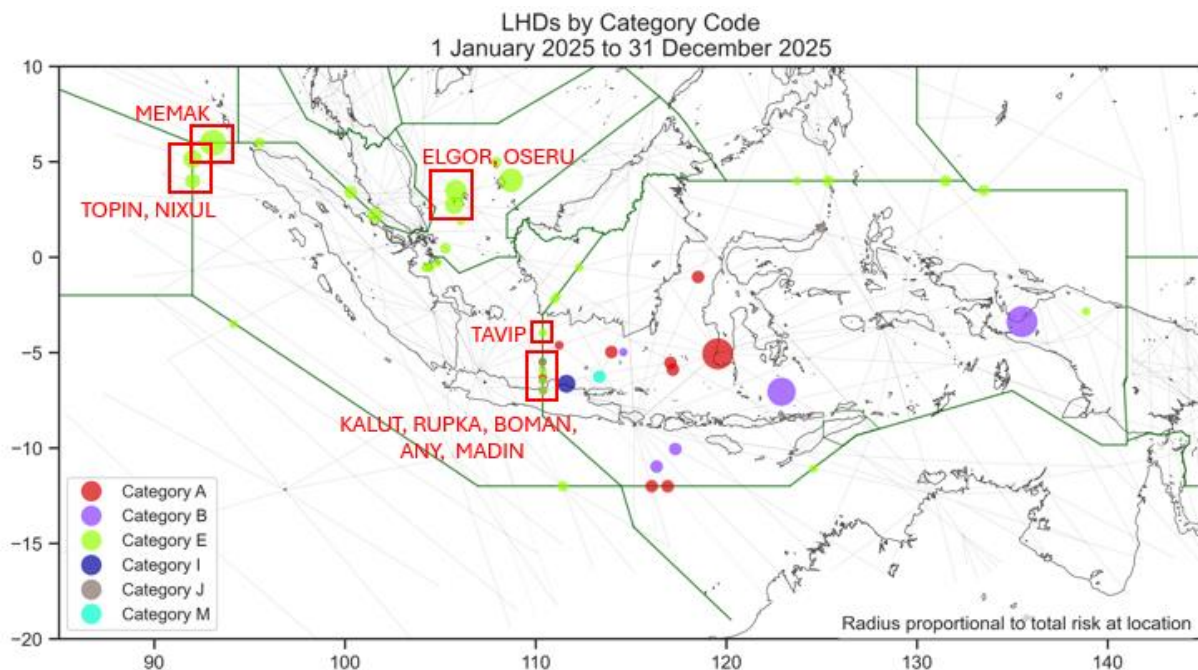


**Figure 4.** Geolocation of LHDs for the Indonesian FIRs for 2025

2.11 A hot spot identification process was developed at MAWG/9. It focuses on visually identifying clusters of LHDs in a given airspace and comparing the number of LHDs and summed risk in each cluster with risk metrics for the region.

2.12 Hot spot identification was conducted for Jakarta and Ujung Pandang FIRs for 2025 LHDs. Five clusters were visually identified (and confirmed by comparing the number of LHDs in each geographic area), and results are shown in **Figure 5**. Clusters are found on the Jakarta/Colombo FIR boundary (TOPIN, NIXUL), Jakarta/Chennai FIR boundary (MEMAK), on the Jakarta/Ujung Pandang FIR boundary (one at TAVIP and one between RUPKA fix and ANY VOR), and one is inside Jakarta FIR (ELGOR, OSERU).

2.13 Hot spot identification results are shown in **Table 5**. The first column details a given metric (or criterion), and each subsequent column details the results for a given identified cluster. The first criterion is the number of LHDs in a given cluster compared with the total number of LHDs divided by the number of clusters plus 1 (32.7). According to this metric, the RUPKA/ANY cluster is a hot spot. The second criterion is the summed risk of a given cluster compared with the total operational summed risk divided by the number of clusters plus 1 ( $2.03 \times 10^{-9}$ ). According to this criterion, no hot spots were found. The third criterion is the summed risk of a given cluster compared to the relevant Target Level of Safety ( $5 \times 10^{-9}$ ), according to which no cluster is a hot spot.



**Figure 5.** Geolocation of LHD Clusters for Calendar Year 2025

**Table 5.** Hot Spot Identification Process for Jakarta and Ujung Pandang FIRs, 2025 LHDs

| 2025 clusters<br>(n=5)                                          | MEMAK | TOPIN,<br>NIXUL | TAVIP | KALUT,<br>RUPKA,<br>BOMAN,<br>ANY,<br>MADIN | ELGOR,<br>OSERU |
|-----------------------------------------------------------------|-------|-----------------|-------|---------------------------------------------|-----------------|
| <i>Number of LHDs</i>                                           | 18    | 10              | 21    | 38                                          | 11              |
| <i>Criterion: number of LHDs <math>\geq 32.7</math></i>         | False | False           | False | True                                        | False           |
| <i>Operational risk<br/>(<math>\times 10^{-9}</math> fapfh)</i> | 0.15  | 0.13            | 0.01  | 0.03                                        | 0.18            |

|                                                        |       |       |       |       |       |
|--------------------------------------------------------|-------|-------|-------|-------|-------|
| Criterion: operational risk $\geq 2.03 \times 10^{-9}$ | False | False | False | False | False |
| Criterion: TLS ( $5 \times 10^{-9}$ fapfh)             | False | False | False | False | False |

### Assessment of Safety Reporting Culture

2.14 MAWG/7 proposed that Regional Monitoring Agencies (RMAs) assess States' reporting culture because the RVSM risk assessment is dependent on the accuracy and quality of the LHD reports received.

2.15 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 Indonesia is shown in **Table 6**.

**Table 6.** Safety Culture Metric for Indonesia by LHD Attribution

| Attribution             | Number of reports | Flight hours | Number of reports per flight hour ( $\times 10^{-5}$ ) |
|-------------------------|-------------------|--------------|--------------------------------------------------------|
| Pilot/Aircrew (A, B, C) | 174               | 852,381.9    | 20.4                                                   |
| ATC (D, E, F)           | 18                | 852,381.9    | 2.1                                                    |
| Other                   | 4                 | 852,381.9    | 0.47                                                   |

2.16 Of the 174 Category E LHDs, 79 reports (45%) corresponded to errors made by neighbouring ATCs, and 95 reports corresponded to errors made by Jakarta or Ujung Pandang ATCs.

### Summary and Discussion

2.17 The total risk in 2025 ( $2.17 \times 10^{-9}$ ) is comparable with the risk value reported for calendar year 2024 (then  $2.25 \times 10^{-9}$ ). 49% of the operational risk was presented by 174 Category E LHDs (ATC coordination error as a result of human factor issues). Most involved aircraft flying on two-way routes, and their mean duration was almost 30 seconds.

2.18 There is one cluster of LHDs that meets the definition of a hot spot. It rests along the Jakarta/Ujung Pandang FIR boundary just north of the island of Java where the airspace structure of 1-way routes is relatively dense. 90 NM separate the endpoints of this hotspot (ANY VOR to the south and RUPKA fix to the north).

## **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.

— END —