INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE THIRTY-FIRST MEETING OF THE REGIONAL AIRSPACE SAFETY MONITORING ADVISORY GROUP (RASMAG/31)

BANGKOK, THAILAND, 29 JUNE – 3 JULY 2026

The views expressed in this Report should be taken as those of the Meeting and not the Organization

Approved by the Meeting
Published by the ICAO Asia and Pacific Office, Bangkok

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APPENDICES TO THE REPORT

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INTRODUCTION

Meeting

1.1 The Thirty-First Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/31) was held from 29 June to 3 July 2026, at the Kotaite Wing of the ICAO Asia and Pacific (APAC) Office in Bangkok, Thailand.

1.2 An Airspace Safety Seminar was conducted in conjunction with the RASMAG/31 on 29 June 2026.

Attendance

2.1 The Meeting was attended by 52 in-person and eight online participants from 18 States, one Special Administrative Region of China, and one International Organization including Australia, Cambodia, China, Hong Kong China, Fiji, India, Japan, Lao PDR, Malaysia, Mongolia, New Zealand, Pakistan, Papua New Guinea, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, United States and ICAO.

2.2 The List of Participants is at **Appendix A** to the Report.

Officers and Secretariat

3.1 Ms. Saifon Obromsook, Director of Safety Management Department, AEROTHAI, presided over the RASMAG/31, as Chairperson.

3.2 Mr. Mior Adli Bin Mior Sallehhuddin, Regional Officer Air Traffic Management (ATM) was the Secretary for the Meeting. He was supported by Mr. Hiroyuki Takata, Regional Officer ATM and Dr. Trish Prakayphet Chalayonnawin, Programme Analysis Associate ATM.

Language and Documentation

4.1 The RASMAG met as a plenary throughout the Meeting. The working language of the meeting was English for all documentation and this Report. A total of 34 Working Papers (WPs), five Information Papers (IPs), eight presentations, and one Flimsy considered by the Meeting.

Note: airspace safety estimates in this report are measured in terms of fatal accidents per flight hour (fapfh).

4.2 The list of working and information papers is at **Appendix B** to the Report.

4.3 **DISCLAIMER**: The presentation of material in this report does not imply the expression of any opinion whatsoever on the part of ICAO, Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) or the RASMAG of APANPIRG concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

Opening of the Meeting

Chairperson of RASMAG

5.1 Ms. Saifon Obromsook welcomed participants to the Meeting.

ICAO APAC Office

5.2 On behalf of Mr. Tao Ma, Regional Director of ICAO APAC Office, Mr. Mior Adli Bin Mior Sallehhuddin welcomed all participants to the Meeting.

Draft Conclusions, Conclusions, Draft Decisions and Decisions of RASMAG – Definition

6.1 RASMAG recorded its actions in the form of Draft Conclusions, Conclusions, Draft Decisions and Decisions within the following definitions:

a) **Draft Conclusions** of RASMAG relate to matters that are not just of a purely technical or operational nature, which need to be considered by APANPIRG;

b) **Conclusions** of RASMAG relate to matters of a purely technical or operational nature, which APANPIRG had delegated authority to RASMAG to act upon;

c) **Draft Decisions** relate solely to matters dealing with the internal working arrangements of the RASMAG, which need to be considered by APANPIRG; and

d) **Decisions** of RASMAG that relate solely to matters dealing with the internal working arrangements of the RASMAG, which APANPIRG had delegated authority to RASMAG to act upon.

List of Draft Conclusions, Conclusions, Draft Decisions and Decisions

7.1 List of Draft Conclusions

<table>
<tr><td colspan="3">Draft Conclusion RASMAG/31-3: Transfer of RVSM Safety Assessment and Monitoring Responsibilities of Hong Kong, China and Macao, China from MAAR to China RMA</td></tr>
<tr><td colspan="2">What: That,
1. effective from 1 January 2027, the competent airspace safety monitoring organizations for safety assessment and monitoring in the vertical plane [i.e. Reduced Vertical Separation Minimum (RVSM)] for Hong Kong, China and Macao, China be transferred to China RMA; and
2. the revised Asia/Pacific Flight Information Regions and Responsible Monitoring Agency at Appendix F to the Report be uploaded to the ICAO APAC Office eDocuments webpage to replace the existing version.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To further streamline the RVSM safety assessment and monitoring structure in China and thereby improving the overall efficiency and consistency of RVSM operations across the airspace system.</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 25-Nov-26</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: Aircraft Operators and RMAs</td></tr>
</table>

7.2 List of Conclusions

<table>
<tr><td colspan="3">Conclusion RASMAG/31-1: Establishment of RASMAG Conclusions/Decisions Tracking List on Monitoring the Application of Performance-based Horizontal Separation Minima</td></tr>
<tr><td colspan="2">What: That,
1. a RASMAG Conclusions/Decisions Tracking List on Monitoring the Application of Performance-based Horizontal Separation Minima be established, to record current changes agreed by RASMAG to the information in ICAO Doc 10063, until the document is amended; and
2. the RASMAG Conclusions/Decisions Tracking List on Monitoring the Application of Performance-based Horizontal Separation Minima at Appendix D to the Report be adopted and uploaded on the ICAO APAC Office eDocuments webpage.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: With the removal of the Asia/Pacific Regions En-route Monitoring Agency (EMA) Handbook, APAC States and monitoring agencies need a mechanism to track regionally agreed changes to the information in ICAO Doc 10063, until the document is amended.</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 3-Jul-26</td><td colspan="2">Status: Adopted by Subgroup</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: APAC EMAs</td></tr>
</table>

<table>
<tr><td colspan="3">Conclusion RASMAG/31-2: Guidance Material for the Continued Safety Monitoring of the Asia Pacific RVSM Airspace Version 4.0</td></tr>
<tr><td colspan="2">What: That,
1. the Guidance Material for the Continued Safety Monitoring of the Asia Pacific RVSM Airspace Version 4.0 be adopted; and
2. the Guidance Material for the Continued Safety Monitoring of the Asia Pacific RVSM Airspace Version 4.0 be uploaded to the ICAO APAC Office eDocuments webpage to replace the existing version.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To update the Guidance Material to include new categories of LHD and the current practices of the RASMAG.</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 3-Jul-26</td><td colspan="2">Status: Adopted by Subgroup</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: APAC RMAs</td></tr>
</table>

7.3 List of Draft Decisions

<table>
<tr><td colspan="3">Draft Decision RASMAG/31-4: Update Regional Airspace Safety Monitoring Advisory Group (RASMAG) Terms of Reference (TOR)</td></tr>
<tr><td colspan="2">What: That, the updated RASMAG TOR at Appendix X to the Report be adopted.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To update the TOR to better reflect the objectives and tasks of RASMAG to identify, review and update the APANPIRG Air Navigation Deficiencies List, as an APANPIRG sub-group.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 25-Nov-26</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other: APAC RMAs and EMAs</td></tr>
</table>

7.4 List of Decisions

Nil.

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REPORT ON AGENDA ITEMS – RASMAG/31

Agenda Item 1: Adoption of Agenda

Adoption of Agenda (WP/01)

1.1 The provisional agenda was adopted by the Meeting. The Meeting noted IP/01 (List of Working and Information Papers).

Agenda Item 2: Review Outcomes of Related Meetings

FIT-Asia Meeting Outcomes (WP/02)

2.1 The Sixteenth Meeting of the FANS Interoperability Team-Asia (FIT-Asia/16) was held in Bangkok, Thailand, from 9 to 11 June 2026.

FIT-Asia Problem Reports (PRs)

2.2 FIT-Asia/16 was presented with updated information on the status of APAC States engagement in data link problem reporting through the FANS-CRA website, and performance analysis reporting to a recognized FIT. **Figure 1** illustrated the number of PRs submitted by the FIT-Asia States per calendar year, since 2016.

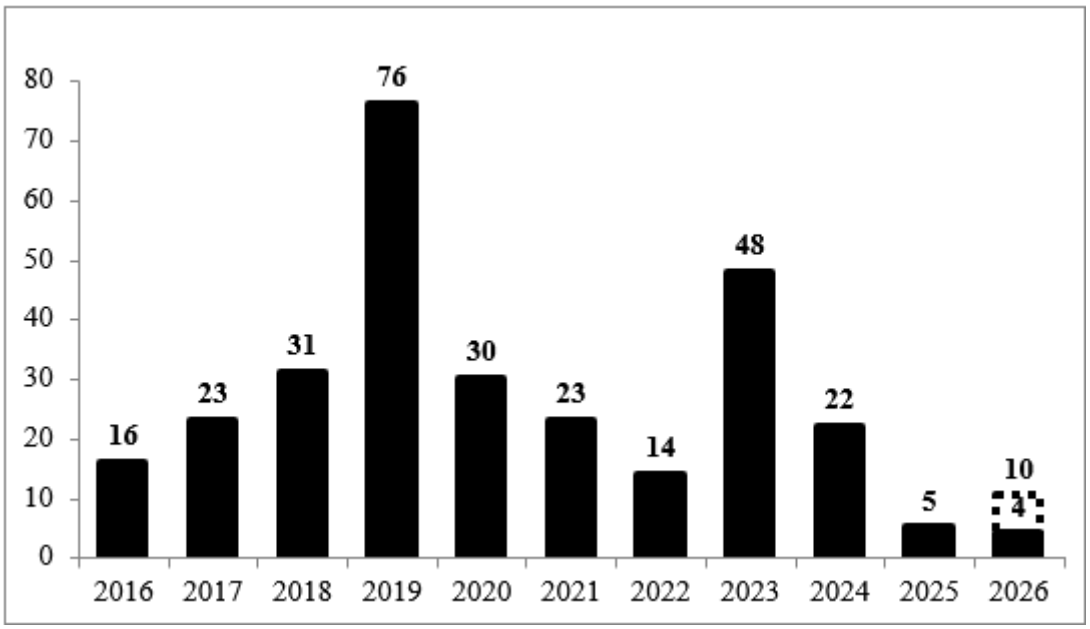

Figure 1. FIT-Asia PR Submissions

CPDLC Uplink Issue Caused by Duplicate 5LNC

2.3 FIT-Asia/16 reviewed the safety implications of duplicate five-letter name-codes (5LNCs) on Controller-pilot Data Link Communications (CPDLC) route uplink operations and noted that such duplications could lead to incorrect route loading, increased flight crew workload, and potential route deviations.

2.4 The Secretariat highlighted ongoing regional efforts to eliminate duplicated 5LNCs, noting that while the number of duplications in the APAC region had been significantly reduced since 2018, over 1,200 duplications remained, requiring continued collaboration among States and stakeholders. Boeing further advised that a software modification for the B737 had been developed and was undergoing certification to mitigate these effects, while testing had not identified similar issues in the B777 and B787 fleets.

Regional PBCS Implementation Update

2.5 FIT-Asia/16 noted that only 19 APAC Administrations submitted completed annual *Survey of the Status of Current and Planned Implementation of Performance-Based Horizontal Separation Minima* form for 2026 update. It was emphasized that the survey form was based on the relevant provisions and guidance material in the *Performance-based Communication and Surveillance (PBCS) Manual* (ICAO Doc 9869). States and Air Navigation Service Providers (ANSPs) implementing PBCS were expected to complete all survey sections (Groups A–E), while those not yet implementing were encouraged to complete Groups D and E to indicate future plans, readiness, and approvals. It was recalled that aircraft and operator approvals by the State of the Operator or State of Registry might still be required to allow correct PBCS capability reporting in flight plans where such procedures were applied.

Asia/Pacific Region Combined PBCS Monitoring Report

2.6 Indonesia and Malaysia prepared and provided the aggregated data link performance monitoring report for the APAC region. States/Administrations were invited to double-check the data before submission each year to avoid format errors and consistency issues. The details, including PBCS data provided by States/Administrations, could be found in **RASMAG/31 WP/02 Attachment A**.

2.7 **Table 1** showed the combined data for Required Surveillance Performance (RSP) across all media types in 2025. The 95 per cent criterion was met in all Flight Information Regions (FIRs). All FIRs achieved marginal performance (99.0–99.89 per cent) in both halves of 2025, except VABF during the first half of the year. VABF improved in the second half and achieved marginal performance.

Table 1. RSP Aggregated Data (All Media Types)

REQUIRED SURVEILLANCE PERFORMANCE						
Region	FIT-ASIA					
Performance Criteria	RSP180					
Time Period	2025 January-June			2025 July-December		
Colour Key Meets Criteria 99.0%-99.89% Under Criteria ***Aggregate All RGS***	No. Messages	Criteria 95% % < = 90sec	Criteria 99.90% % <= 180sec	No. Messages	Criteria 95% % < = 90sec	Criteria 99.90% % <= 180sec
KZAK	6,977,167	98.92%	99.70%	7,536,130	98.98%	99.69%
NFFF						
NZZO	489,785	98.73%	99.55%	522,067	98.79%	99.68%
PAZN	2,188,453	99.00%	99.68%	2,335,929	99.04%	99.65%
RJJJ	3,335,318	98.65%	99.65%	3,899,879	98.94%	99.72%
RPHI	581,773	98.64%	99.59%	809,819	98.14%	99.17%
VABF	823,094	96.44%	98.96%	840,287	97.73%	99.42%
VCCF	541,258	98.54%	99.79%	516,832	98.29%	99.68%
VECF	524,888	98.48%	99.54%	667,011	98.61%	99.59%
VOMF	299,161	97.63%	99.31%	320,696	98.19%	99.49%
VVTS	275,766	98.49%	99.57%	269,007	98.58%	99.58%
WAAA	300,149	99.10%	99.56%	326,663	99.09%	99.51%
WMFC	463,778	98.40%	99.25%	534,048	98.65%	99.43%
WSJC	777,377	98.71%	99.68%	819,846	98.68%	99.69%
ZLLL	627,895	98.50%	99.50%	623,189	98.50%	99.50%
ZWWW	300,139	98.60%	99.50%	120,242	98.70%	99.50%

2.8 CPDLC performance across the APAC region remained strong throughout 2025. All reporting FIRs met the 95 per cent Actual Communication Performance (ACP) and Actual Communication Technical Performance (ACTP) criteria, and most achieved the 99.9 per cent criteria, demonstrating stable performance across the region, including in high-volume FIRs. **Table 2** showed the aggregated Required Communication Performance (RCP) 240 performance for all media types across all FIRs during January–June and July–December 2025.

Table 1. RCP Aggregated Data (All Media Types)

REQUIRED COMMUNICATIONS PERFORMANCE										
Region	FIT-ASIA									
Performance Criteria	RCP240									
Time Period	2025 January-June					2025 July - December				
Colour Key: Meets Criteria; 99.0%-99.89%; Under Criteria	No. Messages	ACP Criteria		ACTP Criteria		No. Messages	ACP Criteria		ACTP Criteria	
		95%	99.90%	95%	99.90%		95%	99.90%	95%	99.90%
Aggregate All RGS		% <= 180sec	% <= 210sec	% <= 120sec	% <= 150sec		% <= 180sec	% <= 210sec	% < = 120sec	% <=150sec
KZAK	373,184	99.40%	99.62%	99.56%	99.71%	416,414	99.42%	99.62%	99.68%	99.80%
NFFF	10,382	99.56%	99.75%	99.65%	99.75%	10,921	99.34%	99.54%	99.66%	99.75%
NZZO	90,642	98.99%	99.30%	99.30%	99.48%	94,476	99.25%	99.49%	99.61%	99.73%
PAZN	136,677	99.26%	99.47%	99.64%	99.75%	143,012	99.25%	99.46%	99.60%	99.69%
RJJJ	74,522	99.70%	99.83%	99.72%	99.80%	82,427	99.71%	99.84%	99.73%	99.81%
RPHI	33,354	98.27%	98.52%	98.70%	98.89%	67,227	97.21%	97.52%	98.61%	98.83%
VABF	74,261	99.15%	99.49%	99.38%	99.66%	85,388	99.27%	99.61%	99.46%	99.73%
VCCF	31,543	99.06%	99.37%	99.13%	99.50%	34,599	99.15%	99.45%	99.30%	99.61%
VECF	12,480	99.13%	99.39%	99.20%	99.39%	18,643	99.08%	99.33%	99.07%	99.33%
VOMF	123,190	99.70%	99.85%	99.74%	99.82%	150,456	99.70%	99.86%	99.71%	99.83%
VVTS	68,681	97.98%	98.66%	99.42%	99.72%	53,632	98.08%	98.70%	99.39%	99.66%
WAAA	58,638	99.42%	99.54%	99.78%	99.81%	54,860	99.30%	99.43%	99.80%	99.82%
WMFC	50,019	95.55%	96.30%	99.03%	99.33%	60,895	98.47%	98.84%	99.06%	99.34%
WSJC	47,186	99.23%	99.46%	99.34%	99.58%	46,032	99.23%	99.47%	99.37%	99.63%
ZLLL	1,977	99.44%	99.54%	98.68%	99.29%	1,855	99.08%	99.51%	98.27%	99.13%
ZWWW	8	100.00%	100.00%	100.00%	100.00%	9	100.00%	100.00%	100.00%	100.00%

Air Navigation Deficiencies Relating to Data Link Performance Monitoring and Analysis

2.9 FIT-Asia/16 participants were reminded that operational PBCS implementation required a formal service agreement with the APANPIRG-recognized Central Reporting Agency (CRA) and were encouraged to complete the necessary arrangements in support of the APAC Project 30/10 target for 2028, with the status reflected in **Table 3**:

Table 3. CRA Formal Service Agreements Status

	APANPIRG-recognized CRA	**Scope of Application**	**Formal Service Agreement**
IPACG and ISPACG (United States)	CRA Boeing	IPACG States, ISPACG States, NAT States	Yes
Japan	CRA Japan	Japan	Yes
SEASMA (Singapore)	CRA Boeing	Singapore, Philippines, Viet Nam	Yes
China	CRA Boeing	China	Yes (2026)
Malaysia	CRA Boeing	Malaysia	In progress (by 2026)
India	CRA Boeing	India	Coordination in progress
Indonesia	CRA Boeing	Indonesia	Coordination in progress
Sri Lanka	CRA Boeing	Sri Lanka	Coordination in progress

2.10 It was noted that no APANPIRG ATM and Airspace Safety Deficiencies in the data link field would be proposed for 2026.

Updating of Relevant ICAO Documents

2.11 Japan and Singapore provided updates on the development of the second edition of the *Global Operational Data Link (GOLD) Manual* (ICAO Doc 10037) and the third edition of the ICAO Doc 9869. FIT-Asia/16 noted that both manuals had been updated to reflect recent ICAO provisions, including enhanced guidance on advanced data link operations, implementation, approvals, monitoring, compliance, and new RCP/RSP specifications. It was further noted that both manuals were progressing towards publication following ICAO review and endorsement.

2.12 The Meeting welcomed the comprehensive report and noted the continued improvement in regional data link performance monitoring and analysis. The Meeting observed that the overall PBCS communication and surveillance performance across the APAC region remained satisfactory despite increasing message volumes. In discussing recurring PBCS performance issues affecting individual aircraft operators and aircraft types across multiple FIRs, the Meeting noted that the timely sharing of non-compliance information among Regional Monitoring Agencies (RMAs), CRAs, States and aircraft operators was essential for identifying root causes, facilitating coordinated investigations and supporting timely corrective actions.

2.13 India highlighted its experience in analysing abnormal ADS-C message transit times and expressed concern regarding significant delays that appeared to be associated with Communication Service Provider (CSP) network performance. The ensuing discussion recognized that identifying the root cause of such issues often required close coordination among States, CSPs, CRAs, aircraft operators and industry partners. The Meeting emphasized the importance of detailed technical investigations, timely submission of PRs, and the continued sharing of investigation outcomes and best practices through FIT-Asia and other relevant regional forums to improve regional data link performance.

2.14 The Meeting further noted that formal service agreements with APANPIRG-recognized CRAs were an essential component of PBCS implementation, enabling States to submit PRs and obtain technical support for performance investigations. In response to an enquiry regarding the establishment of a national CRA, the Secretariat advised that the recognition of a new CRA would require further study and demonstration of technical capability through the appropriate ICAO processes. The Secretariat encouraged States to continue their coordination with the Boeing CRA whilst drawing upon the experience of other States that had recently completed similar arrangements, and the Meeting noted that efforts to establish formal service agreements with the Boeing CRA were ongoing.

Outcomes of RASMAG/MAWG and RMACG Meetings (WP/03)

2.15 The Meeting was provided with updates and relevant discussions on airspace safety monitoring arising from:

a) Thirteenth Meeting of the Regional Airspace Safety Monitoring Advisory Group Monitoring Agencies Working Group (RASMAG/MAWG/13), held in Bangkok, Thailand, from 3 to 6 February 2026; and

b) Twenty-First Meeting of RMA Coordination Group (RMACG/21), held in Brussels, Belgium, from 8 to 12 June 2026.

Adoption of the New RVSM Minimum Monitoring Requirements (MMR)

2.16 The RMACG/21 reviewed and adopted the *RVSM Monitoring Groups and Minimum Monitoring Requirements Version 2026* (**RASMAG/31 WP/03 Appendix A**). It was further noted that the same document would be published on the respective RMAs' websites.

2.17 The revisions, as compared to the previous version, were summarized as follows:

a) civilian MMR Category 2 – new entrants:

   i) Gulfstream G800 (s/n 88001 onward), which entered service in late 2025. It shared engines and wings with the G700 but had a shorter fuselage. Both aircraft were classified as GLF8; the existing GLF8 Monitoring Group (G700 only) was renamed GLF8-I, and a new group for the G800 was designated GLF8-II.

b) military MMR Category 3 – new entrants:

   i) EC37-B (a modified GLF5/G550) operating in the United States;

   ii) FA8X Archange (prototype under testing);

   iii) PRTS (or Scaled Composites Proteu), with one aircraft in service capable of operating up to FL600; and

   iv) S211, an older training aircraft with a limited number of airframes still in service in the United States.

Communication of Results from RVSM Approval Scrutiny

2.18 RMACG/21 discussed the importance of ensuring that RMA activity reporting was based on validated information to maintain data quality and avoid the inclusion of unvalidated data. It was agreed that the reporting process should be clearly defined without hindering timely State action. As no consensus had been reached on the proposal discussed at RMACG/21 and RMACG Action 20/14 remained open, an alternative approach was proposed whereby identifying details, such as aircraft registration numbers, would not be published in reports for unvalidated cases, while still being shared with relevant stakeholders for investigation and follow-up. The European Regional Monitoring Agency (EUR RMA) also updated the RMACG/21 on the planned expansion of the European RVSM Restriction List (ERL), noting that a 2025 Eurocontrol survey of Integrated Initial Flight Plan Processing System (IFPS) States showed broad support for the ERL as beneficial to RVSM safety; consequently, the ERL was to be expanded from Summer 2026 to include five additional IFPS States, bringing the total to 15 participating States.

Risk Assessment of Non-Approved RVSM Operations

2.19 RMACG/21 discussed various approaches to assessing safety risks associated with non-approved RVSM operations and the erroneous use of RVSM designators. Although different methodologies were presented, including treating such operations as technical or operational risks, no consensus was reached. RMACG/21 agreed to continue examining the issue, including defining applicable operation types and aircraft, and further evaluating methodologies such as pair-wise risk assessment and individual aircraft performance assessment.

Review of the RMA's Support to Verify the PBCS Authorization Information

2.20 RMACG/21 discussed the challenges faced by RMAs in supporting the regional PBCS monitoring programme, particularly in maintaining and verifying RCP and RSP authorization information. It was noted that, although requirements for RCP and RSP were defined in ICAO Annex 6, these operations were not subject to specific approvals. As a result, States recorded RCP and RSP capabilities within existing systems using non-standardized formats and methods. Accordingly, RMACG/21 recommended that RMAs review their responsibilities related to PBCS authorization verification and consider removing these tasks from their Terms of Reference (TORs). RMAs agreed to coordinate with regional planning groups and relevant bodies to review and update their TORs as appropriate.

Large Altimetry System Error (ASE) Cases and Solutions

2.21 The Pacific Approvals Registry and Monitoring Organization (PARMO) / North American Approvals Registry and Monitoring Organization (NAARMO) presented statistics and case studies of large ASE events observed between 2016 and 2026, outlining identification processes, stakeholder notification, corrective actions, and post-correction monitoring. A total of 278 aircraft were identified with large ASE events, with 27 still under evaluation, and an increasing proportion involved International General Aviation (IGA) aircraft compared to commercial operators. RMACG/21 emphasized the need for enhanced coordination among RMAs in managing cross-jurisdictional high ASE events and agreed to identify aircraft monitored by multiple systems with inconsistent ASE calculations and share findings. It also supported establishing a formal global high ASE reporting system to enable information sharing, investigation tracking, corrective action follow-up, and coordinated closure.

Summary and Outcomes of ASE Technical Interchange Meeting

2.22 NAARMO presented a summary of the 2025 ASE Technical Interchange Meeting, jointly hosted with EUR RMA in Seattle, United States, which focused primarily on the feasibility of extending RVSM above FL410, along with discussions on height monitoring, ASE trends and resolutions, approvals, avionics, certification, and meteorological data, with participation from a broad range of aviation stakeholders.

2.23 RMACG/21 also reviewed outcomes from the Fifth ICAO Separation and Airspace Safety Panel (SASP/5), noting that while initial assessments indicated the potential expansion of RVSM above FL410 was technically feasible, significant coordination, certification, operational considerations, and system modifications were required prior to implementation.

Promotion of Global Navigation Satellite System (GNSS) Radio Frequency Interference (RFI) Reporting as a Large Height Deviation (LHD)

2.24 The Monitoring Agency for Asia Region (MAAR) presented initiatives to promote reporting of GNSS RFI occurrences in the APAC region, including introducing a dedicated Category R within the LHD/Large Lateral Deviation (LLD)/ Large Longitudinal Error (LLE) taxonomy to support trend identification and mitigation development, while noting further refinement of reporting criteria and relevance to RVSM safety assessments was required. Supporting papers from EUR RMA and North Atlantic Central Monitoring Agency (NAT CMA) highlighted the increasing occurrence of GNSS jamming and spoofing events and their impacts on RVSM operations, collision risk assessment, and ASE monitoring, and outlined current approaches to detection, classification, mitigation, and their treatment in safety monitoring.

2.25 RMACG/21 supported the promotion of Category R for GNSS RFI occurrence reporting, recognizing its value in enhancing data collection, facilitating trend analysis, and supporting the development of mitigation measures.

Publication of RASMAG Safety Bulletin Issue 03

2.26 The RASMAG Safety Bulletin Issue 03 was published in January 2026 was made available for download on the ICAO APAC Office eDocuments webpage (https://www.icao.int/APAC/apac-electronic-documents#tabs-3).

PIRG and RASG Regional Coordination Meeting

2.27 The Meeting noted that the PIRG and RASG Regional Coordination Meeting was held twice yearly, with the next meeting planned for August 2026 focusing on establishing an effective coordination mechanism between APANPIRG and the Regional Aviation Safety Group – Asia Pacific (RASG–APAC), to ensure consistency and avoid duplication across subsidiary bodies.

2.28 The Meeting was informed that RASMAG Chairperson participated alongside other contributory subgroup Chairpersons to strengthen coordination and address overlapping initiatives, including the development of the first RASG-APAC Safety Advisory (i.e. RSA 25-001 *Elevated MAC Risk in RVSM Airspace*, which could be found at https://www.icao.int/APAC/rasg/RegionalSafetyAdvisory). It was further noted that the APAC monitoring agencies agreed to discontinue the RASMAG Safety Bulletin and adopt the RSA as the platform for safety promotion.

2.29 The Meeting discussed the various terminologies used in RASMAG meetings, including "non-approved RVSM operations," "non-RVSM approved aircraft," and "RVSM approval status pending verification." To ensure common understanding and clarity, the Meeting agreed that this matter would be further discussed at the RASMAG/MAWG meetings to define appropriate terminologies, potentially based on weightage criteria.

2.30 In response to an inquiry regarding coordination among relevant APANPIRG and RASG–APAC contributory bodies on discussions related to GNSS RFI, the Secretariat informed the Meeting that WPs had been presented at the relevant meetings for awareness and updates. It was further clarified that the proposed reporting by States to the ICAO APAC Office on GNSS RFI events was intended to support trend analysis, identify geographical areas with recurring occurrences or significant operational impacts, assess operational safety implications, and prioritize associated regional safety risks.

2.31 With regard to the RMACG/21 recommendation for RMAs to review their responsibilities related to PBCS authorization verification and to consider removing these tasks from their TORs, the Meeting noted that this matter would be further discussed at RASMAG/MAWG/14, with the outcomes to be reported to RASMAG/32.

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 2025 to 31 December 2025 (WP/04)

3.1 The Australian Airspace Monitoring Agency (AAMA) presented the airspace safety review of RVSM airspace risk reported in the Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for calendar year 2025.

3.2 **Table 4** provided the technical, operational, and total risk for the RVSM implementation in Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for 2025, each of which met the Target Level of Safety (TLS).

Table 4. RVSM Risk Estimates in Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for Calendar Year 2025

Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs Estimated annual flying hours = 1,354,591 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	0.10×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational Risk	2.1×10^{-9}	-	-
Total Risk	**2.2×10^{-9}**	5.0×10^{-9}	**Below total TLS**

3.3 The reporting safety culture metric measured by the reporting rate of occurrence per flight hour, with occurrences grouped by attribution as shown in **Table 5**.

Table 5. Safety Culture Metric for Australia, Nauru, Papua New Guinea, and Solomon Islands by LHD Attribution for 2025

Attribution	**Number of Reports**	**Flight Hours**	**Number of Reports per Flight Hour ($\times 10^{-5}$)**
Pilot/Aircrew (A, B, C)	61	1,354,591	4.5
ATC (D, E, F)	48	1,354,591	3.54
Others	14	1,354,591	1.03

3.4 **Figure 2** illustrated the geographic location of LHD occurrences intended to provide a mean to identify and visualize risk hot spots related to RVSM operations. The occurrences at each location were represented by a coloured circle, with the radius proportional to the total risk at that location.

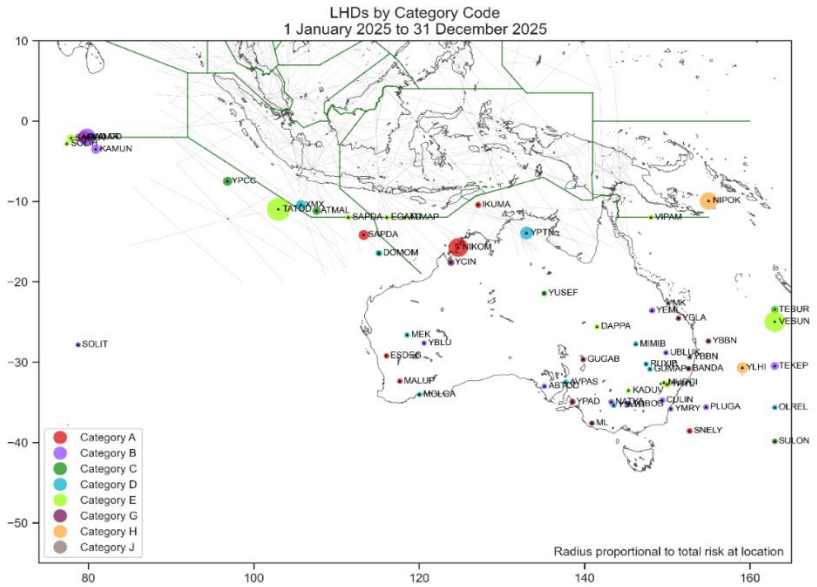

Figure 2. Geolocation of LHDs for Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for Calendar Year 2025

3.5 There were 123 LHDs identified in 2025, compared with 71 in 2024. Similarly, the total risk (2.24×10^{-9}) was also greater (0.92×10^{-9} reported at RASMAG/30).

3.6 Category E was the most common LHD category (38), and a third of those were assessed as risk-bearing (contributing 31 per cent of the total operational risk). The others mostly involved aircraft coordinated to the relevant FIR boundary at the wrong flight level, which mistakes that were queried by receiving ATC and rectified before the aircraft transited the boundary.

RVSM Risk Assessment in the Jakarta and Ujung Pandang Flight Information Regions, 1 January 2025 to 31 December 2025 (WP/05)

3.7 AAMA presented the airspace safety review of RVSM airspace risk reported in the Indonesian FIRs (i.e. Jakarta and Ujung Pandang) for calendar year 2025.

3.8 **Table 6** provided the technical, operational, and total risk for the RVSM implementation in Jakarta and Ujung Pandang FIRs, each of which met TLS.

Table 6. RVSM Risk Estimates in Jakarta and Ujung Pandang FIRs for Calendar Year 2025

Indonesian FIRs Estimated annual flying hours = 852,382 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	0.15×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational Risk	2.03×10^{-9}	-	-
Total Risk	**2.17×10^{-9}**	5.0×10^{-9}	**Below total TLS**

3.9 The reporting safety culture metric measured by the reporting rate of occurrence per flight hour, with occurrences grouped by attribution as shown in **Table 7**.

Table 7. Safety Culture Metric for Indonesia by LHD Attribution for 2025

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
Others	4	852,381.9	0.47

3.10 **Figure 3** illustrated the geographic location of LHD occurrences for calendar year 2025. The occurrences at each location were represented by a coloured circle, with the radius proportional to the total risk at that location.

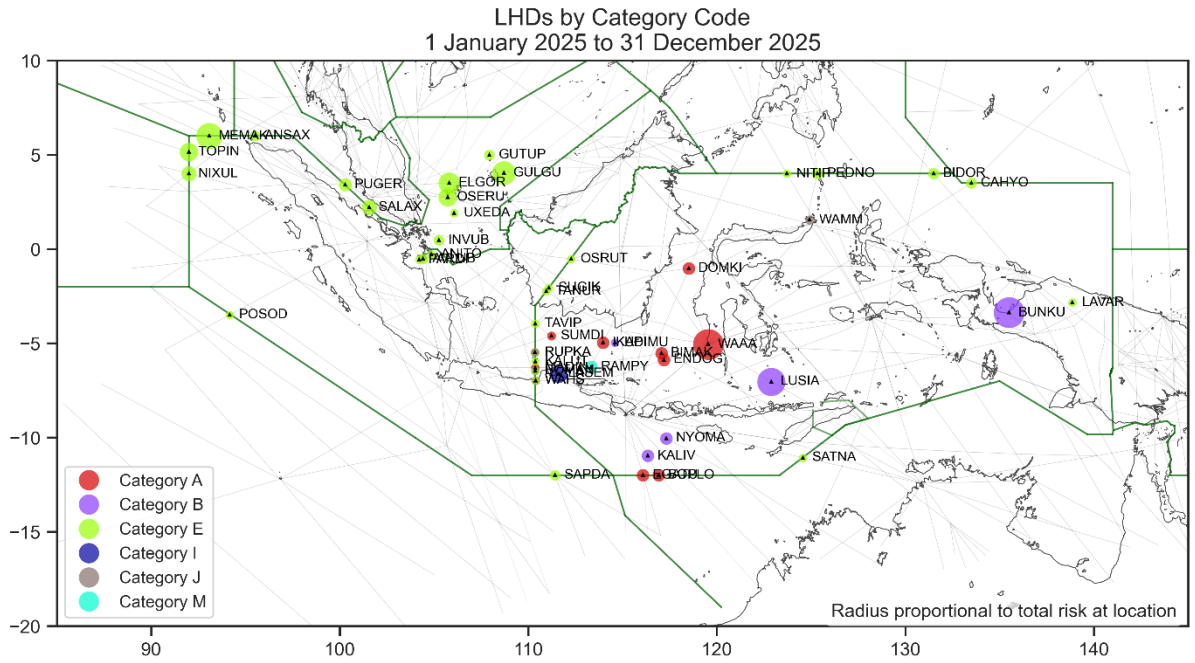

Figure 3. Geolocation of LHDs for the Indonesian FIRs for Calendar Year 2025

3.11 The total risk in 2025 (2.17×10^{-9}) was comparable with the risk value reported for calendar year 2024 (i.e. 2.25×10^{-9}). 49 per cent of the operational risk was presented by 174 Category E LHDs, which mostly involved aircraft flying on bi-directional ATS routes, and their mean duration was almost 30 seconds.

3.12 There was 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 unidirectional ATS routes was relatively dense. 90 NM separate the endpoints of this hot spot (ANY VOR to the south and RUPKA to the north).

3.13 In response to an inquiry, AAMA confirmed that the number of LHDs in Indonesian airspace approximately doubled in 2025 compared to 2024, corresponding to a similar increase observed along the proposed new hot spot (ANY VOR and RUPKA).

2025 Analyses for the Transfer of Control Point between Incheon ACC and Shanghai ACC, Hot Spot B1 (WP/06)

3.14 PARMO presented the analysis of the Hot Spot B1, transfer of control point between Incheon Area Control Centre (ACC) and Shanghai ACC.

3.15 There were 86 LHDs reported for calendar year 2025 representing a 30 per cent decrease in the overall number of reported LHDs compared to 123 LHDs reported in calendar year 2024. Most of the reported LHDs involved errors in ATC transitions and were attributed to LHD Category E-RI. It was noted that all reported LHDs were identified by the receiving ATC unit prior to the aircraft entered their airspace, as a result all reported LHD occurrences were categorized as non-risk bearing (i.e. all reported LHDs had zero duration and did not affect the operational vertical collision risk estimates).

3.16 None of the reported LHDs in calendar year 2025 contribute towards the estimate of operational vertical risk. Therefore, the vertical operational risk estimate was zero for calendar year 2025. The vertical technical risk was 0.68×10^{-9}.

3.17 PARMO recognized the new process for sharing reported LHD information was much improved compared to the previous process. From PARMO's perspective, the new process was more efficient and enhanced airspace safety. The previous process required LHD reports to be relayed via the designated RMAs. Due to the delays associated with the previous process, data retention would often expire before the adjacent ATC unit could confirm the report but more importantly, data retention expiration limited the investigation of underlying causal factors.

3.18 The Meeting noted that the number of reported LHD events was concentrated in the Hot Spot B1 area. In accordance with the defined process for hot spot identification, the area would continue to be classified and monitored as a hot spot, and was to remain under observation until further safety improvement initiatives or mitigation measures were implemented.

Update on AKARA LHD Events and Progress on Sharing Mechanism (WP/07)

3.19 In 2025, China RMA recorded a total of 36 LHD events reported by Shanghai ACC, all of which occurred within RVSM airspace. 50 LHD events were reported by Incheon ACC, of which 37 occurred within RVSM airspace and 13 occurred outside RVSM airspace. Through collaborative verification efforts under the new sharing mechanism, 24 events from Shanghai ACC reports were confirmed by Incheon ACC, and 29 events from Incheon ACC reports within RVSM airspace were confirmed by Shanghai ACC.

3.20 **Figure 4** illustrated LHD events occurred from January to May 2026, China RMA recorded seven LHD occurrences reported by Shanghai ACC, six of which occurred within RVSM airspace and one outside RVSM airspace. Incheon ACC reported 12 occurrences, ten of which occurred within RVSM airspace and two outside RVSM airspace. Through collaborative verification under the new sharing mechanism, five occurrences reported by Shanghai ACC were confirmed by Incheon ACC, and nine RVSM occurrences reported by Incheon ACC were confirmed by Shanghai ACC. The majority of reported LHDs were classified as Category E events, primarily involving no transfer, late transfer, or no flight level revision.

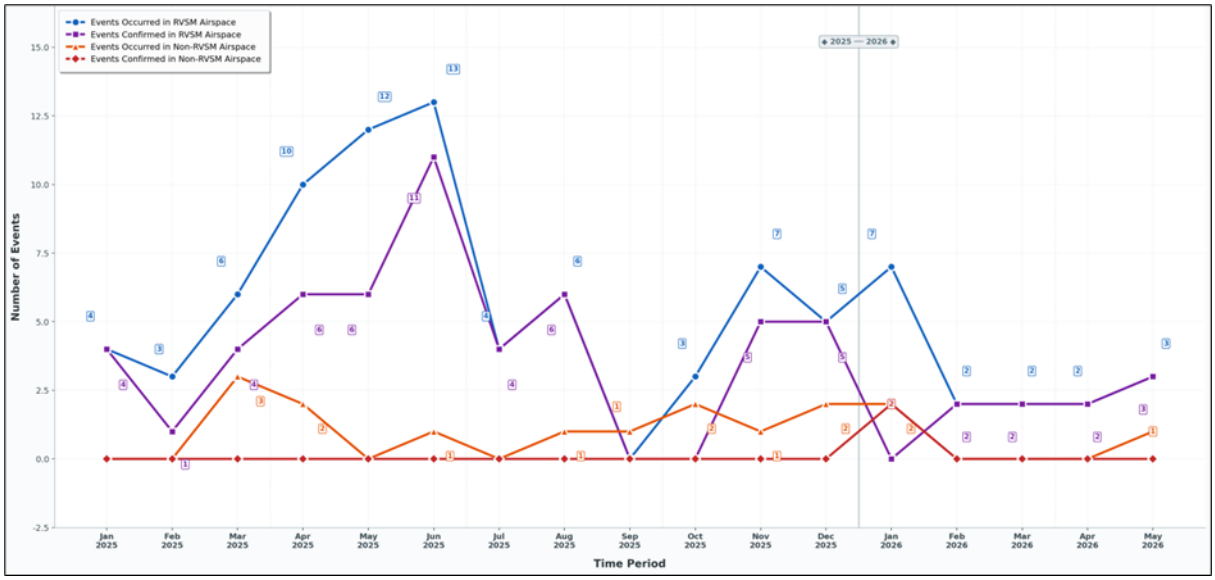

Figure 4. LHD Events from January 2025 to May 2026

3.21 Statistical data for 2025 demonstrated that, although LHD events continued to occur, the confirmation rate and data quality improved under the new mechanism. Data from January to May 2026 demonstrated a significant decrease in the number of LHD events.

3.22 The Meeting noted that the implementation of the new LHD event sharing mechanism between China and the Republic of Korea improved airspace safety monitoring in the concerned airspace. Enhanced timeliness and accuracy of data exchange contributed to more effective identification and analysis of LHD events, thereby supporting risk mitigation efforts in this airspace.

3.23 The Republic of Korea informed the Meeting that, in addition to sharing reported LHD information, it had conducted root cause analyses of confirmed LHD events and shared the findings with China RMA and PARMO.

2025 Central East Pacific Traffic Flow Assessment (Hot Spot N) (WP/08)

3.24 PARMO presented the 2025 vertical risk assessment for the Central East Pacific (CEP) traffic flow in Pacific airspace (between mainland North America and Hawaii). The area had been designated a Hot Spot N at RASMAG/24 owing to several reported occurrences and resulting increased risk estimates.

3.25 In 2025, 42 LHD events were reported within the CEP traffic flow, a slight increase from 40 reported in 2024. The LHD category with the longest cumulative duration was Category E-RI. Reported LHD events comprised one Category A, four Category B, and 37 Category E-RI events.

3.26 **Figure 5** showed that the durations associated with reported LHDs in 2025 had decreased by 50 per cent compared with 2024.

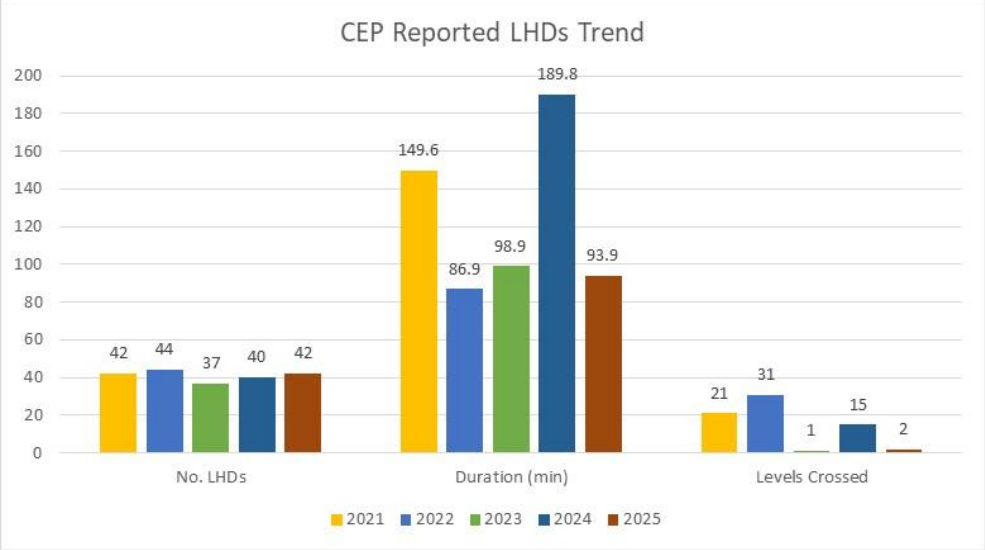

Figure 5. Reported LHDs Comparison Summary

3.27 Various mitigation strategies had been implemented prior to the planned En Route Automation Modernization (ERAM) implementation at the Honolulu Control Facility (HCF). HCF was testing the ERAM system, with full implementation scheduled for calendar year 2027.

3.28 The overall vertical risk for the CEP in 2025 was 6.4 x 10^{-9} fapfh, exceeded the TLS. This represented 57 per cent decrease from the 2024 value of 15.1 x 10^{-9} fapfh.

3.29 **Figure 6** illustrated the two-year (rolling 12-month) trend for CEP vertical collision risk estimates, which showed a decreasing trend attributable to corrective actions implemented by ATC units to mitigate Category E-RI LHD occurrence.

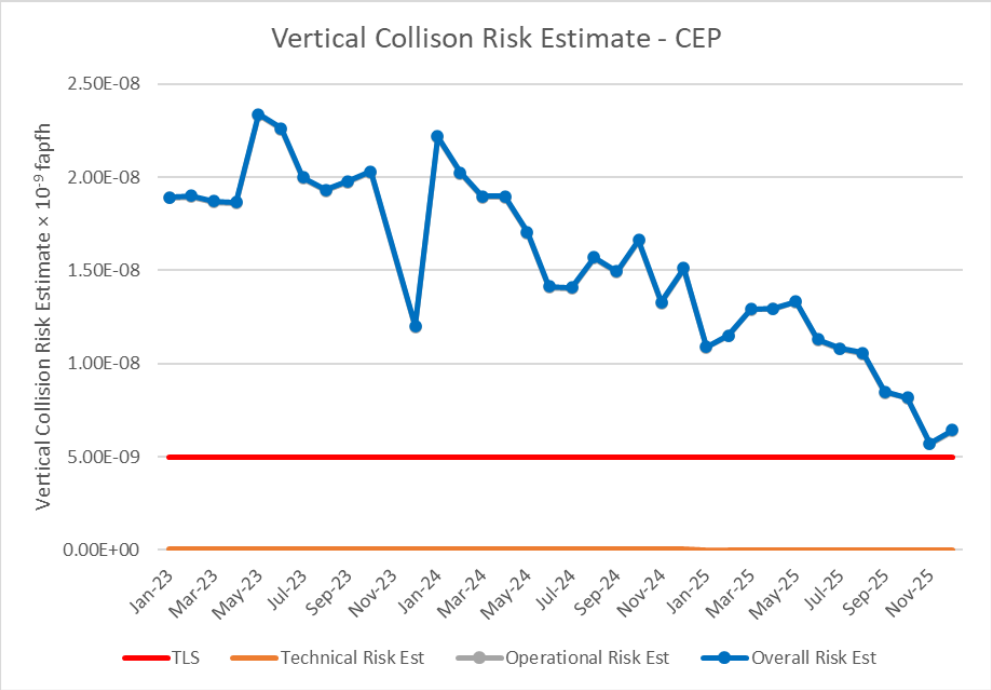

Figure 6. CEP Vertical Collision Risk Estimates by Calendar Year (Rolling 12-month)

3.30 In response to an inquiry, it was noted that the Enhanced Trial Probe (ETP) had been an effective tool in improving controller situational awareness by providing visual alerts of potential conflicts arising from incorrect transfer information, enabling controllers to take timely preventive action. It was further noted that the probing function still required manual initiation by the controller and was not a continuously running background process.

China RMA Vertical Safety Report (WP/09)

3.31 China RMA presented the results of the airspace safety oversight for the RVSM operations in the airspace of nine Chinese FIRs and Pyongyang FIR for calendar year 2025.

Risk Estimates for RVSM Airspace of Chinese FIRs

3.32 **Table 8** provided the technical, operational, and total risk for the RVSM implementation in all Chinese FIRs, of which met TLS.

Table 8. RVSM Risk Estimates in all Chinese FIRs for Calendar Year 2025

Chinese FIRs **Estimated annual flying hours = 2,343,365 hours** ***(Note: estimated hours based on December 2025 TSD)***			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	0.13 x 10-9	2.5 x 10-9	Below technical TLS
Operational Risk	0.79 x 10-9	-	-
Total Risk	**0.92 x 10^{-9}**	5.0 x 10^{-9}	**Below TLS**

3.33 A total of 251 LHD events were reported during the year. **Figure 7** illustrated the geographic location of risk-bearing LHD reports received by China RMA during the assessment period.

Figure 7. Geographical Location of LHDs Reported to China RMA

Risk Estimates for RVSM Airspace of Pyongyang FIR

3.34 **Table 9** provided the technical, operational, and total risk for the RVSM implementation in Pyongyang FIR, of which met TLS.

Table 9. RVSM Risk Estimates in Pyongyang FIR for Calendar Year 2025

Pyongyang FIR Estimated annual flying hours = 319 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	0	2.5×10^{-9}	Below technical TLS
Operational Risk	0	-	-
Total Risk	**0**	5.0×10^{-9}	**Below TLS**

3.35 China RMA informed that according to the email response from DPR Korea, there was no LHD event reported in 2025.

3.36 The Chairperson explained that Category I LHD referred to instances where weather turbulence displaced the aircraft from its flight level by 300 feet or more. China was requested to verify whether the 100 Category I LHD events met this criterion or represented the total number of reported turbulence occurrences. In response, China RMA indicated that it would provide further details through a Flimsy on Category I LHDs.

3.37 The Republic of Korea highlighted a discrepancy in the **RASMAG/31 WP/09 Appendix A**. The revised version of the WP was to be uploaded to the Meeting webpage.

Supplementary Sharing of Category I Events (FL/01)

3.38 China RMA presented supplementary information on Category I LHD events presented in **RASMAG/31 WP/09**, identifying a total of 100 events with a cumulative duration of 13.4 minutes and 112 levels crossed without clearance. The events were primarily attributed to turbulence and weather-related factors, with examples illustrating deviations due to thunderstorms and moderate to severe turbulence. It was observed that some events involved significant altitude fluctuations with recorded durations, while others involved minimal fluctuations with no recorded duration. The Meeting further noted that all Category I events were classified as technical risk events and that China RMA intended to enhance the reporting and analysis of such events in future reports.

JASMA Vertical Safety Report (WP/10)

3.39 The Japan Airspace Safety Monitoring Agency (JASMA) presented the airspace safety review of RVSM airspace risk reported in the Fukuoka FIR for calendar year 2025.

3.40 **Table 10** provided the technical, operational, and total risk for the RVSM implementation in Fukuoka FIR, of which met TLS.

Table 10. RVSM Risk Estimates in Fukuoka FIR for Calendar Year 2025

Fukuoka FIR **Estimated annual flying hours = 1,884,750 hours** ***(Note: estimated hours based on December 2025 TSD)***			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	0.35×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational Risk	2.86×10^{-9}	-	-
Total Risk	**3.21×10^{-9}**	5.0×10^{-9}	**Below TLS**

3.41 A total of 59 LHD events were reported in 2025. **Figure 8** illustrated the geographic location of risk-bearing LHD reports within Fukuoka FIR during the assessment period. Filled blue square symbols represented LHD locations within the RVSM stratum of the Fukuoka FIR, while the circle size indicated LHD durations of 50 seconds or more.

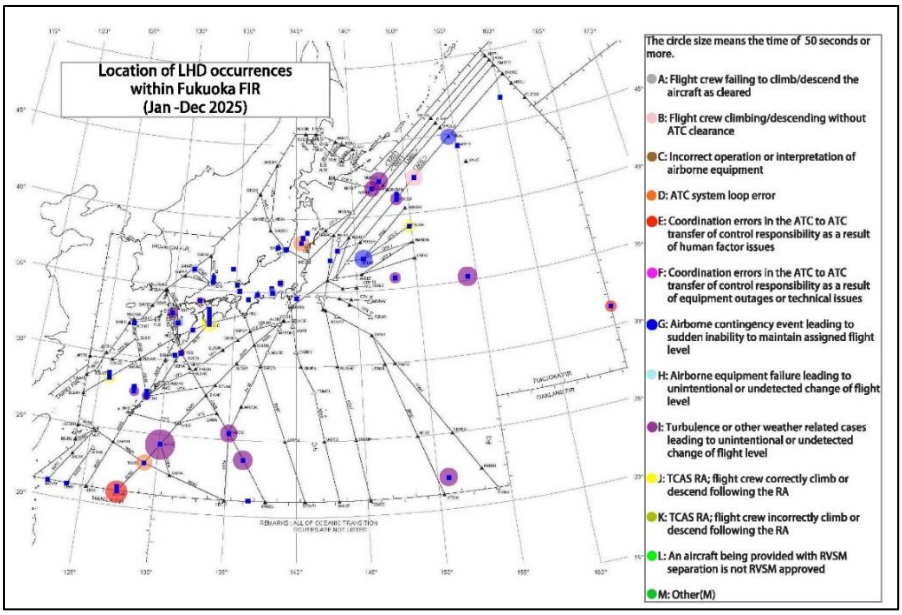

Figure 8. Geographical Location of LHDs within Fukuoka FIR

Hot Spot D1 (FIR Boundary between Fukuoka and Manila FIRs)

3.42 To mitigate transfer errors caused by human factors at Hot Spot D1, bilateral meetings between the Fukuoka and Manila ACCs had been regularly conducted since December 2022, fostering mutual understanding between both ACCs. The number of LHD events at Hot Spot D1 had shown a steady decrease (**Figure 9**). The Meeting was informed that one Category E LHD event had occurred during the transfer from Manila ACC to Fukuoka ACC in 2025.

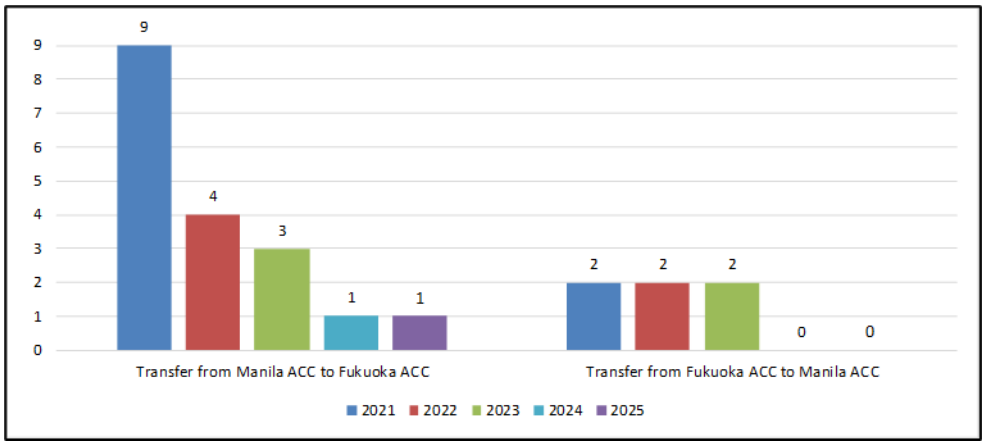

Figure 9. Number of LHDs at Hot Spot D1 between Fukuoka and Manila FIRs

3.43 JASMA further noted that Category I LHD occurrences, which accounted for the largest proportion of reported LHD events, had been observed throughout the Fukuoka FIR. The Meeting noted that the causes were related to pilots deviating to avoid adverse weather conditions, including turbulence, and were not attributed to any specific or distinctive factor.

MAAR Vertical Safety Report (WP/11)

3.44 MAAR presented the airspace safety review of RVSM airspace risk reported in the South Asia and Indian Ocean (SA/IO) airspace, Southeast Asia (SEA) airspace and Mongolian airspace, for calendar year 2025.

SA/IO Airspace

3.45 **Table 11** provided the technical, operational, and total risk for the RVSM implementation in the SA/IO airspace, which met TLS.

Table 11. RVSM Risk Estimates within SA/IO Airspace for Calendar Year 2025

SA/IO Airspace Estimated annual flying hours = 3,117,151 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	1.029×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	0.108×10^{-9}	-	-
Total Risk	**1.137×10^{-9}**	5.0×10^{-9}	**Below TLS**

3.46 A total of 100 LHD events were reported in 2025, compared to 207 in 2024. It was noted that almost all LHD events fell under Category E. When divided into sub-categories, the most frequent sub-category was E-RI at 69 per cent, followed by E-NT at 27 per cent.

3.47 **Figure 10** illustrated the geographic location of LHDs within SA/IO airspace during the assessment period.

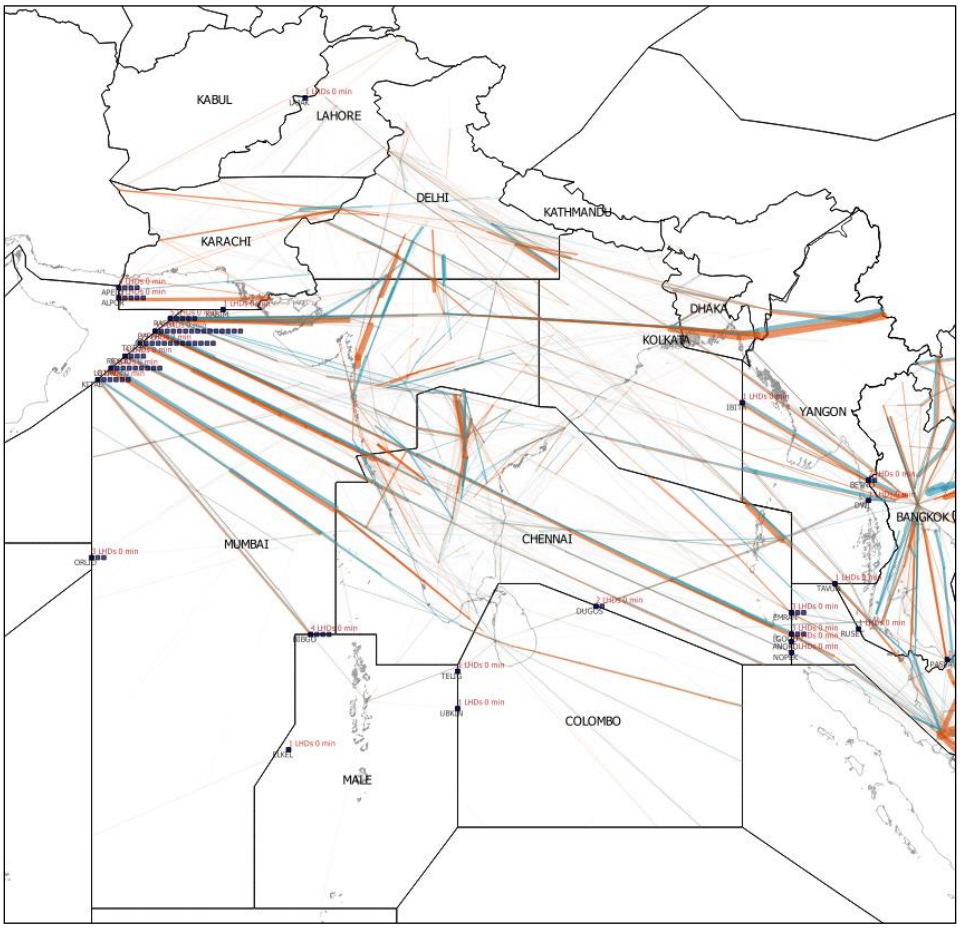

Figure 10. Geographical Location of LHDs within SA/IO Airspace

3.48 **Table 12** presented the number of LHDs and the operational risk for each cluster, as well as the results of the assessment against the established criteria within the SA/IO airspace. A "Negative" result indicated that the cluster did not satisfy the respective criterion, whereas a "Positive" result indicated that the cluster met the criterion and could therefore be identified as a hot spot.

Table 12. Results of Identifying Hot Spots in SA/IO Airspace

2025 Clusters (SA/IO)	**Mumbai/ Muscat (Hot Spot G1)**	**Chennai/ Kuala Lumpur**	**Karachi/ Muscat**
Number of LHDs	52	8	9
Check Criteria: Number >= 25	Positive	Negative	Negative
Operational Risk (x 10^{-9} fapfh)	0.04	0	0
Check Criteria: Risk >= 0.027 x 10^{-9} fapfh	Positive	Negative	Negative
Check Criteria: Operational Risk >= 5.00 x 10^{-9} fapfh	Negative	Negative	Negative

3.49 Based on the analysis of hot spots, the following observations and recommendations were proposed:

a) Hot Spot G1 was identified as the only cluster that met the established hot spot criteria for 2025 and therefore should remain on the list of hot spots until safety improvement initiatives or mitigation measures had been completed; and

b) Hot Spot A1 (Chennai/Dhaka/Kolkata/Yangon), Hot Spot F (Mogadishu/Mumbai), and Hot Spot G2 (Mumbai/Sanaa) should remain on the hot spots list until safety improvement initiatives or mitigation measures had been completed.

3.50 The Meeting was updated that, during the Special ATM Coordination Meeting between India and Oman held in June 2026, the ATM system at Mumbai ACC was in the process of being upgraded, with completion planned for Q4 of 2026. As a result, the new ATM system would be ready to support AIDC implementation.

SEA Airspace

3.51 **Table 13** provided the technical, operational, and total risk for the RVSM implementation in the SEA airspace, which met TLS.

Table 13. RVSM Risk Estimates within SEA Airspace for Calendar Year 2025

SEA Airspace **Estimated annual flying hours = 5,638,171 hours** ***(Note: estimated hours based on December 2025 TSD)***			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	1.356×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational Risk	0.462×10^{-9}	-	-
Total Risk	**1.818×10^{-9}**	5.0×10^{-9}	**Below TLS**

3.52 A total of 63 LHD events were reported in 2025, compared to 89 in 2024. It was noted that almost all LHD events fell under Category E. When divided into sub-categories, the most frequent sub-category was E-RI at 55 per cent, followed by E-NT at 34 per cent.

3.53 **Figure 11** illustrated the geographic location of LHDs within SEA airspace during the assessment period.

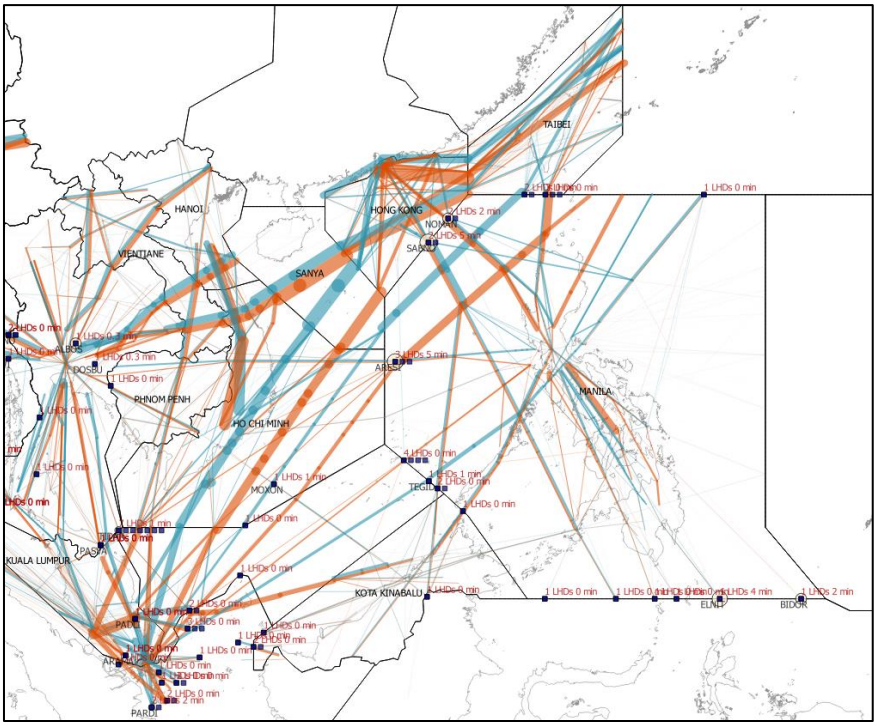

Figure 11. Geographical Location of LHDs within SEA Airspace

3.54 **Table 14** presented the number of LHDs and the operational risk for each cluster, as well as the results of the assessment against the established criteria within the SEA airspace. A "Negative" result indicated that the cluster did not satisfy the respective criterion, whereas a "Positive" result indicated that the cluster met the criterion and could therefore be identified as a hot spot.

Table 14. Results of Identifying Hot Spots in SEA Airspace

2025 Clusters (SEA)	**Bangkok/Ho Chi Minh/ Kuala Lumpur/Singapore (Hot Spot O)**	**Jakarta/Kota Kinabalu/ Singapore**	**Jakarta/Singapore (Hot Spot J)**	**Manila/Singapore**	**Manila/Taibei**	**Manila/Ujung Pandang (Hot Spot D8)**
Number of LHDs	7	6	8	5	5	6
Check Criteria: Number >= 9	Negative	Negative	Negative	Negative	Negative	Negative
Operational Risk (x 10^{-9} fapfh)	0.021	0.000	0.013	0.007	0.000	0.126
Check Criteria: Risk >= 0.066 x 10^{-9} fapfh	Negative	Negative	Negative	Negative	Negative	Positive
Check Criteria: Operational Risk >= 5.00 x 10^{-9} fapfh	Negative	Negative	Negative	Negative	Negative	Negative

3.55 Based on the analysis of hot spots, the following observations and recommendations were proposed:

a) Hot Spot D8 (Manila/Ujung Pandang) was identified as the only cluster that met the established hot spot criteria for 2025 and therefore should remain on the list of hot spots until safety improvement initiatives or mitigation measures had been completed;

b) Hot Spot D5 (Ho Chi Minh/Manila) should remain on the list of hot spots until safety improvement initiatives or mitigation measures had been completed;

c) Hot Spot D1 (Fukuoka/Manila) and Hot Spot J (Jakarta/Singapore) were proposed for removal, given that the mitigation measures had been successfully implemented. For Hot Spot J, Singapore added that the FIR boundary realignment had helped to enhance operational awareness among controllers of both Jakarta ACC and Singapore ACC;

d) Hot Spot D7 (Kota Kinabalu/Manila) was proposed as a potential non-hot spot, given that it had not met the hot spot criteria since 2021 and that the mitigation measures had been successfully implemented.

e) Hot Spot O (Bangkok/Ho Chi Minh/ Kuala Lumpur/Singapore) should remain on the list of hot spots until safety improvement initiatives or mitigation measures had been completed. It was noted that Singapore ACC conducted regular LHD analysis sharing sessions and provided operational aids, such as visual reminders on the air situation display, to enhance controllers' situational awareness. A coordination meeting between Malaysia, Singapore, and Thailand was required to initiate collaboration and develop appropriate mitigation measures.

Mongolian Airspace

3.56 **Table 15** provided the technical, operational, and total risk for the RVSM implementation in Mongolian airspace, which met TLS.

Table 15. RVSM Risk Estimates within Mongolian Airspace for Calendar Year 2025

Mongolian Airspace Estimated annual flying hours = 128,475 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	0.755×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational Risk	0.283×10^{-9}	-	-
Total Risk	**1.038×10^{-9}**	5.0×10^{-9}	**Below TLS**

3.57 In 2025, there were two LHD events were recorded in Mongolian airspace. One was a Category B LHD, in which the flight crew initiated a climb without ATC clearance. Another LHD resulted from a turbulence-induced deviation.

APANPIRG Air Navigation Deficiency List

3.58 To facilitate the process of RVSM safety oversight, States were required to annually submit a December TSD (***Conclusion APANPIRG 16/4***), and ANSPs were responsible for submitting LHD data to their RMAs on a monthly basis.

3.59 MAAR reported that it had not received any data from Afghanistan since the political situation in August 2021. In addition, no LHD reports for 2025 had been received from Myanmar. Consequently, MAAR proposed to retain Afghanistan and to include Myanmar in the APANPIRG List of Deficiencies in ATM and Airspace Safety under "Non-Provision of Safety-related Data".

Reporting Culture

3.60 Over the past several years, MAAR had observed continuous improvement among the States and ANSPs under its jurisdiction. Almost all States now regularly submit their LHD reports to MAAR through the Online LHD Submission System and cooperate in addressing LHD-related matters. Only Nepal and Myanmar continued using LHD reporting template and submit their reports via email.

3.61 Furthermore, most reported LHDs in MAAR's area of responsibility were located at the boundary of FIRs and classified as Category E LHD. There were a small number of other LHD categories observed. Additionally, MAAR had received several nil reports, indicating that no LHDs occurred in that particular month for Delhi, Dhaka, Hanoi, Kathmandu, Phnom Penh and Vientiane FIRs over the past three years. The number of nil reports might raise concerns about whether all LHDs were being captured and reported, suggesting the possibility of under-reporting.

3.62 The Chairperson encouraged States LHD Points of Contact (POCs) to expand their focus on other LHD occurrences in addition to Category E, while promoting a positive safety reporting culture within their States/organizations.

3.63 Additionally, the Chairperson also encouraged States LHD POCs to monitor GNSS RFI-related occurrences and to report them where they could be classified as LHD, LLD, or LLE, in accordance with the proposed classification outlined in **RASMAG/30 WP/22**, as well as the latest update of the *Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace*.

PARMO Vertical Safety Monitoring Report 2025 (WP/12)

3.64 PARMO presented the airspace safety review of RVSM airspace risk reported in the Pacific and a portion of the Northeast Asia airspace, for calendar year 2025.

Pacific Airspace

3.65 **Table 16** provided the technical, operational, and total risk for the RVSM implementation in the Pacific airspace, which exceeded TLS.

Table 16. RVSM Risk Estimates within Pacific Airspace for Calendar Year 2025

Pacific Airspace Estimated annual flying hours = 1,955,758.10 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	0.09×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational Risk	7.96×10^{-9}	-	-
Total Risk	**8.05×10^{-9}**	5.0×10^{-9}	**Above TLS**

3.66 A total of 74 LHD events were reported during the year. **Figure 12** illustrated the geographic location of risk-bearing LHD reports within Pacific airspace during the assessment period.

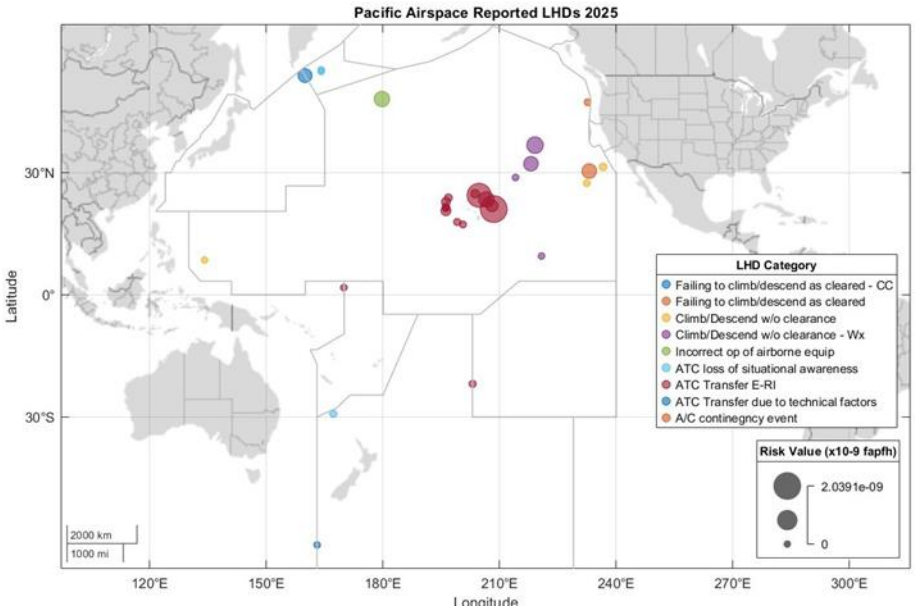

Figure 12. Geographical Location of LHDs within Pacific Airspace

3.67 The Meeting was informed that a software change to the ATM automation had been implemented as a corrective action following a long-duration LHD report. The reported LHD event had a duration of 64 minutes and had been classified as a Category F LHD. The impact of this occurrence on the collision risk estimate had been mitigated by the existing route structure in the relevant area of the Pacific. In addition, ATC refresher training had been implemented to enhance awareness.

Northeast Asia Airspace

3.68 **Table 17** provided the technical, operational, and total risk for the RVSM implementation in the Northeast Asia airspace, of which met TLS.

Table 17. RVSM Risk Estimates within Northeast Asia Airspace for Calendar Year 2025

Northeast Asia Airspace Estimated annual flying hours = 182,037.60 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Comparison with TLS**
Technical Risk	0.26×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational Risk	0.68×10^{-9}	-	-
Total Risk	**0.94×10^{-9}**	5.0×10^{-9}	**Below TLS**

3.69 A total of 87 LHD events were reported during the year. **Figure 13** illustrated the geographic location of reported LHD events, within Incheon FIR, during the assessment period.

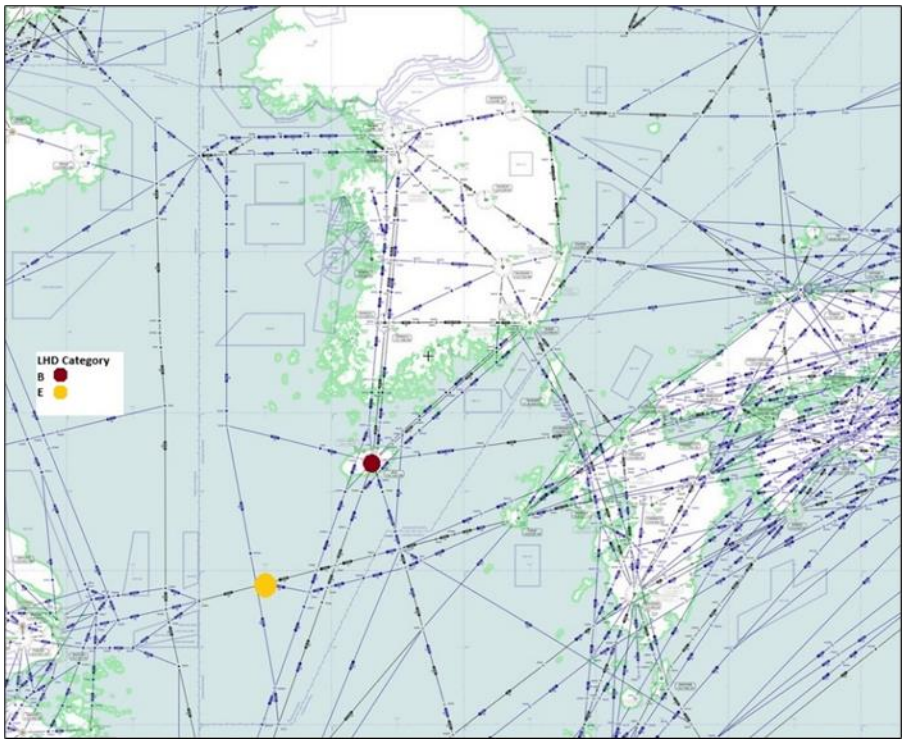

Figure 13. Geographical Location of LHDs within Incheon FIR

BOBASMA Horizontal Safety Monitoring Report (WP/13)

3.70 The Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) presented the horizontal safety assessment report for the implementation of 50 NM horizontal separation in the Bay of Bengal Arabian Sea Indian Ocean (BOBASIO) airspace for the period January to December 2025.

3.71 The lateral and longitudinal risks remained below TLS, as shown in **Table 18**.

Table 18. BOBASIO Airspace Horizontal Risk Estimates

Bay of Bengal Arabian Sea Indian Ocean Airspace Estimated annual flying hours = 617,741 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG/30 Lateral Risk	*1.59777 x 10^{-9}*	*5.0 x 10^{-9}*	*Below TLS*
RASMAG/30 50 NM Longitudinal Risk	*1.65722 x 10^{-9}*	*5.0 x 10^{-9}*	*Below TLS*
Lateral Risk	**1.32085 x 10^{-9}**	5.0 x 10^{-9}	**Below TLS**
50 NM Longitudinal Risk	**1.48931 x 10^{-9}**	5.0 x 10^{-9}	**Below TLS**

3.72 There were zero LLD and LLE reported in 2025.

3.73 BOBASMA clarified that during adverse weather conditions, where flights might deviate to adjacent ATS routes, ATC coordination with adjacent ACCs would be affected. The affected routes were managed as a single route to ensure that aircraft were not assigned the same flight level, thereby contributing to a reduction in LLD and LLE events.

JASMA Horizontal Safety Report (WP/14)

3.74 JASMA presented the horizontal safety assessment report for the North Pacific Ocean airspace for the period January to December 2025. The risk estimation reports covered the horizontal separation standards for:

a) 50 NM lateral separation;

b) 25 NM lateral separation;

c) 10 minutes time-based longitudinal separation (without Mach number technique); and

d) 30 NM distance-based longitudinal separation (PBCS and RNP4).

3.75 The lateral and longitudinal risks remained below TLS, as shown in **Table 19**.

Table 19. North Pacific Ocean Airspace Horizontal Risk Estimates

North Pacific Ocean Airspace Estimated annual flying hours = 1,884,750 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG/30 50 NM Lateral Risk	*2.25×10^{-9}*	*5.0×10^{-9}*	*Below TLS*
RASMAG/30 25 NM Lateral Risk	*0.78×10^{-9}*	*5.0×10^{-9}*	*Below TLS*
RASMAG/30 10 Minutes Time-Based Longitudinal Risk	*0.22×10^{-9}*	*5.0×10^{-9}*	*Below TLS*
RASMAG/30 30 NM Distance-based Longitudinal Risk	*0.016×10^{-9}*	*5.0×10^{-9}*	*Below TLS*
50 NM Lateral Risk	**0.26×10^{-9}**	5.0×10^{-9}	**Below TLS**
25 NM Lateral Risk	**0.12×10^{-9}**	5.0×10^{-9}	**Below TLS**
10 Minutes Time-Based Longitudinal Risk	**0.22×10^{-9}**	5.0×10^{-9}	**Below TLS**
30 NM Distance-Based Longitudinal Risk	**0.029×10^{-9}**	5.0×10^{-9}	**Below TLS**

3.76 A total of 44 LLD and LLE events were reported to JASMA in 2025. Category A incidents accounted for the highest number, increasing significantly from two in 2024 to 13. Category B incidents, the second highest, also rose from eight in 2024 to 11. An increase in operational errors by flight crew was observed in 2025.

3.77 The Meeting was informed that at GURAG (boundary between Fukuoka and Manila FIRs), there were five LLDs and five LLEs reported, representing an increase compared to 2024, when zero LLDs and two LLEs were recorded.

PARMO Horizontal Safety Monitoring Report 2025 (WP/15)

3.78 PARMO presented the horizontal safety assessment report for the for the Anchorage, Auckland, Nadi, Oakland, and Tahiti FIRs for the period January to December 2025.

3.79 The lateral and longitudinal risks remained below TLS, as shown in **Table 20**.

Table 20. Pacific Airspace Horizontal Risk Estimates

Pacific Airspace Estimated annual flying hours = 1,955,758 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG/30 Lateral Risk	*1.15×10^{-9}*	*5.0×10^{-9}*	*Below TLS*
RASMAG/30 Longitudinal Risk	*0.014×10^{-9}*	*5.0×10^{-9}*	*Below TLS*
Lateral Risk	**0.71×10^{-9}**	5.0×10^{-9}	**Below TLS**
Longitudinal Risk	**0.015×10^{-9}**	5.0×10^{-9}	**Below TLS**

3.80 A total of 177 LLD and LLE events were reported to PARMO in 2025. The data indicated a decrease in the number of reported LLDs compared to calendar year 2024. The LLD category with the most significant reduction was Category A, with eight Category A LLDs reported in 2025 compared to 24 in 2024.

3.81 An increasing trend in coordination occurrences between HCF and Oakland ARTCC was observed to have continued in calendar year 2025. These occurrences affected multiple traffic flows within Pacific airspace due to the central geographic location of HCF. However, the metrics for the CEP traffic flow were the most significant due to the high traffic density. The related analysis was provided in **RASMAG/31 WP/08**.

3.82 In response to an inquiry on whether PARMO had experience in identifying hot spots in the horizontal plane, the Meeting was informed that current horizontal risk estimates in the Pacific airspace were below TLS. PARMO indicated that further assessments would be conducted to explore the identification of hot spots in the horizontal plane.

SEASMA Horizontal Safety Report (WP/16)

3.83 The South East Asia Safety Monitoring Agency (SEASMA) presented the horizontal safety assessment report for operations on ATS routes N892, L625, N884 and M767 over the South China Sea. The assessment met the TLS values for lateral and longitudinal separation standards applicable to RNP 10 and RNP 4 operations for the period January to December 2025.

3.84 ATS routes M767 and N884 supported a hybrid mode of RNP 4 and RNP 10 operations. The lateral and longitudinal collision risk estimate trends for RNP 4 operation provided in the paper reflected the risk assessment of these two ATS routes.

3.85 **Table 21** provided the horizontal risk estimates for the airspace over the South China Sea.

Table 21. South China Sea Airspace Horizontal Risk Estimates

South China Sea Airspace Estimated annual flying hours = 54,752 hours *(Note: estimated hours based on December 2025 TSD)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Lateral Risk (RNP 10)	**0.156×10^{-9}**	5.0×10^{-9}	**Below TLS**
Longitudinal Risk (RNP 10)	**0.375×10^{-9}**	5.0×10^{-9}	**Below TLS**
Lateral Risk (RNP 4)	**0.199×10^{-9}**	5.0×10^{-9}	**Below TLS**
Longitudinal Risk (RNP 4)	**0.786×10^{-9}**	5.0×10^{-9}	**Below TLS**

3.86 The number of LLD events increased from two in calendar year 2024 to five in calendar year 2025, while LLE occurrences remained at one. Most LLDs in calendar year 2025 were classified as Category A, primarily due to flight crew deviations without ATC clearance, with contributing factors including weather avoidance and deviations exceeding approved limits or initiated prior to clearance. In contrast, all LLDs and LLEs in calendar year 2024 were classified as Category E, mainly due to coordination errors during ATC-to-ATC transfer of control associated with human factors. In calendar year 2025, only one Category E deviation was recorded, possibly reflecting increased controller awareness. Despite the increase in LLD events, the overall number of events remained low, indicating continued effective collaboration among ANSPs in maintaining safe and efficient operations.

APAC Consolidated Safety Report (WP/17)

3.87 MAAR presented the APAC Consolidated Safety Report, on behalf of the APAC RMAs and En-Route Monitoring Agencies (EMAs). The report was divided into the Pacific (PAC) area, and Asia area (**Figure**).

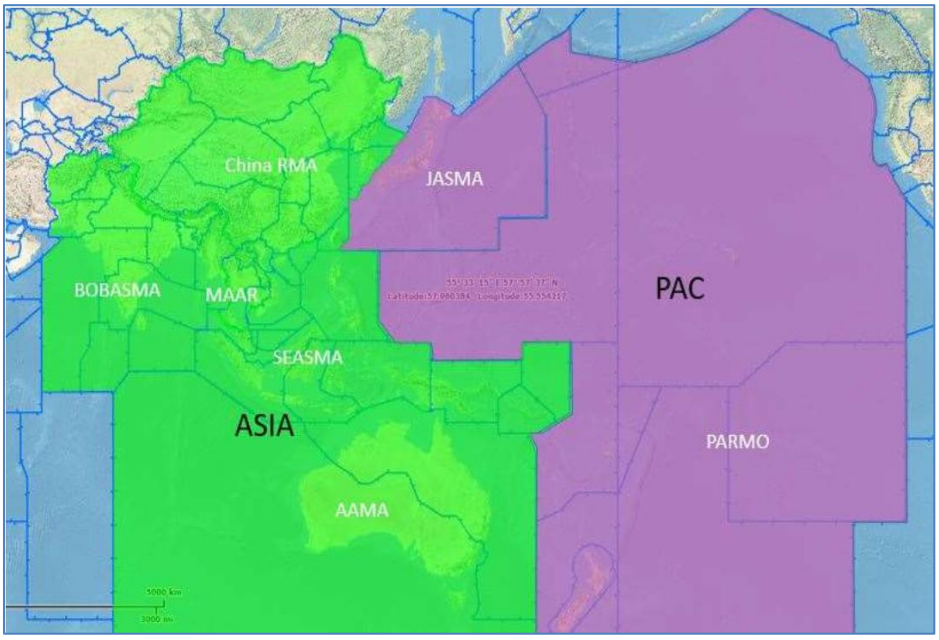

Figure 14. Asia and Pacific Safety Reporting Areas

Pacific Area Vertical Collision Risk

3.88 **Table 22** presented the estimated vertical collision risk for 2025 for the Pacific area, which exceeded TLS.

Table 22. 2025 Pacific Area Vertical Collision Risk Estimates

Pacific Area Estimated annual flying hours = 3,840,508 hours *(Note: estimated hours based on December 2025 TSD)*		
Source of Risk	**Risk Estimation**	**Comparison with TLS**
Vertical Technical Risk	0.22×10^{-9}	Below technical TLS
Operational Risk	5.45×10^{-9}	-
Total Risk	**5.67×10^{-9}**	**Above TLS**

3.89 The Pacific area vertical collision risk estimates had been above TLS and trending upwards each year from 2016 to 2019. In 2025, there was a decrease when compared to the previous year (**Figure**).

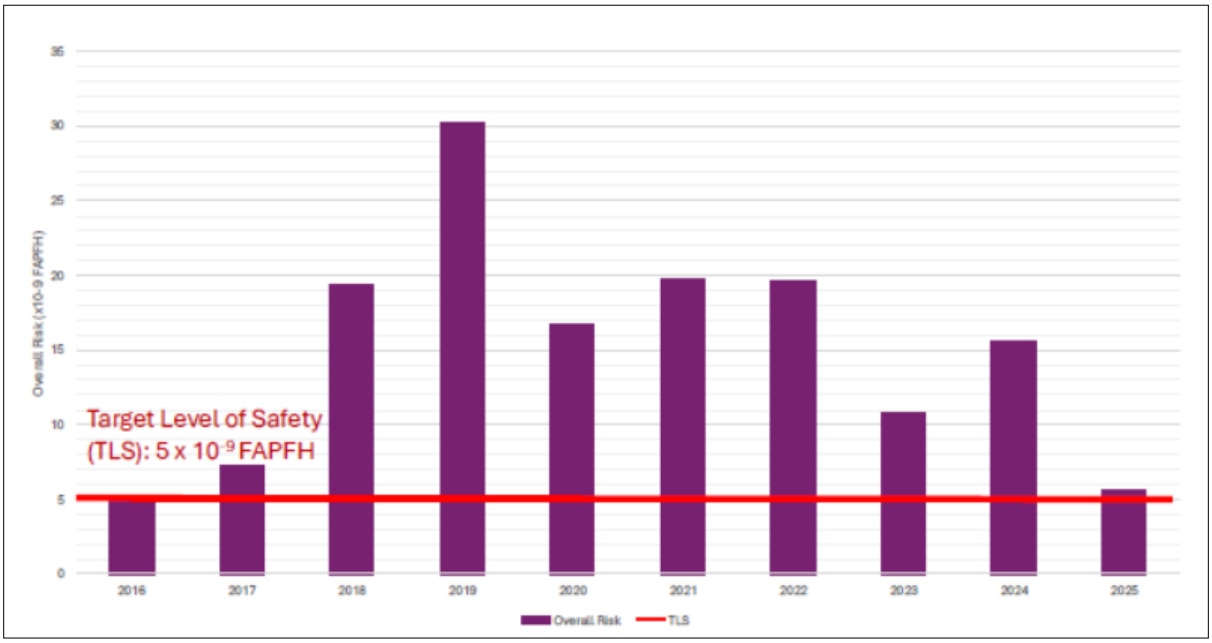

Figure 15. Pacific Area Vertical Collision Risk Estimates 2016 – 2025

3.90 There was a total of 147 LHDs in the Pacific area in 2025 (increased from 139 in 2024), with total duration 383.1 minutes and 33 levels crossed. 28 of the occurrences were Category A, B or C (19%), 78 were Category D, E or F (53%), six were Category G or H (4%), 23 in Category I (16%), 12 were Category J or K (8%), and zero in Category L, M or R.

Pacific Area Horizontal Collision Risk

3.91 The estimated horizontal collision risk for 2025 for the Pacific area met TLS in all lateral and longitudinal risk categories. **Table 23** presented a comparison of the estimated horizontal collision risks for 2024 and 2025.

Table 23. Pacific Area Horizontal Collision Risk Estimates (2024 vs 2025)

2024 Horizontal Risk Estimates	Risk Estimation	Remarks
Total Lateral Risk	1.22 x 10^{-9}	Below TLS
Total Longitudinal Risk	0.01 x 10^{-9}	Below TLS
2025 Horizontal Risk Estimates	**Risk Estimation**	**Remarks**
Total Lateral Risk	0.68 x 10^{-9}	Below TLS
Total Longitudinal Risk	0.02 x 10^{-9}	Below TLS

3.92 There was a total of 221 LLDs and LLEs in the Pacific area in 2025 (increased from 171 in 2024), with a total duration of 602.5 minutes and total horizontal deviation of 1,603 NM. 49 occurrences were Category A, B or C (22%), 161 were Category D, E or F (73%), two were in Category G (1%), three were Category H (1%) and six in Category I, J or R (3%).

Asia Vertical Collision Risk

3.93 **Table 24** presented the estimated vertical collision risk for 2025 for the Asia area, which met TLS.

Table 24. 2025 Asia Area Vertical Collision Risk Estimates

Asia Area **Estimated annual flying hours = 11,115,453 hours** ***(Note: estimated hours based on December 2025 TSD)***		
Source of Risk	**Risk Estimation**	**Comparison with TLS**
Vertical Technical Risk	0.84 × 10^{-9}	Below technical TLS
Operational Risk	0.71 × 10^{-9}	-
Total Risk	**1.55 × 10^{-9}**	**Below TLS**

3.94 The Asia area vertical collision risk estimates had been below TLS since 2021 (**Figure 16**).

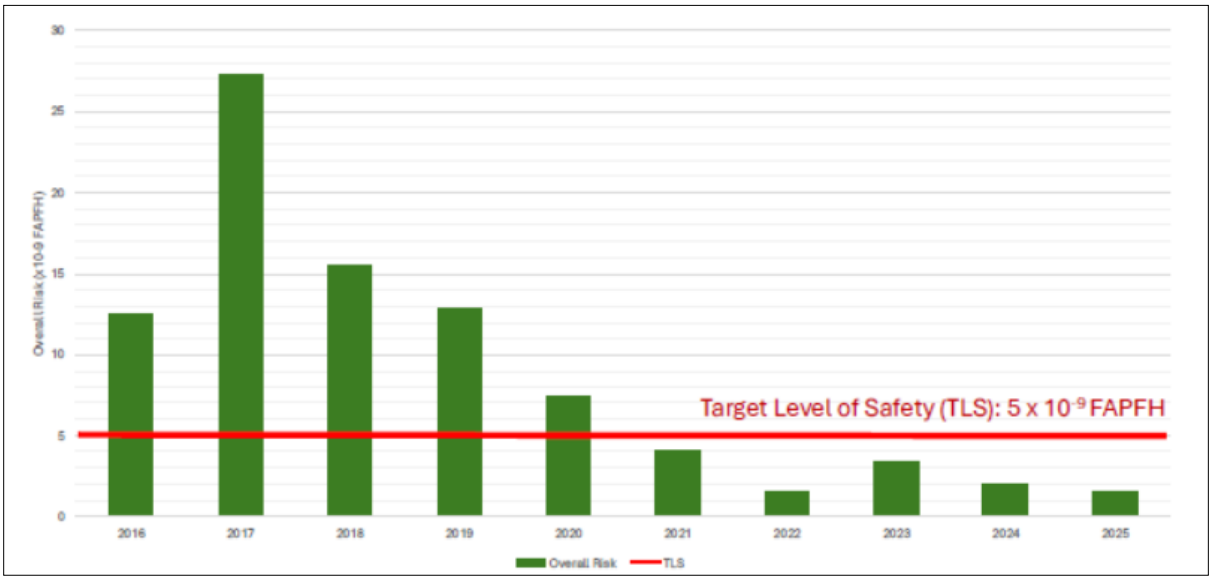

Figure 16. Asia Area Vertical Collision Risk Estimates 2016 – 2025

3.95 There was a total of 813 LHDs in the Asia area in 2025 (increased from 763 in 2024), with total duration 384.1 minutes and 252.8 levels crossed. 78 of the occurrences were Category A, B or C (10%), 504 were Category D, E or F (62%), 12 were Category G or H (1%), 103 in Category I (13%), 22 were Category J or K (2%), and 94 in Category L, M or R (12%).

Asia Area Horizontal Collision Risk

3.96 The estimated horizontal collision risk for 2025 for the Asia area met TLS in all lateral and longitudinal risk categories. **Table** presented a comparison of the estimated horizontal collision risks for 2024 and 2025.

Table 25. Asia Area Horizontal Collision Risk Estimates (2024 vs 2025)

2024 Horizontal Risk Estimates	**Risk Estimation**	**Remarks**
Total Lateral Risk	1.54×10^{-9}	Below TLS
Total Longitudinal Risk	1.62×10^{-9}	Below TLS
2025 Horizontal Risk Estimates	**Risk Estimation**	**Remarks**
Total Lateral Risk	1.26×10^{-9}	Below TLS
Total Longitudinal Risk	1.45×10^{-9}	Below TLS

3.97 There was a total of seven LLDs and LLEs in the Asia area in 2025 (increased from three in 2024), with a total duration of zero minutes and total horizontal deviation of 97 NM. Five occurrences were Category A, B or C (71%), two were Category D, E or F (29%), and zero for other categories.

Reporting Rate of LHDs, LLDs and LLEs

3.98 **Table** showed the number of LHDs, LLDs and LLEs reported for 2019 to 2025, and the number of reports per flying hours.

Table 26. Total LHD, LLD and LLE Reports, and Reports per Flying Hours, 2019 – 2025

Airspace	**Number of Reports**							**1 Report : Flying Hours**						
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
DPRK	0	0	0	0	0	0	0	-	-	-	-	-	-	-
Mongolia	2	0	1	0	0	0	2	1:82,138	-	1:121,621	-	-	-	1:64,238
SEA	152	42	70	62	101	74	69	1:22,275	1:25,106	1:15,456	1:32,620	1:29,400	1:42,001	1:46,259
SA/IO	439	152	135	143	258	204	101	1:7,955	1:7,907	1:11,167	1:21,018	1:10,242	1:20,309	1:36,979
Japan	77	66	80	75	72	76	107	1:20,762	1:14,737	1:13,528	1:18,751	1:23,452	1:25,387	1:19,067
SW Pacific	101	46	47	81	65	71	123	1:9,335	1:6,954	1:11,975	1:5,352	1:18,186	1:17,538	1:11,013
China	79	85	105	72	223	190	251	1:31,119	1:26,867	1:15,477	1:18,003	1:10,525	1:15,149	1:9,336
Pacific	173	134	176	179	203	234	250	1:10,139	1:6,404	1:6,638	1:8,280	1:8,736	1:8,264	1:7,823
Indonesia	37	18	41	54	125	102	196	1:33,321	1:17,346	1:7,402	1:8,060	1:6,099	1:5,379	1:4,349
ROK	34	5	24	108	75	126	87	1:18,959	1:25,965	1:6,285	1:1,056	1:2,220	1:1,568	1:2,092
Total	**1,094**	**548**	**679**	**774**	**1,122**	**1,077**	**1,186**	**1:14,330**	**1:13,202**	**1:11,200**	**1:13,230**	**1:12,135**	**1:14,937**	**1:13,309**

3.99 The estimated 15,783,908 flying hours in 2025 were close to the 16,087,567 hours in 2024. The overall reporting rate of LHDs/LLDs/LLEs slightly improved, from one report per 14,937 hours in 2024 to one report per 13,309 hours in 2025.

3.100 The Meeting noted that the reporting rate for SA/IO significantly dropped in 2025 due to the decreased in the number of LHDs, while the flying hours were closed to the number in 2024.

3.101 The reporting rates for China and SW Pacific significantly improved in 2025.

Hot Spots List

3.102 **Table 27** summarized current LHD hot spots, the FIRs involved, the year of identification, and status remarks.

Table 27. LHD Hot Spots in the APAC Region

Hot Spot	Involved FIRs	Identified	Remarks
A1	Chennai/Dhaka/Kolkata/ Yangon	2015	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria.
B1	Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)	2015	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria.
D1	Fukuoka/Manila	2015	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria. Mitigation measures implemented. **Proposed for removal from the list of hot spots.**
D5	Ho Chi Minh/Manila	2015	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria.
D7	Kota Kinabalu/Manila	2015	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria. Mitigation measures implemented. **Potential non-hotspot.**
D8	Manila/Ujung Pandang	2015	Category E LHDs. Number of reported LHDs below hot spot criteria, but risk level exceeded hot spot criteria.
F	Mogadishu/Mumbai	2015	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria.
G1	Mumbai/Muscat	2015	Category E LHDs. Number of reported LHDs exceeded hot spot criteria, but risk level below hot spot criteria.
G2	Mumbai/Sanaa	2015	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria.
J	Jakarta/Kota Kinabalu/Singapore	2018	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria. Mitigation measures implemented. **Proposed for removal from the list of hot spots.**

Hot Spot	Involved FIRs	Identified	Remarks
N	Hawaii CEP/Oakland USA	2019	Category E LHDs. Number of reported LHDs exceeded hot spot criteria, but risk level below hot spot criteria.
O	Bangkok/Ho Chi Minh/ Kuala Lumpur/Singapore	2023	Category E LHDs. Number of reported LHDs and risk level below hot spot criteria.
P	Jakarta/Ujung Pandang	2026	Category E LHDs. Number of reported LHDs exceeded hot spot criteria, but risk level below hot spot criteria.

3.103 India highlighted that the mitigation measures concerning Hot Spot F and Hot Spot G2 required coordination with States from different regions and would require facilitation from MAAR to coordinate with the Africa Indian Ocean Regional Monitoring Agency (ARMA) and the Middle East Regional Monitoring Agency (MID RMA), respectively.

3.104 Malaysia updated the Meeting on the actions taken regarding Hot Spot O. The matter had been briefed to senior management and registered in State's ANS hazard registry. It was noted that several mitigation measures had been implemented to address the issue, including incorporating information on the hot spot into controller refresher course and planning the publication of an LHD-related safety bulletin to promote awareness and safety. As a result, the number of LHD events caused by Kuala Lumpur ACC had been reduced.

3.105 The Meeting was informed that a side meeting between Malaysia, Singapore, and Thailand would be conducted on following day. Noting that several follow-up meetings would be required to agree on the mitigation measures, the States concerned agreed to share the outcomes of their coordination meetings at the next RASMAG meeting, with a view to exploring collaborative improvement initiatives to prevent LHD occurrences at Hot Spot O.

3.106 The Meeting reviewed and provided feedback on the APAC Consolidated Safety Report. The revised version as agreed by the Meeting was provided at **Appendix C** to the Report.

Agenda Item 4: Airspace Safety Monitoring Documentation and Regional Guidance Material

Removal of the Asia/Pacific Region En-Route Monitoring Agency (EMA) Handbook from the ICAO APAC Office Website (WP/18)

4.1 The Meeting recalled that the *Manual on Monitoring the Application of Performance-based Horizontal Separation Minima* (ICAO Doc 10063) had been adapted from the *Asia/Pacific Region En-Route Monitoring Agency (EMA) Handbook* and was intended to assist groups of States or regions in describing the functionality needed to monitor the safe application of performance-based horizontal separation minima in procedurally controlled airspace.

4.2 The Meeting noted that ICAO Doc 10063 was more comprehensive than the *EMA Handbook*, contained all necessary *EMA Handbook* content, and included additional references to ICAO Annexes, Standards and Recommended Practices (SARPs) and relevant guidance material. Consequently, at the Twenty-Second Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/22, Bangkok, Thailand, 10 – 13 July 2017), ***Conclusion RASMAG/22-9*** had been adopted to endorse ICAO Doc 10063 as guidance material and to replace the *EMA Handbook*.

4.3 The Meeting agreed that, since ICAO Doc 10063 was intended to replace the *EMA Handbook* and continued publication of both documents could create unnecessary duplication and confusion, the *EMA Handbook* should be removed for the following reasons:

a) removal had been endorsed by RASMAG via ***Conclusion RASMAG/22-9***;

b) current reporting forms (LHD/LLE/LLD) were owned by the respective RMAs and EMAs;

c) the *Asia Pacific Flight Information Regions and Responsible Monitoring* had been removed from the *EMA Handbook*, published separately, and posted on the ICAO APAC Office eDocuments webpage during RASMAG/28, thereby identifying the monitoring agency responsible for each designated FIR; and

d) updated operational and technical matters, including LLD reporting criteria, had been recorded in ***Conclusion RASMAG 22-8*** and ***Conclusion RASMAG 30-2***.

4.4 In view of the *EMA Handbook* removal, the Meeting determined that a mechanism was required to record regionally agreed changes to ICAO Doc 10063 pending formal amendment. The Meeting therefore agreed to the following Conclusion:

Conclusion RASMAG/31-1: Establishment of RASMAG Conclusions/Decisions Tracking List on Monitoring the Application of Performance-based Horizontal Separation Minima

That,

1. a *RASMAG Conclusions/Decisions Tracking List on Monitoring the Application of Performance-based Horizontal Separation Minima* be established, to record current changes agreed by RASMAG to the information in ICAO Doc 10063, until the document is amended; and

2. the *RASMAG Conclusions/Decisions Tracking List on Monitoring the Application of Performance-based Horizontal Separation Minima* at **Appendix D** to the Report be adopted and uploaded on the ICAO APAC Office eDocuments webpage.

4.5 It was noted that RMAs, EMAs, and States were to refer to ICAO Doc 10063 for global provisions, while the *RASMAG Conclusions/Decisions Tracking List on Monitoring the Application of Performance-based Horizontal Separation Minima* would provide regional specifics for the application of such minima.

4.6 PARMO informed the Meeting that the second edition of ICAO Doc 10063 had been developed and was pending publication.

Revision of the Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace (WP/19)

4.7 MAAR presented the proposed revision of the *Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace*, updating it from Version 3.0 (August 2024) to Version 4.0 (July 2026). The Meeting noted that the guidance material served as a key reference for post-implementation RVSM safety monitoring, outlining the roles and responsibilities of States and RMAs and supporting a coordinated regional approach to maintaining safe operations. The revision was proposed to incorporate recent developments and decisions endorsed by the APAC monitoring agencies and relevant RASMAG meetings.

4.8 The paper highlighted three major updates introduced in Version 4.0. First, sub-categories for Category E LHDs (i.e. E-NT: No Transfer or Negative Transfer, E-LT: Late Transfer, E-RI: No or Late Revision of Transfer Information, and E-OT: Any Other Type) were established to better classify coordination-related human factor errors. Second, a new Category R was introduced to capture LHD events associated with GNSS RFI, including jamming and spoofing occurrences. Third, the *LHD Analysis Form* (Form A) was revised to incorporate elements from the Human Factors Assessment Questionnaire, aimed at improving the identification of contributing factors and supporting more comprehensive analysis of operational events. These changes were intended to enhance consistency, accuracy, and analytical capability in RVSM safety monitoring.

4.9 The final version of the *Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace Version 4.0*, as reviewed and agreed by the Meeting was provided at **Appendix E** to the Report.

4.10 The Meeting agreed to the following Conclusion:

Conclusion RASMAG/31-2: Guidance Material for the Continued Safety Monitoring of the Asia Pacific RVSM Airspace Version 4.0

That,

1. the *Guidance Material for the Continued Safety Monitoring of the Asia Pacific RVSM Airspace Version 4.0* be adopted; and
2. the *Guidance Material for the Continued Safety Monitoring of the Asia Pacific RVSM Airspace Version 4.0* be uploaded to the ICAO APAC Office eDocuments webpage to replace the existing version.

RASMAG's Safety Data Sharing with Stakeholders (WP/20)

4.11 The paper presented by MAAR provided the background and current practices of RASMAG's safety data sharing with stakeholders, in relation to ***RASMAG Task List Action Item 29/1***, which addressed the identification and de-identification of safety reports for wider distribution. It was noted that the discussion originated from earlier requests by international organizations to access more detailed safety occurrence information, particularly LHD events. The safety data sharing within RASMAG currently covered individual LHD/LLD/LLE reports, annual airspace safety reports, and identified hot spots, and aimed to establish a structured approach for data sharing beyond monitoring agencies.

4.12 The Meeting noted the existing practices, highlighting that certain sensitive information, particularly aircraft call signs, was treated as confidential and required de-identification before being shared externally. It was agreed among monitoring agencies that while high-level summaries and categorized information could be shared with broader stakeholders, detailed event descriptions that might reveal the identity of operators or other entities should not be disclosed. It was also noted that aggregate safety reports and hot spot information were already publicly available, with sensitive details removed, while full data with identified information was only shared among relevant monitoring agencies, States, ANSPs, and operators for safety purposes.

4.13 The Meeting was invited to review the current practices and provide guidance on whether the proposed extension of data sharing to international aviation organizations, such as IATA and IFALPA, was appropriate. It was noted that such organizations could serve as intermediaries in addressing safety issues with aircraft operators. Subject to agreement in principle, it was further indicated that additional work would be undertaken to formalize the data sharing framework, including the development of clear processes, assignment of responsibilities, and establishment of conditions governing the use of shared data.

4.14 In response to an inquiry, PARMO shared that, based on its knowledge, one RMA currently had a data sharing arrangement to provide individual LHD/LLD/LLE reports to agreed stakeholders. The RMA updated reported occurrences after they had been reviewed by its scrutiny group and made them available through its database. Access was provided via username and password, with the respective State authorities granting access rights. It was further noted that tiered access levels were implemented, determining the type and extent of information that could be made available.

4.15 The Meeting noted the concerns raised by several States, including legal and privacy issues that could restrict the provision of data sharing to external parties. It was therefore suggested that a more concrete proposal be developed, including a clear mechanism for data sharing and a requirement for requesting parties to explicitly state the specific purpose for which the data would be used, prior to States being able to provide comments and/or make a decision.

Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region

Enhancing Safety in Hot Spot B1 on ATS Route A593 (WP/21)

5.1 In 2025, the Republic of Korea conducted a safety review of Hot Spot B1, the transfer of control point between Incheon ACC and Shanghai ACC. The review indicated that most of occurrences in the area were attributable to human factors. The safety review of Hot Spot B1 was conducted based on LHD data collected from January to December 2025, as well as mandatory and voluntary safety reports. Out of 91 safety data entries, nine cases were excluded from the analysis due to misreporting or insufficient information. Accordingly, 82 cases were subject to a detailed safety review.

5.2 The safety review identified that 77 cases were attributable to errors by controllers, including uncoordinated flight level changes (40 cases), delayed provision of flight information (13 cases), and omission of flight information (eight cases). In addition, three cases were attributed to human errors by pilot, such as incorrect readback. One case of severe turbulence and one case of aircraft system malfunction were also reported. The risk assessment from the safety review indicated that none of the cases were classified as “Severe” or “Major”. However, 55 cases were categorized as “Minor” and required mitigation measures, all of which were attributable to human errors. Although these cases did not pose an immediate significant safety risk, they highlighted the potential for recurring human errors.

Establishment and Operation of AIDC

5.3 The Republic of Korea highlighted that the establishment and operation of AIDC would constitute the effective measure to mitigate human errors during the transfer of control. Taking these findings into consideration, the Republic of Korea completed the development of the necessary infrastructure at Incheon ACC for AIDC implementation in June 2023 and subsequently requested Shanghai ACC to commence trial operations to enhance safety on ATS route A593. However, China indicated in previous meetings that technical constraints had made it difficult to proceed with trial operations. The Republic of Korea expressed its readiness to engage with Shanghai ACC in discussions on trial operations to resolve technical issues and to facilitate the implementation of AIDC between the two ACCs at the earliest possible opportunity.

Safety Management Cooperation

5.4 The Republic of Korea's Air Traffic Management Office (ATMO), as the ANSP, was responsible for providing safe and efficient air traffic services within the Incheon FIR, while the Korea Office of Civil Aviation (KOCA), as the regulatory authority, was responsible for conducting oversight of its ANSP accordingly. However, safety data related to the airspace delegated to Shanghai ACC had been shared only to a limited extent, with such exchanges largely confined to LHD data. This limitation posed challenges in conducting comprehensive safety reviews and effective safety oversight.

5.5 The Meeting was informed that the Republic of Korea retained responsibility for ensuring continuous and effective safety management in the delegated airspace. Accordingly, as the State responsible for the Incheon FIR, the Republic of Korea requested the establishment of a safety oversight mechanism for the delegated airspace (LAMEN–SADLI segment of ATS route A593). This initiative was expected to contribute not only to strengthening bilateral aviation safety cooperation but also to enhancing overall airspace safety in the APAC region.

Improvement of the Airspace Environment

5.6 At the Thirteenth Meeting of the ATM Sub-Group of APANPIRG (ATM/SG/13, Singapore, 25 – 29 August 2025), China and the Republic of Korea each presented measures aimed at enhancing safety on ATS route A593. Following the discussions, both States agreed to continue their coordination efforts and to submit a joint working paper to ATM/SG/14, scheduled for August 2026, providing an update on the progress of Phase 2 implementation and any associated operational outcomes.

5.7 The Republic of Korea commented that controllers' situational awareness would be enhanced when ATS route structures accurately reflected actual traffic flows. In this regard, the proposed phased implementation plan was developed to align route design with prevailing operational conditions. It was therefore proposed that Phase 2 of the Phased Implementation Plan be implemented at the earliest opportunity, including the establishment of a triple ATS route structure.

Efforts to Enhance Airspace Safety

5.8 To accommodate increasing traffic demand and to maintain airspace capacity and smooth traffic flow, the Republic of Korea indicated that Automatic Dependent Surveillance – Broadcast (ADS–B) equipage would be required for aircraft operating within the Incheon FIR effective 9 April 2027. As a result, surveillance within the Incheon FIR was expected to transition from radar-only surveillance to an integrated ADS–B surveillance environment, thereby enhancing surveillance capability and redundancy.

5.9 Considering the enhanced surveillance capability along the entire ATS route A593, the Republic of Korea expressed its readiness to discuss the reduction of longitudinal separation minima with Fukuoka and Shanghai ACCs in accordance with the ***Fourteenth Air Navigation Conference (AN-Conf/14) Recommendation 3.1/1***. In preparation for Phase 2 operations under the Phased Implementation Plan, the Republic of Korea was also preparing the design of a triple ATS route structure, the removal of Flight Level Allocation Scheme (FLAS), and the improvement of flight information procedures for Visual Flight Rules (VFR) aircraft.

Operational Structure and Terminology of ATS Route A593

5.10 The Republic of Korea opined that the corridor system applied to the ONIKU–LAMEN segment of ATS route A593 within the Incheon FIR (formerly known as the FUKUE–AKARA Corridor) was dismantled with the implementation of Phase 1 on 25 March 2021. Accordingly, Incheon ACC had been providing air traffic services for the SADLI–ONIKU segment (east of 125°E), while Shanghai ACC had been providing air traffic services for the SADLI–LAMEN segment (west of 125°E) under delegation from Incheon ACC. Therefore, the Republic of Korea opined that the terms "Corridor" or "AKARA Corridor" were no longer considered valid, and it was proposed that the terms "A593 Delegated Airspace" or "SADLI–LAMEN Segment" be used instead.

5.11 With regard to the Republic of Korea's proposal to change the terms "Corridor" or "AKARA Corridor," China recalled that the "FUKUE – AKARA Corridor" was established in 1983 by China, Japan, and the Republic of Korea under ICAO. China also mentioned that RASMAG might not be the appropriate forum to discuss the matter.

5.12 The Chairperson noted that RASMAG focused on airspace safety monitoring, particularly hot spots, and highlighted that the naming had been updated as proposed by the Republic of Korea to "LHD Hot Spot B1 Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)".

5.13 With regard to the Republic of Korea's other proposals, the Meeting was informed that China had provided its response and proposed corresponding optimization measures at recent RASMAG and ATM/SG meetings. At the same time, China had been actively preparing for the China–Republic of Korea ATM/CNS Meeting, which was expected to take place prior to ATM/SG/14, either in person or virtually, subject to coordination between the two States.

5.14 The Republic of Korea opined that the objective of RASMAG was to enhance airspace safety and efficiency within the RVSM airspace. In particular, it emphasized the need for more active discussions on fundamental safety enhancement measures, including improvements to ATS route structures and traffic flow optimization, considering that ATS route A593 was a major international route connecting Europe, Northeast Asia, and North America. Given the high traffic volume and limited route capacity in the area, it was emphasized that greater attention should be given to addressing the associated challenges and implementing appropriate mitigation measures.

5.15 In response, the Chairperson explained that RASMAG monitored airspace safety through the identification of airspace safety concerns, including hot spot lists where appropriate, and by tracking the progress of mitigation measures implemented by the concerned States. The Chairperson agreed with the need for continued attention but clarified that RASMAG would not engage in detailed resolution processes, as these would require more extensive bilateral or multilateral coordination. It was further highlighted that, for the removal of a hot spot, States needed to implement mitigation measures and provide supporting evidence demonstrating a reduction in LHD events.

Transfer of RVSM Safety Assessment and Monitoring Responsibilities of Hong Kong China and Macao China to China RMA (WP/22)

5.16 China RMA presented a proposal for the transfer of RVSM safety assessment and monitoring responsibilities for Hong Kong China and Macao China, from MAAR to China RMA. It was highlighted that MAAR had provided these services for the Hong Kong FIR since 2002. The proposal was developed in the context of increasing collaboration within the Greater Bay Area (GBA), which provided a strong foundation for consolidating monitoring responsibilities under China RMA to enhance regional coordination.

5.17 The Meeting was informed that the proposed transfer aimed to consolidate the RVSM safety assessment and monitoring services under the China RMA. This unified approach leverages the established coordination mechanisms and proven track record of cooperation to ensure streamlined operations and enhanced safety oversight for the entire region. The proposal had been presented and/or discussed at several meetings, including APANPIRG/36, RASMAG/MAWG/13 and RMACG/21, and was supported by all relevant stakeholders.

5.18 A structured transition plan was presented, with responsibilities remaining with MAAR prior to RASMAG/31, followed by data handover and a transition period from mid-2026 to the end of 2026 during which China RMA would progressively assume operational duties with MAAR's support. Full implementation was scheduled for 1 January 2027, after which China RMA would assume complete responsibility for monitoring and safety assessment, including preparation of the 2026 safety assessment report.

5.19 RASMAG/31 agreed to the following Draft Conclusion:

Draft Conclusion RASMAG/31-3: Transfer of RVSM Safety Assessment and Monitoring Responsibilities of Hong Kong, China and Macao, China from MAAR to China RMA

That,

1. effective from 1 January 2027, the competent airspace safety monitoring organizations for safety assessment and monitoring in the vertical plane [i.e. Reduced Vertical Separation Minimum (RVSM)] for Hong Kong China and Macao China be transferred to China RMA; and
2. the revised *Asia/Pacific Flight Information Regions and Responsible Monitoring Agency* at **Appendix F** to the Report be uploaded to the ICAO APAC Office eDocuments webpage to replace the existing version.

AAMA Assessment of Non-RVSM Approved Aircraft (WP/23)

5.20 AAMA presented the non-RVSM approved airframes that had filed flight plans to operate within RVSM airspace from June 2025 to March 2026, which was based on the monthly cross-check and comparison of aircraft registrations identified from flight plan data and the lists of RVSM-approved aircraft available from individual RMAs on the ICAO Knowledge Services Network (KSN) website. Only aircraft that had filed flight plans for RVSM levels with a "W" indicated in Item 10 were considered.

5.21 Aircraft that had incorrectly filed flight plans between June 2025 and March 2026 were consequently identified as non-RVSM approved airframes. It was noted that AAMA had seven such unapproved airframes, while NAARMO and PARMO each had one unapproved airframe. Detailed information regarding these aircraft was provided in **RASMAG/31 WP/23**.

5.22 PARMO highlighted that the suspected non-RVSM approved aircraft under the responsibility of NAARMO remained classified as non-RVSM approved and were still under investigation. Regarding the airframe under PARMO's responsibility, it was noted that the aircraft was unlikely to achieve RVSM levels. The operator had filed a "W" in December, which led to its capture by AAMA. However, based on subsequent communication with AAMA, it was understood that no further "W" filings had been made since December 2025.

JASMA Assessment of Non-RVSM Approved Aircraft (WP/24)

5.23 JASMA presented the non-RVSM approved airframes that had filed flight plans to operate within RVSM airspace from January to April 2026. The analysis was based on a monthly cross-check and comparison of aircraft registrations identified from flight plan data extracted from the Flight Object Administration Center System (FACE) of the Japan Civil Aviation Bureau (JCAB) against the lists of RVSM-approved aircraft available in individual RMAs' databases.

5.24 Aircraft that had operated within the RVSM airspace of the Fukuoka FIR between January and April 2026 with "W" filed in Item 10 of their flight plans, but whose RVSM approvals were not registered in the databases as of the tenth day of the following month, were identified and presented in **RASMAG/31 WP/24**. It was noted that one aircraft had operated in RVSM airspace for four consecutive months without its approval being verified in the RMA approval database.

5.25 The Meeting noted that JASMA had communicated the details of the aircraft listed in the WP to the respective RMAs. It was further noted that only PARMO had provided verification confirming that the aircraft under its responsibility was RVSM approved.

MAAR Assessment of Aircraft with RVSM Approval Status Pending Verification (WP/25)

5.26 MAAR presented the results of its annual "W" verification of flight plans for aircraft operating in RVSM airspace across MAAR-designated States. The analysis was based on data from the 2025 TSD and monthly Bangkok FIR flight plan records. A total of 20 aircraft operated in RVSM airspace were identified as having pended RVSM approval status verification, representing a reduction from the 26 aircraft reported at RASMAG/30.

5.27 Overall, the findings indicated that most of the identified cases were attributable to administrative factors, such as delays in F2 Form submissions and aircraft de-registration or transfer, rather than intentional non-compliance. Continued coordination and prompt follow-up were therefore considered essential to ensure the accuracy of RVSM approval data and the correct use of the "W" indicator in flight plans. MAAR noted that it would continue to monitor the situation and explore opportunities to enhance verification processes and information exchange among RMAs and States.

5.28 It was observed that three Indian-registered aircraft were identified as repeat cases, having remained on the list for two consecutive years. These aircraft were observed operating exclusively within Indian FIRs. MAAR had promptly contacted the Directorate General of Civil Aviation (DGCA) India, in parallel with the aircraft operators, following the release of the audit results to request confirmation of their RVSM approval status. Although several operators had verbally confirmed that the aircraft held valid RVSM approvals, MAAR required official confirmation from the State authority. While DGCA India had been submitting F2 Forms to MAAR, the confirmations had been provided gradually and did not yet cover all aircraft on the list. As a result, the RVSM approval status of several Indian-registered aircraft remained pending verification.

5.29 MAAR updated the Meeting that DGCA India had submitted F2 Forms for two of the three aircraft mentioned above during RASMAG/31. MAAR would continue to coordinate with DGCA India to obtain the remaining confirmation documents and update the records accordingly.

RASMAG Task List Action Item 30/6

5.30 The Meeting was informed that MAAR had initiated preliminary discussions on developing a consolidated list of non-RVSM approved aircraft among APAC RMAs in support of ***RASMAG Task List Action Item 30/6***. At RMACG/21, RMAs discussed the need for consistent terminology to distinguish between aircraft with pending RVSM approval verification and those confirmed as non-RVSM approved, and agreed that the Action Item should focus only on confirmed non-RVSM approved aircraft.

5.31 The Meeting noted that the establishment of common terminology was a key initial step prior to further development, and that discussions on this Action Item would continue at future RASMAG/MAWG meetings.

APANPIRG Air Navigation Deficiency List

5.32 The annual RVSM approval snapshot provided by each State was essential for verifying RVSM approval status and identifying aircraft with pending verification. MAAR observed that regular submission of these snapshots enabled States to detect missing approval records and promptly notify MAAR, as well as identify de-registered aircraft for removal from the database, thereby preventing them from contributing to the monitoring burden. MAAR strongly encouraged all States to routinely submit their annual RVSM approval snapshots to maintain the accuracy and currency of the MAAR RVSM database.

5.33 MAAR highlighted that Mongolia and Pakistan did not submit the 2025 annual RVSM approval snapshot and invited RASMAG to consider whether continued non-submission should be brought to the attention of APANPIRG. It was further noted that, should the issue persist, it might warrant inclusion in the APANPIRG Air Navigation Deficiencies in the ATM and Airspace Safety fields.

PARMO RVSM Traffic Compliance Monitoring (WP/26)

5.34 PARMO presented its assessment of aircraft operating within RVSM airspace without a valid RVSM approval record in the Pacific and parts of Northeast Asia under its oversight. The analysis was based on TSD for December 2025, comprising 96,318 operations, where observed RVSM flight levels and corresponding flight plan indications were compared against the May 2026 combined approvals database.

5.35 A total of 18 aircraft were initially identified as having no valid or expired approval and required further analysis. Of these, seven were subsequently confirmed as approved, ferried, or exported, and six were attributed to flight plan misfiles or typographical errors, leaving five aircraft identified as non-approved. It was noted that most discrepancies were due to delays in State notification of RVSM approvals to the relevant RMAs, highlighting the importance of timely data submission.

5.36 AAMA updated the Meeting that the suspected non-RVSM-approved aircraft under its responsibility had been confirmed as RVSM approved, and that the approval status would be updated accordingly in the latest approval database.

China RMA Approval Check of Non-RVSM Aircraft in 2026 (IP/02)

5.37 China RMA presented an overview of its efforts to monitor and update RVSM approval statuses for aircraft operating within RVSM airspace from January to May 2026, reflecting its ongoing commitment to ensuring compliance and continuous monitoring.

5.38 A list of aircraft identified by China RMA as operating in RVSM airspace without corresponding RVSM approval records was provided in the paper.

5.39 **Figure 17** illustrated the monthly distribution of questionable aircraft, confirmed cases, pending confirmations, and the confirmation rate trend from January to May 2026.

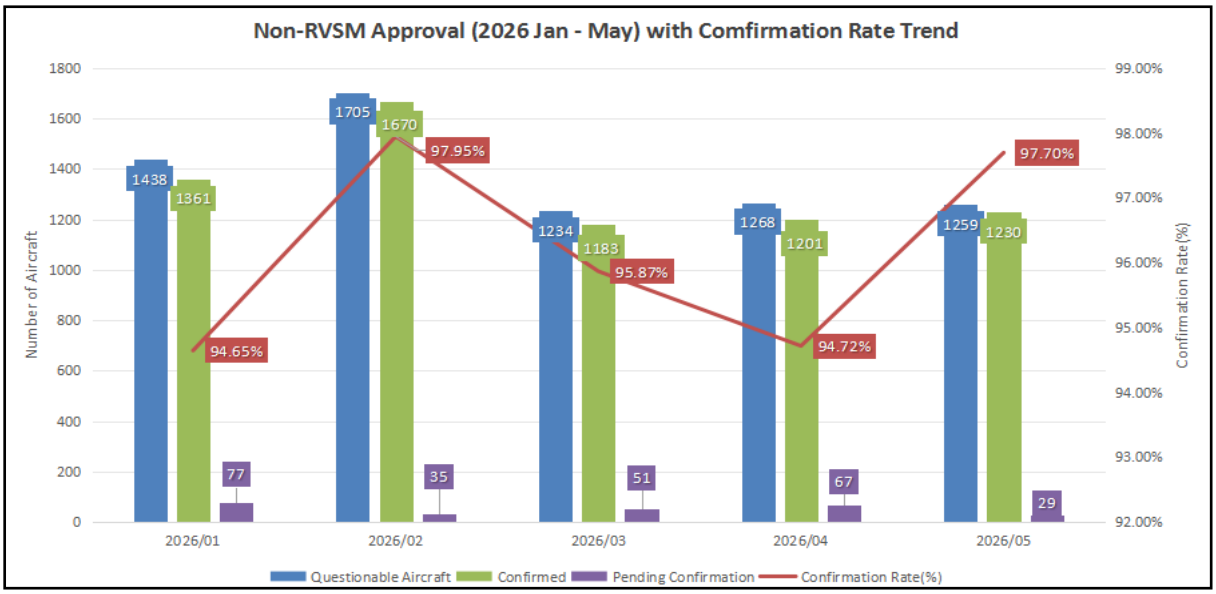

Figure 17. Non-RVSM Approval Status of China RMA from January to May 2026

5.40 The Republic of Korea confirmed that several Republic of Korea-registered aircraft listed in the WP were RVSM approved. The Republic of Korea indicated that it would share this information with PARMO to update the approval database for the validation process.

AAMA RVSM Long Term Height Monitoring Burden (WP/27)

5.41 AAMA presented the monitoring burden based on approvals contained within the AAMA approvals database and global monitoring data available as of 31 May 2026.

5.42 The total number of unique airframes holding RVSM approval from States of Registry under AAMA responsibility as of 31 May 2026 was 1,466. Based on this population, the monitoring burden was calculated at 466 airframes, of which 72 had not been monitored within the preceding two years.

5.43 A breakdown of monitoring burden by State of Registry for States under AAMA responsibility was provided in **RASMAG/31 WP/27**.

5.44 With regard to the Vanuatu-registered aircraft, the Meeting noted that the aircraft's height-keeping monitoring had previously been conducted through ADS–B Height Monitoring System (AHMS), captured via ADS–B while operating over continental Australia. It was further noted that efforts were underway to expand AHMS capabilities, and that access to ADS–B data from other regions would be considered, subject to its suitability for ASE processing. AAMA informed the Meeting that the matter would be urgently discussed with Vanuatu in order to avoid a potential APANPIRG Air Navigation Deficiency.

JASMA LTHM Burden Estimate Update (WP/28)

5.45 JASMA presented the monitoring burden for aircraft registered and operated by Japanese operators to meet ICAO Annex 6 Long Term Height Monitoring (LTHM) requirements as of May 2026.

5.46 As of 31 May 2026, a total of 827 airframes were recorded as RVSM approved in the JASMA approvals database. Applying the MMR to this population resulted in a total monitoring burden of 173 airframes.

5.47 After accounting for aircraft newly approved or monitored within the preceding two years, the outstanding monitoring burden was reduced to 12 airframes (1.5%). These remaining aircraft were primarily operated by small operators, whose flight hours were considered unlikely to have reached 1,000 hours within the recent two-year period.

PARMO RVSM Long Term Height Monitoring Burden (WP/29)

5.48 PARMO presented its analysis of the monitoring burden associated with LTHM requirements for airframes under its responsibility, based on the PARMO RVSM approvals database as of April 2026.

5.49 A total of 572 unique airframes were identified as holding full RVSM approval from States of Registry under PARMO responsibility, resulting in a monitoring burden of 155 airframes, with 13 aircraft not successfully monitored within the preceding two years. This figure may include airframes subject to the 1,000-hour monitoring requirement, for which operators are responsible for providing proof of compliance.

5.50 A summary by State of Registry with a more detailed breakdown was provided in **RASMAG/31 WP/29**.

5.51 New Zealand updated that four of the nine airframes mentioned in the WP had only operated between 120 to 500 hours since they were last monitored, while coordination on the other five airframes was ongoing to ensure that they fulfil Annex 6 requirements. The information had been provided to PARMO, but not in time for it to be reflected in the WP. New Zealand sought for the four airframes to be removed from the long-term height monitoring burden.

5.52 With regard to the Cook Islands-registered aircraft, PARMO confirmed that they had been in contact with the operator and had provided guidance on the specific data required to be collected from the ADS–B Out station or the airframe, including the necessary data fields and instructions on the mode of flight. PARMO expressed optimism that the following day's flight would yield satisfactory monitoring results and could enable removal from the proposed potential APANPIRG Air Navigation Deficiency list.

China RMA LTHM Burden Estimate Update (IP/03)

5.53 China RMA presented the monitoring burden for aircraft registered and operated under its responsibility to meet LTHM requirements, based on the RVSM approval database as of the end of April 2026.

5.54 As of April 2026, for China, a total of 4,750 RVSM-approved aircraft were recorded, resulting in a monitoring burden of 559, with 40 aircraft outstanding. For the Democratic People's Republic of Korea, one operator with four aircraft initially required monitoring; however, following Height-Keeping Performance (HKP) monitoring conducted by China RMA in October 2025, all aircraft were found compliant, with a monitoring burden of zero.

5.55 It was noted that the 40 outstanding China-registered aircraft might not have had ADS-B Out capability; therefore, on-board height monitoring was required to be conducted.

NAARMO RVSM Long Term Height Monitoring Burden (IP/04)

5.56 PARMO presented the analysis of the monitoring burden associated with LTHM requirements for airframes under the NAARMO responsibility, based on the NAARMO RVSM approvals database as of March 2026.

5.57 A total of 25,158 unique airframes were identified as holding full RVSM approval from States of Registry under NARMO responsibility, resulting in a monitoring burden of 13,461 airframes, with 660 aircraft (i.e. 5 per cent) not successfully monitored within the preceding two years. This figure may include airframes subject to the 1,000-hour monitoring requirement, for which operators are responsible for providing proof of compliance.

5.58 It was noted that due to incomplete information provided within the RVSM approvals data as well as the limited number of approvals received from Mexico, a monitoring burden calculation was not performed for Mexico for this reporting period.

5.59 A summary by State of Registry with a more detailed breakdown was provided in **RASMAG/31 IP/04**.

ASE Comparison Before and After the Update of Setouchi HMU (IP/05)

5.60 The paper provided information on a verification study comparing ASE values before and after the update of the Setouchi Height Monitoring Unit (HMU), as well as between different monitoring methods. Following the December 2025 update, the system transitioned to a hybrid configuration combining AHMS as the primary tool and en-route Wide Area Multilateration (WAM) as a supplementary method. Data collected from 14 February to 29 May 2026 covered a total of 34,080 flight tracks; however, limitations in data separation and retention meant that only a relatively short observation period was available. Initial analysis showed that the mean ASE derived from AHMS exhibited a trend toward a narrower distribution compared to pre-update values, suggesting improved stability in aircraft height-keeping performance.

5.61 The comparison between AHMS and WAM was inconclusive due to the small sample size of WAM data, representing only about 5 per cent of total observations. Therefore, the study focused on comparing pre-update HMU data (2025) with post-update AHMS data (2026), particularly for aircraft types with sufficient sample sizes such as A320 and B737NX.

5.62 The results demonstrated that ASE variation under AHMS was significantly reduced, and extreme ASE values observed in the legacy HMU system were no longer present, indicating performance improvement after the upgrade. While preliminary WAM results appeared comparable or slightly worse than the legacy system, the limited dataset prevented firm conclusions, and further monitoring was recommended to validate long-term performance.

APAC Consolidated LTHM Compliance Status (WP/30)

5.63 MAAR presented a consolidated overview of LTHM compliance status in the APAC region, including assessments conducted by the five APAC RMAs (i.e. AAMA, China RMA, JASMA, MAAR and PARMO). Based on RVSM approval data as of 30 April 2026, the assessment indicated a remaining monitoring burden in the APAC region of 326 aircraft. This reflected a stable trend compared to the 324 aircraft reported at RASMAG/30.

APANPIRG Air Navigation Deficiency List

5.64 Based on the criteria for State responsibility to comply with the ICAO Annex 6 Height-Keeping Monitoring Requirement, specifically for cases of non-compliance with LTHM requirement where the remaining monitoring burden was 30 per cent or more, recommendations were proposed to add, remove, or retain States in the APANPIRG Air Navigation deficiency list. These recommendations were derived from assessments of RVSM approval data as of 30 April 2026 and were summarized in **Table 28**, which identified States subject to changes in their deficiency status.

Table 28. APANPIRG Deficiency Status based on RVSM Approval Data as of 30 April 2026

State	2024	2025	Recommendation
Afghanistan (MAAR)	50%	50%	Retain
India (MAAR)	46%	48%	Retain
Cook Islands (PARMO)	0%	100%	Add
Pakistan (MAAR)	24%	32%	Add
Vanuatu (AAMA)	0%	100%	Add
Nepal (MAAR)	45%	11%	Remove

5.65 The paper also outlined several recommendations for States and operators:

a) States were encouraged to:

i) promptly inform their RMAs of any changes, such as transferred or de-registered aircraft, as these would impact the number of aircraft requiring height monitoring;

ii) provide RMAs with lists of aircraft meeting the 1,000-flight hour criterion, enabling these aircraft to be excluded from the remaining monitoring burden calculations and thereby reducing the overall percentage;

iii) promote the retrofit of ADS–B Out capability among operators, where feasible, as a more efficient and cost-effective solution for height monitoring in the long term;

iv) actively share ADS–B data with their designated RMAs as an additional means of alleviating the monitoring burden; and

b) Operators with ADS–B Out-equipped aircraft that had not yet fulfilled monitoring requirements were advised to consult their respective RMAs for alternative arrangements.

5.66 PARMO acknowledged the information provided by New Zealand for the four airframes and agreed that the four airframes could be removed from the long-term height monitoring burden. The figures and percentage for the consolidated long term height monitoring burden list would need to be revised.

Competent Airspace Safety Monitoring Organizations List (WP/31)

5.67 The Meeting reviewed the *RASMAG List of Competent Airspace Safety Monitoring Organizations* (**Appendix G** to the Report).

Agenda Item 6: Air Navigation Deficiencies

APANPIRG ATM and Airspace Safety Deficiencies List (WP/32)

6.1 The Meeting reviewed the APANPIRG ATM and Airspace Safety Deficiencies List and agreed to make the following recommendation to APANPIRG/37, as recorded in **Appendix H** to the Report.

a) To be retained in the Deficiencies list:

Safety Reporting Deficiencies

i) **Afghanistan** [Failure to submit Kabul FIR Large Height Deviation (LHD) data and traffic sample data (TSD)].

ii) **Myanmar** (Failure to submit Yangon LHD data for January–December 2025).

Long Term Height Monitoring Requirement Deficiencies

i) **Afghanistan** (Remaining monitoring burden of 50%, RASMAG/31).

ii) **India** (Remaining monitoring burden of 48%, RASMAG/31).

b) Removal of Deficiency:

Long Term Height Monitoring Requirement Deficiencies

i) **Nepal** (Remaining monitoring burden of 11%, RASMAG/31).

c) Add new Deficiency:

Long Term Height Monitoring Requirement Deficiencies

i) **Cook Islands** (Remaining monitoring burden of 100%, RASMAG/31);

ii) **Pakistan** (Remaining monitoring burden of 32%, RASMAG/31); and

iii) **Vanuatu** (Remaining monitoring burden of 100%, RASMAG/31).

6.2 The Meeting noted that this recommendation reflects the status as of RASMAG/31 and confirmed that, should accurate updates be provided by the deadline, the Secretariat would exclude such items from the recommendations to APANPIRG. Accordingly, relevant States/Administrations/ agencies were encouraged to submit any necessary updates to the Secretariat and MAAR, by 19 October 2026.

Agenda Item 7: Any Other Business

Airspace Safety Seminar

Introduction and Overview of RVSM Implementation

7.1 The presentation provided an overview of RVSM implementation and emphasized the importance of continued safety monitoring to ensure the safe application of RVSM. It was highlighted that RMAs had been established to support the ongoing safety of RVSM operations by maintaining approvals registries, monitoring ASE, verifying aircraft approval status, and conducting safety assessments and collision risk analyses. In addition, EMAs monitor the application of performance-based horizontal separation by collecting and analyzing LLD and LLE reports, assessing associated risks, and coordinating with States and air traffic service providers to address performance issues.

7.2 The Meeting was also presented on the technical objectives related to aircraft HKP. It was noted that RMAs implemented monitoring programmes to assess ASE and identify adverse performance trends in aircraft and fleet groups. HKP was measured using specialized monitoring systems such as GPS-based units, ADS–B monitoring, and ground-based systems, as ASE was not detectable by aircrew or controller, but had a significant impact on operational risk. These monitoring activities supported early detection of performance degradation and ensured that aircraft continued to meet required RVSM standards.

7.3 Furthermore, the MMR was highlighted as a key mechanism to ensure ongoing compliance with RVSM performance standards. It was explained that operators were required to conduct periodic height monitoring of their aircraft fleets based on defined monitoring categories, ensuring that representative aircraft within each group were assessed. Long-term monitoring requirements were enforced, requiring aircraft to be monitored at least once every two years or within 1,000 flight hours. These measures would ensure sustained performance, reduced monitoring burden through structured grouping, and supported the identification and mitigation of long-term safety risks in RVSM airspace.

Implementation and Monitoring for Reduced Horizontal Separation Minima (PBN and PBCS)

7.4 The regional airspace safety monitoring structure was established under RASMAG, supported by RMAs for vertical separation and EMAs for horizontal separation, to ensure harmonized safety oversight across the APAC region. It was highlighted that the evolution of reduced horizontal separation minima progressed from conventional navigation to Performance-based Navigation (PBN) and Performance-based Communication and Surveillance (PBCS), enabling more precise navigation, reliable communication and surveillance, and ultimately the implementation of performance-based horizontal separation while maintaining safety through continuous monitoring.

7.5 It was noted that the implementation of performance-based horizontal separation followed structured steps including safety assessments, trial implementation, and post-implementation monitoring, with ongoing oversight focusing on aircraft performance and compliance with required communication and surveillance specifications. Monitoring activities included the identification and management of horizontal plane deviations such as LLD and LLE, with results used to support corrective actions and continuous safety assurance. It was emphasized that these measures enhanced airspace capacity, operational efficiency, and safety, while supporting sustainable growth and global harmonization.

Provisions on Safety Monitoring Activities for RVSM Airspace

7.6 The Meeting noted that ICAO provisions for safety monitoring activities in RVSM airspace were established through a comprehensive framework of Standards and Recommended Practices (SARPs), procedures, and guidance material, including ICAO Annex 6, ICAO Annex 8, and ICAO Annex 11, as well as ICAO Doc 4444, ICAO Doc 7030, ICAO Doc 9574, and ICAO Doc 9937. These provisions defined the responsibilities of States, operators, and RMAs to ensure that only approved aircraft operated in RVSM airspace, that aircraft continued to meet HKP requirements, and that effective monitoring programmes were implemented to verify compliance and maintain safety objectives. The framework also emphasized coordination, data exchange, and corrective actions for non-compliant aircraft, supported by regional guidance to ensure consistent implementation and oversight across RVSM regions.

RVSM Approval Check

7.7 The presentation highlighted the importance of ensuring accurate RVSM approval status to maintain airspace safety, noting that aircraft indicating RVSM approval in flight plans could be treated as approved by ATC even if not properly verified in RMA databases. It further emphasized that delays or omissions in submitting RVSM approval information to RMAs could result in aircraft being classified as having unverified approval status, thereby posing potential safety risks and increasing the workload associated with verification and coordination among States and RMAs.

7.8 It was further noted that effective management of RVSM approval data relied on the timely submission of approval information, particularly through the F2 reporting format, and regular database exchanges among RMAs. Challenges such as delayed submissions and lack of responses to inquiries were identified, and it was emphasized that timely reporting and enhanced coordination would reduce the number of unverified aircraft, improve database accuracy, strengthen airspace safety, and reduce the administrative burden on RMAs.

HKP Monitoring Program and MMR

7.9 The Meeting noted that RVSM monitoring was required under ICAO provisions to ensure that the continued application of 1,000 ft vertical separation maintained the required level of safety. It was highlighted that aircraft HKP monitoring was essential to detect potential altimetry system issues and to determine the range of total vertical error for use in safety assessments. The monitoring programme also supported verification of RVSM approval effectiveness, evaluation of ASE stability, and overall assurance that safety objectives continued to be met in RVSM airspace.

7.10 The Meeting further noted that the MMR defined the minimum number of aircraft to be monitored by type and category to ensure representative fleet performance, with operators required to conduct initial monitoring within six months of RVSM approval and at periodic intervals thereafter. It was also highlighted that various height monitoring systems were used, including on-board systems, ground-based monitoring units, and AHMS, which collectively enabled performance assessment, detection of trends, and validation of aircraft compliance with RVSM requirements.

RVSM Vertical Safety Assessment

7.11 The presentation provided an overview of RVSM safety assessment aimed to quantify collision risk in RVSM airspace and compare it against TLS using established collision risk models. The assessment considered total risk as the sum of technical and operational risk and relied on inputs such as height-keeping monitoring data, TSD, and reported LHDs. Technical risk represented the likelihood of collision due to aircraft performance limitations in maintaining assigned altitude, including ASEs, assigned altitude deviations, and the presence of non-RVSM-approved aircraft, while operational risk was associated with LHDs arising from pilot actions, ATC coordination or system errors, weather, or contingency events, evaluated based on the duration at incorrect flight levels and the number of levels crossed.

7.12 It was noted that total risk was determined by combining both technical and operational risks and comparing the result against the global safety target, with thresholds set at 2.5×10^{-9} fapfh for technical risk and 5×10^{-9} for total risk. It was emphasized that consistent monitoring, accurate classification of LHDs, and robust data collection were essential to ensure reliable risk assessment. The key takeaway was that maintaining RVSM safety required continuous monitoring of aircraft performance and operational errors, as well as coordinated efforts among stakeholders to ensure that overall risk remained within acceptable safety levels.

Consolidated Safety Reports and Hot Spot Management

7.13 The Meeting reviewed the APAC Consolidated Safety Report and outlined the processes for hot spot identification, monitoring, and removal. It was explained that hot spots had been identified by first detecting clusters of reported events, followed by applying criteria such as the number of occurrences, operational risk contribution, and whether the risk exceeded TLS. Clusters meeting at least one of these criteria had been classified as hot spots.

7.14 The Meeting also noted that hot spots had been continuously monitored by RASMAG through regular reviews and updates from States/Administrations, with progress reported to APANPIRG. For removal, it was emphasized that evidence of effective mitigation measures had been required, demonstrated by sustained reduction in occurrences and risk. A hot spot had only been removed after it no longer met any criteria for at least two consecutive years, subject to formal approval.

Conclusion

7.15 The Airspace Safety Seminar concluded with a summary of key safety responsibilities and actions required to enhance airspace safety. It was emphasized that States, operators, and air traffic service providers should continuously maintain accurate approvals registries, ensure timely reporting and investigation of LHDs, LLDs, and LLEs, and complied with monitoring requirements. Coordination with RMAs should be undertaken to update data, resolve discrepancies, and support safety assessments.

7.16 Additionally, it was highlighted that continuous monitoring, data submission, and the implementation of corrective actions were essential in maintaining compliance and mitigating risks. Stakeholders were expected to ensure the proper application of separation standards, maintain effective communication channels, and support long-term safety improvements through proactive monitoring and regional collaboration.

7.17 The Meeting expressed its appreciation to all presenters for their informative presentations and the valuable information shared, noting that these would contribute to future improvements in airspace safety in the region.

Airspace Safety Points of Contact (WP/33)

7.18 The consolidated ATM POC was circulated to all RASMAG/31 participants for review and update. All States/Administrations were reminded to inform the ICAO APAC Office if at any time there was a change to their Airspace Safety and FIT (SAF) POC.

Agenda Item 8: Review and Update RASMAG Task List

RASMAG Terms of Reference and Task List (WP/34)

8.1 The Meeting reviewed the RASMAG TOR (**Appendix I**) and agreed the following Draft Decision to better reflect RASMAG's objectives and tasks in identifying, reviewing, and updating the APANPIRG Air Navigation Deficiencies List, as an APANPIRG sub-group:

Draft Decision RASMAG/31-4: Update Regional Airspace Safety Monitoring Advisory Group (RASMAG) Terms of Reference (TOR)

That, the updated RASMAG TOR at **Appendix X** to the Report be adopted.

8.2 The Task List, as updated by the Meeting, was provided in **Appendix J** to the report.

Agenda Item 9: Date and Venue of Next Meeting

9.1 The Thirty-Second Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/32) was tentatively scheduled for June or July 2027, in Bangkok, Thailand.

Closing of the Meeting

10.1 In closing the Meeting, the Chairperson thanked and congratulated the efforts made by the participants for their contributions to the Meeting.

10.2 ICAO expressed its sincere appreciation to Ms. Saifon Obromsook for her unwavering support and significant contributions to RASMAG during her tenure as Chairperson from 2018 to 2026. Her exemplary leadership had provided a strong foundation for the advancement of airspace safety and the continued development of the aviation industry across the APAC region.

10.3 The Meeting conveyed its best wishes to Ms. Saifon Obromsook in her future endeavours and expressed confidence that the solid foundation established under her leadership would continue to guide and inspire RASMAG in achieving its objectives and supporting the enhancement of airspace safety across the APAC region.

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LIST OF PARTICIPANTS

	STATE/NAME		TITLE/ORGANIZATION
1.	**AUSTRALIA (2)**		
	1.	Mr. Shea Houlihan (Online)	Risk Intelligence Specialist / Airspace & Network Manager Airservices Australia Australian Airspace Monitoring Agency (AAMA)
	2.	Ms. Lara Connolley (Online)	Risk Intelligence Analyst Airservices Australia Australian Airspace Monitoring Agency (AAMA)
2.	**CAMBODIA (2)**		
	3.	Mr. LORN Thyrith (Online)	Director of QSD
	4.	Mr. ROUS Sambath (Online)	ATS safety officer
3.	**CHINA (3)**		
	5.	Mr. Meng Long	Senior officer of ATC Division, Air Traffic Management Bureau (ATMB) Civil Aviation Administration of China
	6.	Mr. Yongyue Chen	Engineer China RMA
	7.	Mr. Yang Hong	Engineer China RMA

	STATE/NAME		TITLE/ORGANIZATION
4.	**HONG KONG, CHINA (3)**		
	8.	Ms. Alice KONG	Senior Evaluation Officer Civil Aviation Department, Hong Kong China
	9.	Mr. Isaac WONG	Senior Air Traffic Management Standards Officer Civil Aviation Department, Hong Kong China
	10.	Mr. Carl LI	Acting Senior Safety Manager Civil Aviation Department, Hong Kong China
5.	**FIJI (1)**		
	11.	Mr. Eliki Baleinalaba Raiwalui	Air Traffic Management Quality Assurance Safety Officer Fiji Airports Limited
6.	**INDIA (3)**		
	12.	Mr. Krishnan Udayabhanu Rao	Joint General Manger (Air Traffic Management) Airports Authority of India (AAI)
	13.	Mr. J Masivayana	Deputy General Manger (Air Traffic Management) Airports Authority of India (AAI)
	14.	Mr. Paritosh Kumar	Manager (Air Traffic Management) Airports Authority of India (AAI)
7.	**JAPAN (3)**		
	15.	Mr. Kazuto Fukuda	Special Assistant to the Director Japan Civil Aviation Bureau (JCAB)
	16.	Mr. Kenichi Furukawa	Director Department of Research and Study Service Air Traffic Control Association Japan

	STATE/NAME		TITLE/ORGANIZATION
	17.	Mr. Koji Kato	Director Research & Planning Service Air Traffic Control Association Japan
8.	**LAO PDR (4)**		
	18.	Mr. Maity SYLITHAMMAVONG	Deputy General Director of Lao Air Navigation Services (LANS)
	19.	Mr. Xaygnasith XOUYMANIVONG	Director of Air Traffic Service Office (ATSO) Lao Air Navigation Services (LANS)
	20.	Mr. Amphone THANASIN	Chief of Vientiane Area Control Center Lao Air Navigation Services (LANS)
	21.	Mr. Xayphone LATXAVONG	ATM/SAR/MET, Air Navigation Standards Division Officer Department of Civil Aviation of Lao PDR
9.	**MALAYSIA (1)**		
	22.	Mr. Muhd Muzaffar Bin Mustaffa Johari	Senior Executive Air Navigation Services Safety and Quality Division Civil Aviation Authority of Malaysia
10.	**MONGOLIA (1)**		
	23.	Mr. Puntsag Ganbaatar	Head of Air Navigation Oversight Division Civil Aviation Authority of Mongolia
11.	**NEW ZEALAND (1)**		
	24.	Mr. Edmund Heng	Senior Technical Specialist Aeronautical Services Civil Aviation Authority of New Zealand

	STATE/NAME		TITLE/ORGANIZATION
12.	**PAKISTAN (2)**		
	25.	Mr. Ghulam Sarwar Magsi (Online)	Additional Director SQMS Pakistan Civil Aviation Authority
	26.	Mr. Atif Khan (Online)	Deputy Director ATS Pakistan Civil Aviation Authority
13.	**PAPUA NEW GUINEA (2)**		
	27.	Mr. Luya Hegawe (Online)	Senior ATS Inspector Civil Aviation Safety Authority of Papua New Guinea
	28.	Mr. Maclee Lote (Online)	ATS Inspector Civil Aviation Safety Authority of Papua New Guinea
14.	**PHILIPPINES (2)**		
	29.	Ms. Anna Liza D. Chiefe	Air Traffic Management Officer IV Manila ACC Air Traffic Service Civil Aviation Authority of the Philippines
	30.	Ms. Kharen Fontecha	Air Traffic Management Officer III Manila ACC Civil Aviation Authority of the Philippines
15.	**REPUBLIC OF KOREA (3)**		
	31.	Mr. Hu-Ho HA	Senior Deputy Director for Air Traffic Korea Office of Civil Aviation Ministry of Land, Infrastructure and Transport

	STATE/NAME		TITLE/ORGANIZATION
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	33.	Ms. Yoon-joo LEE	Assistant Director for Airspace Management Air Traffic Management Office Ministry of Land, Infrastructure and Transport
16.	**SINGAPORE (3)**		
	34.	Mr. Weng Kit Ying	Deputy Chief (Ops, Area) Civil Aviation Authority of Singapore (CAAS)
	35.	Mr. Teck Kai Chan	Lead Data Scientist Civil Aviation Authority of Singapore
	36.	Mr. Chee Hui Tai	Master Air Traffic Control Officer Civil Aviation Authority of Singapore (CAAS)
17.	**SRI LANKA (3)**		
	37.	Ms. Thilini Dinushika Herath	Senior Civil Aviation Inspector – ATMSP CAASL
	38.	Mr. Thivanka Weerasinghe	Air Traffic Control AASL Sri Lanka
	39.	Ms. Priyasha Hettiarachchi	Air Traffic Controller AASL Sri Lanka
18.	**THAILAND (15)**		
	40.	Mr. Montree Monchaiya	Senior Expert on Aviation Safety in Area of Airworthiness and Aircraft Engineering Specialist The Civil Aviation Authority of Thailand

	STATE/NAME		TITLE/ORGANIZATION
	41.	Mr. Nitchaphon Chuaprang	Senior Air Navigation Operations Officer 8 The Civil Aviation Authority of Thailand
	42.	Mr. Phichpawis Plengsiriwat	Senior Flight Operations Standards Officer 7 The Civil Aviation Authority of Thailand
	43.	Ms. Sataporn Chainarong	Senior Air Navigation Services Standards Officer 8 The Civil Aviation Authority of Thailand
	44.	Ms. Supaporn Thongmaunglaung	Air Navigation Services Standards Officer 5 The Civil Aviation Authority of Thailand
	45.	Mr. Napat Urailert	Senior Aviation Safety Officer 8 The Civil Aviation Authority of Thailand
	46.	Ms. Sasiwimon Sartthummabot	Aviation Safety Officer 6 The Civil Aviation Authority of Thailand
	47.	Ms. Saifon Obromsook	Director, Safety Management Department Aeronautical Radio of Thailand Ltd.
	48.	Ms. Rinthida Jorntes	Safety Management System Assistant Manager Aeronautical Radio of Thailand Ltd.
	49.	Ms. Chantima Sritiapetch	Executive Systems Engineer (Safety Management System) Aeronautical Radio of Thailand Ltd.
	50.	Mr. Dolsarit Somseang	Executive Systems Engineer (Safety Management System) Aeronautical Radio of Thailand Ltd.
	51.	Mr. Ponkrit Sawedsud	Senior System Engineer (Safety Management System) Aeronautical Radio of Thailand Ltd.

	STATE/NAME		TITLE/ORGANIZATION
	52.	Mr. Raksit Soontornmalai	Executive Senior Safety Management System Officer Aeronautical Radio of Thailand Ltd.
	53.	Capt. Sorawat Prasongdee	Team Lead of Flight Operation Safety, Security and Risk Management Department Operations Department Thai Airways International Public Company Limited
	54.	Capt. Thammarat Thammalikhit	Chief (Specialist), Safety Management System Department Corporate Quality, Safety and Security Assurance Department Thai Airways International Public Company Limited
19.	**UNITED STATES (3)**		
	55.	Ms. Christine Falk	Separation Standards Analysis Branch Federal Aviation Administration
	56.	Mr. José Pérez	Separation Standards Analysis Branch Federal Aviation Administration
	57.	Mr. Shayne Campbell	Senior Air Traffic Representative, Asia Pacific Federal Aviation Administration Air Traffic Organization, System Operations
20.	**ICAO (3)**		
	58.	Mr. Mior Adli Bin Mior Sallehhuddin	Regional Officer, Air Traffic Management ICAO Asia and Pacific Regional Office

	STATE/NAME		TITLE/ORGANIZATION
	59.	Mr. Hiroyuki Takata	Regional Officer, Air Traffic Management ICAO Asia and Pacific Regional Office
	60.	Dr. Trish Prakayphet Chalayonnawin	Programme Analysis Associate, Air Traffic Management ICAO Asia and Pacific Regional Office

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LIST OF WORKING PAPERS AND INFORMATION PAPERS

WORKING PAPERS

No.	Agenda Item	Subject	Presented by
01	1	Provisional Agenda	Secretariat
02	2	FIT-Asia Meeting Outcomes	Secretariat
03	2	Outcomes of RASMAG-MAWG and RMACG Meetings	Chairperson
04	3	RVSM Risk Assessment in the Brisbane, Honiara, Melbourne, Nauru, and Port Moresby Flight Information Regions, 1 January 2025 to 31 December 2025	AAMA
05	3	RVSM Risk Assessment in the Jakarta and Ujung Pandang Flight Information Regions, 1 January 2025 to 31 December 2025	AAMA
06	3	2025 Analyses for the Transfer of Control Point between Incheon ACC and Shanghai ACC, Hot Spot B1	PARMO
07	3	Update on AKARA LHD Events and Progress on Sharing Mechanism	China RMA
08	3	2025 Central East Pacific Traffic Flow Assessment (Hot Spot N)	PARMO
09	3	China RMA Vertical Safety Report	China RMA
10	3	JASMA Vertical Safety Report	JASMA
11	3	MAAR Vertical Safety Report	MAAR
12	3	PARMO Vertical Safety Monitoring Report 2025	PARMO
13	3	BOBASMA Horizontal Safety Monitoring Report	BOBASMA
14	3	JASMA Horizontal Safety Report	JASMA
15	3	PARMO Horizontal Safety Monitoring Report 2025	PARMO
16	3	SEASMA Horizontal Safety Report	SEASMA
17	3	APAC Consolidated Safety Report	MAAR
18	4	Removal of the Asia/Pacific Region En-Route Monitoring Agency (EMA) Handbook from the ICAO APAC Office Website	Secretariat
19	4	Revision of the Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace	MAAR
20	4	RASMAG's Safety Data Sharing with Stakeholders	MAAR
21	5	Enhancing Safety in Hot Spot B1 on ATS Route A593	Republic of Korea
22	5	Transfer of RVSM Safety Assessment and Monitoring Responsibilities of Hong Kong China and Macao China to China RMA	China RMA
23	5	AAMA Assessment of Non-RVSM Approved Aircraft	AAMA
24	5	JASMA Assessment of Non-RVSM Approved Aircraft	JASMA

No.	Agenda Item	Subject	Presented by
25	5	MAAR Assessment of Aircraft with RVSM Approval Status Pending Verification	MAAR
26	5	PARMO RVSM Traffic Compliance Monitoring	PARMO
27	5	AAMA RVSM Long Term Height Monitoring Burden	AAMA
28	5	JASMA LTHM Burden Estimate Update	JASMA
29	5	PARMO RVSM Long Term Height Monitoring Burden	PARMO
30	5	APAC Consolidated LTHM Compliance Status	MAAR
31	5	Competent Airspace Safety Monitoring Organizations List	Secretariat
32	6	APANPIRG ATM and Airspace Safety Deficiencies List	Secretariat
33	7	Airspace Safety Points of Contact	Secretariat
34	8	RASMAG Terms of Reference and Task List	Secretariat

INFORMATION PAPERS

No.	Agenda Item	Subject	Presented by
01	-	Provisional List of Working Papers and Information Papers	Secretariat
02	5	China RMA Approval Check of Non-RVSM Aircraft in 2026	China RMA
03	5	China RMA LTHM Burden Estimate Update	China RMA
04	5	NAARMO RVSM Long Term Height Monitoring Burden	PARMO
05	5	ASE Comparison Before and After the Update of Setouchi HMU	JASMA

FLIMSIES

No.	Agenda Item	Subject	Presented by
01	3	Supplementary Sharing of Category I Events	China RMA

PRESENTATIONS

No.	Agenda Item	Subject	Presented by
01	--	Introduction and Overview of RVSM Implementation	PARMO
02	--	Implementation and Monitoring for Reduced Horizontal Separation Minima (PBN and PBCS)	SEASMA
03	--	Provisions on Safety Monitoring Activities for RVSM Airspace	Secretariat
04	--	RVSM Approval Check	JASMA
05	--	HKPM Program and MMR	China RMA

No.	Agenda Item	Subject	Presented by
06	--	RVSM Vertical Safety Assessment	AAMA
07	--	Consolidated Safety Reports and Hot Spot Management	MAAR
08	--	Conclusion	MAAR

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2025 Asia Pacific Consolidated Safety Report

Thirty-First Meeting of the Regional Airspace Safety Monitoring Advisory Group

(RASMAG/31)

Bangkok, Thailand 30 June –3 July 2026

Prepared by APAC RMAs and EMAs

Attachment A

Outline

Background
Scope, Data Sources & Area of Responsibility

PAC Area
Collision Risk Estimates, Geolocations & Hot Spots

Asia Area
Collision Risk Estimates, Geolocations & Hot Spots

Reporting Rate
Reporting Rate of LHDs/LLDs/LLEs

Conclusion
Summary & Key Findings

Background

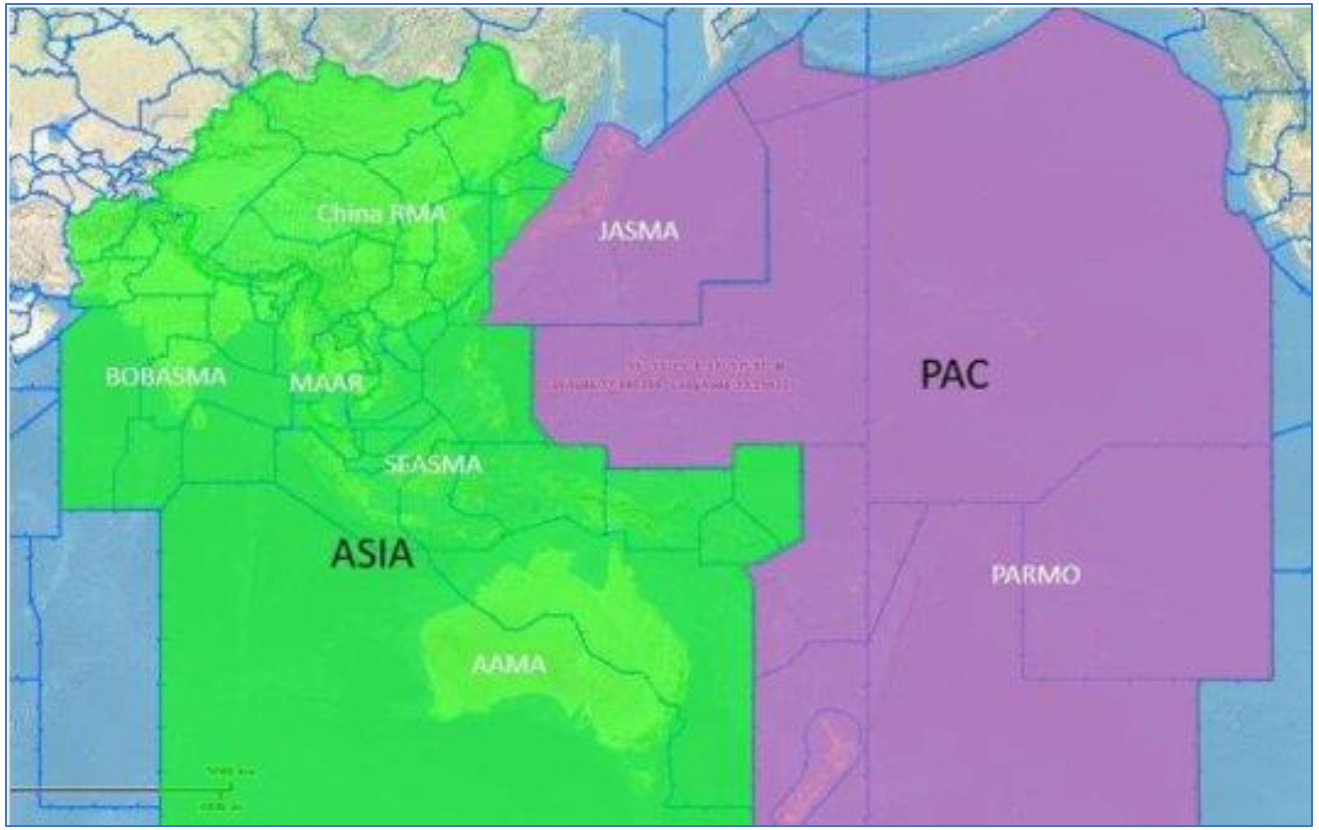
The Asia Pacific Consolidated Safety Report
is produced by APAC monitoring agencies to deliver a comprehensive overview of airspace safety risks in the Asia Pacific region.

This report is derived from the annual analysis of airspace risk conducted by each monitoring agencies bases on:

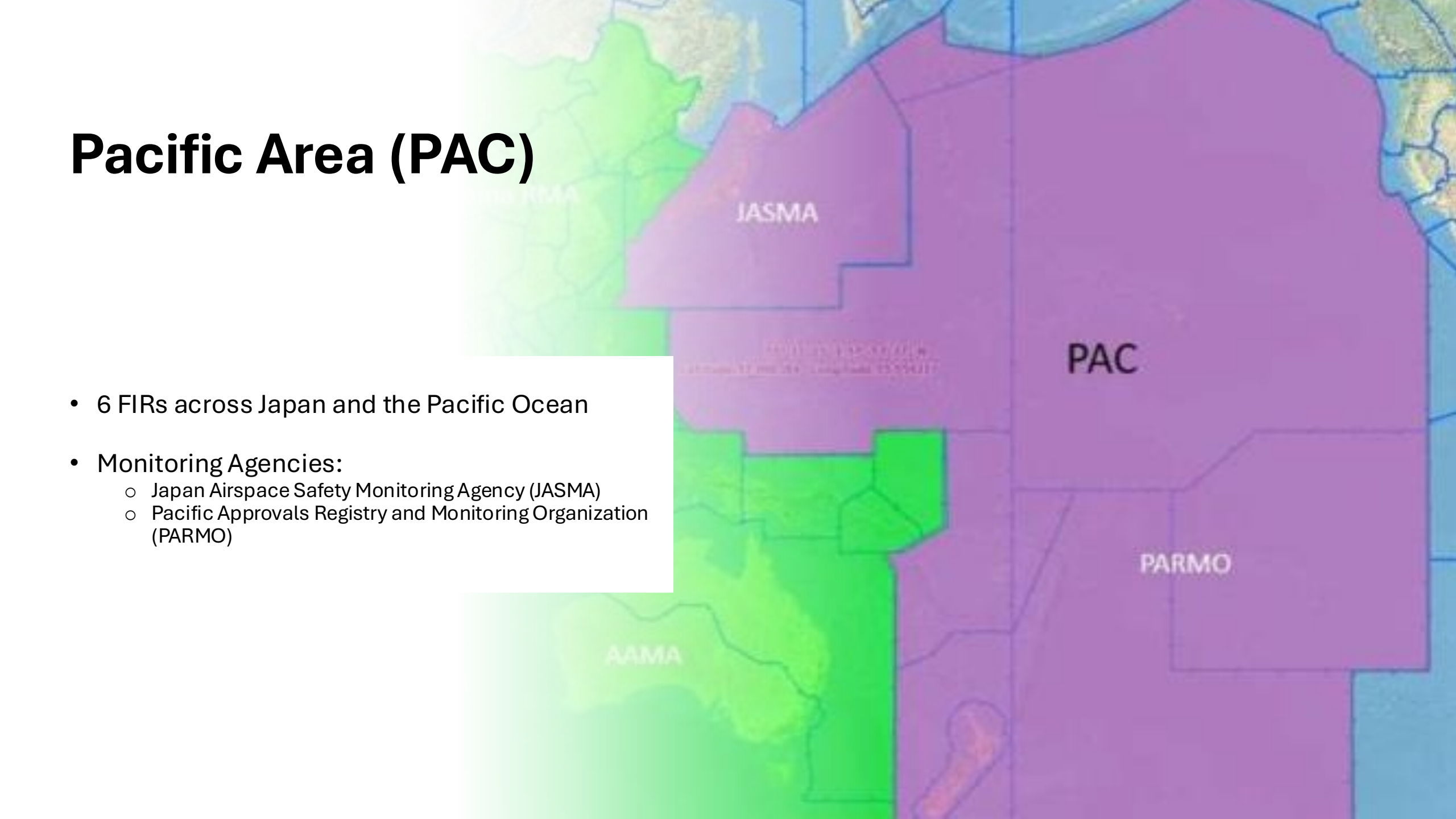
- Traffic Sample Data (TSD) collected in December 2025
- Large Height Deviations (LHDs), Large Longitudinal Errors (LLEs), and Large Lateral Deviations (LLDs) collected throughout 2025.

The report covers two areas:

- Pacific (PAC) Area | 6 FIRs, 2 monitoring agencies
- Asia Area | 37 FIRs, 5 monitoring agencies

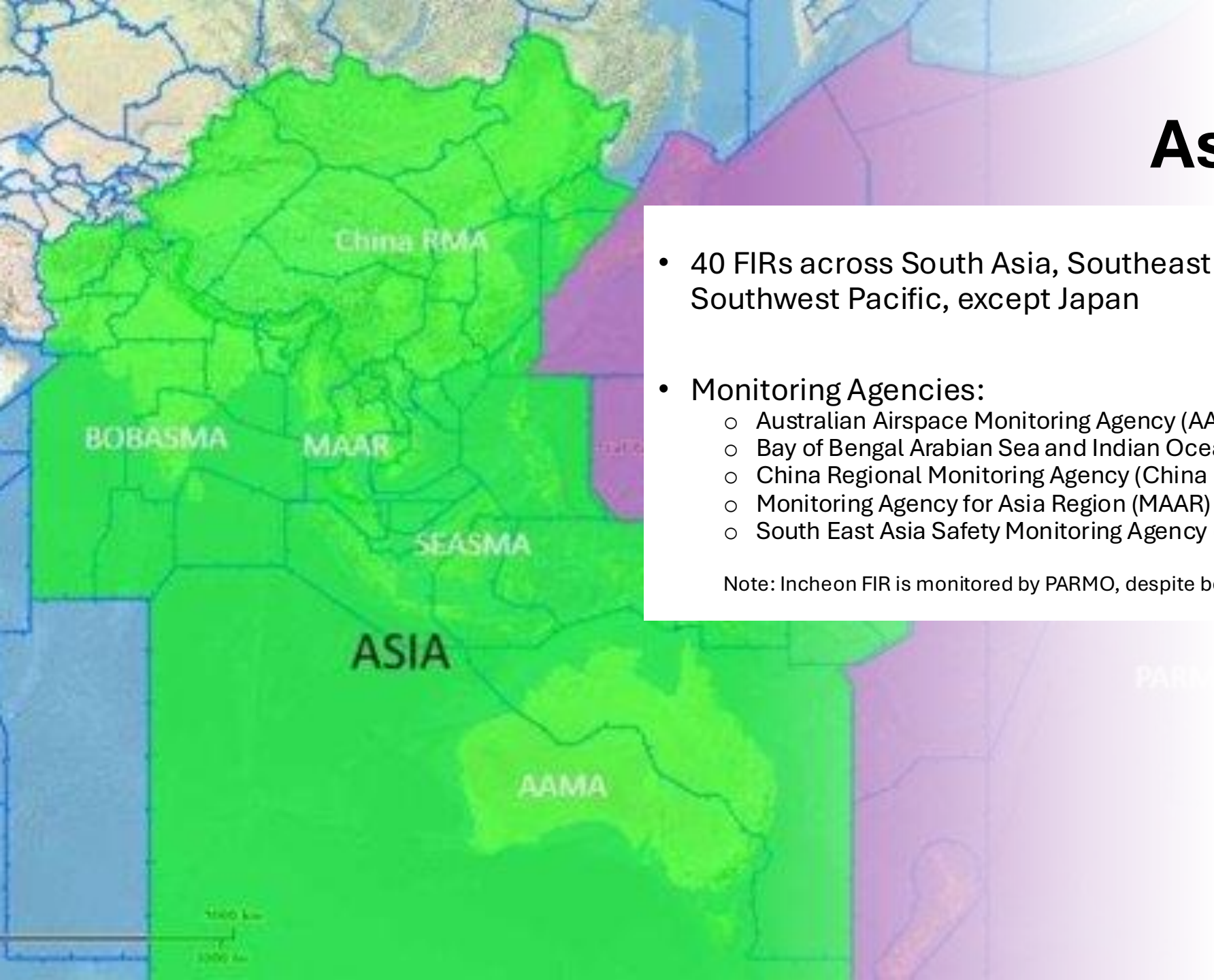


Pacific Area (PAC)



- 6 FIRs across Japan and the Pacific Ocean
- Monitoring Agencies:
  - Japan Airspace Safety Monitoring Agency (JASMA)
  - Pacific Approvals Registry and Monitoring Organization (PARMO)

Asia Area (Asia)



- 40 FIRs across South Asia, Southeast Asia, East Asia and Southwest Pacific, except Japan

- Monitoring Agencies:
  - Australian Airspace Monitoring Agency (AAMA)
  - Bay of Bengal Arabian Sea and Indian Ocean Safety Monitoring Agency (BOBASMA)
  - China Regional Monitoring Agency (China RMA)
  - Monitoring Agency for Asia Region (MAAR)
  - South East Asia Safety Monitoring Agency (SEASMA)

  Note: Incheon FIR is monitored by PARMO, despite being geographically located in East Asia

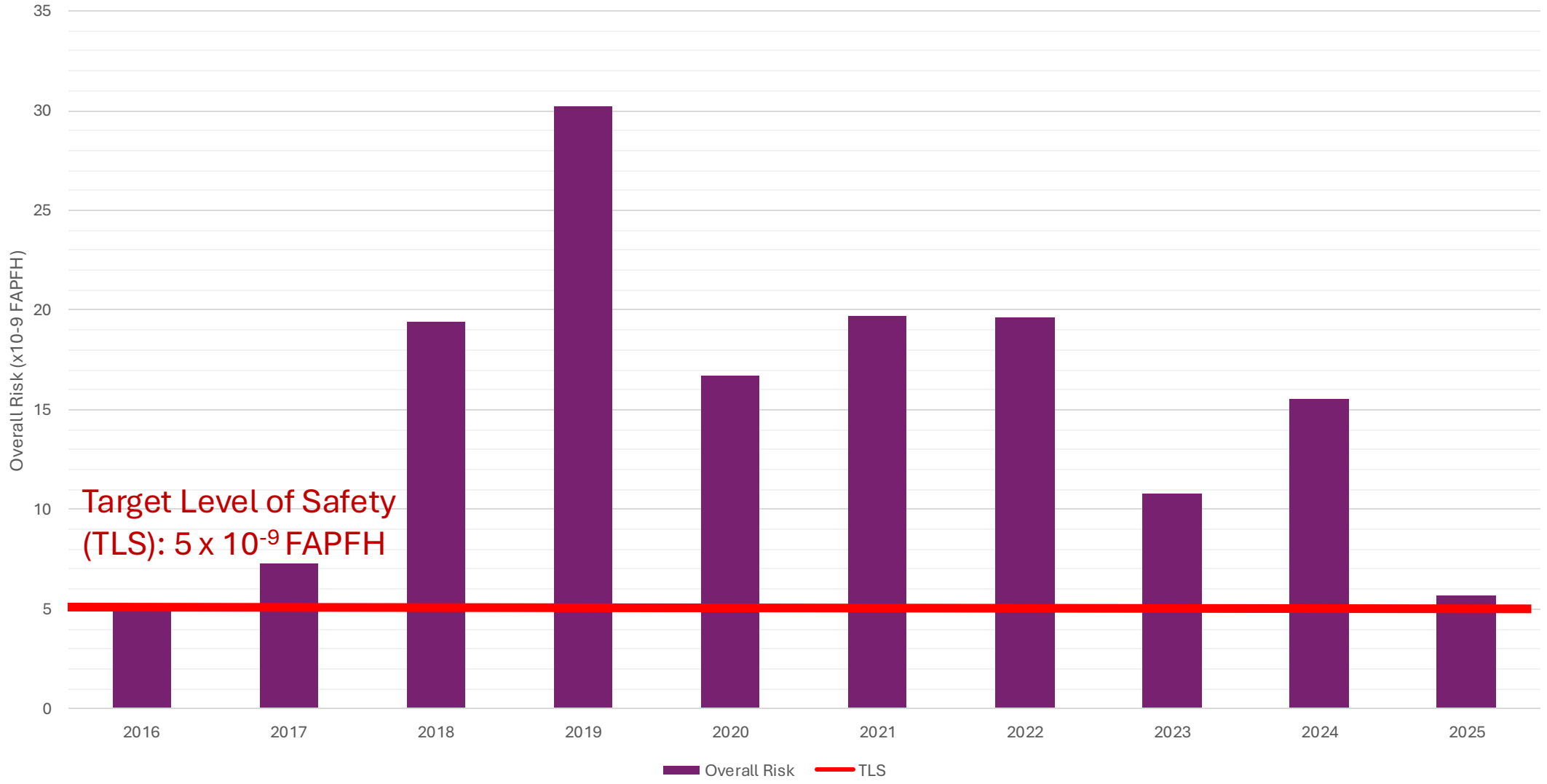
PAC : Vertical Collision Risk

PAC: Vertical Collision Risk Estimates

Annual flying hours: 3,840,508 hours/year

Risk Estimates		Remark
Vertical Technical Risk	0.22×10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	5.45×10^{-9} FAPFH	
Vertical Overall Risk	5.67×10^{-9} FAPFH	Above TLS

PAC: Vertical Collision Risk Estimates



PAC: Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Aircrew/ Pilot	A	Flight crew failing to climb/descend the aircraft as cleared	12	26.5	3
	B	Flight crew climbing/descending without ATC Clearance	14	21.8	3
	C	Incorrect operation or interpretation of airborne equipment	2	8	0
ATC	D	ATC system loop error	7	11	5
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	70	166.3	5
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	1	64	0

PAC: Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	3	9	13
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	3	0.5	0
Weather/ Turbulence	I	Turbulence or other weather-related causes leading to unintentional or undetected change of flight level	23	65	4
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	12	11	0
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	0	0	0
	M	Other	0	0	0
		Total	**147**	**383.1**	**33**

PAC : Horizontal Collision Risk

PAC: Horizontal Collision Risk Estimates

Annual flying hours: 2,111,212 hours/year

2024 Horizontal Risk Estimates		Remark
Total Lateral Risk	1.22×10^{-9} FAPFH	Below TLS
Total Longitudinal Risk	0.01×10^{-9} FAPFH	Below TLS
2025 Horizontal Risk Estimates		**Remark**
Total Lateral Risk	0.68×10^{-9} FAPFH	Below TLS
Total Longitudinal Risk	0.02×10^{-9} FAPFH	Below TLS

PAC: Summary of LLDs and LLEs

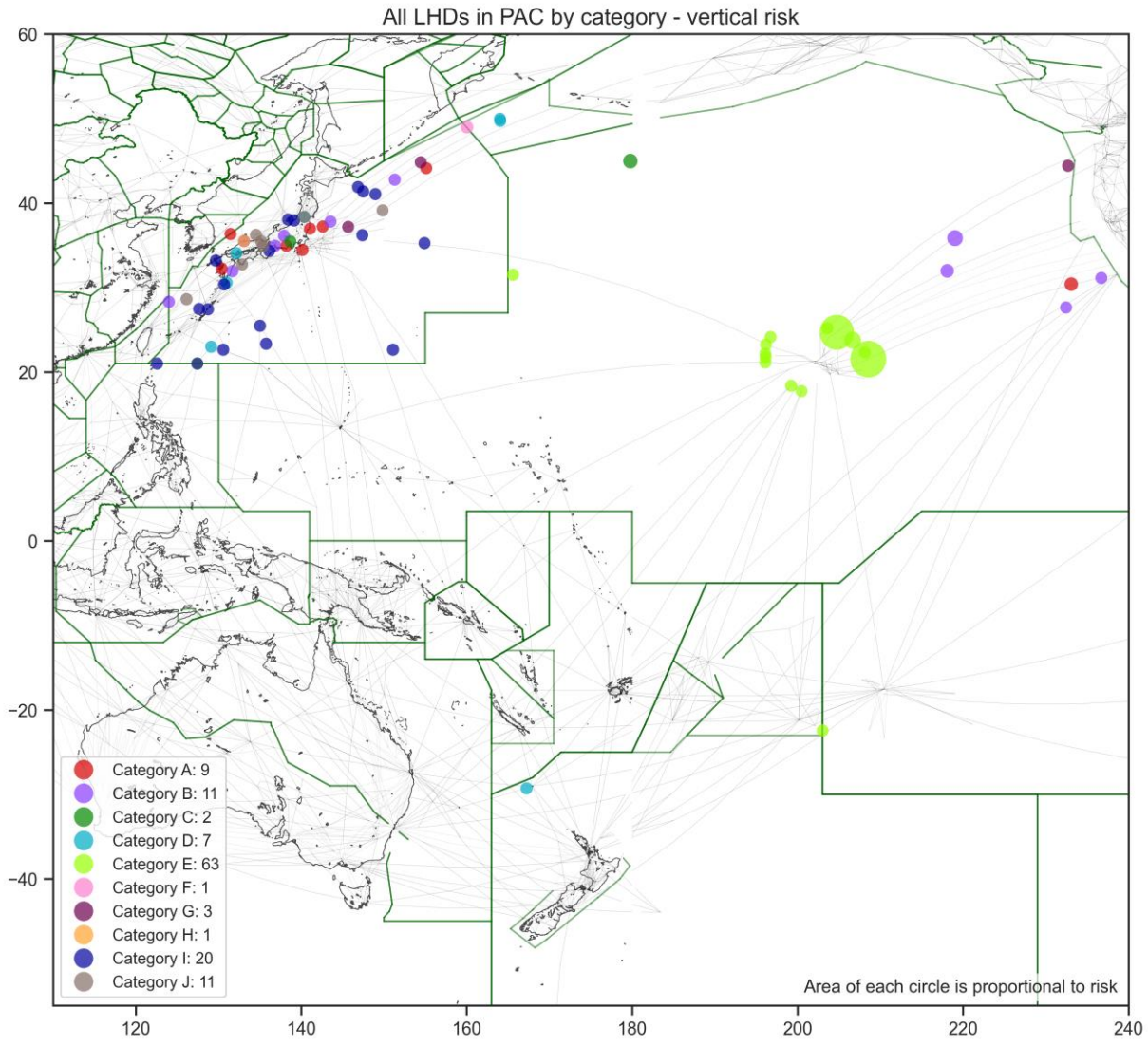
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	21	122	528
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	19	38	106
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	9	63	302
ATC	D	ATC system loop error	5	9	90
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	155	220.5	207
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	1	64	0

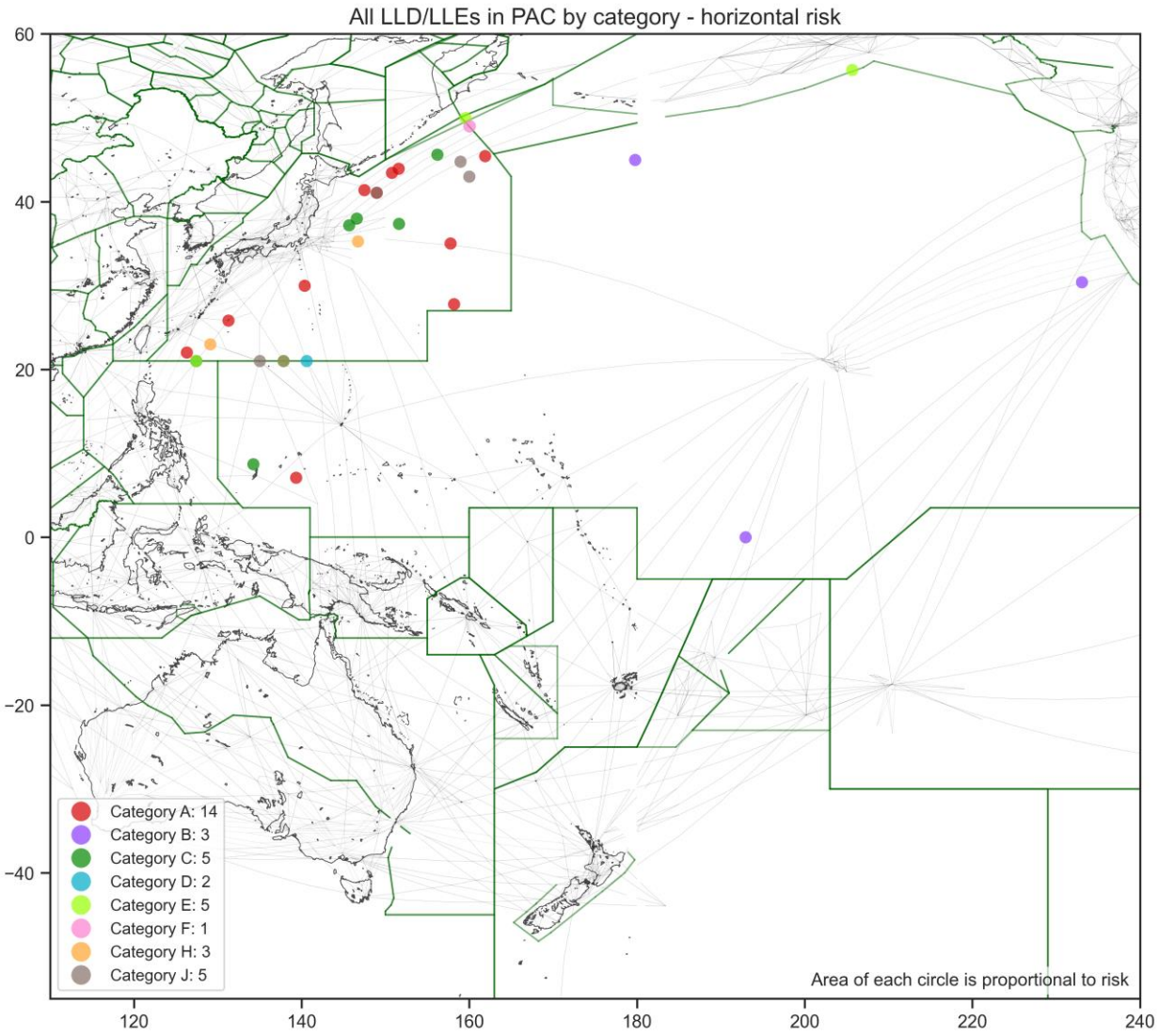
PAC: Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	2	18	0
Weather/ Turbulence	H	Turbulence or other weather-related causes leading to a deviation in the horizontal dimension	3	6	45
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification	0	0	0
	J	Other	6	62	325
		Total	**221**	**602.5**	**1603**

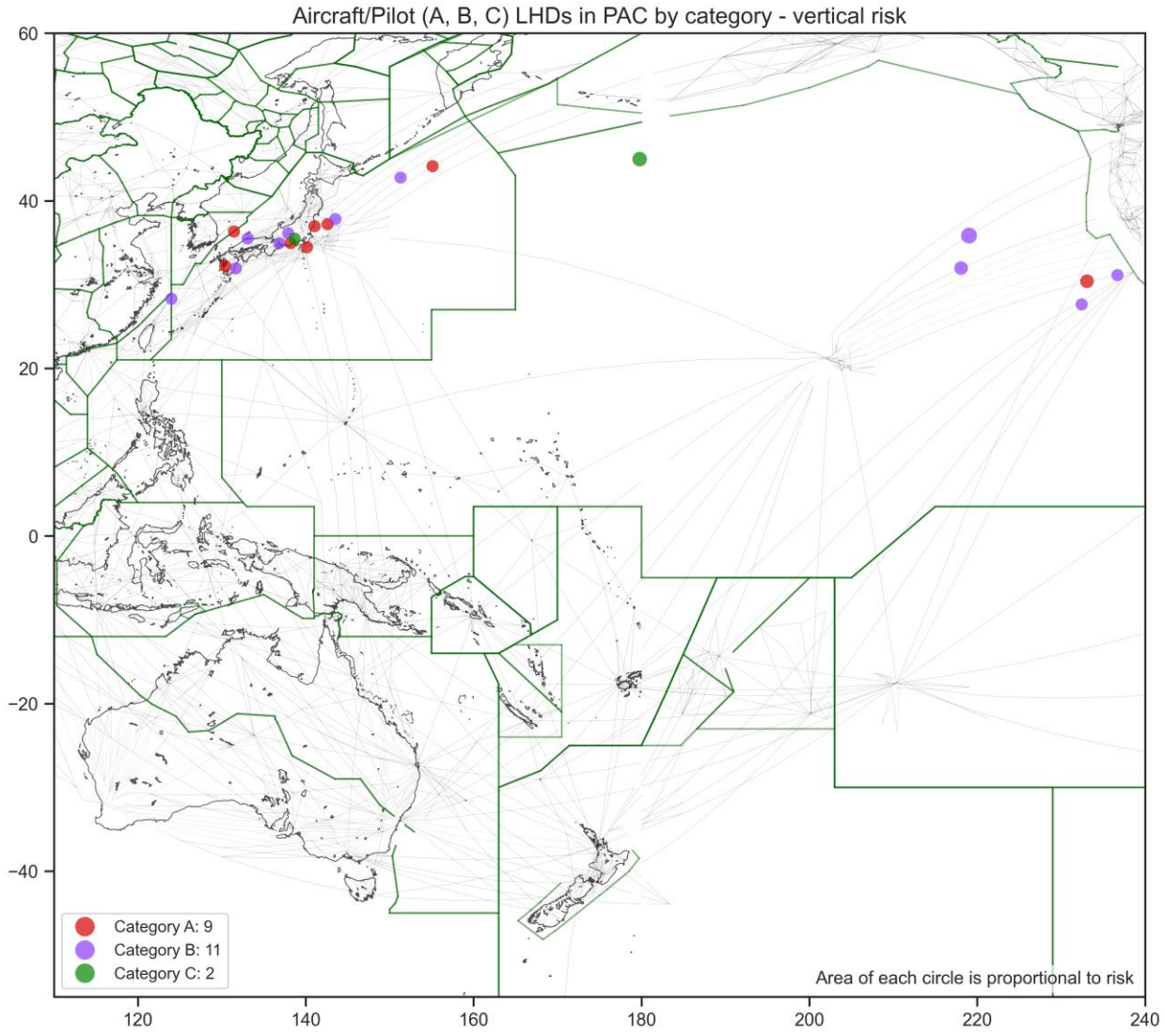
PAC : Geolocation of LHDs/LLDs/LLEs

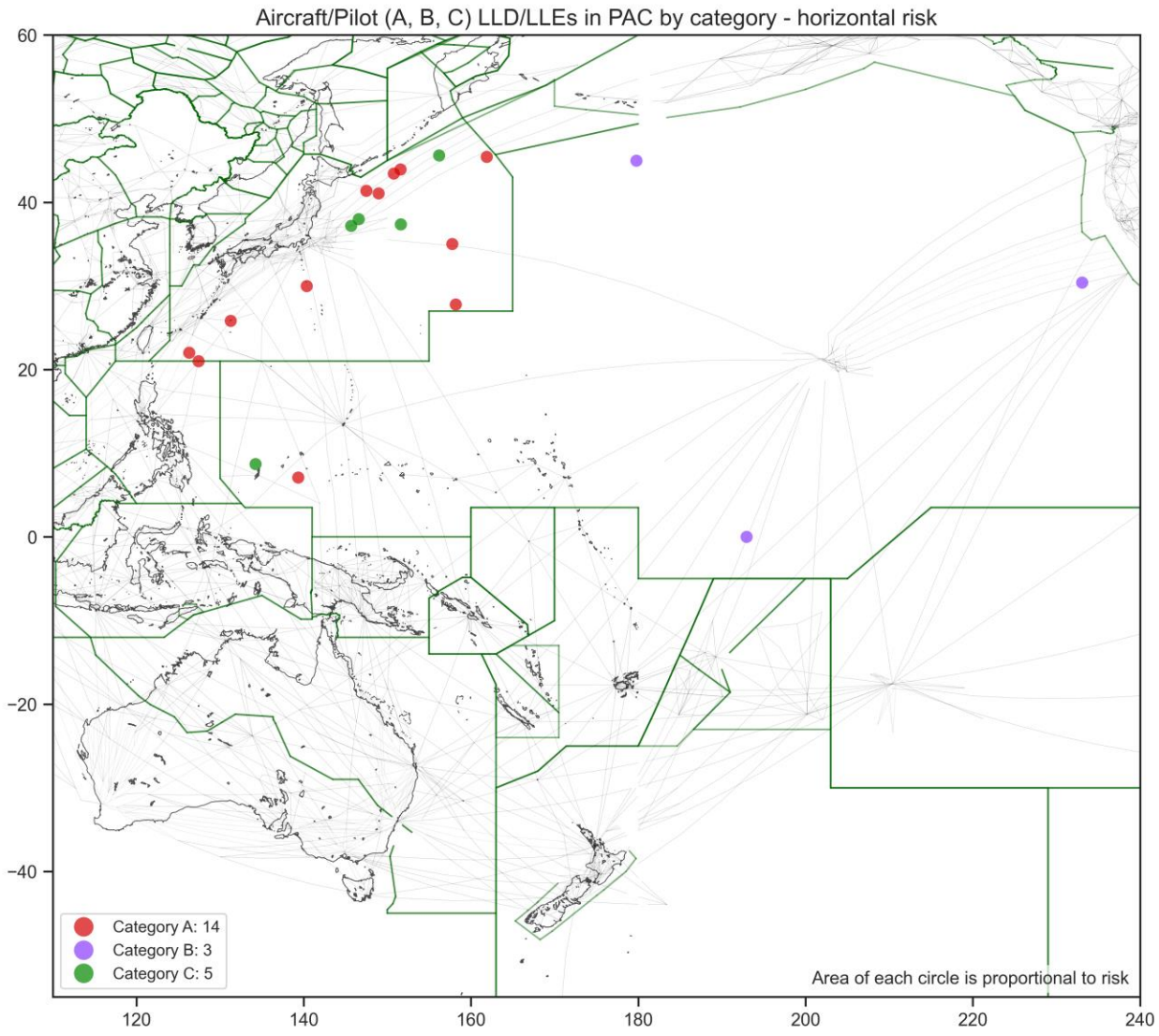
PAC: All Categories



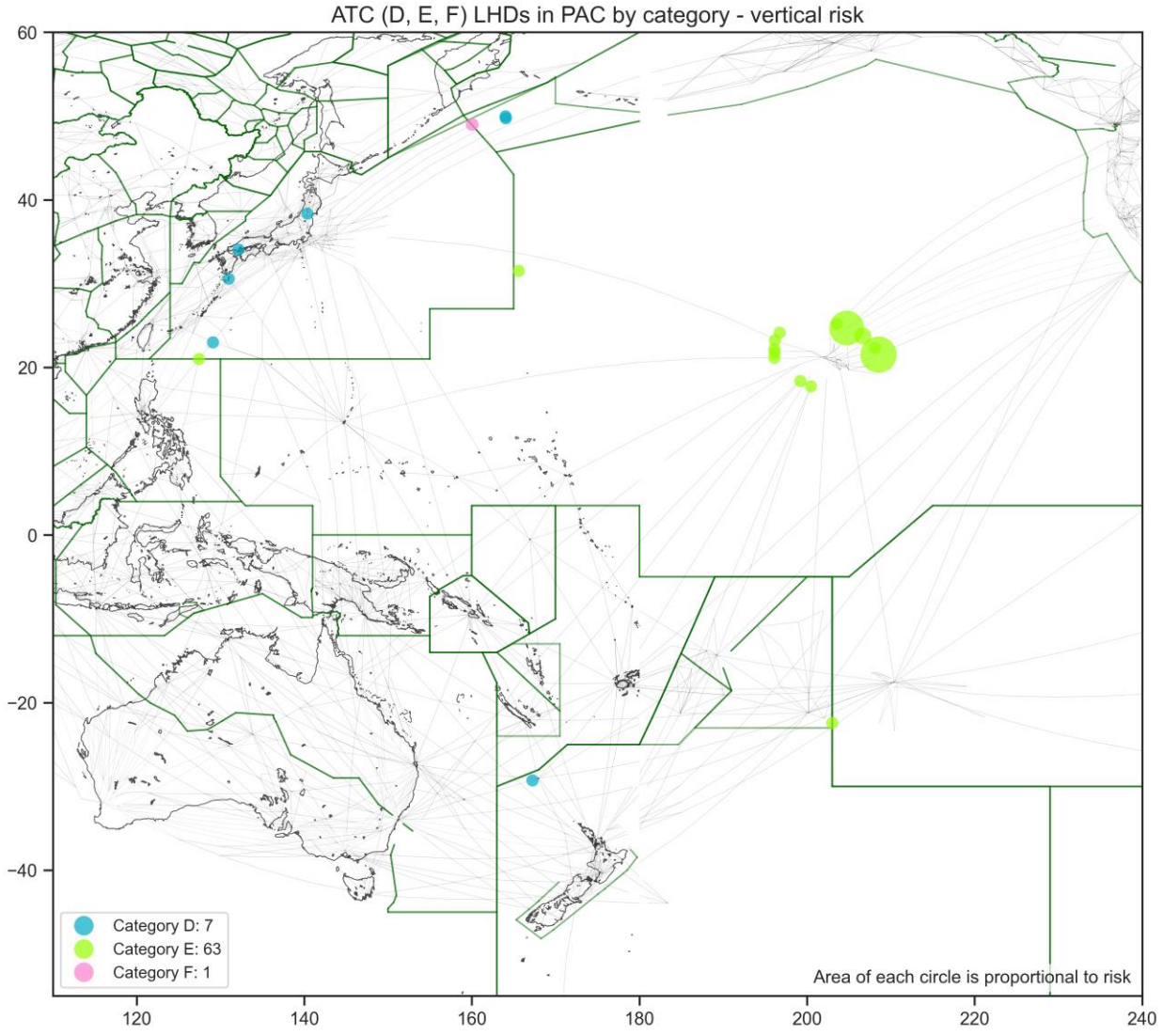


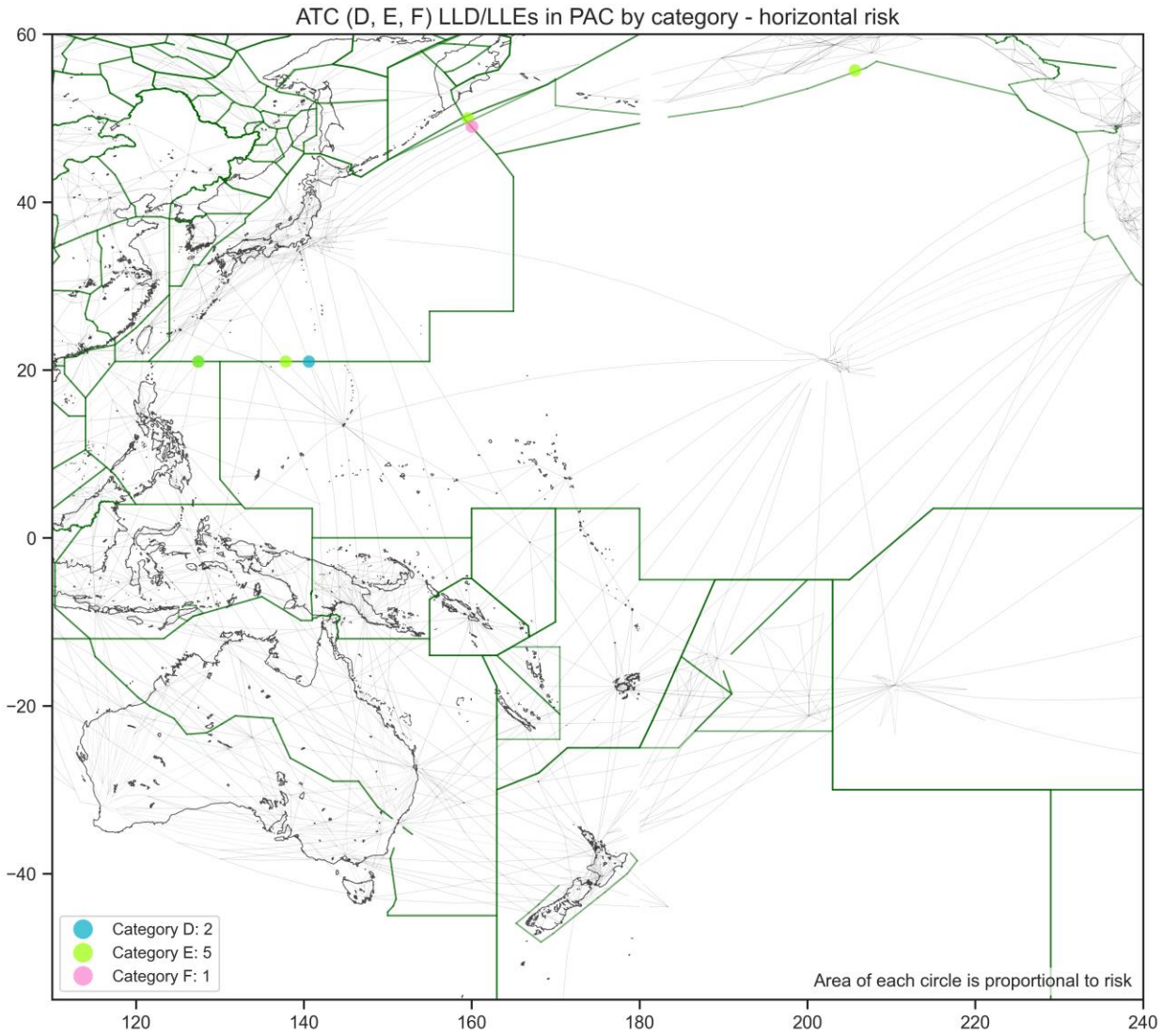
PAC: Aircrew/Pilot (A, B, C)





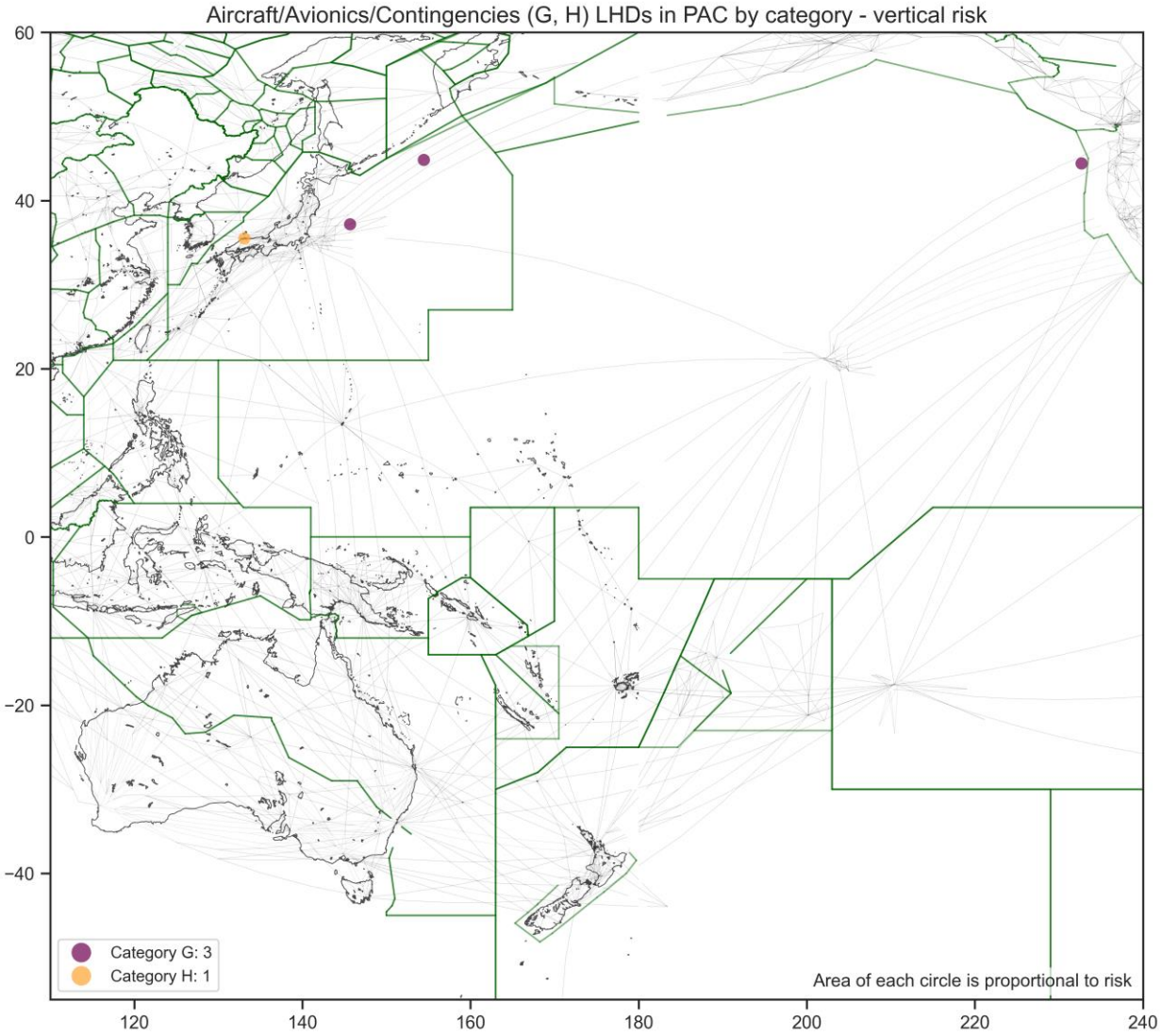
PAC: ATC (D, E, F)

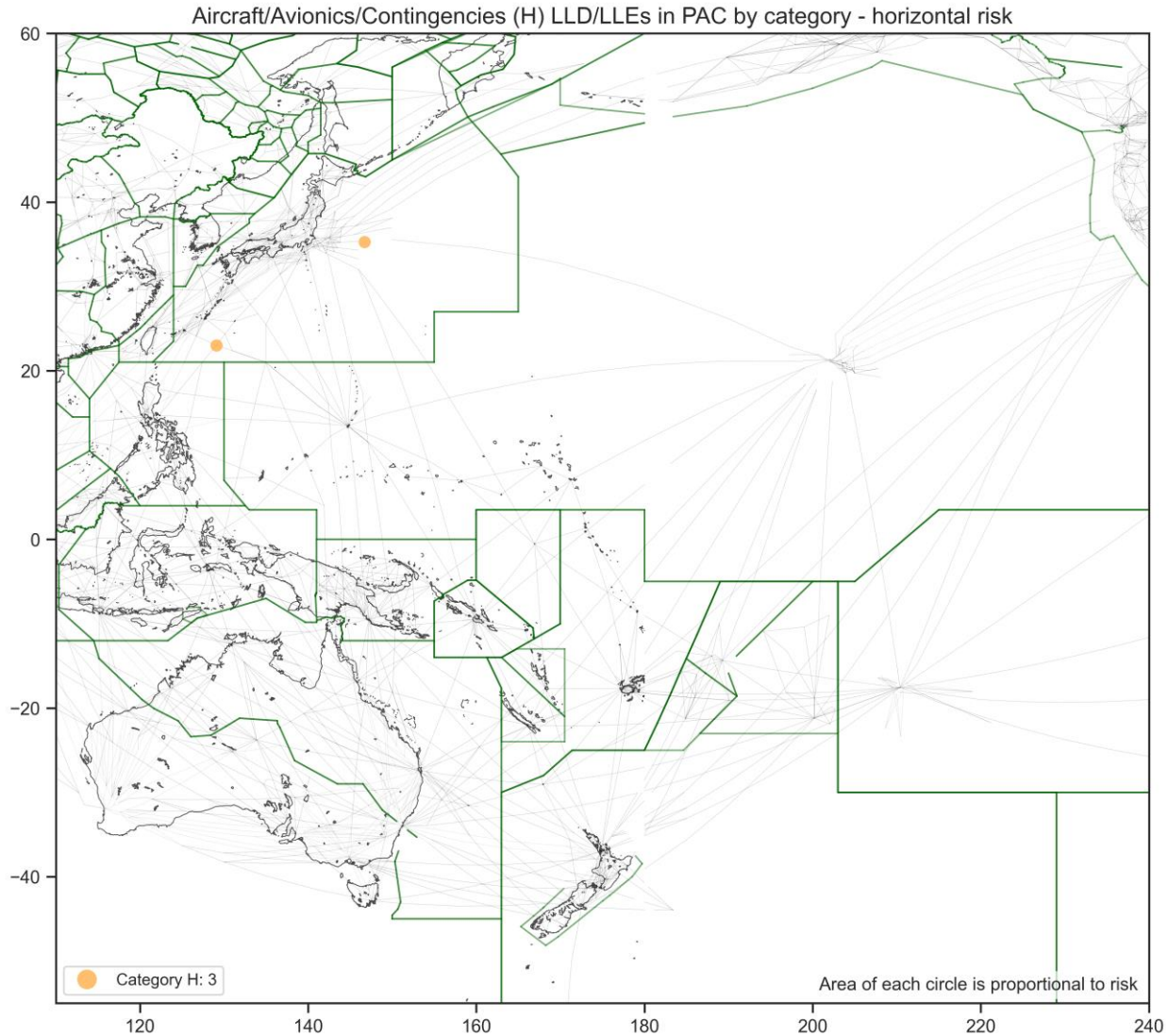

ATC (D, E, F) LHDs in PAC by category - vertical risk
60
40
20
0
−20
−40
120
140
160
180
200
220
240
Category D: 7
Category E: 63
Category F: 1
Area of each circle is proportional to risk


ATC (D, E, F) LLD/LLEs in PAC by category - horizontal risk
60
40
20
0
−20
−40
120
140
160
180
200
220
240
Category D: 2
Category E: 5
Category F: 1
Area of each circle is proportional to risk

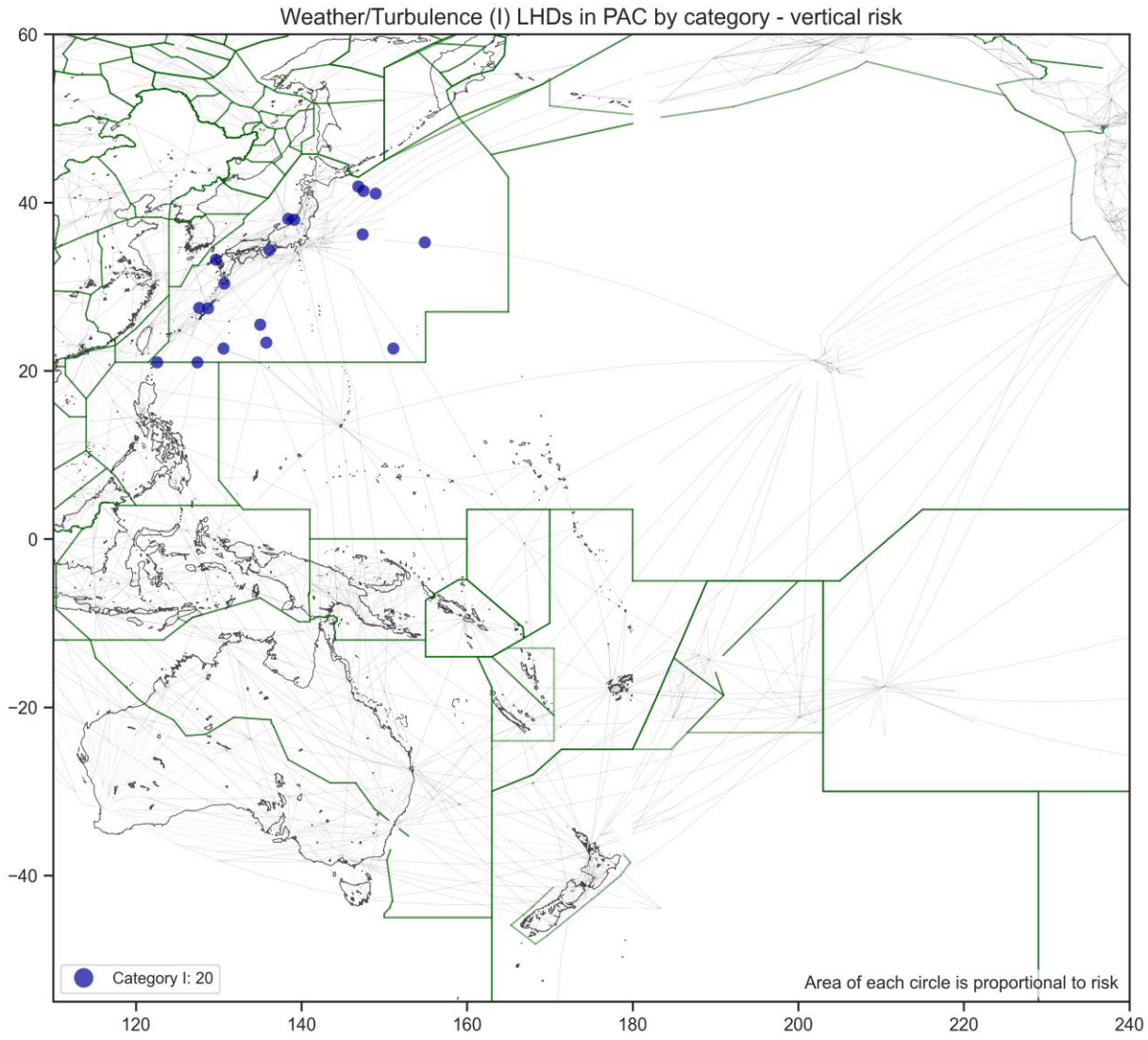
PAC: Aircraft Avionics/Contingencies

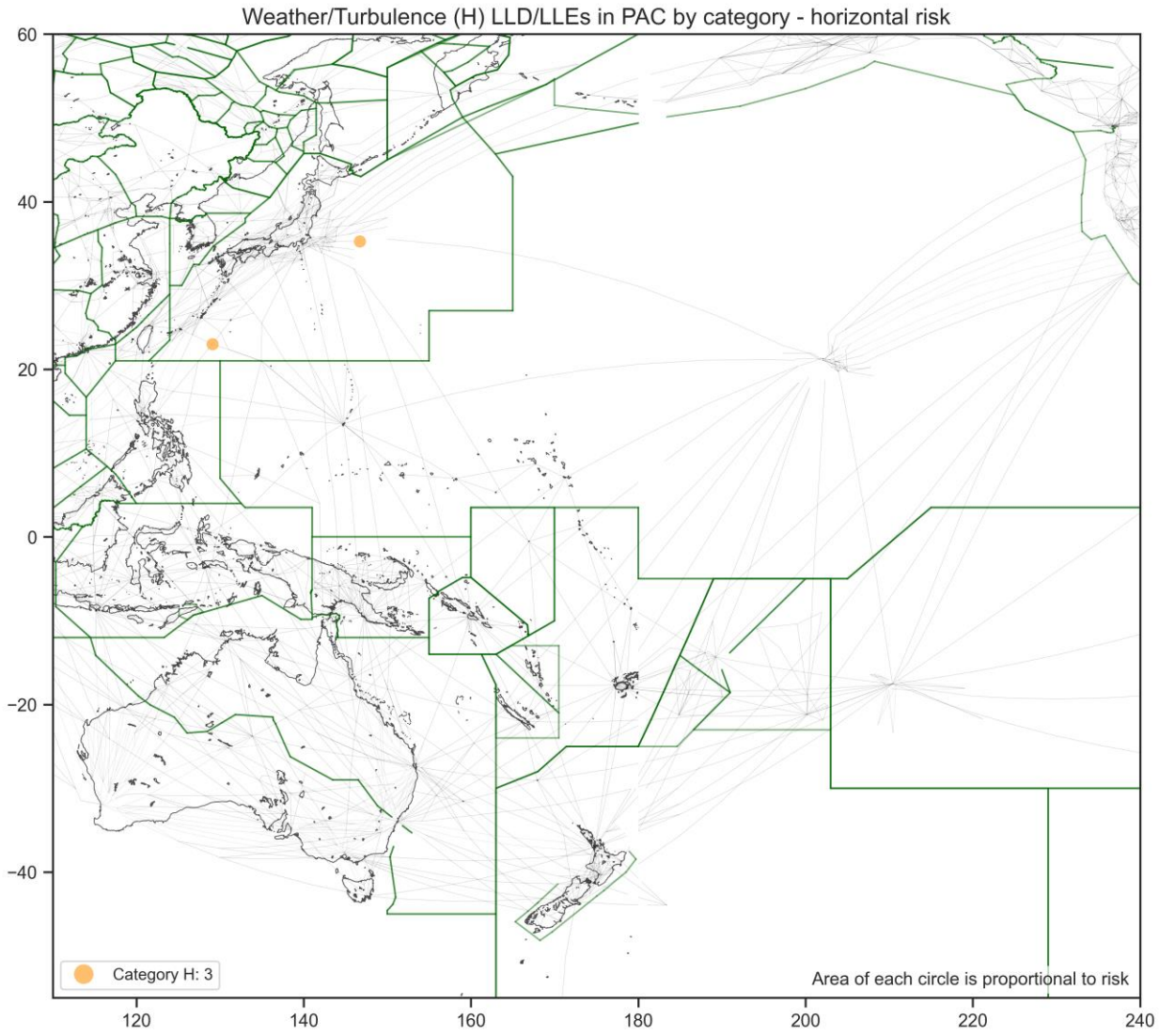
(LHD: G, H; LLD/LLE: H)



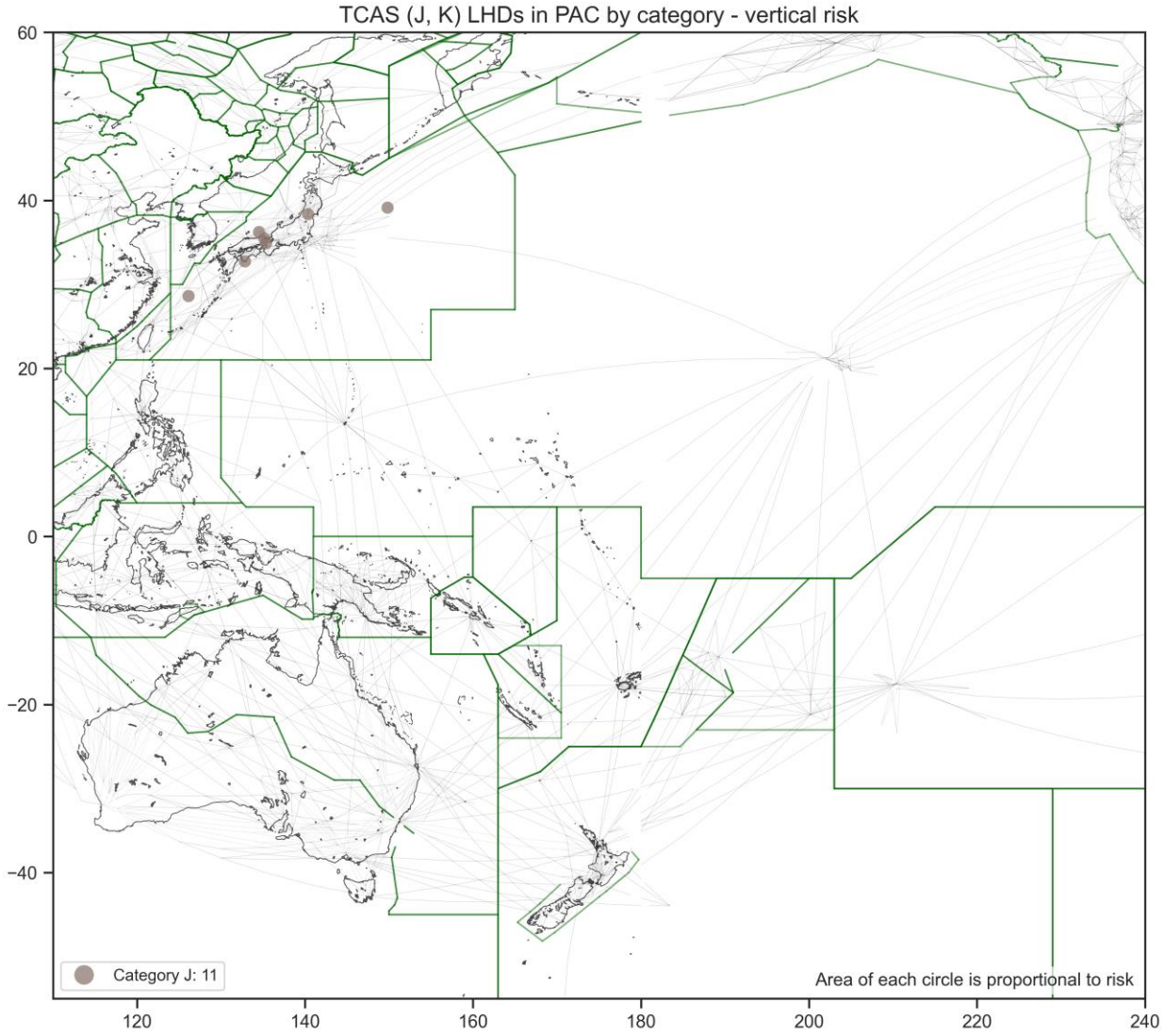


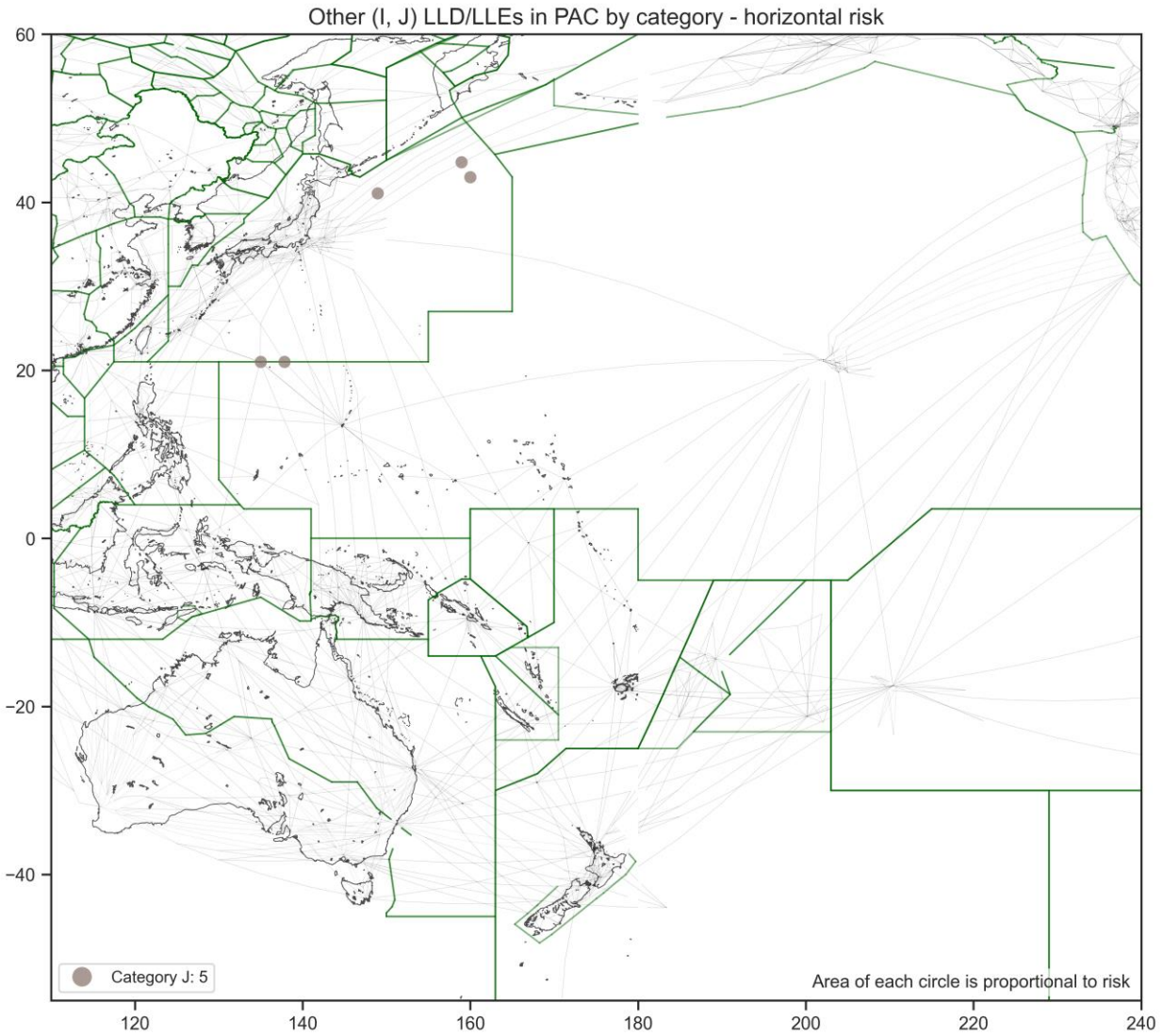
PAC: Weather/Turbulence (LHD: I; LLD/LLE: H)





PAC: TCAS (LHD: J, K; LLD/LLE: I, J)





PAC : Hot Spots

PAC: LHD Hot Spot N (Hawaii CEP/Oakland USA)

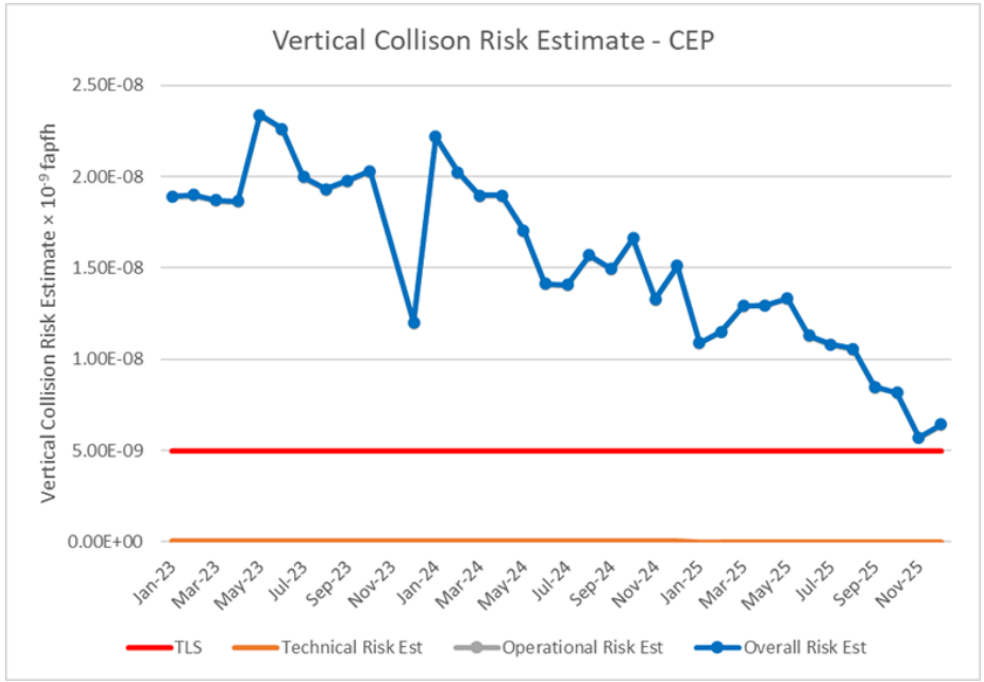
Nature of Occurrences: Coordination errors as a result of human factor issues (Category E-RI)

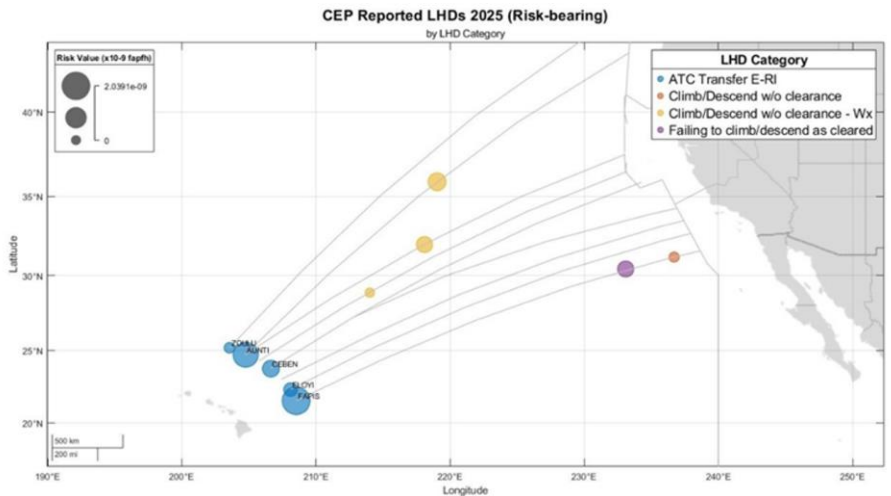
Contributing Factors: High traffic volume Central East Pacific (CEP) traffic flow and user-preferred routings that cross CEP airways

Trend:
- The number of LHDs in 2025 remained consistent with previous years.
- The operational risk decreased.

Mitigations: the data show that air traffic procedures, ATC intervention, and established mitigation strategies are working; the measured safety performance is improving despite the same level of reported LHDs.

Result from the hot spot identification process: **Hot Spot N remains on the hot spot list** and should continue to be monitored until the LHDs and risk are decreased and further safety improvement initiatives are implemented.





ASIA : Vertical Collision Risk

ASIA: Vertical Collision Risk Estimates

Annual flying hours: 11,115,453 hours/year

Vertical Risk Estimates		Remark
Vertical Technical Risk	0.84×10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	0.71×10^{-9} FAPFH	
Vertical Overall Risk	1.55×10^{-9} FAPFH	Below TLS

ASIA: Vertical Collision Risk Estimates

ASIA: Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Aircrew/ Pilot	A	Flight crew failing to climb/descend the aircraft as cleared	27	35	37.5
	B	Flight crew climbing/descending without ATC Clearance	27	32.5	36.6
	C	Incorrect operation or interpretation of airborne equipment	24	5	6
ATC	D	ATC system loop error	34	26.5	19.1
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	458	85.5	7.3
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	12	4	0

ASIA: Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	7	7	10
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	5	12	4
Weather/ Turbulence	I	Turbulence or other weather-related causes leading to unintentional or undetected change of flight level	103	15.4	115.3
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	22	2	16
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	0	0	0
	M	Other	94	159.2	1
		Total	**813**	**384.1**	**252.8**

ASIA : Horizontal Collision Risk

ASIA : Horizontal Collision Risk Estimates

Annual flying hours: 672,493 hours/year

2024 Horizontal Risk Estimates		Remark
Total Lateral Risk	1.54×10^{-9} FAPFH	Below TLS
Total Longitudinal Risk	1.62×10^{-9} FAPFH	Below TLS
2025 Horizontal Risk Estimates		**Remark**
Total Lateral Risk	1.26×10^{-9} FAPFH	Below TLS
Total Longitudinal Risk	1.45×10^{-9} FAPFH	Below TLS

ASIA : Summary of LLDs and LLEs

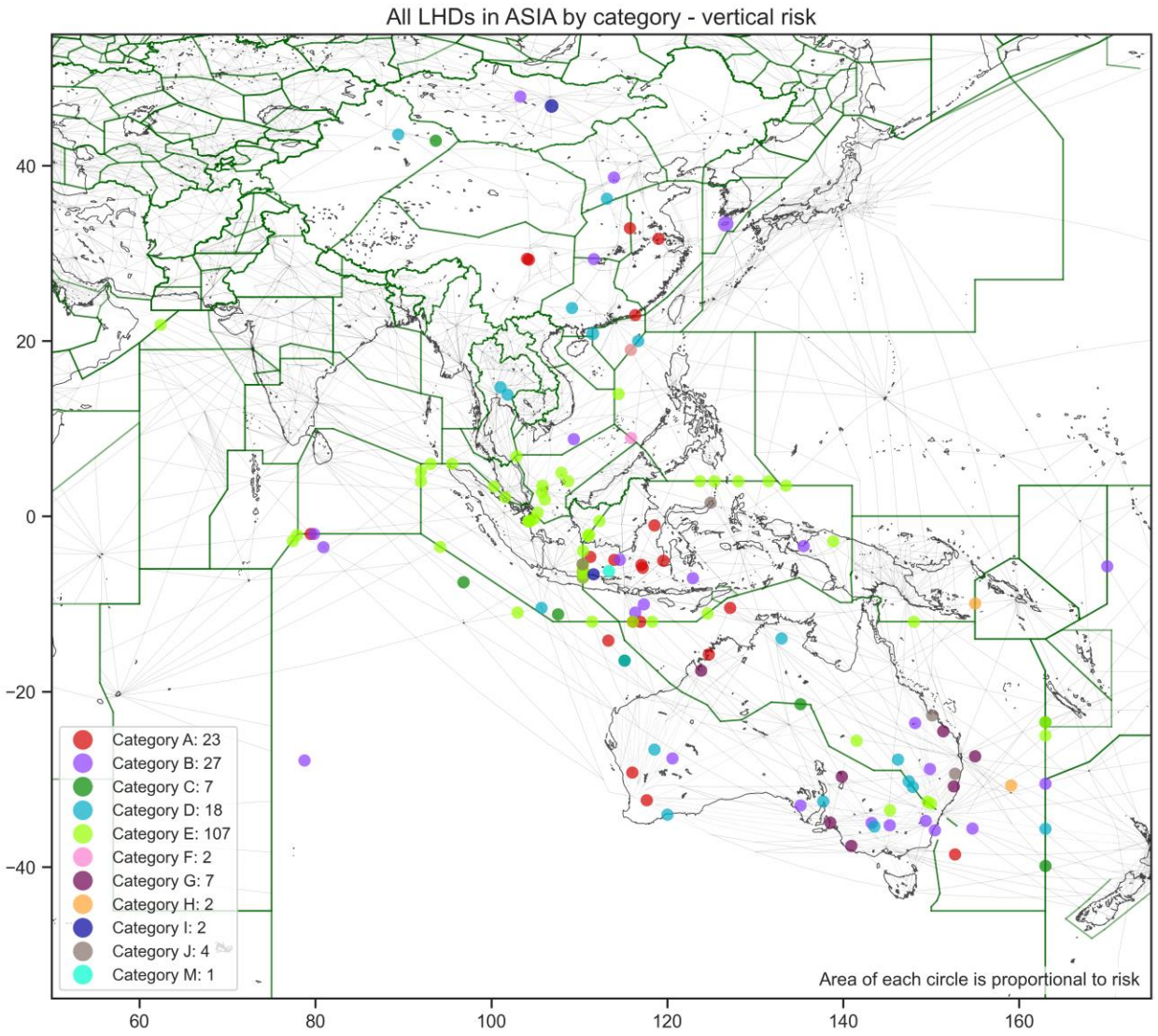
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	4	0	67
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	1	0	20
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	0	0	0
ATC	D	ATC system loop error	0	0	0
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	2	0	10
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	0	0	0

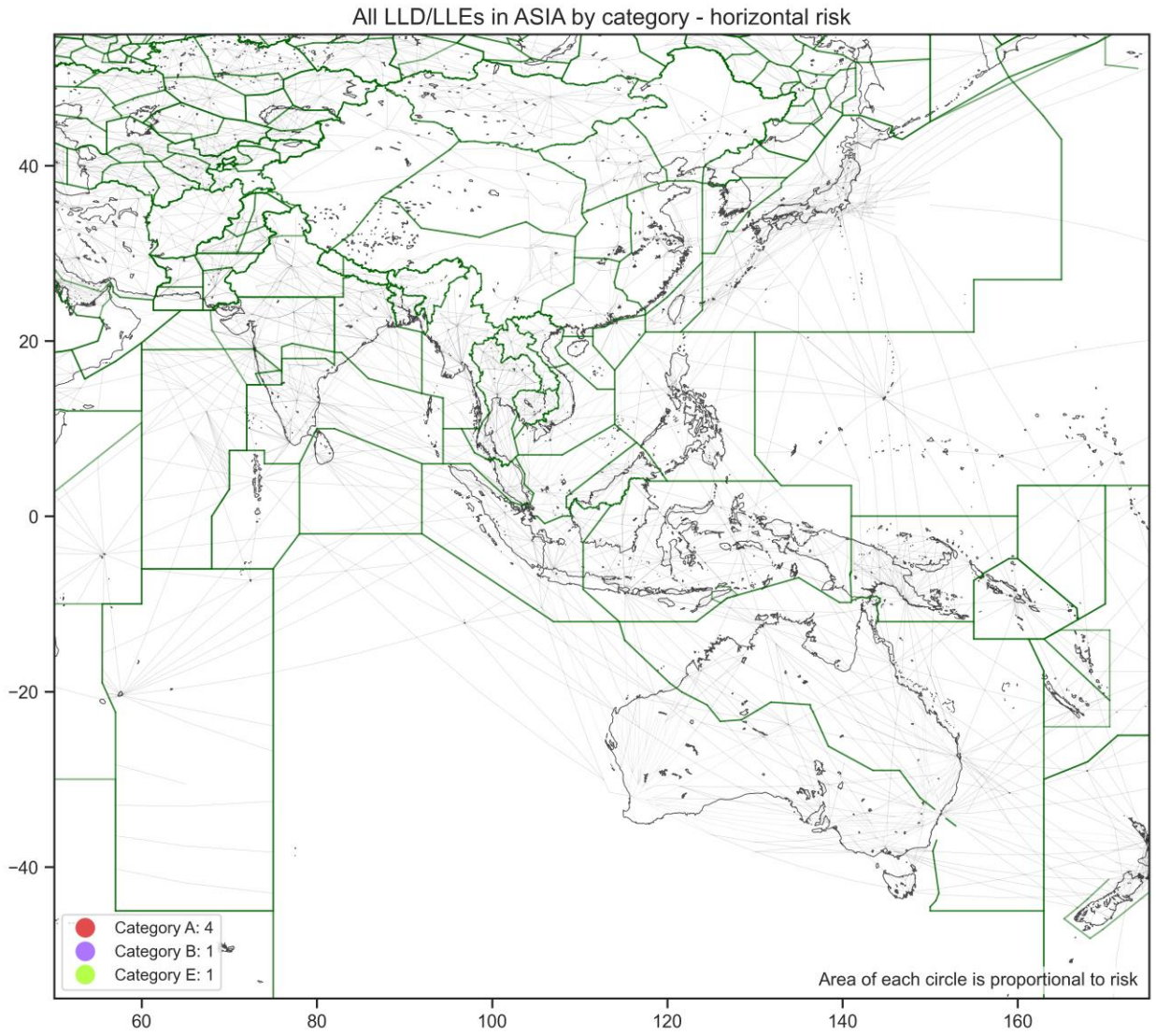
ASIA : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	0	0	0
Weather/ Turbulence	H	Turbulence or other weather-related causes leading to a deviation in the horizontal dimension	0	0	0
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0	0
	J	Other	0	0	0
		Total	**7**	**0**	**97**

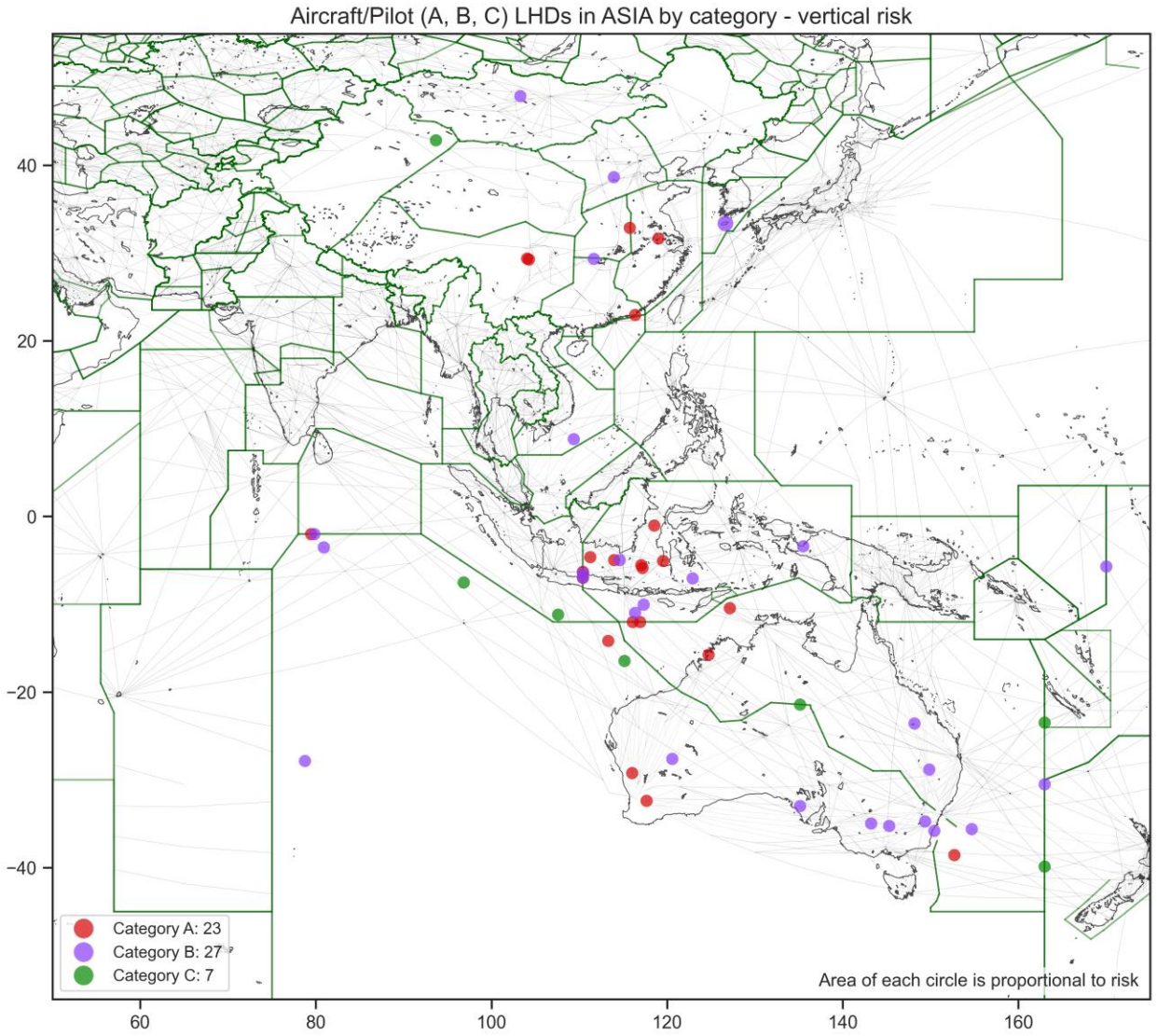
ASIA : Geolocation of LHDs/LLDs/LLEs

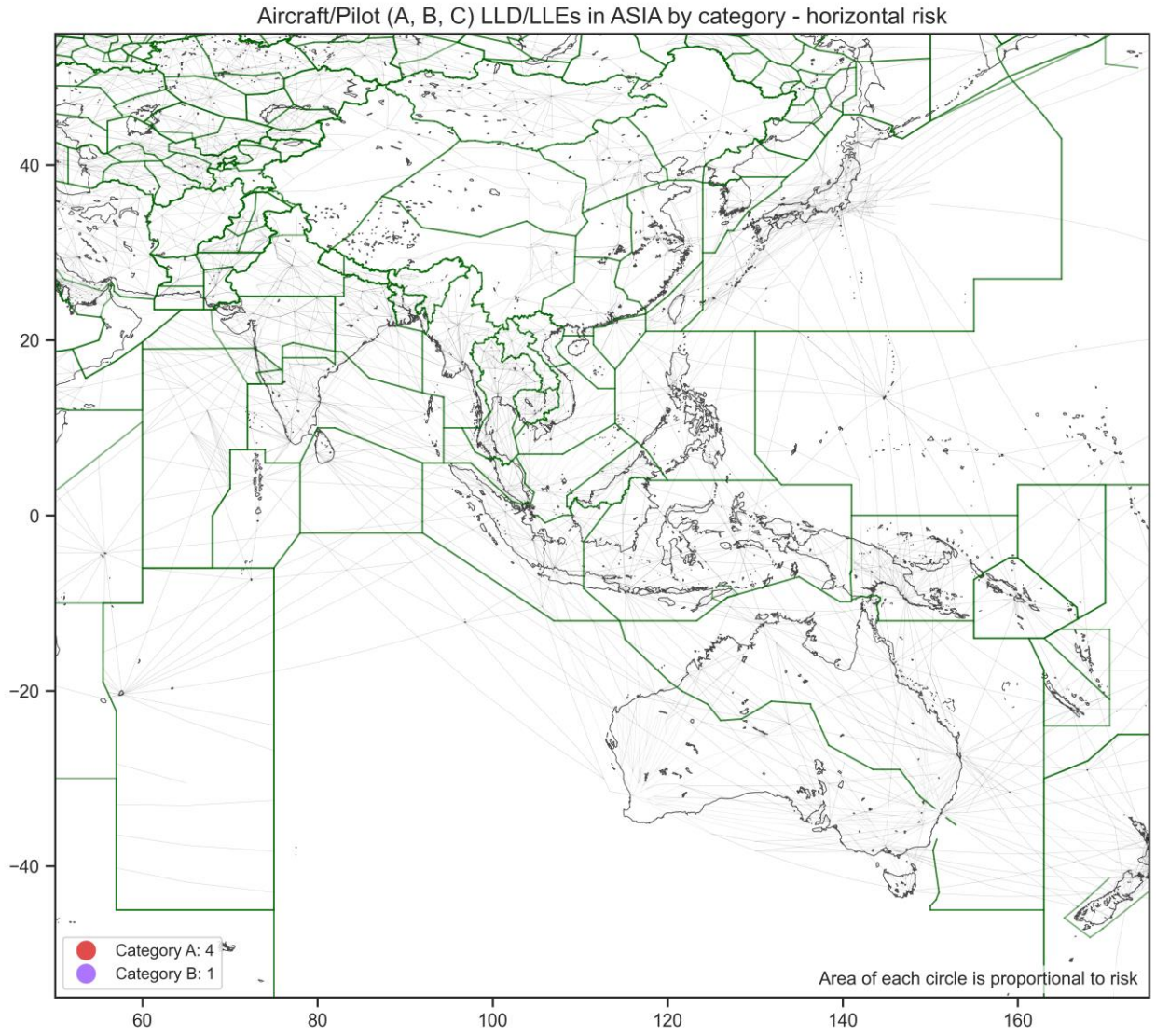
ASIA : All Categories



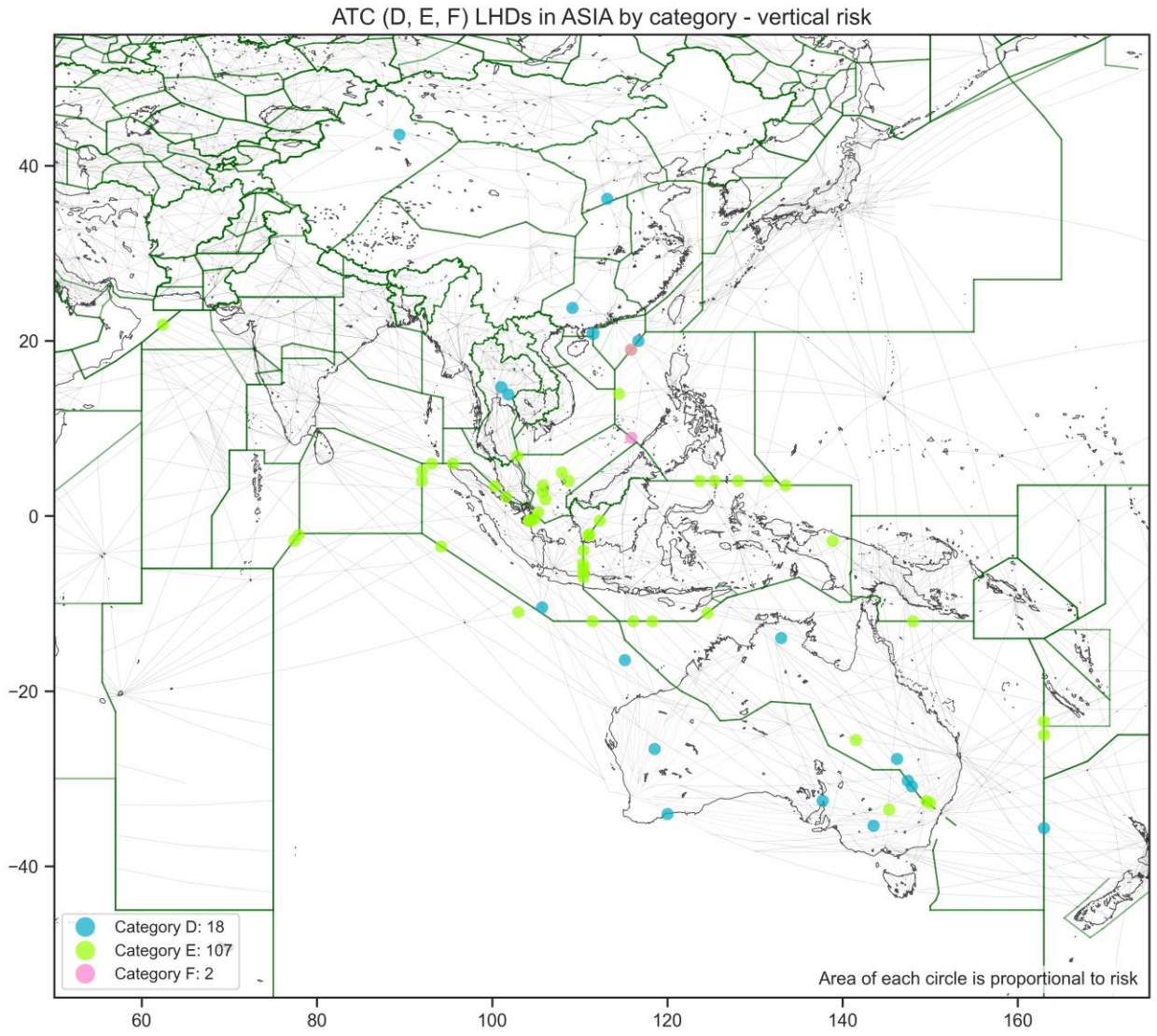


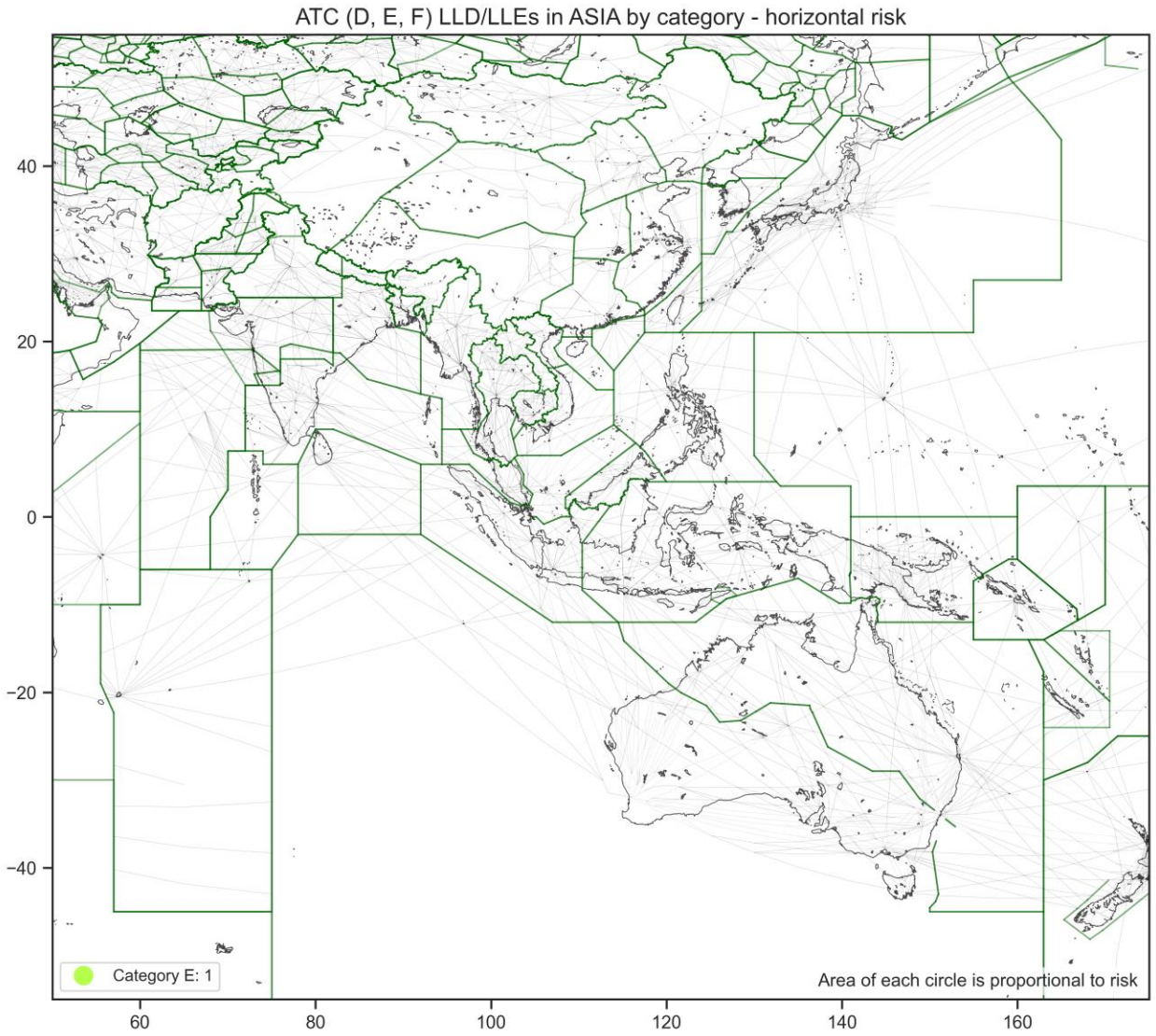
ASIA : Aircrew/Pilot (A, B, C)





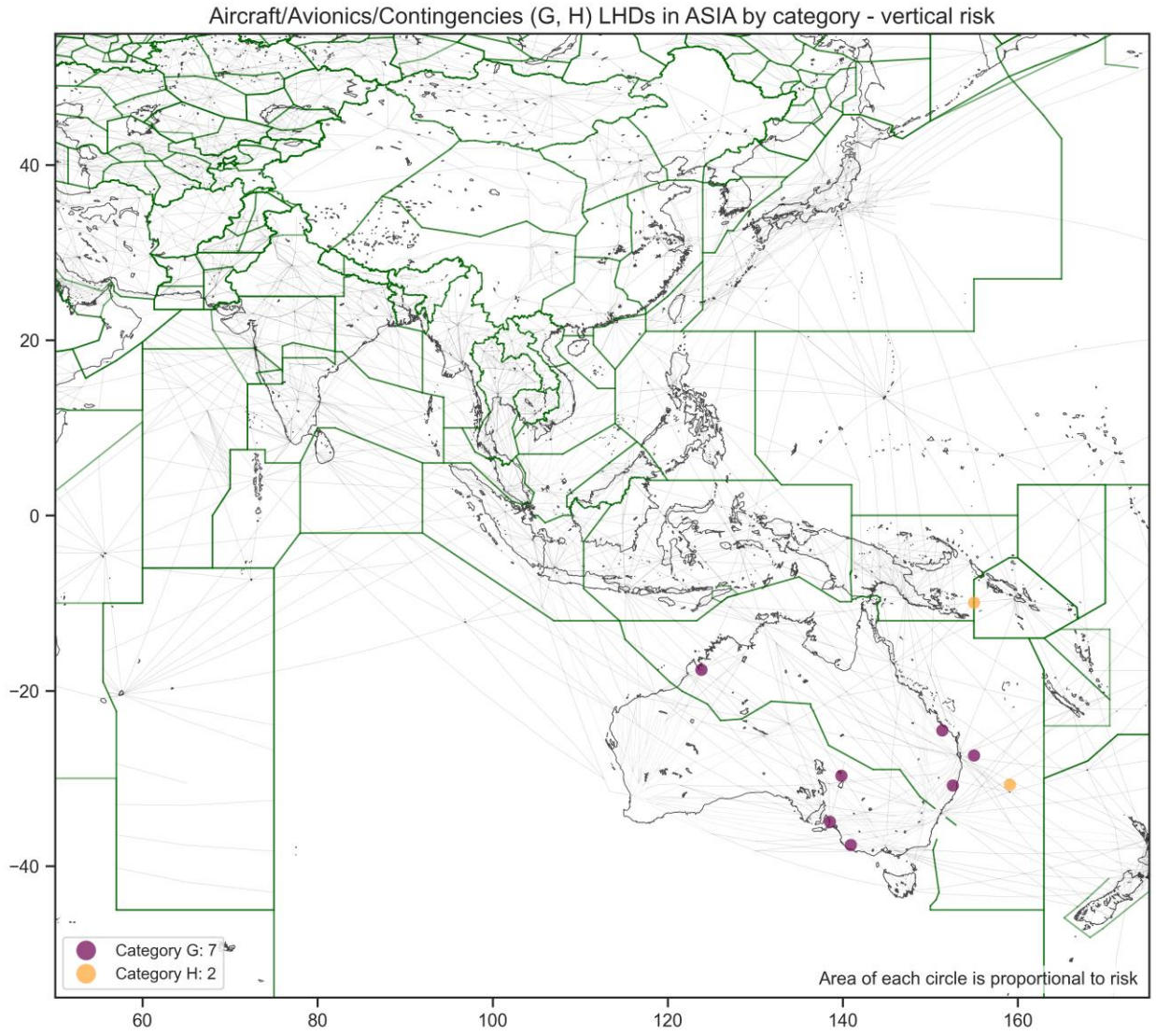
ASIA : ATC (D, E, F)

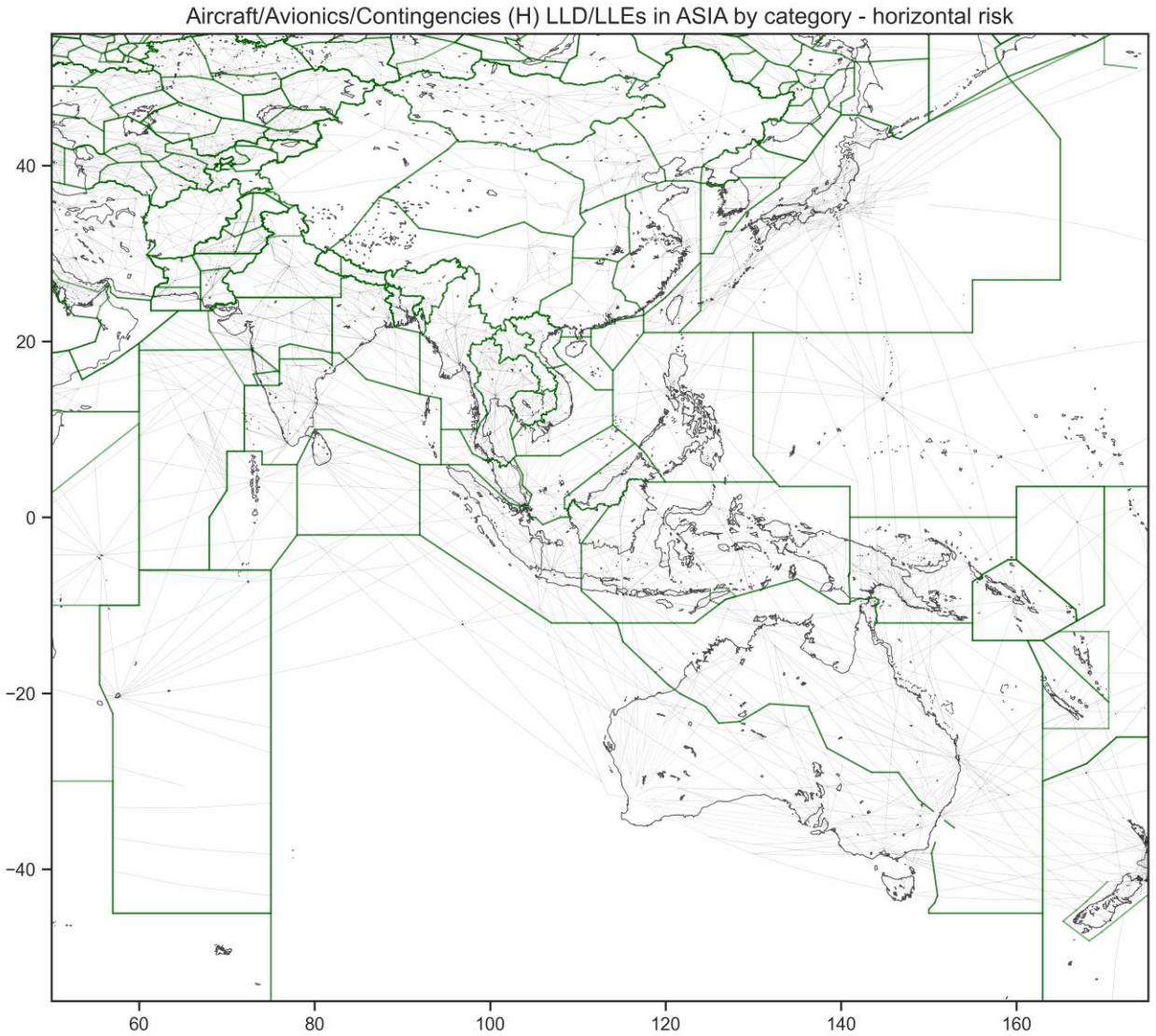

ATC (D, E, F) LHDs in ASIA by category - vertical risk
Category D: 18
Category E: 107
Category F: 2
Area of each circle is proportional to risk
40
20
0
−20
−40
60
80
100
120
140
160


ATC (D, E, F) LLD/LLEs in ASIA by category - horizontal risk
Category E: 1
Area of each circle is proportional to risk
40
20
0
−20
−40
60
80
100
120
140
160

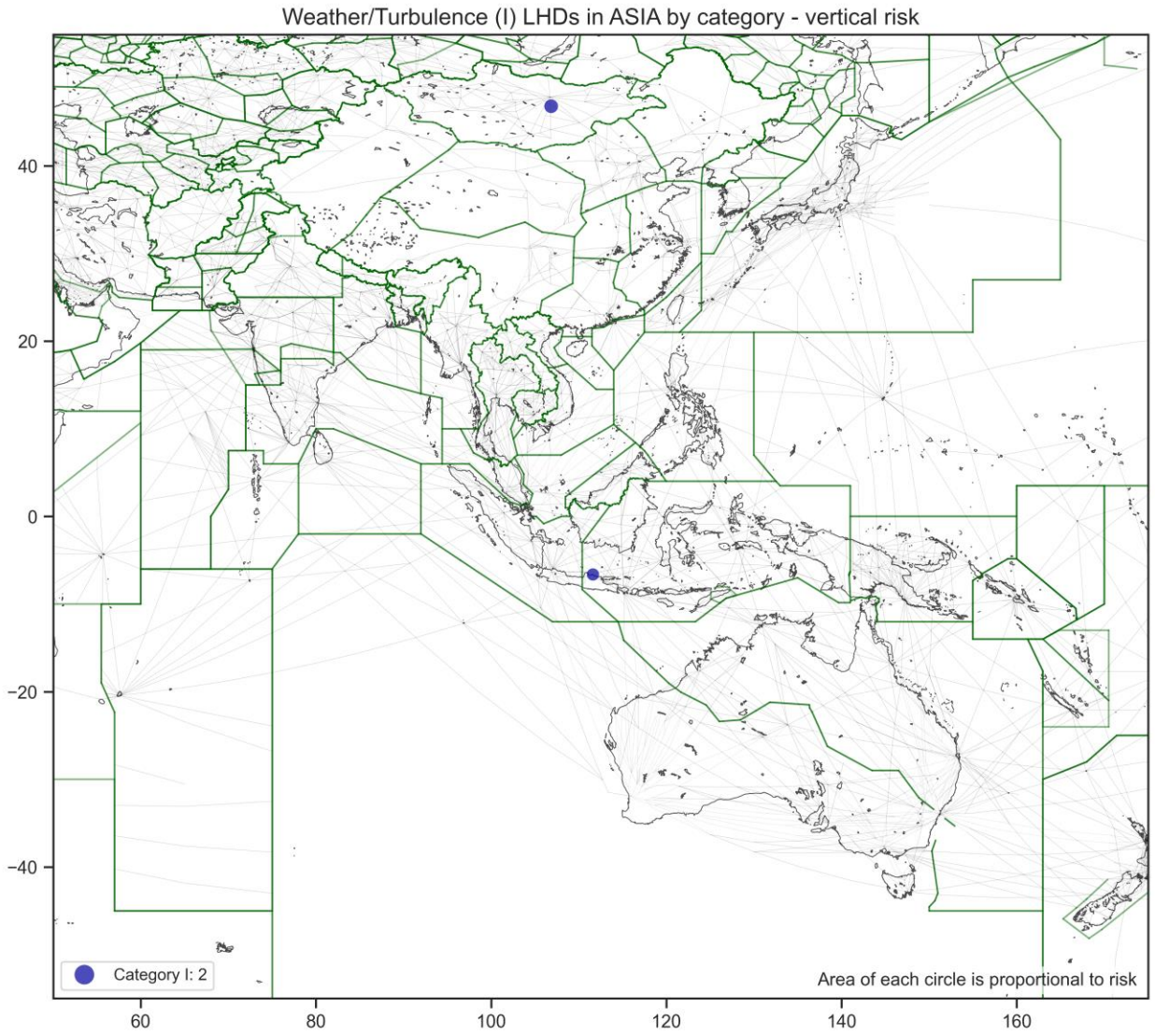
ASIA : Aircraft Avionics/Contingencies

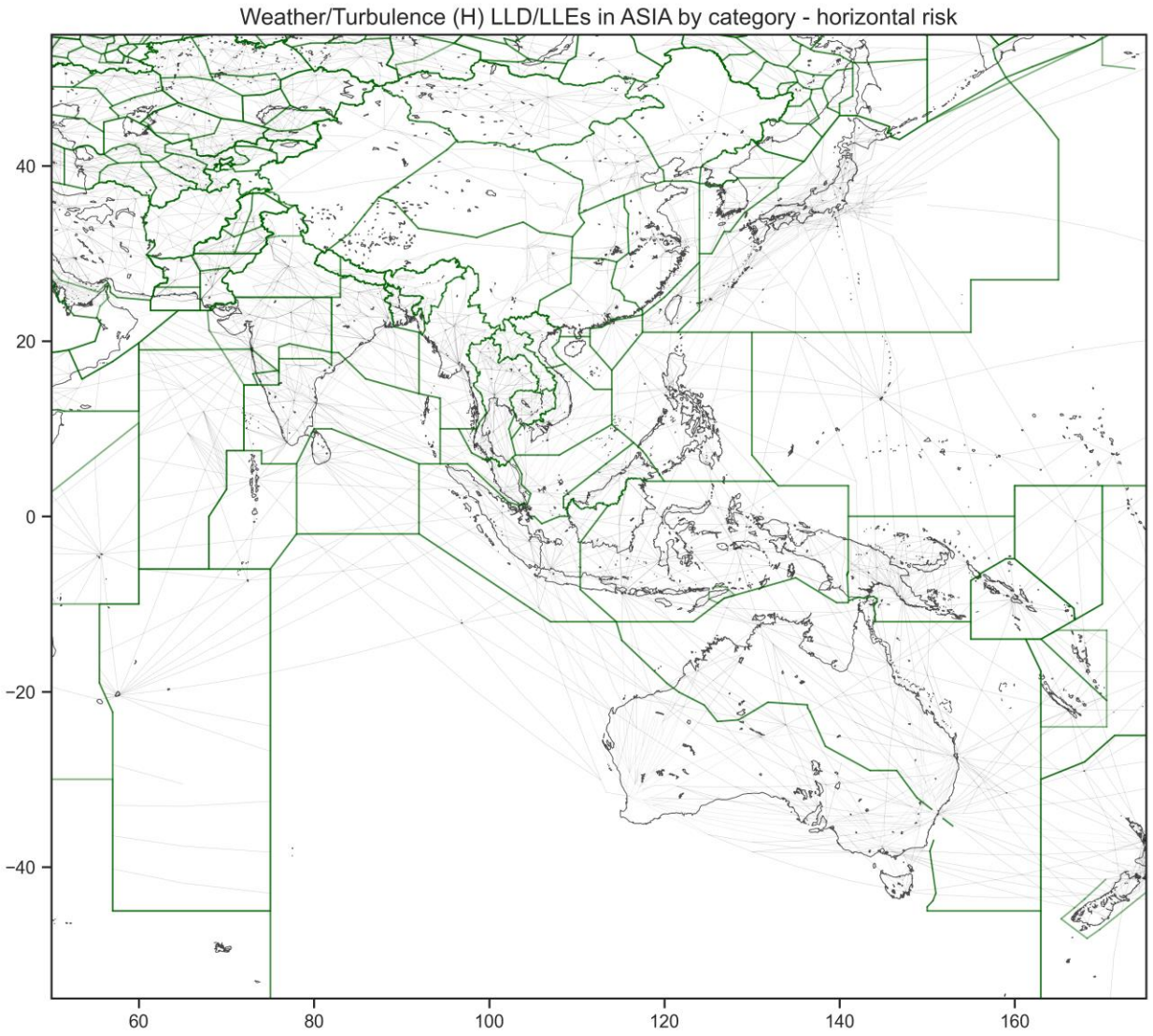
(LHD: G, H; LLD/LLE: H)



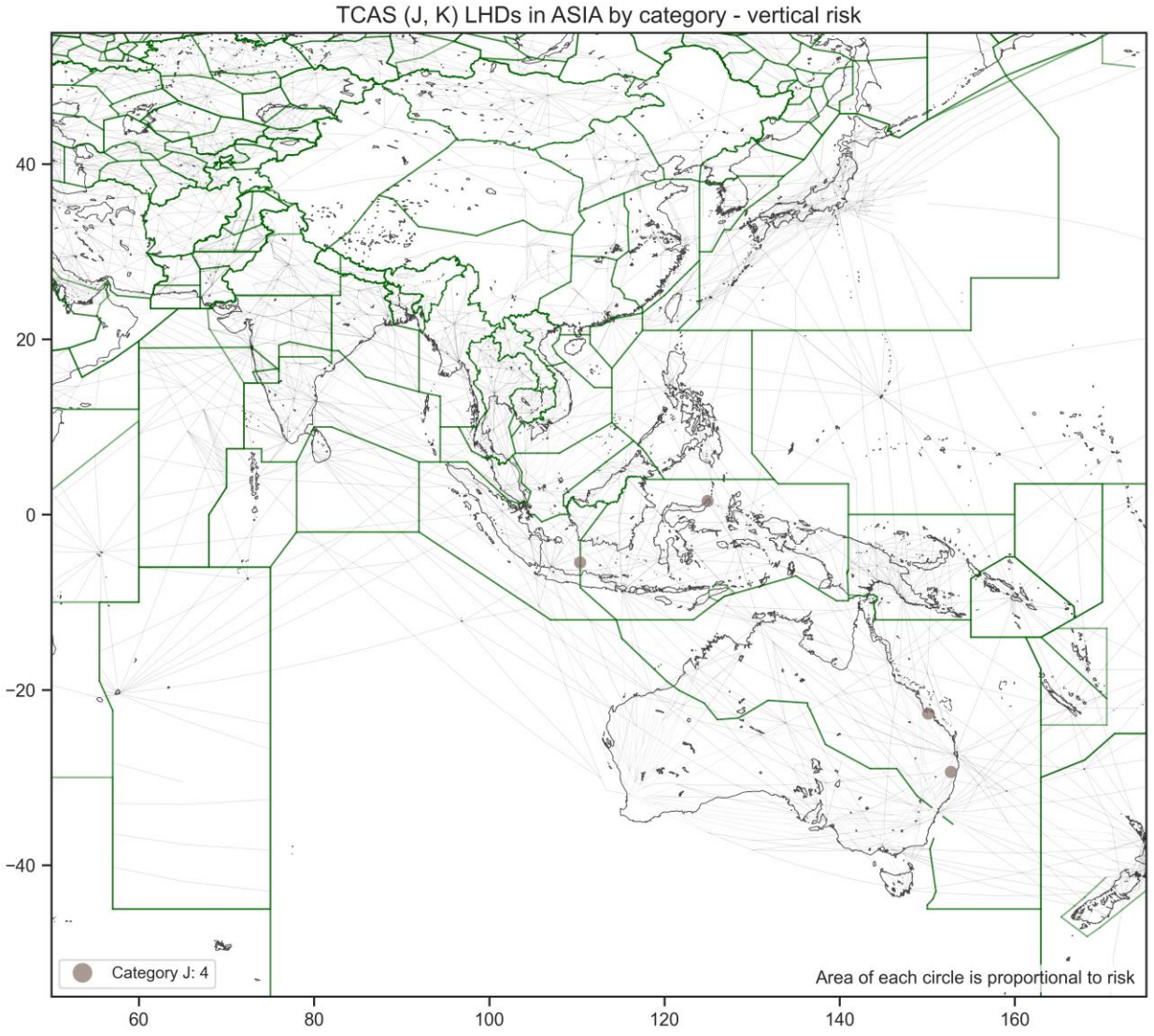


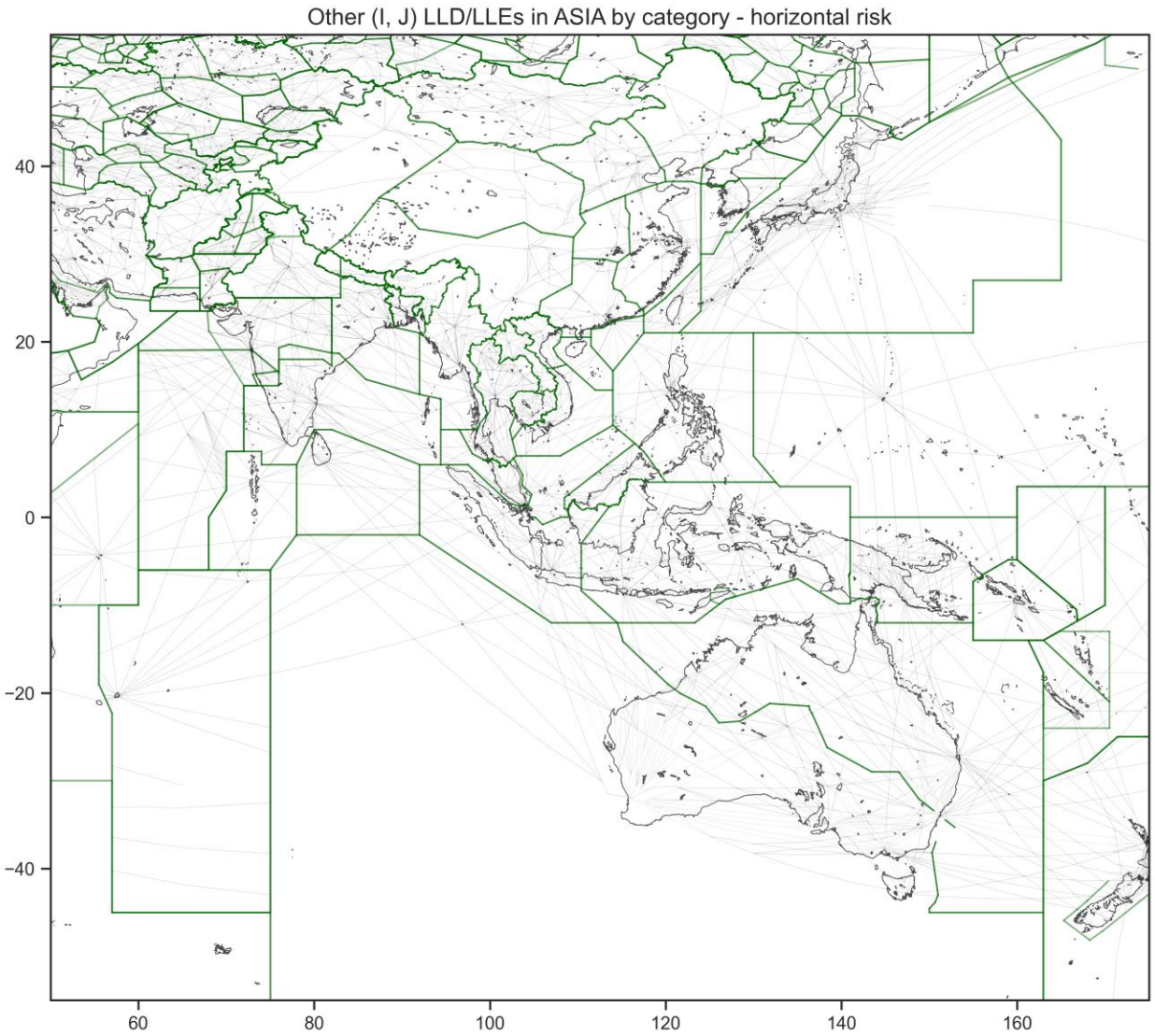
ASIA : Weather/Turbulence (LHD: I; LLD/LLE: H)





ASIA : TCAS (LHD: J, K; LLD/LLE: I, J)





ASIA : Hot Spots

ASIA : LHD Hot Spot A1 (Chennai/Dhaka/Kolkata/Yangon)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors: Gaps in communication and surveillance among Chennai, Kolkata and Yangon ACC.

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Kolkata/Yangon	11	6	1	0.00	0.00	0.00
Chennai/Yangon	15	6	0	0.06	0.00	0.00

Trend:

-The number of LHDs gradually decreased.

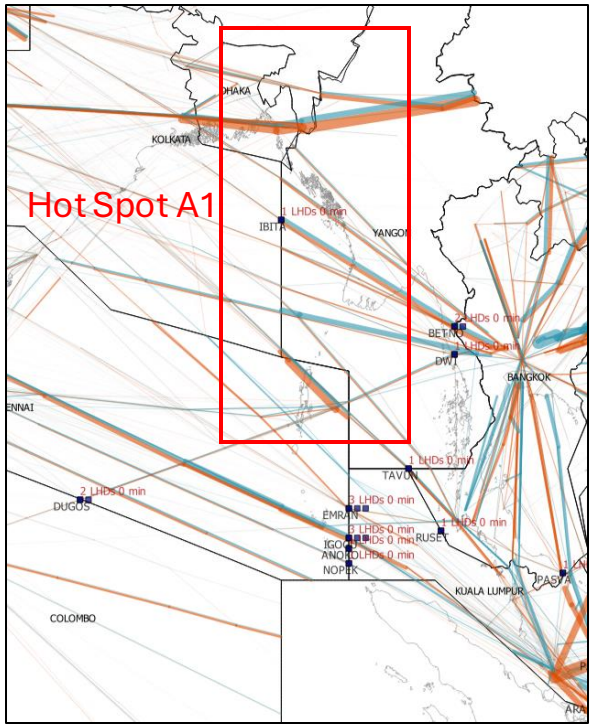
-The operational risk has reduced to zero since 2024.

Mitigations:

- Surveillance has been enhanced by Space-based ADS-B in Indian FIRs and ADS-B data sharing among Kolkata, Chennai, and Yangon ACCs.
- The AIDC was initiated between Kolkata ACC/Chennai ACC and Yangon ACCs, but full operational implementation has not been achieved.

Result from the hot spot identification process:

- Hot Spot A1 does not satisfy the hot spot criteria.
- However, AIDC implementation or other mitigation measures have not been completed.
- Consequently, **Hot Spot A1 remains on the list of hot spots** and should continue to be monitored until further mitigations are implemented.



ASIA : LHD Hot Spot B1

Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors:

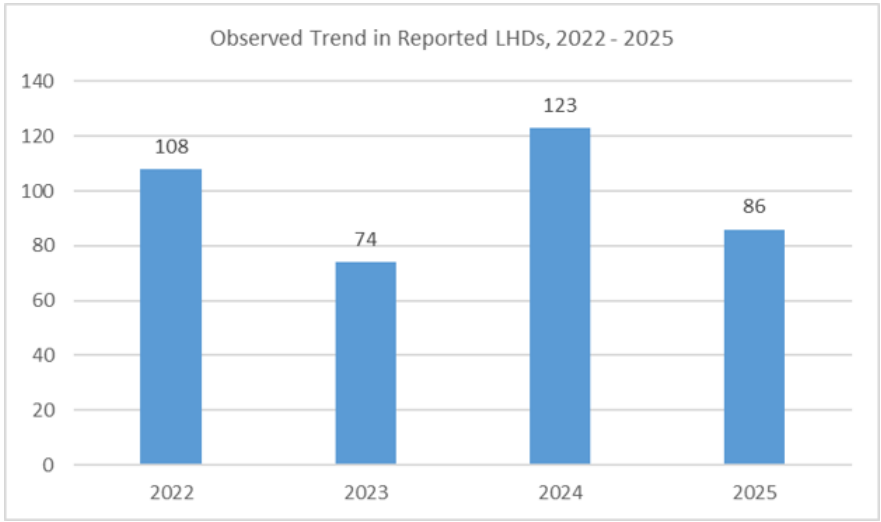
- High traffic volume with limited route capacity

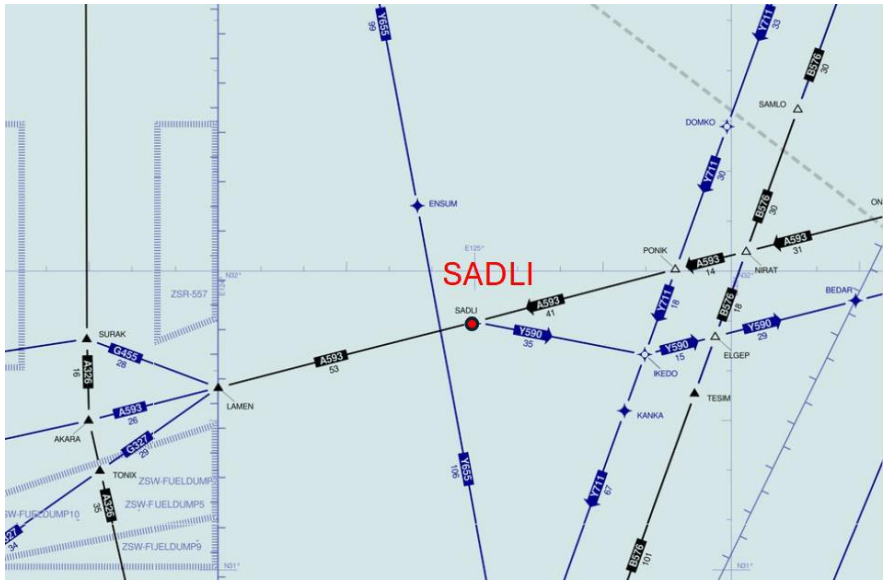
Trend: In 2025, the number of reported LHDs decreased from 2024. The operational risk has been zero since 2021 because all reported occurrences are mitigated by available surveillance and direct speech circuit.

Mitigations: Improvements to process for sharing reported LHD information allows transferring facility to identify underlying causal factors.

Result from the hot spot identification process:

- Hot Spot B1 satisfies the hot spot criteria in terms of the number of LHDs.
- Therefore, **Hot Spot B1 remains on the list of hot spots** and should continue to be monitored until the number of LHDs decreases, and further safety improvement initiatives or mitigation measures are completed.





ASIA : LHD Hot Spot D1 (Fukuoka/Manila)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors :

- Gaps in communication and surveillance
- Complexity in the aircraft transfer procedure from Manila ACC to Fukuoka ACC

Trend:

- The number of LHDs and operational risk decreased.

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Hot Spot D1 (Fukuoka/Manila)	4	4	1	0.19	0.07	0.00

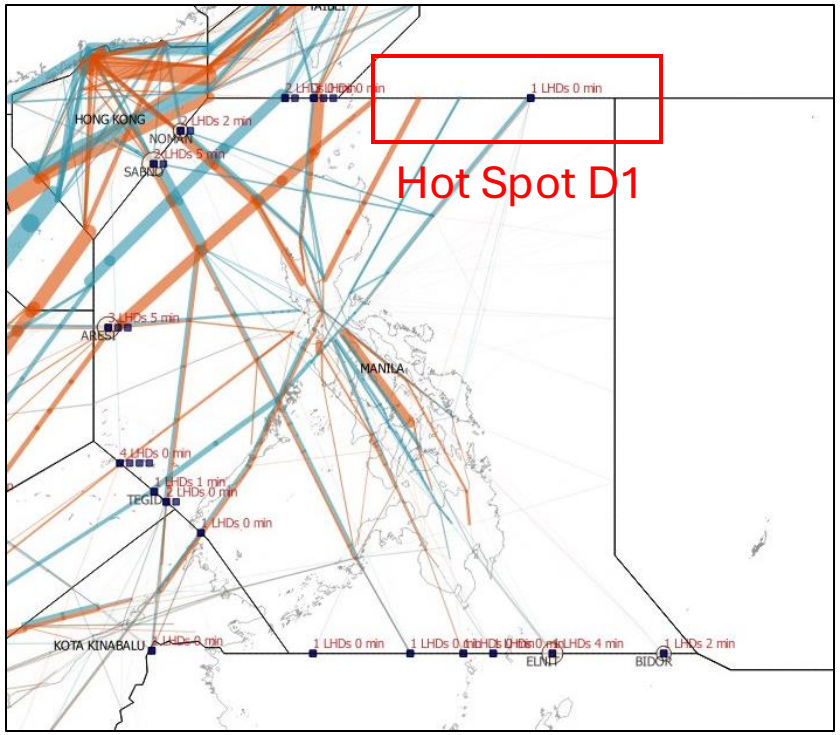
The statistics in this table are derived solely from MAAR's assessment results and do not include assessment results from JASMA.

Mitigations:

- The timing for sending transfer information from Manila ACC to Fukuoka ACC was adjusted from 30 minutes to 20 minutes prior to the estimated time over the FIR boundary. This change reduced the complexity by allowing the transfer to be coordinated within a single sector instead of across two sectors.

Result from the hot spot identification process:

- Hot Spot D1 does not satisfy the hot spot criteria.
- In addition, Fukuoka and Manila ACCs have actively collaborated to investigate the causes and implement mitigations.
- As a result, **Hot Spot D1 is proposed for removal from the list of hot spots, having been marked as a potential non-hot spot in 2024.**



ASIA : LHD Hot Spot D5 (Ho Chi Minh/Manila)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors :

- Gaps in communication and surveillance

Trend:

- The number of LHDs and operational risk decreased.

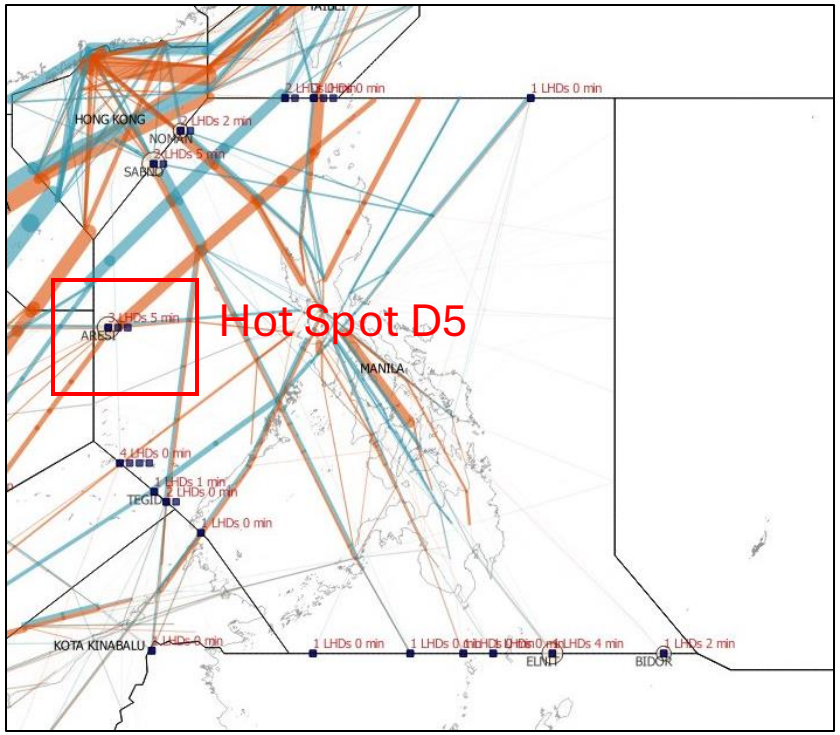
Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Hot Spot D5 (Ho Chi Minh/Manila)	2	6	3	0.10	0.14	0.09

Mitigations:

- Since 2018, the Philippines has implemented safety improvement initiatives, including a new ATM system, sector redesign, enhanced surveillance and ADS-C/CPDLC coverage, controller training, coordination with adjacent ACCs, and AIDC.

Result from the hot spot identification process:

- Hot Spot D5 does not satisfy the hot spot criteria.
- However, AIDC implementation has not been completed yet.
- Therefore, **Hot Spot D5 remains on the list of hot spots** and should continue to be monitored until further safety improvement initiatives are implemented.



ASIA : LHD Hot Spot D7 (Kota Kinabalu/Manila)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors :
- Gaps in communication and surveillance

Trend:
- The number of LHDs decreased.
- The operational risk decreased to zero.

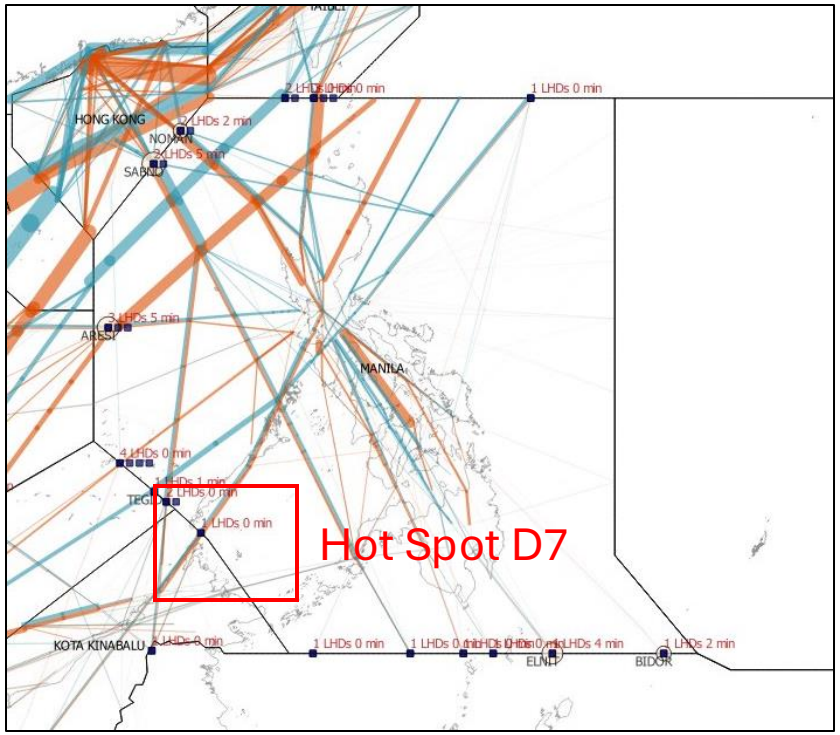
Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Hot Spot D7 (Kota Kinabalu/Manila)	5	6	3	0.13	0.12	0.00

Mitigations:

- Since 2018, the Philippines has implemented safety improvement initiatives, including new ATM system, sector redesign, enhanced surveillance and ADS-C/CPDLC coverage, controller training, coordination with adjacent ACCs, and AIDC.

Result from the hot spot identification process:

- Hot Spot D7 does not satisfy the hot spot criteria since 2023.
- AIDC has been fully operational between Kota Kinabalu and Manila ACCs.
- Consequently, **Hot Spot D7 is marked as a potential non-hotspot.**



ASIA : LHD Hot Spot D8 (Manila/Ujung Pandang)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors :
- Gaps in communication and surveillance

Trend:
- The number of LHDs slightly decreased.
- The operational risk increased.

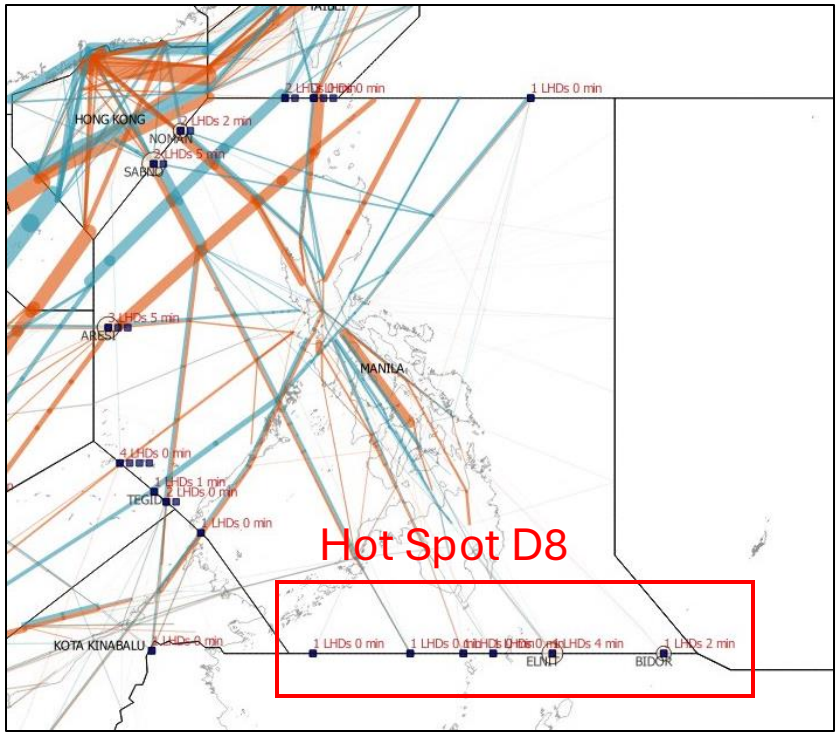
Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Hot Spot D8 (Manila/Ujung Pandang)	15	8	6	0.41	0.06	0.13

Mitigations:

- Since 2018, the Philippines has implemented safety improvement initiatives, including new ATM system, sector redesign, enhanced surveillance and ADS-C/CPDLC coverage, controller training, coordination with adjacent ACCs, and AIDC.

Result from the hot spot identification process:

- Even though AIDC has been successfully operated since 2020, Hot Spot D8 still satisfies the hot spot criteria in terms of the operational risk.
- Thus, **Hot Spot D8 remains on the list of hot spots.**



ASIA : LHD Hot Spot F (Mogadishu/Mumbai)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

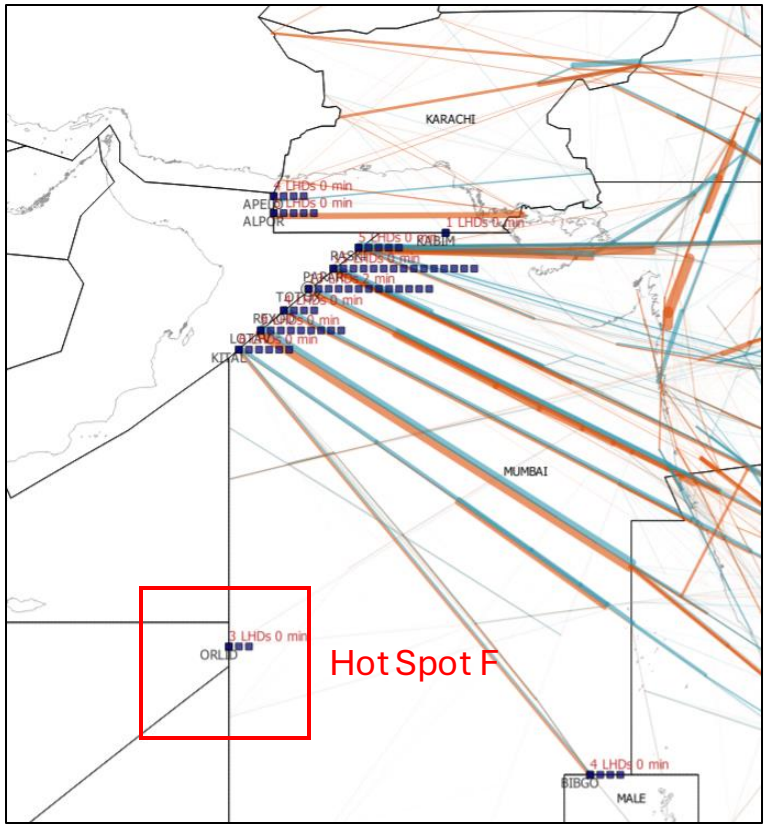
Contributing Factors: Gaps in communication and surveillance between Mogadishu and Mumbai ACC.

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Hot Spot F (Mogadishu/Mumbai)	10	7	3	0.00	0.05	0.00

Trend:
- The number of LHDs decreased.
- Operational risk decreased to zero.

Mitigations:
- Surveillance coverage was enhanced through Space-Based ADS-B in Indian FIRs.
- ATM system at Mumbai FIR is in the process of being upgraded, scheduled for 2026. The new ATM system will be ready for AIDC implementation.

Result from the hot spot identification process:
- Hot Spot F does not satisfy the hot spot criteria.
- However, AIDC implementation or other mitigation measures have not been completed yet.
- Thus, **Hot Spot F remains on the list of hot spots.**



ASIA : LHD Hot Spot G1 (Mumbai/Muscat)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors : Gaps in communication and surveillance among Mumbai and Muscat ACCs.

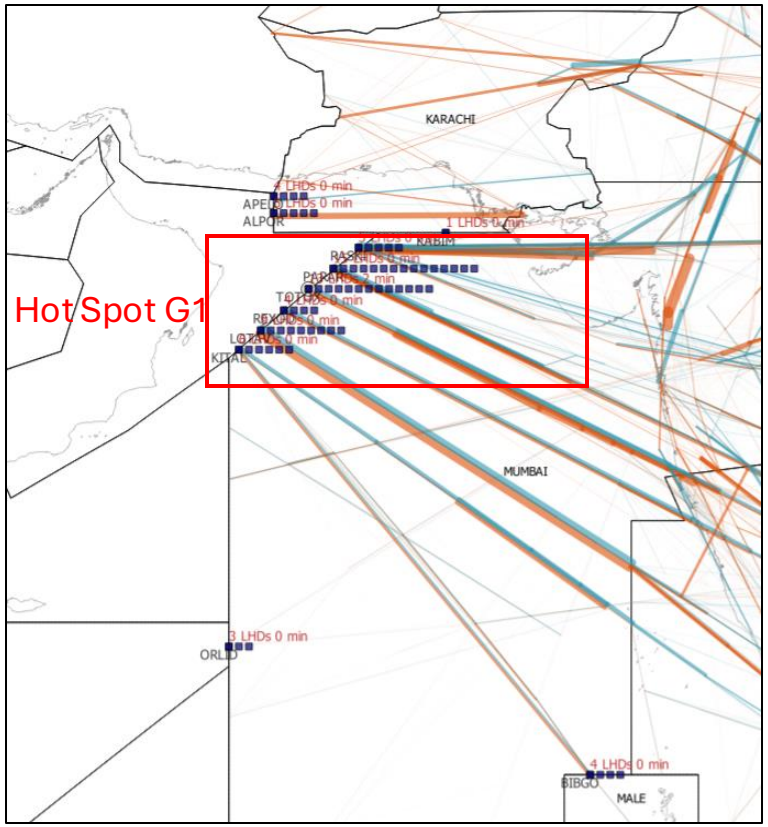
Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Hot Spot G1 (Mumbai/Muscat)	138	132	52	2.79	1.09	0.04

Trend:
- The number of LHDs and operational risk significantly decreased.

Mitigations:
- Surveillance coverage was enhanced through Space-Based ADS-B in Indian FIRs.
- ATM system at Mumbai FIR is in the process of being upgraded in Q4 of 2026. The new ATM system will be ready for AIDC implementation.

Result from the hot spot identification process:

- Hot Spot G1 satisfies the hot spot criteria in terms of the number of LHDs.
- Therefore, **Hot Spot G1 remains on the list of hot spots** and should continue to be monitored until the number of LHDs decreases and further safety improvement initiatives or mitigation measures, such as AIDC, are completed.



ASIA : LHD Hot Spot G2 (Mumbai/Sanaa)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

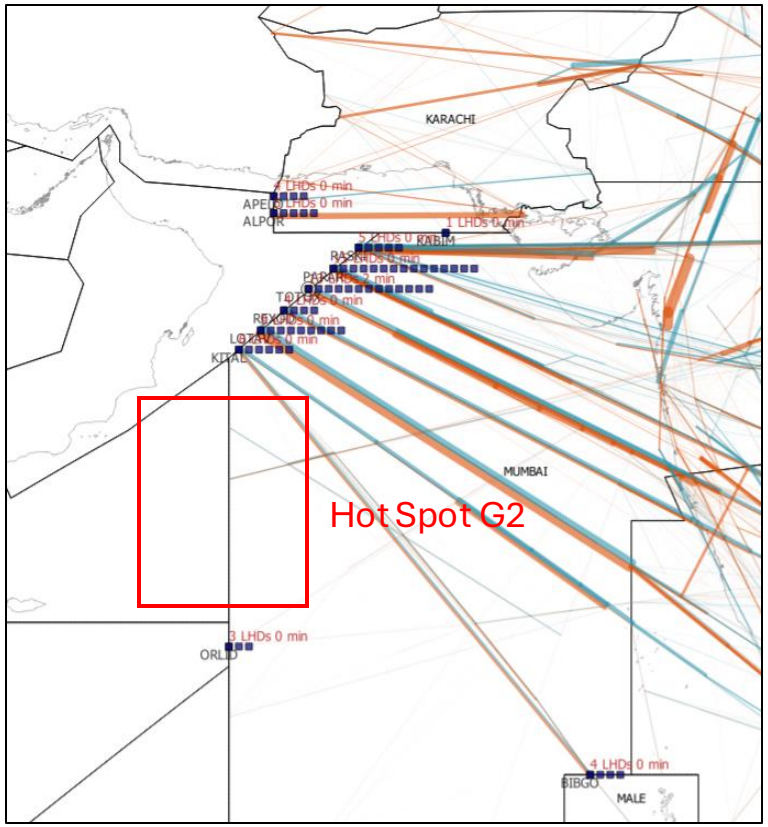
Contributing Factors : Gaps in communication and surveillance among Mumbai and Sanaa ACCs.

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Hot Spot G2 (Mumbai/Sanaa)	3	4	0	0.00	0.00	0.00

Trend:
- The number of LHDs reduced to zero.
- Operational risk was zero since 2023.

Mitigations:
- Surveillance coverage was enhanced through Space-Based ADS-B in Indian FIRs.
- ATM system at Mumbai FIR is in the process of being upgraded, scheduled for 2026. The new ATM system will be ready for AIDC implementation.

Result from the hot spot identification process:
- Hot Spot G2 does not satisfy the hot spot criteria.
- However, AIDC implementation or other mitigation measures have not been completed yet.
- Thus, **Hot Spot G2 remains on the list of hot spots.**



ASIA : LHD Hot Spot J (Jakarta/Kota Kinabalu/Singapore)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors : Gaps in communication and surveillance between Jakarta and Singapore ACC.

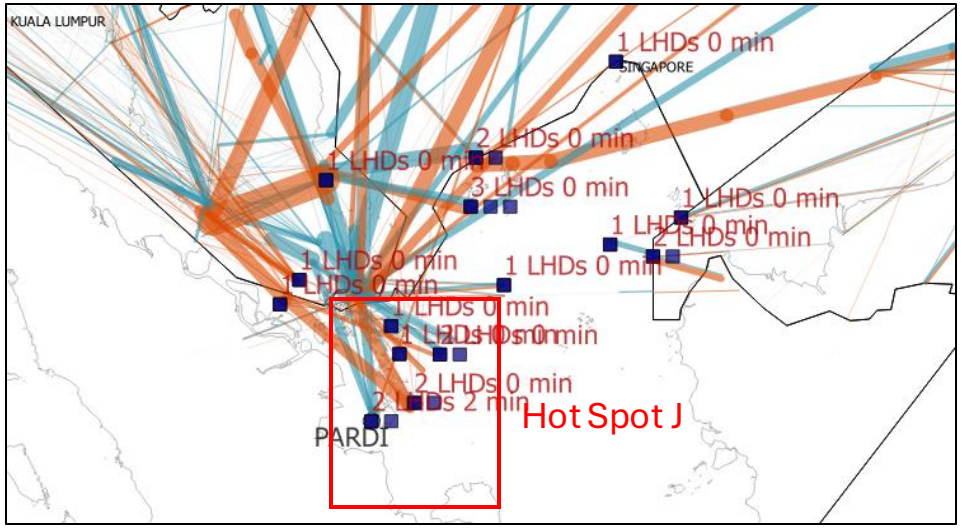
Trend:
- The number of LHDs slightly increased.
- The operational risk significantly decreased.

Mitigations:
- As of 21 March 2024, the FIR boundary between Jakarta and Singapore was realigned. To support the transition and maintain safety, regular operational coordination meetings between both ACCs have been held since 2024.
- The results of the LHD analysis were shared with controllers to enhance safety awareness.

Result from the hot spot identification process:
- Hot Spot J does not satisfy the hot spot criteria.
- In addition, the decrease in the number of LHDs and operational risk reflects the successful implementation of mitigation measures.
- Thus, **Hot Spot J is proposed for removal from the list of hot spots, having been marked as a potential non-hot spot in 2024.**

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Jakarta/Singapore (Hot Spot J)	27	5	8	0.33	0.12	0.01

The statistics in this table are derived solely from MAAR's assessment results and do not include assessment results from AAMA.



ASIA : LHD Hot Spot O

(Bangkok/Ho Chi Minh/Kuala Lumpur/Singapore)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors: The route structure and ATC procedures of handling crossing traffic over this area can be complex due to the different Transfer of Control and Communication Points and the involvement of multiple ATS units.

Trend:

-The number of LHDs increased but the operational risk decreased.

Mitigations:

-Regular LHD analysis sharing with controllers and operational aids e.g. visual reminders on the Air Situational Display have been implemented for Singapore ACC to enhance situational awareness.

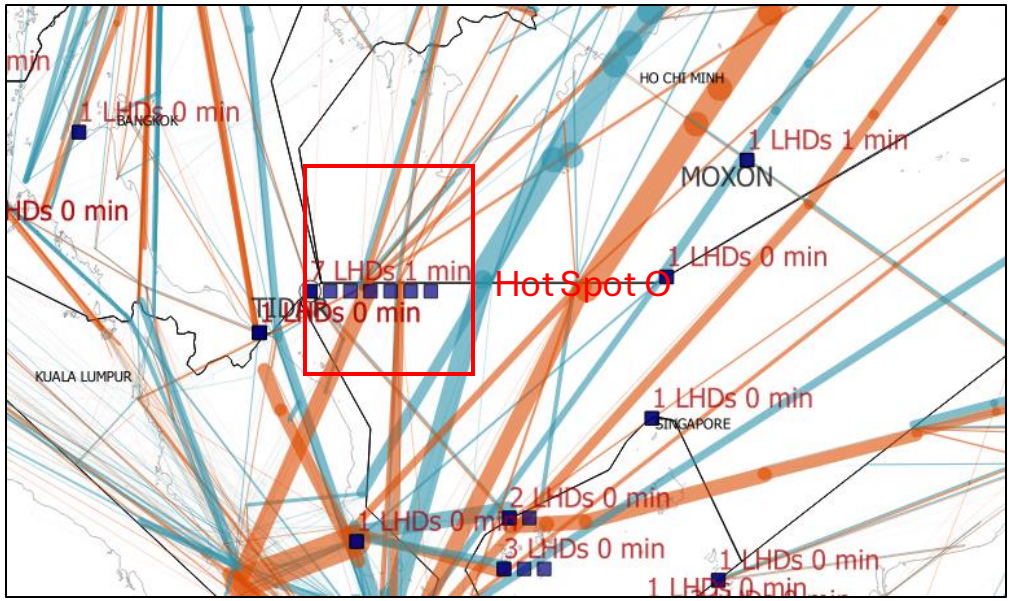
-LHD analysis had been shared to the refresher course for Kuala Lumpur's ATCO. LHD had been included in States's hazard registry. Additionally, the LHD-related Safety Bulletin is planned to be published.

Result from the hot spot identification process:

-Hot Spot O does not satisfy the hot spot criteria. Additionally, safety improvement initiatives or preventive measures have not been initiated by Bangkok ACC.

-Therefore, **Hot Spot O remains on the list of hot spots.**

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2023	2024	2025	2023	2024	2025
Hot Spot O (Bangkok/Ho Chi Minh /Kuala Lumpur/ Singapore)	5	3	7	0.51	0.15	0.02



ASIA : LHD Hot Spot P(Jakarta/Ujung Pandang)

Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

Contributing Factors:

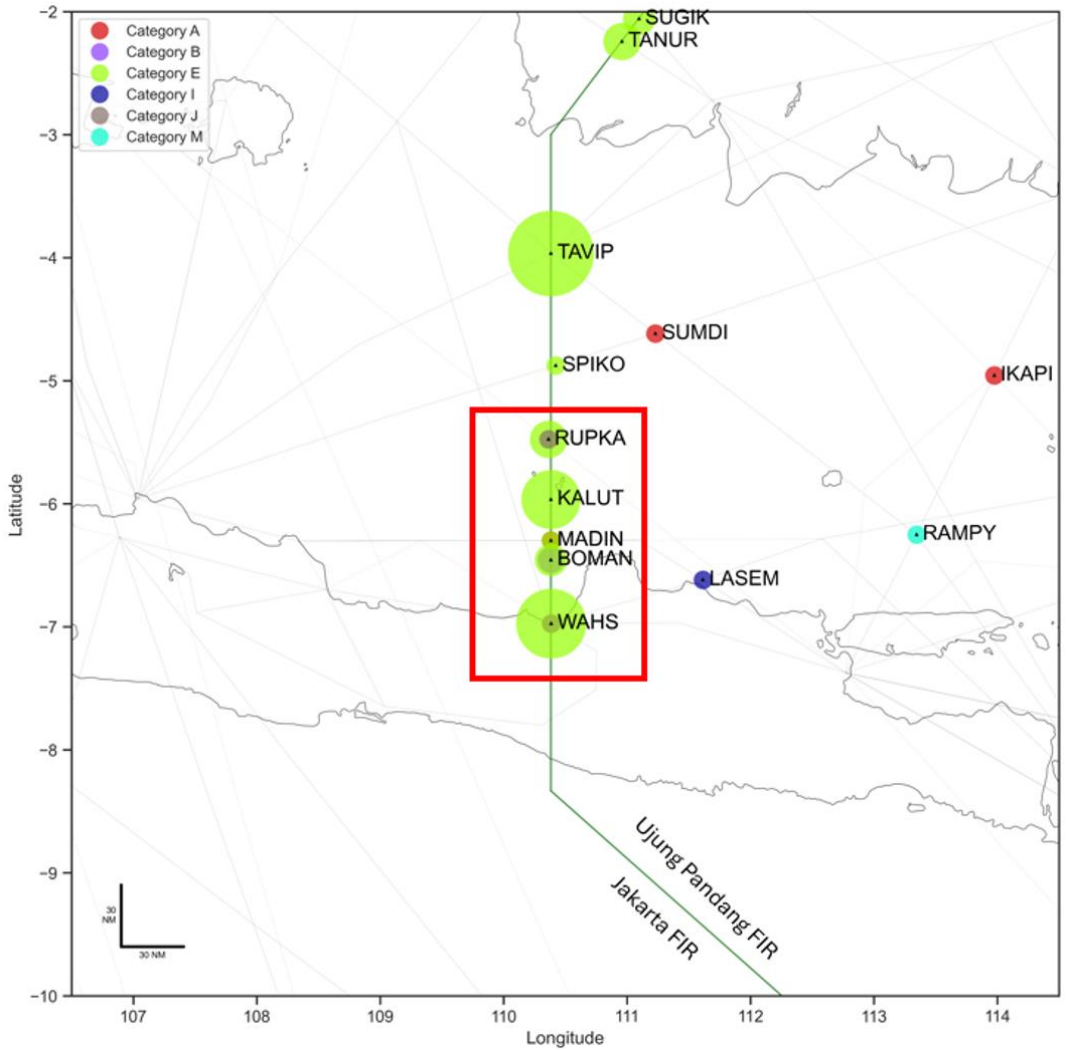
- Gap in communication and high traffic density

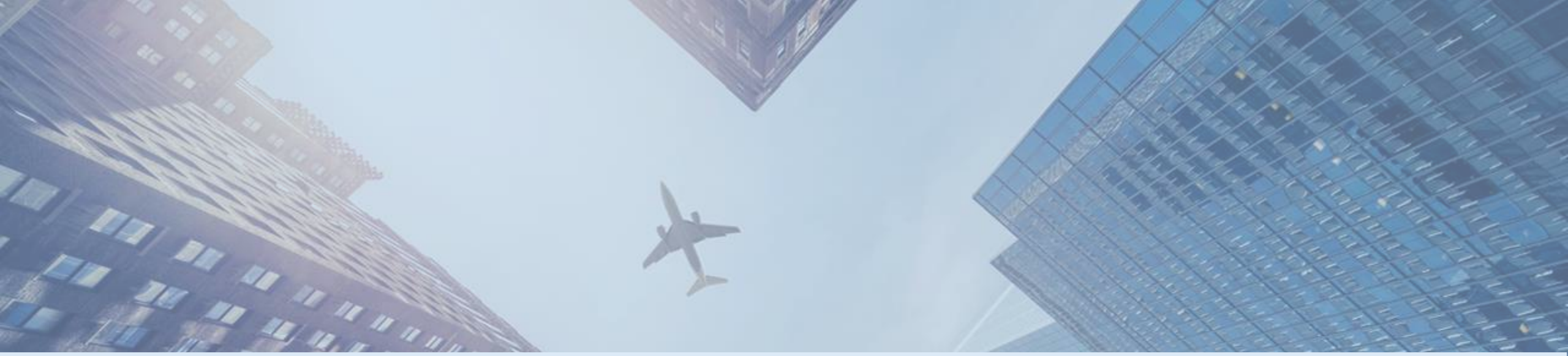
Mitigations:

- The new Jakarta ATC system has been implemented and will be continued with the implementation of AIDC between Jakarta and Ujung Pandang ACCs.
- AirNav Indonesia is working toward re-sectorization of Ujung Pandang ACC.
- The results of the LHD analysis were shared with controllers to enhance safety awareness.

Result from the hot spot identification process:

- Hot Spot P satisfies the hot spot criteria, with 38 LHDs between RUPKA fix and ANY VOR (a 90-Nautical Mile distance)
- The summed operational risk of LHDs in this Hot Spot is 2.68 x 10^{-11} FAPFH





Reporting Rate of LHDs/LLDs/LLEs

Reporting Rate of LHDs/LLDs/LLEs in 2025

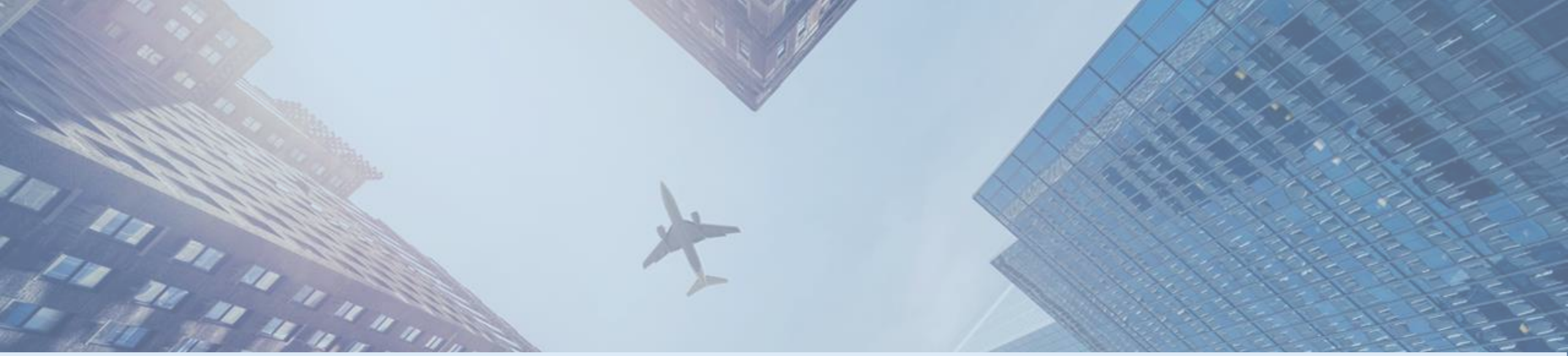
Airspace	Flying Hours	Aircrew/Pilot		ATC		Other		Total	
		# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs
DPRK	319	0	-	0	-	0	-	0	-
Mongolia	128,475	1	1: 128,475	0	-	1	1: 128,475	2	1: 64,238
SEA	3,191,884	6	1: 531,981	60	1: 53,198	3	1: 1,063,961	69	1: 46,259
SA/IO	3,734,892	0	-	98	1: 38,111	3	1: 1,244,964	101	1: 36,979
Japan	2,040,204	44	1: 46,368	18	1: 113,345	45	1: 45,338	107	1: 19,067
SW Pacific	1,354,591	49	1: 27,645	61	1: 22,206	13	1: 104,199	123	1: 11,013
China	2,343,365	9	1: 260,374	33	1: 71,011	209	1: 11,212	251	1: 9,336
Pacific	1,955,758	33	1: 59,265	210	1: 9,313	7	1: 279,394	250	1: 7,823
Indonesia	852,382	18	1: 47,355	174	1: 4,899	4	1: 213,095	196	1: 4,349
ROK	182,038	0	-	86	1: 2,117	1	1: 182,038	87	1: 2,092
Total	**15,783,908**	**160**	**1: 98,649**	**740**	**1: 21,330**	**286**	**1: 55,188**	**1,186**	**1: 13,309**

Note:

- DPRK submitted NIL reports for all months in 2025.

Reporting Rate of LHDs/LLDs/LLEs in 2025

Airspace	# Reports							1 Report : Flying Hours						
	2019	2020	2021	2022	2023	2024	2025	2019	2020	2021	2022	2023	2024	2025
DPRK	0	0	0	0	0	0	0	-	-	-	-	-	-	-
Mongolia	2	0	1	0	0	0	2	1: 82,138	-	1: 121,621	-	-	-	1: 64,238
SEA	152	42	70	62	101	74	69	1: 22,275	1: 25,106	1: 15,456	1: 32,620	1: 29,400	1: 42,001	1: 46,259
SA/IO	439	152	135	143	258	204	101	1: 7,955	1: 7,907	1: 11,167	1: 21,018	1: 10,242	1: 20,309	1: 36,979
Japan	77	66	80	75	72	76	107	1: 20,762	1: 14,737	1: 13,528	1: 18,751	1: 23,452	1: 25,387	1: 19,067
SW Pacific	101	46	47	81	65	71	123	1: 9,335	1: 6,954	1: 11,975	1: 5,352	1: 18,186	1: 17,538	1: 11,013
China	79	85	105	72	223	190	251	1: 31,119	1: 26,867	1: 15,477	1: 18,003	1: 10,525	1: 15,149	1: 9,336
Pacific	173	134	176	179	203	234	250	1: 10,139	1: 6,404	1: 6,638	1: 8,280	1: 8,736	1: 8,264	1: 7,823
Indonesia	37	18	41	54	125	102	196	1: 33,321	1: 17,346	1: 7,402	1: 8,060	1: 6,099	1:5,379	1: 4,349
ROK	34	5	24	108	75	126	87	1: 18,959	1: 25,965	1: 6,285	1: 1,056	1: 2,220	1:1,568	1: 2,092
Total	**1,094**	**548**	**679**	**774**	**1122**	**1077**	**1,186**	**1: 14,330**	**1: 13,202**	**1: 11,200**	**1:13,230**	**1:12,135**	**1:14,937**	**1: 13,309**



Conclusion

RVSM TLS Compliance - Vertical

- **The 2025 PAC vertical overall risk is 5.67 x 10^{-9} FAPFH, slightly above the TLS (5.00 x 10^{-9} FAPFH).**
    - The level of risk significantly decreased from **15.53 x 10^{-9} FAPFH in 2024**
    - Majority of the vertical risk was driven by LHDs occurring in the Hawaii CEP/Oakland area. While the ATM system upgrade is in the plan, the ATC intervention procedures, mitigation strategies, and refresher training have contributed to the improved safety performance in this area.
- **The 2025 ASIA vertical overall risk is 1.55 x 10^{-9} FAPFH, below the TLS.**
- **In both areas, the dominant LHD cause is Category E (ATC-to-ATC coordination errors from human factors): 48% of LHDs in PAC and 56% of LHDs in Asia.**

RVSM TLS Compliance - Horizontal

- **All horizontal risk estimates were relatively low and remained below the TLS in both the Pacific and Asia.**

RASMAG's Hot Spot List

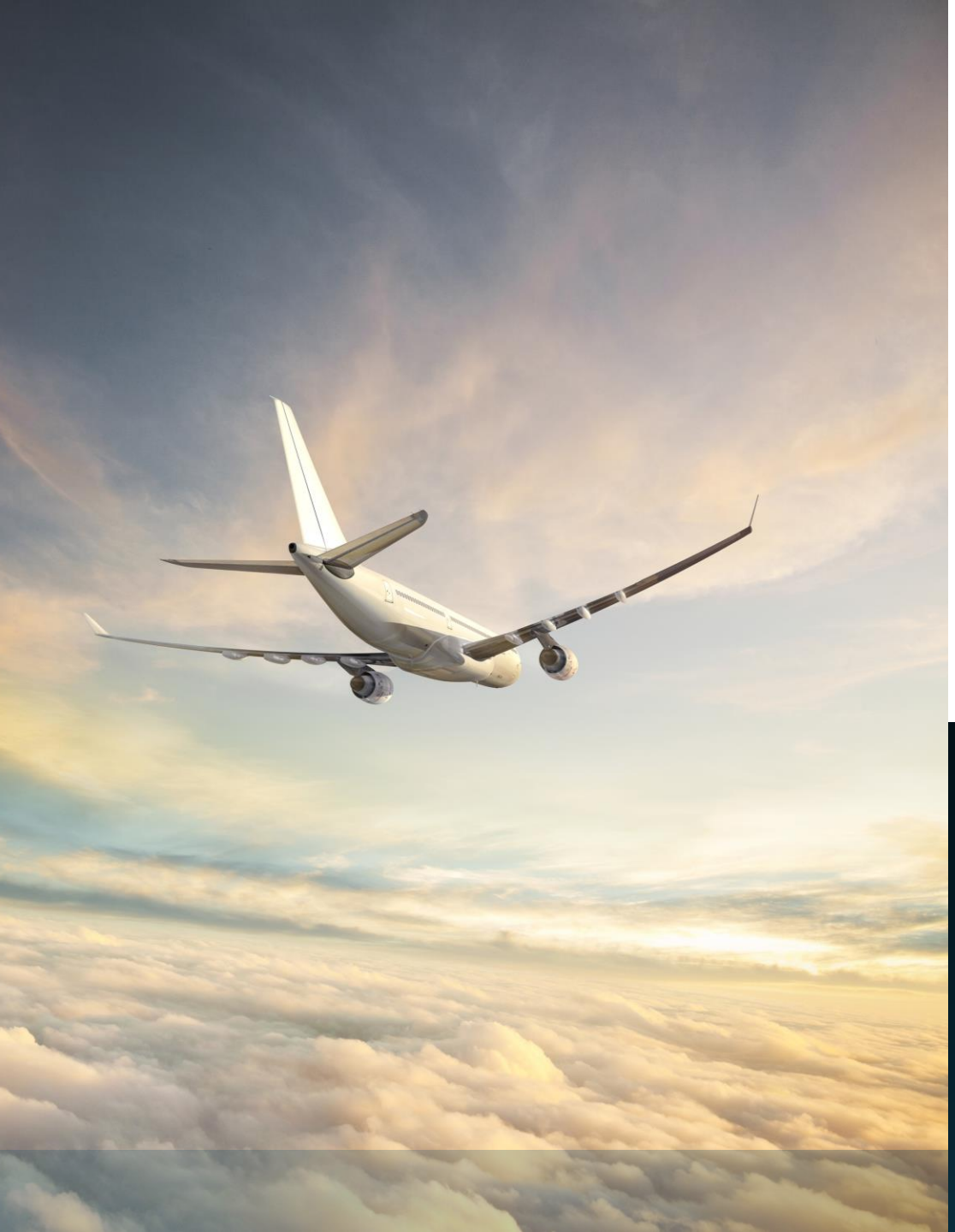
✓ No. of LHDs or Risk Level below **the hot spot criteria**

✗ No. of LHDs or Risk Level exceed **the hot spot criteria**

Hot Spot	Involved FIRs	Identified	Hot Spot Criteria Check list			Remarks
			No. of LHDs	Risk	Mitigations	
A1	Chennai/Dhaka/Kolkata/Yangon	2015	✓	✓	On-going	Continue to be monitored
B1	Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)	2015	✓	✓	On-going	Continue to be monitored
D1	Fukuoka/Manila	2015	✓	✓	Completed	**Proposed for removal from the list of hot spots.**
D5	Ho Chi Minh/Manila	2015	✓	✓	On-going	Continue to be monitored
D7	Kota Kinabalu/Manila	2015	✓	✓	Completed	**Potential non-hotspot.**
D8	Manila/Ujung Pandang	2015	✓	✗	On-going	Continue to be monitored
F	Mogadishu/Mumbai	2015	✓	✓	On-going	Continue to be monitored
G1	Mumbai/Muscat	2015	✗	✓	On-going	Continue to be monitored
G2	Mumbai/Sanaa	2015	✓	✓	On-going	Continue to be monitored
J	Jakarta/Kota Kinabalu/ Singapore	2018	✓	✓	Completed	**Proposed for removal from the list of hot spots.**
N	Hawaii CEP/Oakland USA	2019	✗	✓	On-going	Continue to be monitored
O	Bangkok/Ho Chi Minh/ Kuala Lumpur/ Singapore	2023	✓	✓	On-going	Continue to be monitored
P	Jakarta/Ujung Pandang	2026	✗	✓	On-going	**New Hot Spot**

Reporting Rate of LHDs/LLDs/LLEs

- **The estimated 15,783,908 flying hours in 2025 were close to the 16,087,567 hours in 2024.**
- **The overall reporting rate of LHDs/LLDs/LLEs slightly improved**, from
  1 report per 14,937 hours in 2024 to
  1 report per 13,309 hours in 2025.
- The reporting rate for **SA/IO significantly dropped in 2025** due to the decrease in the number of LHDs, while the flying hours were closed to the number in 2024.
- The reporting rates for **China and SW Pacific significantly improved in 2025.**
- The reporting rates for **other areas in 2025 were close to 2024 values**.
- The reporting rate for **DPRK could not be calculated**, as there were no reported occurrence. However, DPRK submitted NIL reports for all months, indicating no occurrences at all.



THANK YOU

Thirty-First Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/31)
Bangkok, Thailand
30 June –3 July 2026

Link for RASMAG meeting:
https://www.icao.int/APAC/Meetings/Pages/2025-RASMAG-31.aspx

RASMAG CONCLUSIONS/DECISIONS TRACKING LIST ON MONITORING THE APPLICATION OF PERFORMANCE-BASED HORIZONTAL SEPARATION MINIMA

This document records current changes agreed by RASMAG to the information in ICAO Doc 10063 until the document is amended. Last updated: **3 July 2026**.

1) ***Conclusion RASMAG/22-8: Asia/Pacific Reporting of Large Lateral Deviations***

That, in accordance with the revised definition of Large Lateral Deviation (LLD) contained in ICAO Doc 10063, that the Asia/Pacific Region endorse a new criterion of 10 NM for the reporting of LLDs in relation to navigation errors relative to the implementation of reduced horizontal separation minima.

Why: Doc 10063 has determined that the criterion for when a lateral navigation error is to be reported as an LLD should be determined on a regional basis. Currently Asia/Pacific uses a value of 15 NM. Given the new lateral minima below 30 NM (23 NM), RASMAG has reviewed this value, and has endorsed a proposal to amend the criterion to 10 NM, which aligns to other global regions such as the NAT.

2) ***Conclusion RASMAG/22-9: EMA Handbook and ICAO Doc 10063 Content***

En-route Monitoring Agencies performing horizontal plane performance monitoring in the Asia/Pacific Region should adopt ICAO Document 10063 Manual on Monitoring the Application of Performance-based Horizontal Separation Minima, as guidance material, and replace the EMA Handbook with ICAO Document 10063 (ICAO to remove the EMA Handbook from the APAC website).

Why: The majority of the differences between the EMA Handbook and ICAO Doc 10063 are due to changes taken place since the EMA Handbook was drafted and an attempt to generalize terms for global standardization. ICAO Doc 10063 is more comprehensive than the EMA Handbook, and ICAO Document 10063 contains more references to ICAO Annexes, Standards and Recommended Practices and guidance material where applicable.

3) ***Conclusion RASMAG/28-4: Removal of EMA handbook Appendix A and Guidance for PBCS Non-Compliance Reporting***

That,

1. *the removal of EMA Handbook Appendix A – Asia Pacific Flight Information Regions and Responsible Monitoring Agency (RASMAG/28 WP/22 refers); and*
2. *the additional guidance for PBCS Non-compliance reporting; be included in amendments to the following:*
   a) *The Revised EMA Handbook at Appendix C to the Report;*
   b) *Revised PBCS Action List at Appendix D to the Report; and*
   c) *The Asia Pacific Flight Information Regions and Responsible Monitoring Agency document at Appendix E to the Report*
3. *the above-mentioned documents be uploaded to replace the previous versions.*
4. *States/Administrations are urged to submit timely reports including Nil reports.*

Why: Lack of a standardized implementation of non-compliance reporting practices would become universally adopted and consistent reporting among the States and RMAs.

4) Conclusion RASMAG/30-2: Large Lateral Deviation Reporting Criteria in Asia and Pacific Region

That,

a) Asia and Pacific Region to adopt a Large Lateral Deviation Reporting Criteria 5 NM threshold when applying or planning to implement lateral separation minima less than 50 NM. This revised value balances operational practicality with safety oversight requirements.

b) The 5 NM reporting criteria for lateral separation minima less than 50 NM to be updated in the Asia/Pacific Regions En-route Monitoring Agency (EMA) Handbook on the ICAO APAC eDocuments Webpage.

Why: Adopting a 5 NM reporting threshold harmonized the requirements between the ADS-C downlink reports and manual reporting.

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GUIDANCE MATERIAL FOR THE CONTINUED SAFETY MONITORING OF THE ASIA-PACIFIC RVSM AIRSPACE

Version 4.0

July 2026

FOREWORD

Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace is published by the ICAO Asia and Pacific Office, on behalf of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG).

The purpose of this document is to describe the post-implementation safety monitoring activities for RVSM airspace, including the respective roles and responsibilities of States and Regional Monitoring Agencies (RMAs). It also signifies the importance of a collaborative approach to ensure the continued safe operation of RVSM in the Asia/Pacific Air Navigation Region.

The Guidance material will be updated from time to time by the Regional Airspace Safety Monitoring Advisory Group (RASMAG) and amendments will be issued accordingly.

AMENDMENT HISTORY			
Version	**Effective Date**	**Description**	**Section Affected**
1.0	July 2019	First version approved by RASMAG/24	All
2.0	August 2023	Reformat document template and make minor editorial changes	All
		Update Appendix B – APANPIRG CONCLUSIONS AND DECISIONS (up to the 33rd meeting of APANPIRG) and insert references to the conclusions and decisions in the document	All and Appendix B
		Add new content	3.37, 6.11 - 6.13, 6.15, Appendix C - G
		Rephrase the background and scope of the document	1.4, 1.10, 1.11
		Rephrase to the RMA responsibilities and duties	2.14, 2.24, 2.26, 4.2
		Remove LHD as a cause to withdraw an RVSM approval	3.18
		Rephrase the implementation of a two-year limit for an RVSM approval and remove the recommendation	3.23
		Rephrase to make LTHM as a requirement, rather than a recommendation	5.9
		Rephrase the tolerable ASE performance requirements	5.13
		- Remove the need for States to classify LHDs into categories - Add date and time to the list of minimum information for LHD reporting	6.10

3.0	August 2024	Add new content under section "Management Process of Hot Spots"	6.16 - 6.30
4.0	July 2026	Update the review of APANPIRG Conclusions and Decisions up to APANPIRG/36 in 2025	Appendix B
		Revise LHD categories: E sub-categories and new R category for GNSS radio frequency interference	Appendix C
		Revise LHD Analysis Form (Form A)	Appendix F

TABLE OF CONTENTS

LIST OF DEFINITIONS

The following definitions are provided in order to clarify certain specialised terms used in this document.

Accredited States	Those States within an RVSM region which are collectively responsible for coordination, through a single Regional Monitoring Agency, for the implementation of APANPIRG RVSM safety policy, decisions, exchange of RVSM approvals, large height deviations, long term height-keeping monitoring data and other RVSM related information.
Accredited RMA	An RMA, established by APANPIRG, to which a State is accredited for the coordination of RVSM related issues.
Altimetry System Error (ASE)	The difference between the altitude indicated by the altimeter display assuming a correct altimeter barometric setting and the pressure altitude corresponding to the undisturbed ambient pressure.
Assigned Altitude Deviation (AAD)	The difference between the transponder Mode C altitude and the assigned altitude/flight level.
Automatic Altitude Control System	Any system which is designed to automatically control the aircraft to a referenced pressure altitude.
General Air Traffic (GAT)	Flights conducted in accordance with the rules and provisions of ICAO.
Collision Risk	The expected number of mid-air aircraft accidents in a prescribed volume of airspace for a specific number of flight hours due to loss of planned separation. (Note - one collision is considered to produce two accidents.)
Height-Keeping Capability	Aircraft height-keeping performance which can be expected under nominal environmental operating conditions with proper aircraft operating practices and maintenance.
Height-Keeping Performance	The observed performance of an aircraft with respect to adherence to cleared flight level.
Hexadecimal Number Format	A representation of a 4-bit binary number (0 - 15 in decimal) by use of numbers 0 to 9 and letters A to F
Large Height Deviation	A vertical deviation of 300 ft or more from an ATC assigned or coordinated altitude. The deviation may be the result of human error, equipment malfunction or environmental factors such as turbulence, and should be reported in accordance with Appendix C – LHD/LLE/LLD TAXONOMY.
Operational Air Traffic (OAT)	Flights which do not comply with the provisions stated for GAT and which rules and procedures have been specified by appropriate authorities.
Reduced Vertical Separation Minimum (RVSM)	A vertical separation minimum of 300 m (1 000 ft) which is applied between FL 290 and FL 410 inclusive, on the basis of regional air navigation agreements and in accordance with conditions specified therein.

RVSM Approval	The approval that is issued by the appropriate authority of the State in which the Operator is based or the State in which the aircraft is registered.
State Aircraft	Aircraft used in Military, Customs, and Police services shall be deemed to be State Aircraft (Reference - ICAO Convention on International Civil Aviation, Article 3 (b)).
Static Source Error	The difference between the pressure sensed by the static system at the static port and the undisturbed ambient pressure.
Static Source Error Correction (SSEC)	A correction which may be applied to compensate for the static source error associated with an aircraft.
Target Level of Safety (TLS)	A generic term representing the level of risk which is considered acceptable in particular circumstances.
Vertical Separation	Vertical separation is the spacing provided between aircraft in the vertical plane to avoid collision.

LIST OF ABBREVIATIONS

The acronyms listed hereunder have been chosen from those which are specifically related to activities of the APANPIRG and/or are most frequently found in this report in order to assist in its reading.

AAD	Assigned Altitude Deviation
ADS-B	Automatic Dependent Surveillance - Broadcast
AHMS	ADS-B Height Monitoring System
AMC	Acceptable Means of Compliance
AOC	Air Operator's Certificate
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ASE	Altimetry System Error
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Services
CFL	Cleared Flight Level
CRM	Collision Risk Model
FIR	Flight Information Region
FL	Flight Level
GAT	General Air Traffic
GMU	GPS Monitoring Unit
GPS	Global Positioning System
HMU	Height Monitoring Unit
ICAO	International Civil Aviation Organisation
IGA	International General Aviation
LHD	Large Height Deviation
LTHM	Long Term Height Monitoring
MASPS	Minimum Aircraft System Performance Specification
MEL	Minimum Equipment List
NSA	National Supervisory Authorities
OAT	Operational Air Traffic
PANS	Procedures for Air Navigation Services
RMA	Regional Monitoring Agency
RPG	Regional Planning Group
RVSM	Reduced Vertical Separation Minimum of 300 m (1000 ft) between FL 290 and FL 410 inclusive
SSE	Static Source Error
SSEC	Static Source Error Correction
SSR	Secondary Surveillance Radar

STC	Supplementary Type Certificate
TC	Type Certificate
TCAS	Traffic Collision and Avoidance System
TLS	Target Level of Safety
TVE	Total Vertical Error
VSM	Vertical Separation Minimum

1. INTRODUCTION

Background

1.1 The implementation of a Reduced Vertical Separation Minimum between FL 290 and FL 410 in the Asia and Pacific Air Navigation Region provided the benefits of additional en-route capacity and improved fuel efficiency for aircraft operators. Such a major transformation of the separation minimum required extensive safety analysis of the inherent increase in the risk of mid-air collision, which resulted in the definition of more stringent aircraft altitude keeping performance requirements. A monitoring programme was also initiated to ensure that both the technical and operational safety issues of the new separation standard were appropriately identified and addressed prior to implementation.

1.2 The new aircraft performance requirements were incorporated into a number of global standards and Acceptable Means of Compliance (AMC). These are generically termed Minimum Aircraft System Performance Specifications (MASPS). The MASPS include the minimum build standard and equipment configuration of an aircraft, the accuracy of the altimetry system over the full operational flight envelope and the continued airworthiness procedures necessary to ensure that the performance is maintained. Operators which demonstrated both technical compliance and the application of appropriate operational procedures obtained an approval to operate within RVSM airspace with 1,000 ft. vertical separation.

1.3 The pre-implementation safety programme required monitoring of aircraft technical height keeping performance, verification of aircraft/operator RVSM approval status and the undertaking of a collision risk assessment to ensure that an internationally agreed Target Level of Safety (TLS) was satisfied.

1.4 Analysis of the data provided by the pre-implementation monitoring programme indicated that the risk level was acceptable, assuming that only approved aircraft would operate within the airspace and that aircraft altimetry system performance would remain stable over time.

1.5 In 2002, ICAO took the decision that in all regions in which RVSM had been implemented, it would be necessary for the Regional Planning Groups (RPG) to initiate programmes for the continuous monitoring of aircraft height keeping performance to ensure that risk levels remained below the TLS. In addition, these programmes would include monitoring the compliance of operator/aircraft approval requirements.

1.6 In the Asia and Pacific Region, the Regional Airspace Safety Monitoring Advisory Group (RASMAG) was established by the Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) to achieve a regional approach for coordination and harmonization of airspace safety monitoring activities, and where necessary provide assistance to States to acquit their responsibilities.

1.7 To support the work of the RASMAG, five regional monitoring agencies (RMAs) have been established and endorsed by APANPIRG. The RMAs conduct airspace monitoring and safety oversight activities on behalf of States accredited to their respective regions in accordance with the procedures and processes detailed in ICAO Doc 9937 *Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive.*

1.8 This responsibility includes monitoring operators/aircraft with regards to height keeping performance and approval status, and long-term fleet monitoring requirements. The responsibility of the RMA is limited to monitoring operator compliance with the various technical and operational requirements and reporting any non-compliance or safety issue to the State exercising operational authority over that operator. It remains the responsibility of individual States to ensure that any appropriate remedial action is taken.

1.9 Common Terms of Reference (ToR) for all RMAs are approved by RASMAG and are reproduced in Appendix A – TERMS OF REFERENCE OF ASIA PACIFIC MONITORING AGENCIES.

Scope and Purpose of the Document

1.10 This document provides operational guidance and practices concerning RVSM safety monitoring program in the Asia/Pacific Air Navigation Region based on the ICAO's requirements in the ICAO Annex 6, Annex 11, Doc 9574, Doc 9937 and other related manuals.

1.11 The document describes the regional framework established by RASMAG and interaction between stakeholders which is required to support the safe operation of RVSM and demonstrate compliance with regulatory requirements.

1.12 The specific purpose of this guidance material is therefore to:

a) Encapsulate the regulatory requirements contained in Annex 6 and 11 to the Convention on International Civil Aviation and to describe a practical safety monitoring framework in order to meet the particular demands of the Asia/Pacific RVSM airspace;

b) Describe the principal roles and interfaces of the APANPIRG, accredited member State and the RMA to provide an effective framework for all safety monitoring and oversight activities;

c) Describe the data exchange and coordination requirements between the RMA and State National Supervisory Authorities as well as recommended working practices; and

d) Provide recommendations for appropriate action in the event of operator non-compliance with RVSM approval or performance requirements.

1.13 To facilitate comprehension this document often refers to the operations and role of the Asia Pacific RMAs in the definite singular article (The RMA). However, it must be emphasised that there are more than one active RMA in the region although some modes of operation differ.

2. RVSM REGULATORY REQUIREMENTS AND MONITORING ACTIVITIES

2.1 There are a number of documents which relate to requirements, guidance and best practices for the safe continuous operation of RVSM. Some of these documents are in effect regulatory requirements which govern all contracting States to the Convention on International Civil Aviation (unless States have notified ICAO of any differences). These are the Annexes to the Convention on International Civil Aviation and are defined as International Standards and Recommended Practices (SARPs). Other documents relate to procedures, the application of which is governed by the Annexes. Finally, there is guidance material including the Acceptable Means of Compliance related to aircraft MASPS, the application of RVSM and the operating procedures for an RMA.

2.2 The major documents which impact the application of RVSM and the responsibilities related to technical aircraft performance, safety oversight and compliance monitoring are described below in **Table 1**.

Document	Description	Type
ICAO Annex 11	High level requirements for the establishment of regional monitoring agencies in all regions in which RVSM has been implemented	SARPs
ICAO Annex 6 (Part 1 and 2)	The operation of Aircraft	SARPs
ICAO Annex 8	Airworthiness of Aircraft	SARPs
ICAO Doc 4444	Procedures for Air Navigation Services – Air Traffic Management	Procedures (governed by ICAO Annexes)
ICAO Doc 7030	Regional Supplementary Procedures	Regional Procedures (governed by ICAO Annexes)
ICAO Doc 9574	Implementation of a Reduced Vertical Separation Minimum	ICAO Guidance material
ICAO Doc 9937	Operating procedures for Regional Monitoring Agencies	ICAO Guidance material

Table 1: Documents Related to Regulatory Requirements and Safety Oversight Activities within RVSM Airspace

2.3 Of the documents listed above in **Table 1**, ICAO Annex 6 and ICAO Doc 7030 contain the most relevant information related the material contained in this document. The following sections expand on the specific RVSM requirements contained in these two documents.

2.4 Please note that the referencing paragraph numbers are omitted on purpose for maintainability of this document.

ICAO Annex 6

2.5 Annex 6 to the Convention on International Civil Aviation defines requirements for the operation of aircraft. Part 1 relates to commercial operators and part 2 to operators of IGA aircraft.

2.6 Prior to granting an RVSM approval a State is required to confirm that the aeroplane satisfies minimum equipment and height keeping performance requirements. The State must also be satisfied that the operator has instituted appropriate continued airworthiness and flight crew procedures and practices. Following the granting of an approval the State is responsible for ensuring that the aircraft continues to meet

height keeping performance requirements, that all operators participate in regional or global monitoring programmes and that only approved aircraft operate within the airspace.

2.7 A summary of the responsibilities of individual State Authorities defined in ICAO Annex 6 are reproduced below in **Table 2**.

Annex 6 Part 1	Annex 6 Part 2
Aeroplane equipment requirements	
Aeroplane shall be approved by State of Operator	Aeroplane shall be approved by State of Registry
Aeroplane vertical navigation performance requirements	
Pre-approval aeroplane/operator requirements	
State (of Operator) responsibility to ensure provisions for receiving reports from accredited RMA and implementing measures to correct the performance of aircraft not compliant with height keeping requirements	State (of Registry) responsibility to ensure provisions for receiving reports from accredited RMA and implementing measures to correct the performance of aircraft not compliant with height keeping requirements
State of Operator that has issued an RVSM approval to an operator shall ensure that the operator complies with biennial fleet monitoring targets.	State of Registry that has issued an RVSM approval to an operator shall ensure that the operator complies with biennial fleet monitoring targets.
All States that are responsible for airspace where RVSM has been implemented, or which have issued RVSM approvals shall establish provisions and procedures to ensure that appropriate action will be taken with operators of non-approved aircraft. (**These provisions and procedures need to address both the situation where the aircraft is operating without approval in the airspace of the State and the situation where an operator for which the State has regulatory oversight responsibility is found to be operating without the required approval in the airspace of another State.)**	
The aeroplane shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the aeroplane to navigate in accordance with [aeroplane equipment requirements]	

Table 2: Summary of Requirements for the Approval and Operation of Aircraft in RVSM Airspace

2.8 States should ensure that appropriate processes and procedures are in place to take appropriate action with operators who fail to comply with the regulatory requirements, or operate aircraft which no longer comply with the conditions under which an RVSM approval was issued. Such action may include withdrawal of an RVSM approval on a temporary or permanent basis.

ICAO Doc 7030

2.9 Regional requirements are contained in ICAO Regional Supplementary Procedures, ICAO Doc 7030. The principal supplementary procedures related to RVSM are summarized below in **Table 3**.

Doc 7030 Supplementary Procedures Summary

General

- Within the RVSM airspace, the vertical separation minimum shall be 300 m (1 000 ft).
- Operators intending to conduct flights within the airspace where RVSM is applied shall require an RVSM approval either from the State of Registry or the State of the Operator. The State of Registry or the State of the Operator, as appropriate, should verify that the height-keeping performance capability of approved aircraft meets the requirements specified in Annex 6, Parts I and II.
- Within the RVSM airspace, aircraft that have not received RVSM State approval may be cleared to operate in accordance with policy and procedures established by the State provided that 600 m (2 000 ft) vertical separation is applied.
- ATC clearance into RVSM airspace shall not be issued to formation flights of civil aircraft.
- If the receiving unit has not received a flight plan, the sending unit shall verbally inform the receiving unit whether or not the aircraft is RVSM-approved.
- Monitoring of flight operations in the RVSM airspace shall be conducted to assess the continuing compliance of aircraft with the height-keeping performance requirements.

In-Flight Contingency

An in-flight contingency affecting flight in RVSM airspace pertains to unforeseen circumstances that directly impact on the ability of one or more aircraft to operate in accordance with the vertical navigation performance requirements of RVSM airspace. Such in-flight contingencies can result from degradation of aircraft equipment associated with height-keeping or from turbulent atmospheric conditions.

- When a single aircraft is experiencing an in-flight contingency that impacts on RVSM operations, the associated coordination message(s) shall be supplemented verbally by a description of the cause of the contingency.
- The pilot shall inform ATC as soon as possible of any circumstances where the vertical navigation performance requirements for RVSM airspace cannot be maintained. In such cases, the pilot shall obtain a revised ATC clearance prior to initiating any deviation from the cleared route and/or flight level, whenever possible. When a revised ATC clearance cannot be obtained prior to such a deviation, the pilot shall obtain a revised clearance as soon as possible thereafter.
- When informed by the pilot of an RVSM-approved aircraft operating in RVSM airspace that the aircraft's equipment no longer meets the RVSM requirements, ATC shall consider the aircraft as non-RVSM-approved.
- ATC shall take action immediately to provide a minimum vertical separation of 600 m (2 000 ft) or an appropriate horizontal separation from all other aircraft concerned that are operating in RVSM airspace. An aircraft rendered non-RVSM-approved shall normally be cleared out of the RVSM airspace by ATC when it is possible to do so.
- Pilots shall inform ATC, as soon as practicable, of any restoration of the proper functioning of equipment required to meet the RVSM requirements.
- The first ACC to become aware of a change in an aircraft's RVSM status shall coordinate with adjacent ACCs, as appropriate.
- When an aircraft operating in RVSM airspace encounters severe turbulence due to weather or wake vortex that the pilot believes will impact the aircraft's capability to maintain its cleared flight level, the pilot shall inform ATC. ATC shall establish either an appropriate horizontal separation or an increased minimum vertical separation.

• ATC shall, to the extent possible, accommodate pilot requests for flight level and/or route changes and shall pass on traffic information as required. • When a meteorological forecast is predicting severe turbulence, ATC shall determine whether RVSM should be suspended and, if so, for how long and for which specific flight level(s) and/or area. • ATC shall solicit reports from other aircraft to determine whether RVSM should be suspended entirely or within a specific flight level band and/or area. • The ACC suspending RVSM shall coordinate such suspension(s) with, and any required adjustments to, sector capabilities with adjacent ACCs, as appropriate, to ensure an orderly progression to the transfer of traffic. • In cases where RVSM will be suspended, the ACC suspending RVSM shall coordinate with adjacent ACCs with regard to the flight levels appropriate for the transfer of traffic, unless a contingency flight level allocation scheme has been determined by letter of agreement. The ACC suspending RVSM shall also coordinate applicable sector capabilities with adjacent ACCs as appropriate.

Table 3: Summary of Regional Supplementary Procedures related to RVSM

2.10 A summary of the responsibilities of States defined in Annex 8 Airworthiness of Aircraft are presented in **Table 4**: Summary of Requirements for the Aircraft RVSM airworthiness.

Annex 8, part II
The State establishes that continuing aircraft airworthiness determined through the periodical inspection at appropriate time interval having regard to lapse of time and type of service or, alternatively, by means of a system of inspection that will produce at least an equivalent result.
Any failure to maintain an aircraft in an airworthy condition as defined by the appropriate airworthiness requirements render the aircraft ineligible for operation
The State, where aircraft was registered, issues airworthiness certificate or updates ones certificate in accordance with [requirements associated with a Certificate of Airworthiness] The State, where aircraft was registered, establishes requirements, that the aircraft is suitable for the flights operating, in compliance with the technical maintenance requirement in accordance with Annex 6.

Table 4: Summary of Requirements for the Aircraft RVSM airworthiness

2.11 States should be aware that the requirements described above are applicable to all aircraft, including commercial, general aviation, military and other State designated aircraft, intending to operate under GAT rules with a 1,000 ft. vertical separation minimum in RVSM airspace. Non-approved State designated aircraft may request a clearance in RVSM airspace with a 2,000 ft. vertical separation minimum; however, operators must declare non-RVSM on flight plans.

Regional Monitoring Agencies

2.12 A Regional Monitoring Agency is established by an ICAO Regional Planning Group to oversee the safety of operations in RVSM airspace. There are no formal regulatory requirements defining the responsibilities of an RMA. Instead, the RMA operates under Terms of Reference (ToR) agreed with the PIRG for implementation of monitoring functions to the required quality standard.

2.13 RMAs are expected to operate in accordance with the precepts of ICAO Doc. 9574 - *Manual on Implementation of a 1,000 ft. Vertical Separation Minimum between FL 290 and FL 410 Inclusive*. Guidance

on the operation and procedures of an RMA are included in ICAO Doc. 9937 - *Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the use of a 1,000 ft. Vertical Separation Minimum between FL 290 and FL 410 Inclusive*.

2.14 The ICAO Doc 9574 states that there is a need for system performance monitoring for the operational use of RVSM. The principal responsibility of an RMA is to support the continued safe use of RVSM within a designated airspace, including verifying aircraft/operator RVSM approval status, monitoring aircraft height keeping performance, verifying the operator's compliance with the long-term monitoring requirements and providing annual airspace safety assessment. The RMA monitors aircraft/operator compliance within the precepts of ICAO Annex 6, reporting non-compliance and any associated safety issues to the States which retain the responsibility for ensuring that appropriate remedial action is taken. To perform this function, it is essential that the States provide practical support to the RMA, particularly with regards to coordinating RVSM approval data exchanges and providing operational incident reports for inclusion in the annual safety assessment.

2.15 RMAs prepare RVSM annual safety reports which are presented to RASMAG. Completed reports usually include:

a) A quantitative assessment of the risk of mid-air collision attributable to the implementation of RVSM. This assessment includes both, technical risk attributable to aircraft technical height keeping performance, and total risk due to all causes including technical and human/operational errors;

b) A review of the major contributing factors which result in Large Height Deviations, with the purpose of reducing the number of risk bearing incidents;

c) Any other safety related issues associated with the implementation or continued use of RVSM;

d) Recommended measures to decrease risk with particular emphasis on improving aircraft height-keeping performance;

e) Recommended measures to improve the safe operation of RVSM airspace; and

f) Implementation of all applicable conclusions and decisions agreed by APANPIRG. Report non-compliance with APANPIRG conclusions and decisions by individual States, operators and service providers.

Monitoring Compliance with Requirements

2.16 This section provides an overview of the activities which the RMA and accredited States are required to conduct to provide an effective safety oversight and compliance monitoring infrastructure for Asia/Pacific RVSM airspace. It describes the high-level functions of the monitoring programme and how these relate to the various responsibilities which are defined in the ICAO Annexes and global and regional procedures documents. Specific procedural detail for each of these functions is provided in the subsequent sections.

2.17 The major functional objectives of the monitoring programme are to, conduct technical aircraft height keeping performance monitoring, verify the approval status of aircraft and operators flying in RVSM airspace and conduct airspace safety assessments. For each of these functions to be conducted effectively it is important that the Regional Monitoring Agency and accredited States operate in close cooperation, with each organisation fulfilling its obligations as determined by APANPIRG.

RVSM Approvals

2.18 Under the provisions of Annex 6 and the regional supplementary procedures all operators and aircraft intending to operate in RVSM airspace with a 1,000 ft. vertical separation are required to be approved by the State exercising operational authority over that aircraft and/or operator. Operators indicate that they hold a valid approval by filing a 'W' in item 10 of the ICAO flight plan. States are required to take appropriate action in the event that a non-approved operator/aircraft is found to be operating within RVSM airspace.

2.19 The practical task of monitoring aircraft/operator approval status is devolved to the RMA. For the RMA to perform this function effectively it is important that a complete inventory of aircraft approved to operate in RVSM airspace is maintained. The RMA maintains a central database of RVSM approved aircraft populated with records provided by individual States and other RMAs.

2.20 The RMA cross checks the central records of RVSM approvals against flight plans. A request for approval status of any unreported aircraft for which a 'W' has been inserted into the flight plan is sent to the appropriate State for confirmation of approval status. If the State confirms the approval, then the record is added to the responsible RMAs database and no further action is required. In the event that the aircraft is not approved the State is required to take appropriate action, which may be to exclude the operator from operating in RVSM airspace until a valid approval has been issued.

2.21 To ensure an effective service and to minimise workload for both the RMA and individual authorities, States should ensure that the list of RVSM approvals for which it is responsible is kept up to date and communicated regularly to the RMA. States should also ensure that they have introduced procedures for receiving reports of possible non-approved aircraft from the RMA and conducting follow up investigations to verify the true status of the aircraft reported. In addition to transmitting new approvals to the RMA it is equally important that the RMA is informed when approvals are withdrawn or when aircraft are de- or re-registered. It has been demonstrated that the most effective mechanism is for each State to maintain a single centralised database of RVSM approvals which should be communicated to the RMA on a regular basis.

Aircraft Technical Height Monitoring Programme

2.22 Under the provisions of Annex 11 each RVSM region is required to maintain a technical height keeping performance monitoring programme. The specific requirements of the monitoring programme are defined in Annex 6 and RVSM guidance material and include; verification of individual aircraft altimetry system performance, verification of generic aircraft MASPS, operator compliance with fleet monitoring targets and finally to provide technical performance data for annual airspace safety assessments.

2.23 The RMA conducts technical height keeping performance monitoring which involves comparing measured aircraft geometric height data against actual geometric pressure altitude derived from meteorological data, provided by accredited meteorological international organisations. The monitoring systems in use include individual on-board GPS Monitoring Unit (GMU), ground-based multilateration Height Monitoring Unit (HMU), and ADS-B Height Monitoring System (AHMS).

2.24 The RMA is responsible for submitting reports of individual aircraft which do not comply with performance requirements to the appropriate State authorities for remedial action. The RMA also submits reports of operators which do not meet biennial fleet monitoring targets, upon receipt of which States are also required to take appropriate action. In the event that the RMA identifies that a specific aircraft type may not comply with the RVSM performance requirements then the technical height keeping performance monitoring information is forwarded to the appropriate authority/State which issued the original aircraft airworthiness approval or the RMA of that State. The original airworthiness authority/State will then investigate and resolve any non-compliance with the aircraft manufacturer.

2.25 Data from the technical aircraft height keeping performance monitoring programme also contributes to the annual safety assessment, providing core data which is extrapolated for all RVSM airspace to provide a technical collision risk assessment which must satisfy a Target Level of Safety of 2.5 x 10^{-9} collisions per flight hour.

Operational Risk Events

2.26 One of the main responsibilities of an RMA is to verify that the target level of safety will continue to be met upon implementation of RVSM and provide safety assessment report to ICAO. The assessment consists of two elements which are the technical risk (as described above) and the risk due to operational issues such as aircraft altitude deviations and other risk bearing incidents such as incorrect coordination, communication errors and TCAS events.

2.27 The operational risk assessment relies on States to provide reports of operational incidents reinforced with specific event information when requested by the RMA.

RMA/State Interfaces

2.28 For the RVSM safety oversight and monitoring compliance programme to remain effective it is essential that the interfaces between the RMA and each accredited State are adequately defined and maintained. Each State should ensure that appropriate contact information is provided to the RMA. It is considered to be most effective for each State to provide a single contact point for communicating with the RMA for all RVSM matters. This contact is required to transmit all RVSM approval information to the RMA, receive and process; reports of non-approved aircraft; reports of technically non-compliant aircraft; reports of operators which are not compliant with fleet monitoring targets, and to submit operational event reports for inclusion in the annual RVSM safety assessment.

2.29 States should ensure that staff required to interface with the RMA are adequately trained and instructed in the various responsibilities required. In the event that individuals change work roles or leave the organisation it is essential that a complete handover to a replacement is completed so that there is no detrimental effect on the overall quality of service. In the event that it is not feasible to maintain single points of contact then it is necessary to ensure that the RMA is notified of all contacts and their respective responsibilities.

2.30 The operational framework including the accepted procedures to accomplish the monitoring programme objectives are discussed in more detail in the following sections.

3. RVSM APPROVAL PROCESSES

3.1 This section provides guidance and recommendations for the issuance and management of aircraft RVSM approvals by a State, and the coordination of that data with the RMA to which the State is accredited. It also describes the policies of the RMA with regard to compliance with approval requirements and how the information is shared with other RVSM regions.

3.2 A brief description of the constituent parts of the RVSM approval is provided below. In the following sections focus is given to the issues which particularly relate to maintenance of the approval, the conditions under which an approval may be considered to be valid and compliance monitoring in the post implementation environment.

3.3 There are a minimum of three constituent parts of an RVSM approval which are:

- Airworthiness Approval (MASPS): Confirmation that the build of an aircraft satisfies minimum equipment and height keeping performance requirements and that an appropriate maintenance programme has been developed by the manufacturer to maintain performance;

- Continued Airworthiness: Confirmation that the operator of an aircraft has instituted an appropriate continued airworthiness programme which should be based on the procedures developed by the manufacturer; and

- Operational Approval: Confirmation that the operator of an aircraft has instituted appropriate flight crew procedures for operations in RVSM airspace.

3.4 Detailed guidance material describing the recognised processes for the approval of the build of an aircraft is contained in ICAO Doc. 9574, FAA AC 91-85 and EASA AMC CS-ACNS, Annex I to ED Decision 2013/031/R. Additional material applicable to this document is provided in the next section.

3.5 The airworthiness approval is valid for all individual airframes produced to the same build standard and is normally issued by a single airworthiness authority. It is not considered necessary for subsequent approval authorities to re-confirm the airworthiness approval unless the aircraft has been modified or constructed to a Supplementary Type Certificate (STC) or equivalent build standard not covered by the original approval.

3.6 Unlike the Airworthiness Approval, the Continued Airworthiness and Operational Approval need to be issued by each individual approval authority, which must verify that the operator has instituted appropriate continued airworthiness procedures and that flight crews have been trained in RVSM operational procedures. The operational approval indicating valid areas of operation should be stated on the operator's AOC or in the pilot's flight manual. Once the approval authority is satisfied that all requirements have been met the State is required to notify the RMA that the aircraft in question meets all criteria for operations in RVSM airspace and is approved.

3.7 The airworthiness approval normally remains valid for the operational lifetime of an airframe, provided that the aircraft has been maintained in accordance with the manufacturers continued airworthiness procedures and that the aircraft is not subject to any modification which may require re-evaluation of the build standard. The continued airworthiness and operational approvals are operator specific and may not be transferred upon re-registration. Under certain circumstances it may be necessary to withdraw or re-issue an operational approval if the conditions under which the original approval was issued are no longer valid.

3.8 By issuing an approval to operate in RVSM airspace, a State is declaring that all contributing approval requirements are met including airworthiness approval, continued airworthiness and operational approval.

3.9 In the event that, following a report issued by the RMA, an aircraft is found to be operating in RVSM airspace with a 'W' designator, the State should make immediate contact with the operator concerned and where necessary issue instructions to cease flights in RVSM airspace. A review should be held into the circumstances under which the operator was operating without approval and appropriate action taken.

RVSM airworthiness approval

3.10 The aircraft airworthiness approval is normally granted by a single airworthiness authority and applies to a particular build standard which is defined by a specific Type Certificate (TC), Supplementary TC (STC), Service Bulleting (SB) or TC amendment. To obtain the approval, the manufacturer is required to submit an RVSM approval data package which is then evaluated in detail by the airworthiness authority prior to issuing the approval.

3.11 As a minimum the RVSM approval data package consists of the following:

a) The applicable build standard to which the data package applies;

b) A definition of the applicable flight envelopes;

c) Data showing compliance with the RVSM performance criteria;

d) The procedure to be used to ensure that all aircraft submitted for airworthiness approval comply with RVSM criteria. These procedures include the references of applicable Service Bulletins and the applicable approved aircraft flight manual amendment or supplement; and

e) The maintenance instructions that ensure continued airworthiness for RVSM approval.

3.12 RVSM performance data should include both measured and analytical data indicating the Static Source Error characteristics of the aircraft build standard and the corrections which must be applied to demonstrate the required performance.

3.13 Once a State (normally the State of manufacture or in the case of the EU, EASA) has issued an RVSM airworthiness approval for a specific build standard, it is not normally necessary for States issuing operational approvals for aircraft constructed to that same build standard to repeat the process. However, States issuing approvals to operators should verify that the build standard of an aircraft put forward for approval is the same as that referenced on the original RVSM airworthiness approval. This is particularly important when an aircraft is modified or built to an STC issued at a later date to that of the original airworthiness approval.

3.14 Particular attention should be given to aircraft built for special purpose roles, such as military applications, photographic or civilian survey missions. Procurement authorities are recommended to explicitly indicate whether an aircraft derivative is required to operate in an RVSM environment, with reduced separation minima, on the appropriate procurement specification and that such an individual RVSM solution is required to be demonstrated by submission of an RVSM approval data package.

3.15 In the event that an aircraft undergoes any structural or equipment modifications post airworthiness approval issue, then the original airworthiness approval may no longer be valid. States responsible for approving the modification must issue a new airworthiness approval based on a data package produced specifically for the modification. Revised aircraft performance data will need to be submitted to verify RVSM criteria compliance.

3.16 An aircraft which is constructed to a build standard with a generic RVSM airworthiness approval, and which exhibits common RVSM performance characteristics, is termed an RVSM Group certified aircraft. Any aircraft which is built or modified to a unique build standard with its own individual RVSM airworthiness approval, is termed an RVSM Non-Group aircraft. States must ensure that a full RVSM performance and analysis process is conducted on all individual Non-Group aircraft prior to issuing an RVSM approval. RMAs maintain a list of all recognised RVSM group definitions and can provide guidance on specific cases.

Validity of an RVSM operational approval

3.17 As the RVSM Operational Approval issued by a State includes verification of the operator's continued airworthiness and flight crew procedures, the approval cannot be transferred between operators. In the event that an operator changes its technical support structure (i.e. changes maintenance supplier) then it may be necessary to re-issue the approval.

3.18 Under certain circumstances it may be necessary to withdraw an RVSM approval from an operator. Such circumstances may include operator non-compliance with performance or fleet monitoring target requirements, or any other reason determined appropriate by the approval authority. Withdrawal of approval may apply to individual airframes or a complete fleet. Rarely, it may be necessary for the original airworthiness authority to withdraw approval for a complete build standard.

3.19 In accordance with Annex 8 to the Convention on International Civil Aviation, the State Authority should ensure a periodic inspection to demonstrate that the RVSM airworthiness remains valid, and that the aircraft and operator remain in compliance with the established requirements. As part of the height keeping performance monitoring program, the RMA conducts trend analysis and can assist in monitoring the efficacy of an operator's RVSM continuous airworthiness procedures. If RVSM continuous airworthiness procedures are determined to be inadequate, the RVSM approval may be considered to be invalid.

3.20 In accordance with the requirements of Annex 6, any aircraft that operates with reduced separation minima in RVSM airspace must hold a valid RVSM approval. Similarly, any aircraft which is non-compliant with Altimetry System Error requirements (due to inadequate RVSM continuous airworthiness procedures) can be considered to be non-compliant with general airworthiness requirements defined in Annex 8. Under the precepts of this requirement, any non-compliance renders the aircraft ineligible for operation.

3.21 State authorities should also consider the RVSM approval status of any aircraft/operator under the following circumstances:

a) The conditions under which an initial approval was issued have changed. For example, the construction or equipment configuration of the aircraft has been changed such that the original RVSM data approval package is no longer valid;

b) The operator is not in compliance with the long-term monitoring requirements, and so cannot demonstrate the effectiveness of continued airworthiness procedures.

3.22 In such circumstances as those described above, the State should satisfy itself that corrective action has been taken before the aircraft is permitted to continue operations in RVSM airspace. Such action may include submission of a new RVSM approval data package, but in all cases should include height monitoring in accordance with a plan agreed between the State and operator and coordinated with the RMA. Such a monitoring program should demonstrate compliance with all airworthiness requirements within a reasonable time frame which should not exceed 6 months. Failure to comply with an agreed monitoring plan should result in the removal of the RVSM type approval for the operator (i.e. removal of approval for all airframes of the type for which the operator is non-compliant with monitoring targets).

3.23 There is no harmonized requirement to limit the duration of an RVSM approval. Some States have implemented a two-year limit to ensure that operators comply with all height monitoring requirements before a renewal is issued. However, States which do not issue an approval with such a limitation should ensure that they have initiated procedures to ensure that operators continue to comply with all height monitoring requirements. An operator with an expired approval shall be treated identically to an operator flying with no approval and reported for non-compliance with Asia/Pacific flight rules. It was agreed as APANPIRG Conclusion 27/31 – Reduced Vertical Separation Minimum (RVSM) Approval Expiry - that States should:

a) in case they intend to allow RVSM approvals to expire, review their RVSM approvals data sharing procedures to take into account their ability to update RVSM approvals to Regional Monitoring Agencies (RMAs) before they expire; and
b) in case they do not allow RVSM approvals to expire, notify the RMA to remove all existing expiration dates (if any), and ensure that any future withdrawals of RVSM approvals are sent to the RMA.

3.24 In the event that an aircraft is re-registered then the approval issued to the original operator shall be automatically cancelled. Aircraft which are dry-leased, i.e. leased to a third-party operator (lessee) who provides their own crew, shall not be operated on an approval issued to the owner/operator (lessor).

3.25 Any aircraft/operator found to be operating as RVSM approved, without an approval being issued by the State exercising operational authority, with an expired approval, or with an approval issued to another operator or registration shall be reported as non-approved to the State exercising operational authority and any other States in whose airspace the aircraft may be operating. It remains the responsibility of individual States to ensure that appropriate action is taken with operators of non-approved aircraft. It was agreed as APANPIRG Conclusion 28/12 – Management of Non-RVSM Aircraft - that, due to the continuing problem of non-Reduced Vertical Separation Minimum (RVSM) aircraft operating inappropriately within the RVSM Stratum on a long-term basis:

a) Asia/Pacific States should respond in a timely manner to Regional Monitoring Agency (RMA) recommendations; and
b) Asia/Pacific States and Administrations should enact policies, legislation (including appropriate enforcement actions), and procedures to ensure such non-approved aircraft are identified and refused entry into the RVSM stratum unless specifically exempted, or they have Air Traffic Control (ATC) approval, and
c) ICAO should survey Asia/Pacific States and Administrations to determine whether such policies, legislation and procedures to exclude non-RVSM aircraft have been implement; and
d) RMAs should treat aircraft with an unverified RVSM approval status by its State of Approval for more than one month, starting from the first RMA notification, as a non-RVSM approved aircraft and that information provided to relevant State authorities for appropriate action; and
e) RMAs should be empowered by APANPIRG to have direct communication with concerned ministries/authorities if required in the event of inadequate action by the State.

RVSM approvals - RMA

3.26 Aircraft approval status verification is delegated to the accredited RMA. The RMA maintains a database of aircraft which is populated with approval records submitted by State representatives and RMAs from other RVSM regions.

3.27 The RMA conducts regular audits of flight plans, comparing the registrations of aircraft from flight plans in which RVSM approval has been indicated, to records contained in the RMA database of approvals. The RMA will submit a request to the appropriate State authority if an aircraft which is not listed in the database is found to be operating as RVSM approved. If the aircraft is subsequently confirmed as holding a valid approval, then its details are added to the database. If the aircraft is not approved then it remains the

responsibility of the State to take appropriate action, which may be to instruct the operator to cease flying in RVSM airspace until a valid approval has been issued.

3.28 The RMA functions as a monitoring and reporting agency only. The RMA is not responsible for verifying that any conditions applicable to an RVSM approval issued by a State are met; however, the RMA may require clarification if an aircraft is not recognised as an RVSM type. In addition, the RMA is not responsible for verifying that the operator is compliant with any operational limitation defined on the AOC or flight manual, or that the aircraft is being flown by the operator or crew to whom the approval has been issued.

3.29 It is the responsibility of individual States to implement processes and procedures to verify that aircraft construction, equipment, performance, maintenance instructions and crew training all comply with the RVSM regulatory requirements. The RMA cannot be involved in the internal approval process. Specifically, height monitoring data cannot be used in lieu of certified and calibrated SSE measurement systems, operated under controlled conditions, to provide engineering substantiation of aircraft height keeping performance.

3.30 Non-approved aircraft present potential safety threats in RVSM airspace and so need to be identified and appropriate action taken in an expeditious manner. To improve the effectiveness of the RMA and to avoid unnecessary investigations, it is important that States support the RMA by ensuring that the records of RVSM approvals are correct and up to date. Errors in the database result in unnecessary workload for both the RMA and State authority.

3.31 States can report individual aircraft approvals to the RMA using form F2 available on each RMA's website.

3.32 An RVSM approval shall be considered valid indefinitely unless a State issues a specific expiry date or until the State informs the RMA that an approval is no longer valid (i.e. the aircraft has been re-registered, placed in indefinite storage, scrapped, or the approval is withdrawn for any other reason). The RMA will not accept a transfer of an RVSM approval between operators. Upon a change of operator, the RMA will remove the approval confirmation until a new approval is issued. The RMA will not accept RVSM approvals directly from operators.

3.33 In addition to conducting audits of flight plans within its own accredited area of responsibility, an RMA may be requested to confirm the approval status of an aircraft operating in another RVSM region. The RMA will forward all such requests to the appropriate State authority.

3.34 Aircraft which are confirmed as non-approved will be reported as such to the States where they were operating. This information will also be available to States within the region.

3.35 To maintain an accurate database of approvals, the RMA will periodically request a State to participate in an audit of the full list, or inventory, of approvals for which the State is responsible. (APANPIRG Conclusion 20/22 − Provide Annual Update of RVSM Approvals to RMAs).

3.36 A structured approach to approvals management and efficient State/RMA coordination procedures is important to ensure the effectiveness of the safety oversight programme. Any breakdown in coordination may result in increased workload and distraction from addressing priority safety issues and may be referenced in the annual RASMAG Report presented by the RASMAG to APANPIRG.

3.37 In the event that a State does not provide safety related data to approved regional safety monitoring agencies, including RMAs, in accordance with the requirements of safety monitoring, then the RMA shall propose to the RASMAG to subsequently propose the State to be included in the APANPIRG ATM and Airspace Safety Deficiencies List (APANPIRG Conclusion 16/6 – Non-Provision of safety related data by States).

RVSM approvals - States

3.38 In accordance with the precepts of ICAO Annex 6, States are the principal authorities, tasked with ensuring that all aircraft under their operational authority, intending to operate in RVSM airspace, are approved. States are required to ensure that aircraft/operators continue to comply with performance and fleet monitoring target requirements. States are also required to take appropriate action with operators of non-approved aircraft found to be operating within their sovereign airspace.

3.39 States should ensure that a list of personnel authorised to issue notifications of RVSM approvals to the RMA are supplied beforehand. States can submit relevant contact information using form F1 available on each RMA's website.

3.40 To minimise workload and to avoid aircraft being incorrectly identified as non-approved, it is important that States have processes and procedures in place to enable the easy verification of the status of any aircraft for which they exercise operational authority. It is recommended that each State implement a centralised database of approvals which can be periodically cross checked with the RMA database.

3.41 States must ensure that they have implemented processes and procedures to respond to requests for approval status confirmation received from the RMA and that appropriate action is taken with operators of any aircraft which are found to be operating without approval. Expeditious responses to RMA requests are necessary to avoid aircraft being incorrectly labelled as non-approved.

3.42 States should ensure that RVSM approvals are issued prior to operators commencing flights in RVSM airspace. This applies to delivery and ferry flights as well as normal operations. To minimise workload and avoid unnecessary investigative actions, States should ensure that new approval records together with any changes to existing records are forwarded to the RMA with minimum delay. States should pay particular attention to ensure that the RMA is notified when an aircraft is re-registered, removed from service, changes operator or any other situation which may affect the RVSM approval status. Regular cross checks between the RMA and States are necessary to maintain the currency of the region's approvals and to minimise unnecessary workload.

3.43 It is recommended that in the event that an operator is found to be flying in RVSM airspace without approval then they should be instructed to cease filing flight plans with 'W' in item 10 with immediate effect. Furthermore, the State should investigate the circumstances under which the operator was conducting such flights and either, implement procedural changes where necessary, or take appropriate action in the event of wilful action on the part of the operator.

3.44 States should also consider the approval status of any aircraft/operator which does not comply with performance or fleet monitoring target requirements, as reported by the RMA. States which issue expiry dates should ensure that aircraft/operators are fully compliant with all requirements before any approval extension is issued. It is important that States ensure that they have instituted procedures to ensure appropriate action is taken with operators of aircraft with approvals due for expiration. An aircraft with an expired approval shall be considered as non-approved.

3.45 Upon receipt of any report involving a failure to adhere to RVSM in-flight crew procedures, the State should ensure the investigation of the circumstances of the incident. Where appropriate the State should ensure that remedial training has been implemented to avoid future repetitions and, depending on the severity or frequency of incidents, should consider withdrawal of the operator's RVSM approval.

3.46 In addition to taking appropriate action with any non-compliant aircraft/operator, it may be necessary for a State to implement a review of its own internal approval processes which may have inadvertently contributed to any aircraft/operator non-compliance. Such situations may include:

- Issuing an approval based on an invalid RVSM approval data package (for example when an aircraft is constructed to an STC when the data package is only valid for aircraft constructed to the original TC);

- Inadequate, inappropriate or overdue response upon receipt of a non-compliance by the accredited RMA;

- Lack of operator familiarity with RVSM flight crew procedures or approval requirements; and

- Inadequate configuration management control of RVSM approval information including data coordination with the accredited RMA.

RVSM approvals – Flight planning

3.47 All operators of RVSM approved aircraft indicate that a particular aircraft is RVSM approved by filing a 'W' in item 10 of the ICAO flight plan (including State approved aircraft). Any filing of the 'W' by a non-approved aircraft is in contravention of ICAO Doc. 7030.

3.48 State aircraft which are not RVSM approved may be permitted to operate in RVSM airspace with a 2,000 ft. vertical separation minimum; however, they must not file a 'W' in the flight plan and must indicate STS/NONRVSM in item 18 of the flight plan. Only military, customs and police may file flight plans as State aircraft. Formation flights are not permitted in RVSM airspace even if the individual aircraft themselves are RVSM approved. It was agreed as APANPIRG Conclusion 25/26 – Flights in RVSM Airspace by non-approved State Aircraft – that, Asia/Pacific States be urged to ensure close cooperation between civilian and military authorities, so that all RVSM operational requirements are clearly understood and complied with by State aircraft. It was also agreed as APANPIRG Conclusion 32/6 – RVSM Approvals Data and Filing of RVSM Indicator in Flight Plans of State Aircraft – that, States are urged to liaise with their State aircraft operators to not file 'W' in item 10 of the ICAO flight plan of aircraft that are not approved for RVSM.

3.49 Civilian non-approved aircraft will normally not be provided with an ATC clearance into RVSM airspace with the exception of designated airspaces in the Asia/Pacific region where non-approved civilian aircraft are permitted to operate. States are required by the precepts of ICAO Annex 6 to take appropriate action with aircraft/operators found to be operating in RVSM airspace without approval. It was agreed as APANPIRG Conclusion 24/26 – Repetitive Non-RVSM Approved Aircraft Operating as RVSM Approved Flights – that, Asia/Pacific States should, except where a specific non-RVSM operation is authorised, deny entry to operate within RVSM airspace for aircraft that have been confirmed as non-RVSM approved over a significant length of time, or by intensive checking. Operators should ensure that flight plan dispatchers have accurate information regarding the RVSM approval status of all aircraft within a fleet so that incorrect approval status is not entered into the flight plan.

RMA action of non-approved and non-compliant aircraft

3.50 Under the precepts of ICAO Annex 6 a State is required to take appropriate actions in the event that an aircraft for which it exercises operational authority is found to be operating in RVSM airspace without approval. In addition, a State is also required to take appropriate action against any non-approved aircraft, irrespective of the State of origin, which may be operating within the airspace of the State concerned. The monitoring of this second requirement is problematic for many States as there is no reference document or system which can be easily accessed to confirm the approval status of all aircraft operating within their airspace.

3.51 Specific action which any State may take with regard to an aircraft requesting an RVSM clearance, remains the responsibility of the individual State concerned. However, it should be emphasised that Asia/Pacific States should, except where a specific non-RVSM operation is authorised, deny entry to operate

within RVSM airspace for aircraft that have been confirmed as non-RVSM approved over a significant length of time (APANPIRG Conclusion 24/26 – Repetitive Non-RVSM Approved Aircraft Operating as RVSM Approved Flights).

4. RMA/STATE COORDINATION

RMA contacts

4.1 An RMA is established to support States to demonstrate compliance with ongoing safety oversight and airspace monitoring requirements in RVSM airspace. The five RMAs in the Asia/Pacific Air Navigation region represent 39 States. As the RMA is responsible for managing RVSM approvals (both civil and military), addressing RVSM airworthiness issues and processing operational event reports for risk assessment, it is often necessary for a State to provide multiple contacts to the RMA. Therefore, the RMA may be required to maintain connections with a number of individual points of contact within its area of accreditation. The RMA must also maintain communication with all other RMAs which represent the different RVSM regions around the world as well as aircraft manufacturers and regulatory bodies.

4.2 The data communication traffic for the RMA is relatively high so it is important that the RMA is aware of the credentials and responsibility/authority of any individual with which it communicates; particularly as some data exchanges involve sensitive and confidential information. In general, the RMA directly communicates with the designated States. Except by prior arrangement, the RMA may directly communicate with operators in the responsible RVSM region. The RMA does not accept direct communications from operators or States from other RVSM regions, requesting that all such communications be directed through the host RMA, who can often provide the appropriate information without reference to other RMAs.

4.3 Each RMA provides a generic e-mail address to which all information and requests for data and assistance should first be directed. The RMA will review each message and redirect to a specialist if necessary. All messages to the RMA will be acknowledged and if appropriate a dialogue will be initiated either through the generic e-mail address or by a specialist in the area of discussion.

4.4 The web addresses for the Asia/Pacific RMAs are:

- AAMA: http://www.airservicesaustralia.com/services/aama/
- China RMA: http://www.chinarma.cn/
- JASMA: http://www.jasma.jp/
- MAAR: https://www.aerothai.co.th/maar/index.php
- PARMO: https://www.faa.gov/air_traffic/separation_standards/parmo/

4.5 The RMAs are not operational ATC units and therefore are normally manned during regular working hours only.

State contacts

4.6 To provide a coordinated and effective safety oversight and monitoring programme for RVSM in Asia/Pacific it is important that each State delegates specific units and/or individuals to interface directly with the RMA to which it is accredited. States should ensure that official points of contact are clearly identified and reported to the RMA. States should ensure that authorised points of contact are notified to the RMA for the following areas:

a) Exchanging RVSM approval information with the RMA on a regular basis;

b) Managing requests for approval status confirmation received from the RMA and taking appropriate action with operators of non-approved aircraft;

c) Managing reports received from the RMA of aberrant and non-compliant aircraft Altimetry System Error and other airworthiness issues;

d) Addressing operator non-compliance with fleet monitoring targets received from the RMA;

e) Collating and distributing operational incident reports in RVSM airspace;

f) Providing flight plan traffic sample data of December every year to support the annual RVSM safety assessment (as defined in ICAO Doc. 9937 and agreed in APAPIRG Conclusion 16/4 – Traffic Sample Data Collection).

4.7 It is desirable to minimise the number of contacts from each State with which the RMA has to coordinate actions; however, in the majority of cases it is accepted that two or more points of contact may be required to ensure appropriate expertise is available for each of the functions described above.

4.8 To avoid misunderstanding and the delay in verifying credentials following communications from unknown contacts, States should submit all authorised points of contact to their accredited RMA using F1 form available on each RMA's website.

4.9 It is important that each State ensures that responsibilities are transferred and new RMA F1 forms are issued in the event of staff leaving or changing position so that continuity of service with the RMA is maintained.

Inappropriate State Actions

4.10 Effective oversight and resolution of safety issues in RVSM airspace can only be achieved if the RMA and its accredited States function together to ensure that RVSM data is accurate and that appropriate follow up actions are taken in an expeditious manner. It is particularly important that States ensure that appropriate remedial action is taken as quickly as possible in the event that the RMA submits a report requiring State action. (APANPIRG Conclusion 22/10 – RVSM Approvals, item c and Conclusion 23/15 – Long-Term Non-RVSM Approved Aircraft, item b)

4.11 In the event that a State does not take action which is considered appropriate with any non-approved or non-compliant aircraft/operator, then the RMA shall propose to the RASMAG to subsequently propose the State to be included in the APANPIRG ATM and Airspace Safety Deficiencies List.

5. TECHNICAL HEIGHT KEEPING PERFORMANCE AND MONITORING

5.1 A major part of the RVSM safety oversight programme involves monitoring aircraft technical height keeping performance, or more specifically, aircraft Altimetry System Error (ASE). ASE is the difference between the altitude indicated by the altimeter display, assuming a correct altimeter barometric setting, and the pressure altitude corresponding to the undisturbed ambient pressure; or described more simply as the difference between the actual altitude of the aircraft and the indicated altitude of the aircraft. Any aircraft flying at an incorrect level presents a threat to air safety; however, ASE is particularly dangerous as the effect is frequently invisible to pilots, ground controllers and aircraft collision avoidance systems such as TCAS.

5.2 A major contributor to ASE is the Static Source Error (SSE), which is the error introduced, when attempting to measure the ambient air pressure, caused by the physical presence of the aircraft itself. The SSE characteristic is a variable influenced by a number of parameters including, airframe design and configuration, speed, altitude, weight and attitude of the aircraft. The SSE characteristic of an airframe is modelled at the design phase with corrections applied in the aircraft's avionics system which are intended to remove its effects. However, the SSE characteristic can change over time due to a number of factors including, degradation of sensor components, physical damage to sensor probes or static ports, blockages of the pressure system, or aircraft modifications. In the event that the SSE characteristic changes then the corrections applied in the avionics may no longer be valid, resulting in increased ASE. Validated continuous airworthiness programmes are essential to ensure any changes to SSE are detected and corrected.

5.3 The purpose of the height monitoring programme is to verify that the initial Static Source Error Corrections (SSEC) remains valid, that the continuous airworthiness programmes are adequate and that operators have implemented such programmes correctly. Biennial minimum monitoring targets for all operators of RVSM approved aircraft are defined in ICAO Annex 6 to ensure correct application of continuous airworthiness programmes; however increased quantities of monitoring are required when a new RVSM type or variant is developed until such time as the initial and long-term ASE characteristic of the design has been confirmed. The actual monitoring target for any operator of an RVSM approved aircraft is therefore determined by the type of aircraft. The monitoring requirements for all RVSM approved aircraft, variants and derivations are defined in a table revised annually by the ICAO RMA Coordination Group (RMACG). Copies of the latest MMR can be obtained from the RMA to which a State is accredited.

5.4 The accurate measurement of ASE requires the use of precise and calibrated specialist equipment operated under controlled conditions, and is an expensive process which is normally only performed at the initial airworthiness stage. It is not feasible to expect all operators of RVSM approved aircraft to undergo repeated flight checks under these controlled conditions to demonstrate continued compliance with ASE performance requirements. A number of alternative systems have been developed which provide accurate estimates of aircraft ASE under most conditions. The major advantage of these systems is that they can operate with little or no active participation on the part of the operator and are transparent to the crew. A brief description of techniques employed by RMAs to estimate aircraft ASE characteristics is provided in the following section.

Height Monitoring Systems

5.5 There are three independent height monitoring systems currently in use. These are:

- GPS Monitoring Unit (GMU). This is a portable carry-on device used to estimate the ASE of a single flight for one aircraft. The advantage is that the aircraft can be monitored almost anywhere that it is scheduled to operate; however, the operating and processing costs for the operator are high as they rely on dedicated resources;

- Height Monitoring Unit (HMU). An HMU is a fixed ground-based system which with one central and four outer receiving stations. The HMU measures geometric height of an aircraft

using the multilateration principle. Multilateration obtains three-dimensional positions calculated from the time difference of arrival (TDOA) of signals at each receiving stations from the transponder of an aircraft in flight. At least four receiving stations are required, and the fifth improves omni-directional coverage, accuracy and system redundancy. The coverage of an HMU is approximately 30 – 50 NM in radius; and,

- ADS-B Height Monitoring Systems (AHMS). An Automatic dependent surveillance-broadcast (ADS-B) Height Monitoring System (AHMS) is a height monitoring system that utilizes data from an existing ADS-B network. It uses geometric height data available from ADS-B equipped aircraft in order to calculate the ASE. The coverage of an AHMS depends on the coverage of the ADS-B network it obtains data from.

5.6 There are advantages and disadvantages to all the monitoring systems; however, they all operate on the same fundamental principle, which is the comparison of the true height of an aircraft against the height of the pressure level which corresponds to the indicated altitude of the aircraft. The implementation of such a system is however quite complex. For GMUs, the height of the aircraft is provided by the GPS receiver of the on-board GMU. For an AHMS, the height of the aircraft is obtained from the aircraft's GPS receivers. An HMU, on the other hand, relies on the estimation of the aircraft height using multilateration techniques. The determination of the height of the pressure level which corresponds to the indicated altitude of the aircraft is challenging as the pressure levels move up and down depending on the specific meteorological conditions and vary in magnitude over both time and position. Various methods of modelling the continually changing height of the pressure level have been implemented; however, they all rely on an initial set of values obtained from various Numerical Weather Prediction models (NWP) provided by national and international meteorological organisations.

5.7 It is important to ensure that the monitoring data is correlated to the correct aircraft. Height monitoring systems only receive the aircraft ICAO 24-bit aircraft identifier. It is necessary to compare the 24-bit aircraft address to the address provided by the State in the RVSM approval data. If the transmitted address is different from the one recorded by the RMA, then the monitoring result will not be correlated to the correct aircraft.

Operator Long Term Height Monitoring Programme

5.8 All operators of RVSM approved aircraft are required to participate in the RVSM height monitoring programme. The principal purposes of the long-term height monitoring programme are to verify long term ASE stability and the efficacy of an operator's continued airworthiness programme.

5.9 All operators of RVSM approved aircraft in the Asia/Pacific Air Navigation Region are required to comply with the Long-Term Height Monitoring (LTHM) requirements defined in the current version of the MMR. Data from any of the recognised RVSM monitoring programmes may be used to satisfy an operator's monitoring target. The monitoring target varies dependent on the total amount and quality of monitoring data available, the period over which time such data was obtained and the quality of the performance data. For aircraft designs which have been monitored, with statistically representative data samples demonstrating stable performance, for in excess of two years, the requirement is for all operators to have a minimum of two aircraft monitored every two years or 1,000 flight hours, whichever the greater. For aircraft designs which have received a generic RVSM airworthiness approval within the last two years, operators are required to have 60% of their fleets monitored every two years or 1,000 flight hours, whichever the greater. Finally, if an aircraft is modified or built to a unique design and presented for RVSM airworthiness approval on an individual basis then that aircraft is required to be monitored every two years or 1,000 flight hours, whichever the greater.

5.10 States should ensure that all operators of RVSM approved aircraft under their operational authority comply with the minimum fleet monitoring targets. States should ensure that operators, including those with a single aircraft or small fleets, have implemented plans to demonstrate compliance with LTHM

requirements and that the targets are met in the time frame required (APANPIRG Conclusion 27/32 – Reduced Vertical Separation Minimum (RVSM) Monitoring of Small Fleets). States should take appropriate action with any operator which fails to comply with the LTHM requirements. Such appropriate action includes temporary revocation or suspension of an approval, complete withdrawal of approval and refusing an extension in the event that an approval has expired.

5.11 The RMAs conduct regular assessments of operator compliance with monitoring targets, the results of which are forwarded to the various State authorities which have the responsibility for determining what further action should be taken. Operators are encouraged to contact the RMA to check availability and flight requirements for the various height monitoring programmes prior to conducting any dedicated monitoring flights.

ASE Performance Investigations

5.12 ASE data acquired from the height monitoring programmes is used in three ways by the RMA. The total data sample provides the input to the technical collision risk assessment conducted annually by the RMA and presented to RASMAG and the APANPIRG. Data is also grouped by aircraft type and individual airframe to assess generic and discrete airframe ASE performance.

5.13 The ICAO Annexes and the various MASPS documents define the maximum tolerable ASE performance requirements for both RVSM groups (i.e. the total population of aircraft built to a common compliance standard), and individual airframes, in order to comply with the technical safety limits. The principal requirements are described below:

- The absolute value of mean ASE of any RVSM group shall not exceed 80 ft.;
- The sum of the absolute value of mean ASE and 3 standard deviations of ASE of any RVSM group shall not exceed 245 ft.; and
- The ASE of any individual airframe shall not exceed 245 ft. in magnitude.

5.14 The RMA collects the measurement results and conducts regular analysis of both group and individual airframe performance. In the event that the group performance results, taking into account the size of the available data sample, indicate non-compliance with one or both of the requirements defined above then it requests a more detailed investigation by the Authority responsible for issuing the original airworthiness certificate. The resolution of any generic RVSM group investigation may be time consuming and expensive. Actions to resolve a generic performance investigation may include design changes, re-calculation of SSEC or amendments to continuous airworthiness procedures. Although removal of a generic RVSM airworthiness approval remains the ultimate sanction of any authority, the implications for both the manufacturer and existing operators would be extremely serious making this an unlikely scenario in all but the most extreme cases which impact safety separation standards.

5.15 More common than a group investigation is an investigation into the performance of an individual aircraft which exhibits non-compliant ASE performance due to damage or degradation of a component within the static pressure system. In addition to reporting an aircraft which is not compliant with the absolute ASE limit, the RMA monitors performance which is not consistent with the core distribution of aircraft and which may be in the early stages of deterioration towards becoming non-compliant. Such performance is termed aberrant.

5.16 Any aircraft which exhibits performance which is not compliant with the ASE performance requirements defined above is subject to a mandatory report submitted to the appropriate State authority for immediate action. An RMA may recommend a State or operator to investigate the performance of an aircraft which is aberrant if the typical performance is over a pre-set limit (typically 200 ft.) or if the ASE characteristic

indicates a significant trend towards non-compliance. States are urged to formulate a course of actions in regards to an aircraft reported as being non-compliant.

5.17 Although the RMA may institute an investigation into a non-compliant or aberrant aircraft, it remains the responsibility of the appropriate State authority to ensure that the case is investigated and resolved to its own satisfaction. The RMA can provide assistance and guidance, either directly advising the operator or as consultant to the State. Upon confirmation that remedial action has been completed the RMA will liaise with the State to decide if the investigation can be closed. Additional monitoring should be conducted to ensure any remedial action has been successful. The problems most commonly associated with poor ASE performance include the following:

- Humidity, leaks or corrosion in static pressure lines;
- Damage, blockage corrosion to static vents, pitot heads or probes;
- Air flow disturbance in area of static sensors due to paint damage, contamination or other physical changes;
- Airframe skin waviness effects;
- Angle of Attack vanes stiff or out of tolerance;
- TAT units out of tolerance;
- Air Data Computers out of tolerance;
- Damage to pressure transducers;
- Invalid SSEC; and
- Invalid MASPS compliance.

5.18 Any aircraft which fails to meet the technical vertical navigation performance requirements, particularly with regards to Altimetry System Error, represents a risk to maintaining vertical separation between aircraft. Following the receipt of a report of large ASE the State authority should be expected to take action proportional to the magnitude and characteristic of the non-compliance.

- An individual non-compliant ASE result considered to be inconsistent with typical performance for that airframe and which has subsequently returned to normal levels. The State should investigate the circumstances of the problem and if necessary, implement changes to operational and continuous airworthiness procedures. Dependent on the severity of the problem the operator may be permitted to continue operations in RVSM airspace during the investigation.
- An individual or multiple non-compliant ASE results considered to be representative of typical performance for that airframe. The State should withdraw the RVSM approval until an investigation into the problem is completed and the operator can demonstrate that the non-compliance has been resolved. In the event that non-compliance is due to aircraft modification, equipment change, etc., then it may be necessary to re-evaluate the entire RVSM approval data package for the aircraft concerned, prior to issuing a new approval.

- A generic RVSM group fails to comply with group performance requirements. The State which issued the original airworthiness approval for the type should actively investigate the circumstances and if necessary, withdraw the type approval until resolved.

6. ALTITUDE DEVIATION AND OTHER OPERATIONAL REPORTS

6.1 A key safety objective of the Asia/Pacific RVSM monitoring programme is the estimation of collision risk due to technical and operational reasons. The collision risk estimation process is complex and not within the scope of this document. The key parameters for the collision risk assessment are deviations from assigned (or planned/expected) flight levels, including both the magnitude and the duration of events, and the aircraft dimensions.

6.2 The technical risk assessment is conducted using monitoring data which is considered to be generic and so can be extrapolated for the entire population of aircraft throughout the region. The required magnitude and duration parameters are embedded in the data itself and the aircraft dimensions available once the monitoring result is correlated to a known registration.

6.3 The calculation of the operational risk is similar in concept; however, the data can only be supplied from operational units and is dependent on the specific operational environment and air situation at the time of the event. Each operational risk event is unique in nature and therefore it is not possible to extrapolate the parameters derived from one event to other areas of the region. To enable the RMA to provide a reasonable estimate of risk due to operational factors, it is important that all accredited States institute processes to collect operational incident reports and forward the relevant information to the RMA for inclusion in the risk assessment process.

6.4 The following sections describe the information which is required by the RMA to conduct the collision risk estimate and the definitions of events which should be reported.

Description of Operational Events

6.5 Altitude deviations and sudden unplanned alterations to ATC clearances inherently carry a greater risk in areas in which a reduced vertical separation minimum has been implemented. It is therefore important that an assessment is periodically conducted to ensure that collision risk estimates satisfy pre-defined Target Levels of Safety (TLS).

6.6 The RMA conducts operational environment collision risk estimates using data provided by accredited member States. An event is reportable to the RMA when either an aircraft makes a deviation from a cleared level between FL 280 and FL 420 (cleared or actual) or an ATC clearance results in a risk bearing situation, such as loss of separation or TCAS initiated deviation.

6.7 The range of factors which may result in a reportable event include the following:

- Pilot not following an ATC clearance resulting in flight at unassigned flight level;
- Unexpected rate of climb/descent resulting in exceeding or not achieving cleared flight level;
- Pilot not following established contingency procedures for emergency descent;
- Technical failure in the altimetry or automatic altitude control system of an aircraft;
- Turbulence or other weather-related phenomena;
- Response to airborne collision avoidance system resolution advisory;
- An error in issuing an ATC clearance which results in flight at incorrect level or which impairs separation minima;

- Coordination errors between adjacent ATC units in the transfer of control responsibility for an aircraft resulting in flight at an incorrect or unexpected flight level; and

- Communication loop errors, (undetected or garbled read back/feedback errors).

6.8 The important parameters which must be available if the report is to be used for the quantifiable risk assessment include the magnitude of deviation and duration. It is possible that a single event will have multiple phases each with its own set of parameters. As much information as possible should be provided on the report to assist in the estimation of the required parameters and nature of the event.

Reporting of Operational Events

6.9 A number of methodologies are available for estimating the collision risk parameters due to operational events. These may include follow up investigations to determine the nature of any deviation, and/or the receipt and analysis of dedicated operational incident reports, or large Height Deviations. In both methodologies it is essential that individual States provide the operational event reports to the accredited RMA.

6.10 When States submit operational incident reports, it is important to ensure that the following minimum information is provided:

- High level description of event;

- Aircraft type and identity;

- Date, time and location of occurrence;

- Magnitude of vertical error or deviation (for each phase of event if applicable), which may also be reported as expected flight level, and actual or observed flight level; and

- Duration of deviation (for each phase of event if applicable).

6.11 States may refer to Appendix C – LHD/LLE/LLD TAXONOMY for the description and examples of LHDs to be reported and

6.12 Appendix D – LHD FAQs for the frequently asked questions about LHD reporting. The RMA can provide copies of preformatted forms for the purposes of reporting operational incidents. Please note that each individual RMA may arrange a different mechanism for the reporting such as an e-mail submission or an online system. In some RVSM regions special arrangements may be made for the submission of RVSM operational incident reports through other safety oversight programmes.

6.13 Cross-boundary LHDs can be categorized as category E "coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues" and involve two ATS units. To ensure that there is coordination between the two involving ATS units to uncover the cause and prevent future occurrences, the cross-boundary LHD coordination procedure is recommended for every LHD occurrence that involves another ATS unit, as illustrated in Appendix E – Cross-Boundary LHD Coordination Procedure. If the LHD point of contact from another State is unknown, the RMA may be able to assist State to obtain such information.

6.14 Due to the continuing prevalence of LHDs, States are encouraged to conduct further investigation and provide in-depth analyses of LHDs, especially those induced by their responsible ATS units. Appendix F – LHD Analysis Form (Form A) is recommended as a template for sharing the analysis results and Guidance on the Human Factors Assessment

6.15 This section aims to support the identification of contributing factors in Form A by using the Human Factors Assessment Questionnaire (HFAQ) as guidance. The HFAQ is primarily based on James Reason's theoretical framework on human error and safety management. It is further supported by the Human Factors Analysis and Classification System (HFACS), developed by Douglas A. Wiegmann and Scott A. Shappell. It can assist States and ATS providers to identify the individual's action or inaction that leads to an LHD and clarify the scope of the errors and their causes.

Note: Even though the identification of the individual action is **optional** and not needed to complete Form A, it can help the organization understand each individual variability.

Individual Actions

Please select at least one category below (Slip, Lapse, or Mistake) and select at least one subcategory. If none apply, select "Other" and provide details.

☐ Slip: Observable actions related to attention or perception issues.

- ☐ Interference: planned action was interfered with by an unintended or irrelevant action
- ☐ Mistiming: timing an action incorrectly
- ☐ Capture: performing a more common/familiar action rather than the intended action
- ☐ Perception: perceiving or not perceiving accurately
- ☐ Misordering: performing an action out of sequence
- ☐ Reversal: performing the opposite action rather than intended action

☐ Lapse – Internal, un-observable events related to memory.

- ☐ Omissions: forgetting to perform or complete action
- ☐ Repetitions: performing action again because one is not sure if it was done
- ☐ Reduced Intentionality: performing action without really meaning to

☐ Mistake: Incorrect plan despite having the right intention. Failure in judgment or decision-making at the planning stage.

- ☐ Rule-Based Mistakes: misapplication of procedures or incorrect situation diagnosis
- ☐ Knowledge-Based Mistakes: lack of knowledge to solve a novel problem

☐ Other …….

Once the individual action (slip, lapse, or mistake) and the associated subcategory have been identified, please proceed to Form A to select or determine the relevant contributing factors that influenced these individual actions.

The contributing factors in Form A are organized into four main categories: Procedures/LOAs, Human Factor Issues, Systems/Equipment, and Other Factors. The identification of these contributing factors is crucial for understanding the underlying causes of errors and for developing effective mitigation strategies. The contributing factors given as guidance in Form A are listed below for references.

Contributing Factors

Procedures/LOAs

- Non-existent procedures/LOAs
- Unclear, inappropriate, or outdated procedures/LOAs

Human Factor Issues

- Mental factors such as haste, fixation, distraction, fatigue, drowsiness, etc.
- Physiological factors such as dehydration, sickness, physical fatigue, etc.
- Limited proficiency qualifications or experience to safely perform the required tasks
- Poor communication, coordination, or teamwork among staff

Systems/Equipment

- Unavailable necessary systems/equipment
- Defective or unserviceable systems/equipment
- Poorly designed systems/equipment

Other Factors

- Inadequate or ineffective training
- Inadequate supervision or mentoring
- Failure of supervisor to correct problems with equipment, known safety hazard, or violated Standard Operating Procedures
- Inadequate staff levels or planning
- Poorly defined roles, responsibilities, or tasks
- Poor physical work conditions (e.g., noise, lighting, clutter, weather)
- Organizational issues: lack of resources, unclear policies, or poor communication from leadership

6.16 Appendix G – LHD Preventative/Mitigation Measures Form (Form B) for sharing mitigation measures planned or taken to minimize LHDs with the RASMAG and the responsible RMA. The purpose is not to apportion blame on any organizations but to understand the underlying root causes in order to develop safety mitigations to prevent reoccurrences.

Risk Estimation of Operational Events

6.17 The RMA is responsible for reviewing all operational incident reports and compiling the parameters for the collision risk analysis. If a report does not include the minimum information required, then the report may not be included in the assessment. In the event that some information is missing the RMA may, based on previous reports and experience, include an estimate for a parameter so that the report may contribute to the risk assessment. If appropriate the RMA may also send a request to the operator directly or through another RMA to clarify the contributory causes of a large height deviation. On the basis of internal investigation, the operator should reply to the RMA's request and provide information regarding the cause of any large height deviation. The RMA will clearly distinguish between parameters which have been submitted on reports and those which are estimates based on the evidence available.

6.18 The common guidance for the Asia Pacific RMAs on how to treat TCAS RA-related reports (agreed at the RASMAG MAWG/9 meeting in 2022) is as follows:

a. If there is an operational error leading to the RA that fits the definition of an LHD, then the RMA should treat that error as a separate LHD. The category of this LHD should correspond to the nature of that operational error.

b. For all vertical deviations as a result of the TCAS RA itself that have a magnitude of 300 feet or more,

   i. if the flight crew correctly follow the RA, the deviations should be recorded as Category J LHDs and treated as technical errors

   ii. if the flight crew incorrectly follow the RA, the deviations should be recorded as Category K LHDs and treated as operational errors.

c. For all non-deviations resulting from the flight crew disregarding the TCAS RA, they should be recorded as Category K LHDs and treated as operational errors.

Management Process of Hot Spots

6.19 The types of operational errors that are used for RASMAG's monitoring activities are Large Height Deviations (LHDs), Large Lateral Deviations (LLDs) and Large Longitudinal Errors (LLEs). These are indicative of operational risks inherent in the APAC airspace. They become visible with the mature reporting culture of service providers and States. In 2015, the RASMAG/20 meeting decided to identify and prioritize high risk areas as LHD, LLD and LLE hot spots. The list of hot spots together with the analysis is reported to the APANPIRG annually so that specific actions could be initiated to reduce risk to an acceptable level. The EMAs, RMAs, States, and ATC units are also urged to take actions to establish scrutiny groups or alternate means to address the hot spots and present action plans and details of progress to the RASMAG.

6.20 In 2024, the meeting of RASMAG/29 adopted the management process of LHD, LLE, and LLD hot spots for Asia Pacific Region. The process consists of three (3) parts: identifying, monitoring, and removing a hot spot.

<u>Identifying an LHD/LLD/LLE hot spot</u>

6.21 Cluster Identification - the monitoring agency will explore, perhaps by plotting a map, if any occurrences are reported in close proximity (i.e. an area where the traffic flows are controlled by multiple ATS units, an area along the FIR/sector boundaries between adjacent ATS units, or an area with a specific traffic route system). This step requires a subjective judgement by the responsible monitoring agency. The identified clusters of occurrences will be determined if they fit criteria of being hot spots in the next step. The RASMAG meeting can also identify such a cluster and request the monitoring agency to investigate if it fits the hot spot criteria.

6.22 Hot Spot Criteria - the cluster of occurrences will be identified as an LHD, LLD or LLE hot spot if it fits **at least one** of the following criteria:

a. The number of occurrences - the number of all occurrences in the cluster takes up a "relatively big portion" of the total number of occurrence reports of that specific region.

To be a "relatively big portion" in number,

$$\text{the number of occurrences in the cluster} \geq \frac{\textit{the total number of occurrences in the region}}{n+1}$$

where 'n' is the number of clusters in the region.

b. The risk estimate - the sum of operational risk estimates of all occurrences in the cluster takes up a "relatively big portion" of the region's operational risk estimate.

To be a "relatively big portion" in risk,

$$\text{the sum of operational risk of the cluster} \geq \frac{\textit{the region's operational risk estimate}}{n+1}$$

where 'n' is the number of clusters in the region.

c. Exceeding the TLS - the sum of operational risk estimate of all occurrences in the cluster reaches or exceeds the overall TLS of 5×10^{-9} FAPFH.

6.23 There are some circumstances where LHDs, LLDs and LLEs are scattered throughout the region and, hence, a hot spot cannot be identified even though the overall TLS is exceeded. It can be caused by a few occurrences with high operational risk. No patterns or commonalities can be found. These cases should be individually addressed, not as hot spots.

6.24 After LHD, LLD or LLE hot spots are identified, the responsible monitoring agency will report details to the RASMAG meeting for consideration. With concurrence from the RASMAG, the monitoring process of these hot spots will start.

Monitoring an LHD/LLD/LLE hot spot

6.25 The list of LHD, LLD or LLE hot spots in APAC is maintained by RASMAG with details of the involved FIRs, the 'lead' monitoring agency, the year of identification, and the current status. The naming of a hot spot should be arranged by FIRs in an alphabetical order to prevent the speculation of involvement from the order of FIRs.

6.26 During the annual RASMAG meeting, working papers or information papers are expected from the relevant States and administrations to update the meeting on the actions being taken to address each hot spot.

6.27 The 'lead' monitoring agencies are also expected to have the hot spots analysed in their safety assessment reports for the annual RASMAG meeting.

6.28 After its annual meeting, the RASMAG will report the current list of LHD, LLD or LLE hot spots in APAC together with progress updates to the APANPIRG in a consolidated manner and, if required, request for further actions.

6.29 If the environmental condition of an existing hot spot changes (e.g., the route structure or traffic pattern is changed, and the mitigation measures are completed and demonstrated the risk reduction in one part of the hot spot), that hot spot can be split into smaller areas depending on the FIR interfaces, the contributing factors, implementation of mitigation measures, etc. To split a hot spot, the same process as detailed in this section is applied by considering if the split clusters satisfy any of the hot spot criteria.

Removing an LHD/LLD/LLE hot spot

6.30 To remove an LHD, LLD, or LLE hot spot from the list maintained by the RASMAG, proof of mitigation and/or prevention measures should be presented to the RASMAG meeting and the implementation results should reflect the effectiveness of risk controls in terms of reduction in the number of occurrences and operational risk of the hot spot.

6.31 The risk assessment report from the responsible monitoring agency should demonstrate that the hot spot no longer satisfies any of the criteria listed in 2.4 for at least 2 consecutive years. With approval from the RASMAG meeting, the hot spot will be labelled as 'potential non-hot spot' after the first year and 'removed' after the second year. However, the RASMAG may decide to continue monitoring certain hot spots (retaining the 'potential non-hot spot' status) even if they no longer satisfy the criteria for at least 2 consecutive years when other circumstantial factors could have temporarily reduced the number of occurrences and the risk.

6.32 When a hot spot is marked as 'removed', the specific monitoring process for that particular hot spot will stop; the hot spot will be monitored under regular process.

6.33 For record control purposes, the hot spot details will not be removed from the list but the status will reflect its being non-hot spots. However, the same hot spot record maybe reused if the operational errors of the same issues re-emerge in the same area.

APPENDIX A – TERMS OF REFERENCE OF ASIA PACIFIC MONITORING AGENCIES

Regional Monitoring Agencies
Operating in the International Civil Aviation Organization (ICAO) Asia and Pacific Region (APAC)

Terms of Reference

Monitoring Agencies operating in the ICAO Asia Pacific Region support satisfaction of safety requirements as specified in Annex 11 to the Convention on International Civil Aviation, *Rules of the Air*, and fulfill the functions as specified by ICAO Doc 9937, *Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive* and ICAO Doc 10063, *Manual on Monitoring the Application of Performance-based Horizontal Separation Minima.*

Monitoring agencies also support the objectives of the RASMAG:

a) facilitate the safe implementation of reduced separation minima and CNS/ATM applications within the Asia and Pacific Regions in regard to airspace safety monitoring; and

b) assist States to achieve the established levels of airspace safety for international airspace within the Asia and Pacific Regions.

There are two types of monitoring agencies operating in the Asia Pacific region.

(a) Regional monitoring agencies (RMAs) monitor and assess operations applicable to Reduced Vertical Separation Minimum (RVSM).

(b) En-route monitoring agencies (EMAs) monitor and assess operations applicable to reduced horizontal plane separation minima.

Asia Pacific monitoring agencies shall support the use of RVSM and performance-based horizontal plane separation minima in Asia Pacific airspace, which shall consist of airspace as defined by RASMAG.

Asia Pacific monitoring agencies shall perform the following functions:

1. Establish a database to maintain information necessary for verification of operator/aircraft compliance with requirements associated with application of RVSM and performance-based horizontal plane separation minima.
2. Initiate checks of operator/aircraft compliance with RVSM and performance-based horizontal plane separation minima as filed in a flight plan and operating in the relevant airspace, identify operators and aircraft not meeting the requirements and using the relevant airspace, and notify the appropriate State of Registry/State of the Operator accordingly;
3. Facilitate the transfer of information necessary for verification of operator/aircraft compliance with requirements associated with application of RVSM and performance-based horizontal plane separation minima to and from other monitoring agencies;
4. Receive and assess reports of large deviations/errors and
    a. determine, wherever possible, the root cause of each vertical/lateral deviation or longitudinal error together with its size and/or duration
    b. take the necessary action with the relevant State and operator to determine the likely cause of the deviation

    Guidance for determining large deviations in the vertical and horizontal planes is included in ICAO Docs 9937 and 10063 respectively
5. Assess compliance of operators and aircraft operating in the Asia Pacific Region with RVSM height-keeping performance requirements*;

6. Investigate the height-keeping performance of the aircraft in the core of the distribution*;
7. Establish and/or maintain a database of operational performance data, including vertical, lateral navigation and/or communication and/or surveillance performance for:
    a. all flight operations;
    b. operators/aircraft types; and
    c. individual airframes;
8. Determine the appropriate method to monitor longitudinal risk**;
9. Analyse data collected on a predictive and proactive basis to detect deviation/error trends in the horizontal and vertical planes and, hence, to take action as specified in ICAO Doc 9937 and ICAO Doc 10063;
10. Conduct periodic risk assessments:
    a. assess the overall risk (technical combined with operational and in-flight contingencies) in the system against the overall safety objectives; and
    b. proactively identify aberrant changes in operational performance from the agreed regional safety goal;
11. Initiate necessary remedial actions as necessary and coordinate with RASMAG as necessary in light of monitoring results; and
12. Submit reports as required to the RASMAG.

* *Applicable to RMAs only*

** *Applicable to EMAs only*

APPENDIX B – APANPIRG CONCLUSIONS AND DECISIONS

APANPIRG Conclusions and Decision (Up to the 36th APANPIRG in 2025)

Conclusion 16/3 – Large Height Deviations – Western Pacific/South China Sea area	That, in noting the prevalence of RVSM large height deviation occurrences in the Western Pacific/South China Sea area, the Regional Office draw the attention of all States concerned to identify and put in place remedial actions to mitigate such significant errors on an urgent basis.
Conclusion 16/4 – Traffic Sample Data Collection	That, States be advised by the Regional Office that December every year had been adopted for the routine collection of 30 days of traffic sample data to satisfy airspace safety monitoring requirements.
Conclusion 16/5 – No implementation of reduced separation unless compliant with Annex 11	That, recognizing that some States had not adequately complied with safety management provisions, the Regional Office advise States of the Asia/Pacific Region that further regional implementation of reduced separation minima should only proceed in circumstances where implementing States can demonstrate an ability to comply with Annex 11, Chapter 2, safety management provisions for the continuous monitoring and regular assessment of the safety level achieved.
Conclusion 16/6 – Non-Provision of safety related data by States	That the Regional Office advise that States not providing safety related data to approved regional safety monitoring agencies, including RMAs, in accordance with the requirements of safety monitoring agencies will be included in the APANPIRG List of Deficiencies in the ATM/AIS/SAR fields.
Conclusion 18/3 – Prevalence of LHDs from ATC Unit-to-ATC Unit coordination errors	That, in noting the continued prevalence of RVSM Large Height Deviation (LHD) occurrences resulting from ATC Unit-to-ATC Unit coordination errors, as reported by RMAs assessing RVSM operations within Asia Pacific Region, the Regional Office: a) draws to the attention of States that investigations into LHD should concentrate in this area, and b) highlights the APANPIRG recommendation that States work towards the implementation of compatible AIDC capabilities based on the Asia/Pacific AIDC ICD between ATC units as soon as possible.
Conclusion 19/15 – Enhanced communications between States and RVSM RMAs	That, noting the Annex 6 provisions for the global long-term monitoring of airframes used in RVSM operations and the critical role of Asia/Pacific RVSM Regional Monitoring Agencies (RMAs) in monitoring the safety of RVSM operations, the Regional Office draw the attention of States to the Long-Term Height Monitoring Actions promulgated by RASMAG. In particular States are encouraged to immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs.

Decisions 20/21 – Expand use of safety monitoring data	That the arrangements for annual month of December traffic sample data by all States to satisfy airspace safety monitoring analysis called for by APANPIRG Conclusion 16/4 be expanded to enable this data to also be available for airspace planning and implementation purposes. This will apply only where such data is not otherwise available to regional or State implementing bodies and only with specific written authority of the ICAO Asia/Pacific Regional Office on each occasion.
Conclusion 20/22 − Provide Annual Update of RVSM Approvals to RMAs	That, in addition to the continuous update of RVSM Approvals data called for by Conclusion 19/15 and APANPIRG RMA requirements, States provide an update of RVSM Approvals data in conjunction with the annual December traffic sample data submission required by Conclusion 16/4.
Conclusion 22/10 – RVSM Approvals	That, the States are urged to: a) ensure that they provide point of contact details and complete RVSM approval data to the appropriate RMA in a timely manner; and b) encourage their ANSP to provide details to their RMA, on a monthly basis, of all flight plans filed showing RVSM approval; and c) take appropriate action regarding non-compliant aircraft, on the basis of the data provided by their RMA.
Conclusion 23/15 – Long-Term Non-RVSM Approved Aircraft	That, States are urged in a timely manner to: a) update Regional Monitoring Agency data on RVSM approved aircraft; and b) respond to, and take action regarding RMA queries on long-term data indicating that aircraft were not approved.
Conclusion 23/16 – Safety Monitoring Data Provision	That, recognising the importance of data collection for safety monitoring purposes, States be urged to: a) provide data as requested by Regional and En-Route Monitoring Agencies (RMA/EMA) in accordance with the RMA Manual (Doc 9937) and EMA Manual (either through a formal agreement or an informal understanding as appropriate); and b) provide available ADS-B data for height-keeping monitoring to RMAs when requested.
Conclusion 24/26 – Repetitive Non-RVSM Approved Aircraft Operating as RVSM Approved Flights	That, Asia/Pacific States should, except where a specific non-RVSM operation is authorised, deny entry to operate within RVSM airspace for aircraft that have been confirmed as non-RVSM approved over a significant length of time, or by intensive checking.

Conclusion 24/27 – Prioritization of AIDC Implementation to Address LHDs	Considering that ATS Inter-facility Data Communications (AIDC) is an important means of minimizing Large Height Deviations (LHD), Asia/Pacific States should support the expedition of AIDC through collaborative projects at the following significant LHD interface areas: a) Indonesia: between Jakarta and Chennai/Ujung Pandang/Brisbane/Melbourne FIRs; b) India: between Chennai and Kuala Lumpur FIRs; c) Philippines: between Manila and Fukuoka/Taibei/Hong Kong/Ho Chi Minh/ Singapore/Kota Kinabalu/ Ujung Pandang FIRs; and d) China: between – i. Urumqi and Lahore FIRs; and ii. Beijing and Ulaan Baatar FIRs.
Conclusion 25/25 – Submission of FPLs as Traffic Sample Data (TSD)	That, Asia/Pacific States that do not have an automated TSD generation capability be urged to consult with the appropriate Regional Monitoring Agency (RMA) and if agreed, submit their raw Flight Plan (FPL) messages to the appropriate RMA, instead of conventional TSDs.
Conclusion 25/26 – Flights in RVSM Airspace by non-approved State Aircraft	That, Asia/Pacific States be urged to ensure close cooperation between civilian and military authorities, so that all RVSM operational requirements are clearly understood and complied with by State aircraft.

Conclusion 26/28 - Asia/Pacific LHD Hot Spot Action Plans	That, the following Regional Monitoring Agencies (RMAs), States and ATC units should take urgent action to establish a scrutiny group or an alternate means to address the following Large Height Deviation (LHD) hot spot areas and present Action Plans and details of progress made to the ICAO Regional Office, prior to 01 January 2016: a) MAAR, India, Myanmar and Malaysia – Kolkata/Chennai FIRs interface with Yangon/Kuala Lumpur FIRs; b) PARMO, China RMA, JASMA, MAAR, China, Japan, Republic of Korea and Taibei Area Control Centre (ACC) – Incheon FIR AKARA Corridor interface with Shanghai/Fukuoka/Taibei FIRs; c) China RMA, MAAR, China and Hong Kong China – Hong Kong FIR interface with Guangzhou/Sanya FIRs; d) MAAR, AAMA, JASMA, Hong Kong China, Indonesia, Japan and the Philippines – Manila FIR interface with Fukuoka/Hong Kong China/ Singapore/Ujung Pandang FIRs; and e) China RMA, MAAR, China and Pakistan – Urumqi FIR interface with Lahore FIR. *Note 1*: the RMAs in bold were expected to take the lead in organising the scrutiny groups or alternative means to address the issues. *Note 2*: BOBASIO (Bay of Bengal Arabian Sea Indian Ocean) in agreement with MAAR has been identified as a scrutiny group for BOBASIO States in respect of the BOBLHD Hot spot Action Plan.
Conclusion 27/29 – Use of Available ADS-B Data for Aircraft Height Monitoring	That, ADS-B data obtained by a Regional Monitoring Agency (RMA) for use in aircraft height-keeping monitoring by means of an ADS-B Height Monitoring System (AHMS), can be sourced from aircraft not subject to an ADS-B related operational approval.
Conclusion 27/30 – Large Height Deviation Guidance Material	That, Asia/Pacific States should utilise the Large Height Deviation (LHD) Guidance Material on LHD taxonomy, reporting form(s), cross-boundary LHD reporting flow, and LHD Point of Contacts (POC) posted on Asia/Pacific Regional Monitoring Agency (RMA) websites.
Conclusion 27/31 – Reduced Vertical Separation Minimum (RVSM) Approval Expiry	That, Asia/Pacific States should: a) in case they intend to allow RVSM approvals to expire, review their RVSM approvals data sharing procedures to take into account their ability to update RVSM approvals to Regional Monitoring Agencies (RMAs) before they expire; and b) in case they do not allow RVSM approvals to expire, notify the RMA to remove all existing expiration dates (if any), and ensure that any future withdrawals of RVSM approvals are sent to the RMA.

Conclusion 27/32 – Reduced Vertical Separation Minimum (RVSM) Monitoring of Small Fleets	That, Asia/Pacific States should have processes to ensure that single aircraft operators or operators with small fleets are appropriately monitored in terms of Annex 6 requirements, including: a) the provision of guidance material so operators are aware of their responsibilities; and b) regulatory procedures being in place to ensure a State meets its obligation under Annex 6 that RVSM approved aircraft are monitored systematically.
Conclusion 28/12 – Management of Non-RVSM Aircraft	That, due to the continuing problem of non-Reduced Vertical Separation Minimum (RVSM) aircraft operating inappropriately within the RVSM Stratum on a long-term basis: a) Asia/Pacific States should respond in a timely manner to Regional Monitoring Agency (RMA) recommendations; and b) Asia/Pacific States and Administrations should enact policies, legislation (including appropriate enforcement actions), and procedures to ensure such non-approved aircraft are identified and refused entry into the RVSM stratum unless specifically exempted, or they have Air Traffic Control (ATC) approval, and c) ICAO should survey Asia/Pacific States and Administrations to determine whether such policies, legislation and procedures to exclude non-RVSM aircraft have been implement; and d) RMAs should treat aircraft with an unverified RVSM approval status by its State of Approval for more than one month, starting from the first RMA notification, as a non-RVSM approved aircraft and that information provided to relevant State authorities for appropriate action; and e) RMAs should be empowered by APANPIRG to have direct communication with concerned ministries/authorities if required in the event of inadequate action by the State.

Conclusion 29/28 – Empowerment to adopt Conclusions and Decisions on purely technical/operational matters by APANPIRG's Sub Groups	That, the empowerment to APANPIRG Sub Groups to adopt Conclusions and Decisions on technical/operational matters has been working effectively and considering its benefit for effectiveness of APANPIRG work: 1) APANPIRG Subgroup should adopt Conclusions/Decisions related to: a) any amendment to TOR, including an extension of time of Working Group/Taskforce formed under relevant Subgroup; and b) all technical and operational aspects of Subgroup's work within its TOR. 2) APANPIRG Subgroup should formulate Draft Conclusions/ Draft Decisions and submit to APANPIRG for adoption: a) any amendment to TOR, including an extension of time of Working Group/Taskforce formed under TOR approved by the APANPIRG; b) APANPIRG Air Navigation Deficiencies[1]; and c) report on slow progress by States in implementation aspects. 3) ICAO Secretariat would indicate clearly in the report of the Sub-group meeting on how the cross Sub-group Conclusions/Decisions to be coordinated and endorsed; and 4) As per empowerment principle, APANPIRG Subgroups or Taskforce/Working Groups are empowered to make Conclusions/Decisions related to regional guidance material for publication in ICAO APAC website. [1] *Note: In case States provide satisfactory evidence to the APAC Office for the resolution of the deficiencies, the APAC Office in consultation with the Chair of respective Sub Group and subsequent approval from Chairman of APANPIRG may take action to remove the deficiency from APANPIRG open deficiency list.*

Conclusion 31/11 – Alphanumeric Call Sign Initiative	Noting: 1) the extreme safety risks associated with pilot-ATC miscommunication and the number of Category D (ATC Loop Error) Large Height Deviations (LHDs); 2) APANPIRG Conclusion 27/15. ATMSG Conclusions 5-5 and 5-6 regarding the Asia Pacific Alpha Numeric Call-Sign (ANCS) call sign project; and 3) alphanumeric call signs were a well-established call sign confusion mitigation, that: leading Air Navigation Service Providers (ANSPs) and aerodrome operators, in coordination with CANSO and ACI, were urged to consider a trial to identify and overcome any barriers for the implementation of alphanumeric call signs, with a view to developing a project for the Asia/Pacific (APAC) Region.
Conclusion 32/6 – RVSM Approvals Data and Filing of RVSM Indicator in Flight Plans of State Aircraft	That, States are urged to: 1. liaise with their State aircraft operators to not file ‘W’ in item 10 of the ICAO flight plan of aircraft that are not approved for RVSM; and 2. respond to a survey on RMA and State responsibility on the matter of RVSM approvals of State aircraft.

APPENDIX C – LHD/LLE/LLD TAXONOMY

Note: The LLE/LLD Taxonomy are not part of RVSM monitoring but are provided in this document for ease of reference. It is last revised by MAWG/13 in 2026 and presented in 2026 at RASMAG/31.

<table>
<tr><th>LHD Category Code</th><th>LHD Category Description</th></tr>
<tr><td>A</td><td>Flight crew failing to climb/descend the aircraft as cleared</td></tr>
<tr><td>B</td><td>Flight crew climbing/descending without ATC Clearance</td></tr>
<tr><td>C</td><td>Incorrect flight level provided due to incorrect operation or interpretation of airborne equipment
(e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance in FMS, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance etc.)</td></tr>
<tr><td>D</td><td>ATC system loop error
(e.g. ATC issues incorrect flight level clearance or flight crew misunderstands flight level clearance message.)</td></tr>
<tr><td>E</td><td>Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues
Sub-Category:
<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>E-NT</td><td>No Transfer or Negative Transfer</td></tr>
<tr><td>E-LT</td><td>Late Transfer</td></tr>
<tr><td>E-RI</td><td>No or Late Revision of Transfer Information</td></tr>
<tr><td>E-OT</td><td>Any Other Types</td></tr>
</table></td></tr>
<tr><td>F</td><td>Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues
(e.g. late or non-existent coordination of flight level)</td></tr>
<tr><td>G</td><td>Aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure)</td></tr>
<tr><td>H</td><td>Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors)</td></tr>
<tr><td>I</td><td>Turbulence or other weather-related causes leading to unintentional or undetected change of flight level</td></tr>
<tr><td>J</td><td>TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory</td></tr>
<tr><td>K</td><td>TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory</td></tr>
<tr><td>L</td><td>An aircraft being provided with RVSM separation is not RVSM approved
(e.g. flight plan indicating RVSM approval but aircraft not approved, ATC misinterpretation of flight plan)</td></tr>
<tr><td>M</td><td>Others</td></tr>
</table>

R	GNSS Radio Frequency Interference causes an aircraft deviation from the flight profile expected by the controller or the controller's loss of awareness of the actual position of the aircraft. Note: Jamming – The airborne equipment is unable to receive GNSS signals, leading to loss of aircraft navigation system and abnormal avionic system behavior. Spoofing – The airborne equipment receives counterfeit signals causing aircraft to compute incorrect position, navigation, and timing (PNT) and exhibit abnormal avionic system behavior.

LHD Taxonomy with Examples

LHD Category Code	LHD Category Description
A	Flight crew failing to climb/descend the aircraft as cleared Example: Aircraft A was at FL300 and assigned FL360. A CLAM alert was seen as the aircraft passed FL364. The Mode C level reached FL365 before descending back to FL360.
B	Flight crew climbing/descending without ATC Clearance
C	Incorrect flight level provided due to incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance in FMS, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance etc.) Example: The aircraft was maintaining a flight level below the assigned altitude. The altimeters had not been reset at transition. The FL assigned was 350. The aircraft was maintaining FL346 for an excess of 4 minutes.
D	ATC system loop error (e.g. ATC issues incorrect flight level clearance or flight crew misunderstands flight level clearance message.) Example: All communications between ATC and aircraft are by HF third party voice relay. Aircraft 1 was maintaining FL360 and requested FL380. A clearance to FL370 was issued, with an expectation for higher levels at a later point. A clearance was then issued to Aircraft 2 to climb to FL390, this was correctly read back by the HF operator, but was issued to Aircraft 1. The error was detected when Aircraft 1 reported maintaining FL390.

E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues E-NT: No Transfer or Negative Transfer Example: Sector A did not coordinate the transfer of control for Aircraft 1 to Sector B. Then, Aircraft 1 entered Sector B at FL400. After Aircraft 1 passed the Transfer of Control Point, the controller at Sector B detected and contacted Sector A for necessary transfer of information. E-LT: Late Transfer Example: At time 1455, Sector A coordinated with Sector B to pass the estimate of Aircraft 1, estimating the waypoint at 1500, 5 minutes prior to the waypoint where 50 NM longitudinal separation is applied. Note: Providing the estimate less than approximately 7 minutes before the waypoint can be used as criteria to be considered a late transfer, based on the applicable longitudinal separation of 50 NM and a commonly used safety assessment value of aircraft speed at 480 knots (8 NM / min). E-RI: No or Late Revision of Transfer Information Example: The Sector A controller received coordination on Aircraft 1 for Waypoint X at FL370 from Sector B. At 0504 Aircraft 1 was at Waypoint X at FL350 requesting FL370. E-OT: Any Other Type
F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues (e.g. late or non-existent coordination of flight level) Example: Controller in FIR A attempted to send an AIDC message to coordinate transfer of aircraft at FL320. Messaging was unsuccessful to contact adjacent FIR by telephone fail. Aircraft contacted adjacent FIR without coordination being completed.
G	Aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure) Example: Aircraft 1 descended from FL400 to FL300 with a pressurization issue.

H	Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors) Example: Aircraft 1 cruising at FL380. ATC receives alert indicating aircraft climbing through FL383. Flight crew advises attempting to regain cleared level with autopilot and navigation system failure.
I	Turbulence or other weather-related causes leading to unintentional or undetected change of flight level Example: During the cruise at FL400, the aircraft encountered severe turbulence, resulting in the aircraft descending 1,000 ft. without a clearance.
J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory Example: Aircraft 1 was cruising at FL350. Flight crew received "Traffic Alert" from TCAS and almost immediately after an "RA Climb" instruction. Flight crew responded and climbed Aircraft 1 to approx FL353 to comply with TCAS instruction. The TCAS display indicated that opposite direction Aircraft 2 descended to approx FL345 and passed below Aircraft 1.
K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RVSM approval but aircraft not approved, ATC misinterpretation of flight plan) Example 1: Original flight plan details submitted by FIR A for outbound leg showed Aircraft 1 as negative RVSM. Subsequent flight plan submitted by FIR B showed Aircraft 1 as RVSM approved. FIR A controller checked with aircraft shortly after entering FIR A and pilot confirmed negative RVSM. Example 2: Aircraft 2 cruising FL310 was handed off to the Sector X controller who noticed the label of Aircraft 2 indicated RVSM approval. The Sector X controller had controlled the aircraft the day before. It was then a non-RVSM aircraft. The controller queried the status of Aircraft 2 with the pilot who advised the aircraft was negative RVSM.
M	Others

R	GNSS Radio Frequency Interference causes an aircraft deviation from the flight profile expected by the controller or the controller's loss of awareness of the actual position of the aircraft. Example 1: Aircraft 1 experienced GNSS jamming/spoofing, causing the warnings from the Terrain Avoidance Warning System (TAWS) to be triggered. Flight crew responded to the warning and climbed Aircraft 1. Example 2: Aircraft 1 experienced GNSS jamming/spoofing, causing the ADS-B target to disappear from the controller's monitor. The controller was only made aware when contacted by the flight crew. Note: Jamming – The airborne equipment is unable to receive GNSS signals, leading to loss of aircraft navigation system and abnormal avionic system behavior. Spoofing – The airborne equipment receives counterfeit signals causing aircraft to compute incorrect position, navigation, and timing (PNT) and exhibit abnormal avionic system behavior.

APPENDIX D – LHD FAQS

General

Q: What is an LHD?

A: An RVSM Large Height Deviation (LHD) is defined as any vertical deviation of 300 feet (90 m.) or more from the flight level expected to be occupied by the flight. The deviation may be the result of any operational error or technical condition affecting the flight and includes any operational error that causes the aircraft to be at a location (position and/or time) that is unexpected by the controller.

In other words, an LHD occurs when a controller expects an aircraft to be at one location, but the aircraft is actually at another location.

Q: Why States are required to submit LHD report?

A: ICAO Doc9574 RVSM Implementation Manual (section 5.4) specifies that ATC authorities are responsible to report LHD for any reason to their responsible RMA for collision risk assessment.

Q: How does an LHD contribute to mid-air collision risk?

A: An aircraft occupies space unexpected by a controller. Not knowing that the space is occupied, the controller may clear another aircraft to that location, which may cause a mid-air collision.

Q: What is the benefit of LHD reporting while it may be perceived as additional workload by some units?

A: Reporting safety significant occurrences is a key process of a good safety management system since it enables an organization to have the necessary information to be able to manage the associated risk. LHDs are considered 'hazards' in the RVSM airspace as they could potentially lead to a catastrophic outcome - a mid-air collision. Do not fall into a trap where we get too comfortable with the risk just because nothing has not happened yet.

To report to the RMA or not

Q: Some states impose flow restrictions by issuing NOTAMs or AFTN service message. If the incoming traffic violates the flow restriction but complies with separation agreed in the LOA, should this incident be reported as an LHD?

A: No. This operational error may be reported internally, but does not need to be reported as an LHD to the RMA.

Q: A controller does not receive a transfer or the appropriate revision of the transfer of an aircraft from the transferring unit, but surveillance system enables the accepting controller to determine the location of the incoming aircraft well before the Transfer-of-Control (TOC) point, allowing the accepting controller to call the transferring controller back to confirm the aircraft's intent. Should this incident be reported?

A: Yes. Although such occurrences typically do not contribute to the quantitative estimate of risk, these occurrences should still be reported as LHDs to the responsible RMA. Even though the individual event has been mitigated, those errors were still made by the transferring ACC unit. With our online LHD reporting system, such an occurrence will be notified to the transferring ACC unit's POC. If such occurrences are not reported, then the transferring ACC unit would not have known about these transfer errors. States are strongly encouraged to collaborate with their neighbouring ACC to prevent such occurrences in the future.

Q: The transferred SSR code does not match the incoming traffic. The controller sees the incoming traffic, but cannot identify it. Should this be reported?

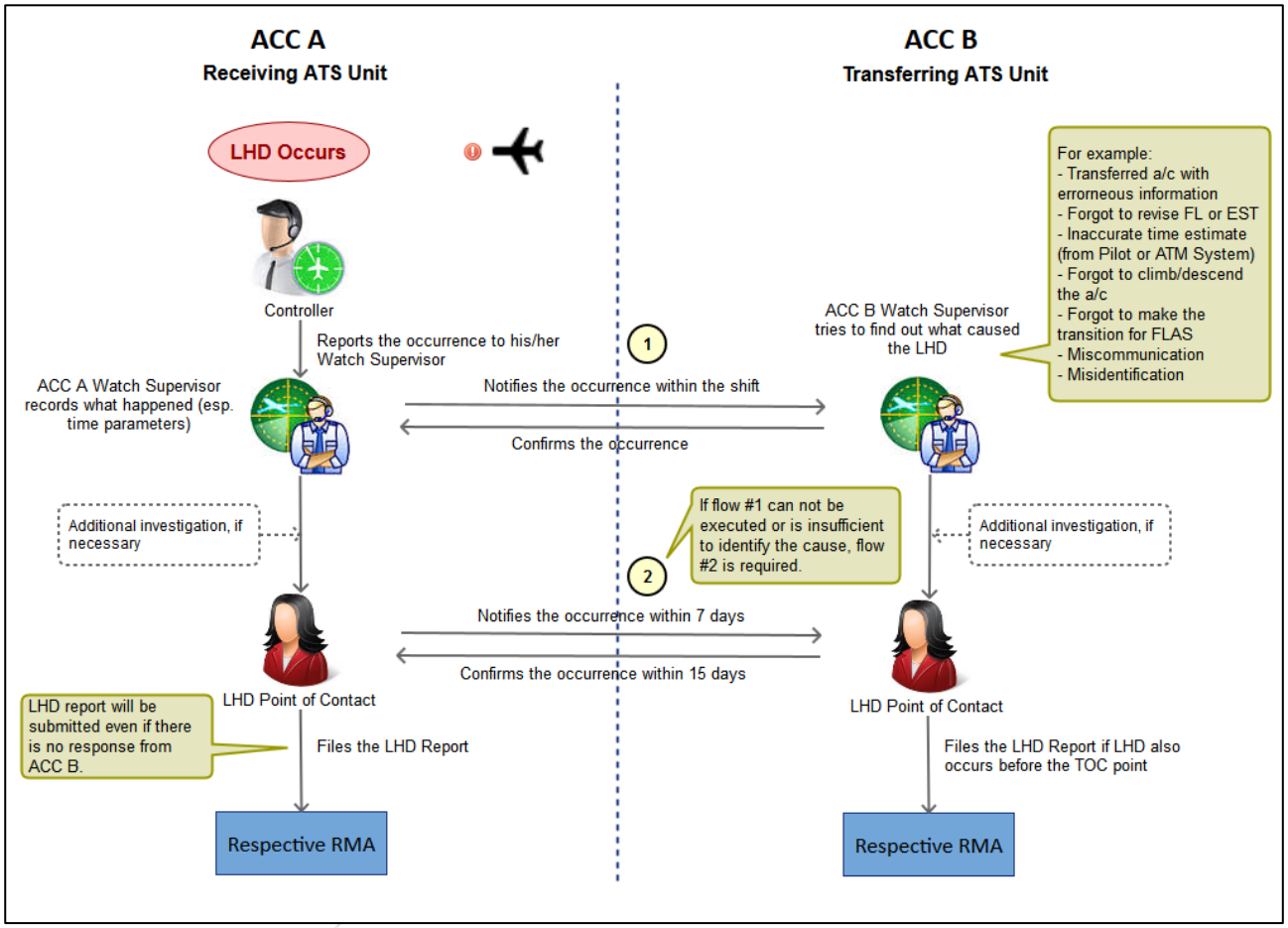
A: Yes. The RMA will analyse this type of occurrence case by case.

Q: The traffic doesn't arrive at the transferred time. The controller calls the transferring unit to get an updated transferred time. Should this occurrence be reported?

A: Yes, but it should be reported to your designated Enroute Monitoring Agency (EMA). If the time difference is big, such an occurrence would be an LHD; the EMA will relay the report to the RMA.

APPENDIX E – CROSS-BOUNDARY LHD COORDINATION PROCEDURE

Cross-boundary LHDs are mostly, but not limited to, Category E "coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues". Category E LHDs constitute about 90% of all LHD occurrences and usually most of the risk in RVSM. To ensure that there is coordination between the two involving ATS units to uncover the cause and prevent future occurrences, the following additional coordination procedure is recommended for every LHD occurrence that involves another ATS unit.



APPENDIX F – LHD ANALYSIS FORM (FORM A)

Due to the continuing prevalence of LHDs, States are encouraged to conduct further investigation and provide in-depth analyses of LHDs, especially those induced by their responsible ATS units. The purpose is not to apportion blame on any organizations but to understand the underlying root causes in order to develop safety mitigations to prevent reoccurrence. In case of significant occurrences (such as long duration LHDs), States are encouraged to provide an analysis for each occurrence. For other occurrences, States can provide analysis of a group of similar occurrences.

Instruction for completing Form A

1. **Fill Basic Information**: Provide your organization's name and the date of analysis.
2. **Describe the Occurrence**:
    - If it is a single occurrence, please provide occurrence date, call sign*, and location in the Description of Occurrence(s) Section.
    - If it is a group of occurrences, please summarize the common nature of occurrences in the Description of Occurrence(s) Section.
3. **Fill the Analysis Table**:
    - **Contributing factors/causes**: Describe all factors that led to the occurrence. If following the guidance, select the relevant categories from the drop-down list; otherwise, enter the actual contributing factors/causes.

      Remark: *Users may refer to the Guidance on the Human Factors Assessment, which serves as an assisting tool to identify the individual actions leading to an LHD. Consequently, users is able to select the appropriate contributing factors/causes in the analysis table.*

    - **Mitigations/controls/barriers**: Describe measures or improvements implemented to prevent, detect, or reduce the LHD.
4. **Submit the Form A**: Email the completed form to **maar@aerothai.co.th** or your responsible RMA.

LHD Analysis Form (Form A)

1. Organization:

2. Date of Analysis:

Description of Occurrence(s), please include the date, call sign, and location

Contributing Factors and Mitigations

-Contributing factors/causes: Please describe ***all*** factors leading to such occurrence(s)
-Mitigations/controls/barriers: Please describe any measure which could be used to prevent/detect LHD occurrence(s), or reduce their duration. Also, please describe existing barriers which could be improved.

Procedures/LOAs –which could be non-existent, inappropriate, not strictly adhered to, or needed review	
Contributing factors/causes	**Mitigations/controls/barriers**
Choose an item.	
Choose an item.	
Choose an item.	

Human Factor Issues –ex. fatigue, workload, competency, English proficiency, teamwork, situational awareness	
Contributing factors/causes	**Mitigations/controls/barriers**
Choose an item.	
Choose an item.	
Choose an item.	

Systems/Equipment –ex. equipment failures, unserviceability, usability, reliability, poor design	
Contributing factors/causes	**Mitigations/controls/barriers**
Choose an item.	
Choose an item.	
Choose an item.	

Other Factors – ex. training, staffing, clearly defined roles and responsibilities, workplace condition, weather	
Contributing factors/causes	**Mitigations/controls/barriers**
Choose an item.	
Choose an item.	
Choose an item.	

*This information is used for reference by the RMA only. Sensitive information will later be de-identified. If you plan to present this form directly to RASMAG and other meeting, you can omit callsign.

Guidance on the Human Factors Assessment

This section aims to support the identification of contributing factors in Form A by using the Human Factors Assessment Questionnaire (HFAQ) as guidance. The HFAQ is primarily based on James Reason's theoretical framework on human error and safety management. It is further supported by the Human Factors Analysis and Classification System (HFACS), developed by Douglas A. Wiegmann and Scott A. Shappell. It can assist States and ATS providers to identify the individual's action or inaction that leads to an LHD and clarify the scope of the errors and their causes.

Note: Even though the identification of the individual action is **optional** and not needed to complete Form A, it can help the organization understand each individual variability.

Individual Actions

Please select at least one category below (Slip, Lapse, or Mistake) and select at least one subcategory. If none apply, select "Other" and provide details.

☐ Slip: Observable actions related to attention or perception issues.

- ☐ Interference: planned action was interfered with by an unintended or irrelevant action
- ☐ Mistiming: timing an action incorrectly
- ☐ Capture: performing a more common/familiar action rather than the intended action
- ☐ Perception: perceiving or not perceiving accurately
- ☐ Misordering: performing an action out of sequence
- ☐ Reversal: performing the opposite action rather than intended action

☐ Lapse – Internal, un-observable events related to memory.

- ☐ Omissions: forgetting to perform or complete action
- ☐ Repetitions: performing action again because one is not sure if it was done
- ☐ Reduced Intentionality: performing action without really meaning to

☐ Mistake: Incorrect plan despite having the right intention. Failure in judgment or decision-making at the planning stage.

- ☐ Rule-Based Mistakes: misapplication of procedures or incorrect situation diagnosis
- ☐ Knowledge-Based Mistakes: lack of knowledge to solve a novel problem

☐ Other …….

Once the individual action (slip, lapse, or mistake) and the associated subcategory have been identified, please proceed to Form A to select or determine the relevant contributing factors that influenced these individual actions.

The contributing factors in Form A are organized into four main categories: Procedures/LOAs, Human Factor Issues, Systems/Equipment, and Other Factors. The identification of these contributing factors is crucial for understanding the underlying causes of errors and for developing effective mitigation strategies. The contributing factors given as guidance in Form A are listed below for references.

Contributing Factors

Procedures/LOAs

- Non-existent procedures/LOAs
- Unclear, inappropriate, or outdated procedures/LOAs

Human Factor Issues

- Mental factors such as haste, fixation, distraction, fatigue, drowsiness, etc.
- Physiological factors such as dehydration, sickness, physical fatigue, etc.
- Limited proficiency qualifications or experience to safely perform the required tasks
- Poor communication, coordination, or teamwork among staff

Systems/Equipment

- Unavailable necessary systems/equipment
- Defective or unserviceable systems/equipment
- Poorly designed systems/equipment

Other Factors

- Inadequate or ineffective training
- Inadequate supervision or mentoring
- Failure of supervisor to correct problems with equipment, known safety hazard, or violated Standard Operating Procedures
- Inadequate staff levels or planning
- Poorly defined roles, responsibilities, or tasks
- Poor physical work conditions (e.g., noise, lighting, clutter, weather)
- Organizational issues: lack of resources, unclear policies, or poor communication from leadership

APPENDIX G – LHD PREVENTATIVE/MITIGATION MEASURES FORM (FORM B)

Due to the continuing prevalence of LHDs, States are urged to provide a list of measures planned or taken to minimize LHDs (including detection of LHD occurrences and actions taken to reduce LHD duration). Please list all actions planned or taken by your organization, including comments on their effectiveness.

1. Organization:

2. Date of analysis:

3. Hotspot/Area (example: eastern boundary of FIR A):

4. Please provide detailed description of the followings:

No.	Preventive/mitigation measures planned/taken	Target/actual effective date	Progresses/difficulties	Comments on effectiveness of mitigations
1				
2				
3				
4				
5				
6				

5. Is there anything the RMA/RASMAG/ICAO can assist with related to LHDs?

ASIA/PACIFIC FLIGHT INFORMATION REGIONS AND RESPONSIBLE MONITORING AGENCY

RASMAG-endorsed Asia/Pacific EMAs and RMAs

Monitoring Agency	Endorsed to provide EMA and/or RMA services
Australian Airspace Monitoring Agency (AAMA)	EMA, RMA
Bay of Bengal Arabian Sea Indian Ocean Safety Monitoring Agency (BOBASMA)	EMA
China Regional Monitoring Agency (China RMA)	EMA, RMA
Japan Airspace Safety Monitoring Agency (JASMA)	EMA, RMA
Monitoring Agency for the Asia Region (MAAR)	RMA
Pacific Approvals Registry and Monitoring Organization (PARMO)	EMA, RMA
South East Asia Safety Monitoring Agency (SEASMA)	EMA

Asia/Pacific Flight Information Regions and Responsible Monitoring Agency

FIR/UIR Location Indicator	RVSM Oversight Responsibility (RMA)	Horizontal Plane Oversight Responsibility (EMA)
Anchorage Oceanic (~~PZAN~~ PAZA)	PARMO	PARMO
Auckland Oceanic (NZZO)	PARMO	PARMO
Bangkok (VTBB)	MAAR	N/A
Beijing (ZBPE)	China RMA	N/A
Brisbane FIR (YBBB)	AAMA	AAMA
Chennai (VOMF)	MAAR	BOBASMA
Colombo (VCCF)	MAAR	BOBASMA
Delhi (VIDF)	MAAR	BOBASMA
Dhaka (VGFR)	MAAR	BOBASMA
Fukuoka (RJJJ)	JASMA	JASMA
Guangzhou (ZGZU)	China RMA	N/A
Hanoi (~~VVVV~~ VVHN)	MAAR	N/A
Ho Chi Minh (~~VVTS~~ VVHM)	MAAR	SEASMA
Hong Kong (VHHK)	~~MAAR~~ China RMA	SEASMA
Honiara (AGGG)	AAMA	N/A

FIR/UIR Location Indicator	**RVSM Oversight Responsibility (RMA)**	**Horizontal Plane Oversight Responsibility (EMA)**
Incheon (RKRR)	PARMO	N/A
Jakarta (WIIF)	AAMA	SEASMA
Kabul (OAKX)	MAAR	BOBASMA
Karachi (OPKR)	MAAR	BOBASMA
Kathmandu (VNSM)	MAAR	BOBASMA
Kolkata (VECF)	MAAR	BOBASMA
Kota Kinabalu (WBFC)	MAAR	SEASMA
Kuala Lumpur (WMFC)	MAAR	SEASMA
Kunming (ZPKM)	China RMA	N/A
Lahore (OPLR)	MAAR	BOBASMA
Lanzhou (ZLHW)	China RMA	China RMA
Male (VRMF)	MAAR	BOBASMA
Manila (RPHI)	MAAR	SEASMA
Melbourne (YMMM)	AAMA	AAMA
Mumbai (VABF)	MAAR	BOBASMA
Nadi (NFFF)	PARMO	PARMO
Nauru (ANAU)	AAMA	N/A
New Zealand (NZZC) (Christchurch FIR)	PARMO	PARMO
Oakland Oceanic (KZAK)	PARMO	PARMO
Phnom Penh (~~VDPP~~ VDPF)	MAAR	N/A
Port Moresby (AYPM)	AAMA	N/A
Pyongyang (ZKKP)	China RMA	N/A
Sanya (ZJSA)	China RMA	SEASMA
Shanghai (ZSHA)	China RMA	N/A
Shenyang (ZYSH)	China RMA	N/A
Singapore (WSJC)	MAAR	SEASMA
Tahiti	PARMO	PARMO
Taibei	MAAR	N/A
Ujung Pandang (WAAF)	AAMA	SEASMA
Ulaanbaatar (ZMUB)	MAAR	N/A
Urumqi (ZWUQ)	China RMA	China RMA
Vientiane (VLAO)	MAAR	N/A
Wuhan (ZHWH)	China RMA	N/A
Yangon (VYYY)	MAAR	BOBASMA

RASMAG LIST OF COMPETENT AIRSPACE SAFETY MONITORING ORGANIZATIONS

The Regional Airspace Safety Monitoring Advisory Group (RASMAG) of APANPIRG is required by its terms of reference to recommend and facilitate the implementation of airspace safety monitoring and performance assessment services, and to review and recommend on the competency and compatibility of airspace monitoring organizations. In order to assist in addressing these requirements, RASMAG updates and distributes the following list of competent airspace safety monitoring organizations for use by States requiring airspace safety monitoring services. In the context of the list, abbreviations have meanings as follows:

- RMA – Regional Monitoring Agency – safety assessment and monitoring in the vertical plane (i.e. RVSM);
- EMA – En-route Monitoring Agency – safety assessment and monitoring in the horizontal plane (i.e. RSP, RCP, RNP for performance-based horizontal separations);
- CRA – Central Reporting Agency – technical performance of data link systems (i.e. ADS/CPDLC); and
- FIT – FANS 1/A Interoperability/Implementation Team – parent body to a CRA.

DISCLAIMER: The presentation of material in this report does not imply the expression of any opinion whatsoever on the part of ICAO, Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) or RASMAG concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

(Last updated 02 July 2026)

Organization *(including contact officer)*	State	Competency	Status	Airspace Assessed (FIRs)
Australian Airspace Monitoring Agency (AAMA) - Airservices https://www.airservicesaustralia.com/about-us/our-services/aama/ Dr. Steven Barry Risk Intelligence Lead Email: steve.barry@AirservicesAustralia.com; Dr. Shea Houlihan Risk Intelligence Specialist Email: Shea.Houlihan@AirservicesAustralia.com; Risk Intelligence, Airservices Australia Email: aama@airservicesaustralia.com;	Australia	RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby, and Ujung Pandang (including Timor-Leste) FIRs
		EMA	Current	Brisbane, Melbourne, Honiara, Nauru, and Port Moresby FIRs
China RMA - **Air Traffic Management Bureau (ATMB) of Civil Aviation Administration of China (CAAC)** http://www.chinarma.cn Mr. Yongyue Chen (Monsoon) Coordinator of China RMA, ADCC, ATMB of CAAC Email: rmachina@rmachina.cn;	China	RMA and EMA	Current	RMA for: Beijing, Guangzhou, Kunming, Lanzhou, Pyongyang, Sanya, Shanghai, Shenyang, Urumqi, and Wuhan FIRs EMA for: Lanzhou and Urumqi FIRs

Organization *(including contact officer)*	State	Competency	Status	Airspace Assessed (FIRs)
~~**India Bay of Bengal Arabian Sea Indian Ocean Safety Monitoring Agency (BOBASMA)**~~ ~~http://www.aai.aero/public_notices/aaisite_test/bobasma_index.jsp~~ ~~Mr. J. Masivayana~~ ~~Assistant General Manager (ATM), Airports Authority of India~~ ~~Phone No: + 91 44 22561253~~ ~~Fax No: +91 44 22561740~~ ~~Email: bobasmachennai@gmail.com; bobasma@aai.aero;~~ **India Bay of Bengal Arabian Sea Indian Ocean Safety Monitoring Agency (BOBASMA)** http://www.aai.aero/public_notices/aaisite_test/bobasma_index.jsp Mr. J. Masivayana Deputy General Manager (ATM), Airports Authority of India Phone No: + 91 44 22561253 Fax No: +91 44 22561740 Email: bobasmachennai@gmail.com; bobasma@aai.aero;	India	EMA	Current	Chennai, Colombo, Delhi, Dhaka, Kabul, Karachi, Kolkata, Lahore, Male, Mumbai, and Yangon FIRs
Japan Airspace Safety Monitoring Agency (JASMA) – Japan Civil Aviation Bureau (JCAB) https://www.jasma.jp Mr. Kazuto Fukuda Email: fukuda-k46s4@mlit.go.jp; Central Reporting Agency Japan (CRA Japan)	Japan	RMA and EMA CRA	Current Current	Fukuoka FIR Fukuoka FIR

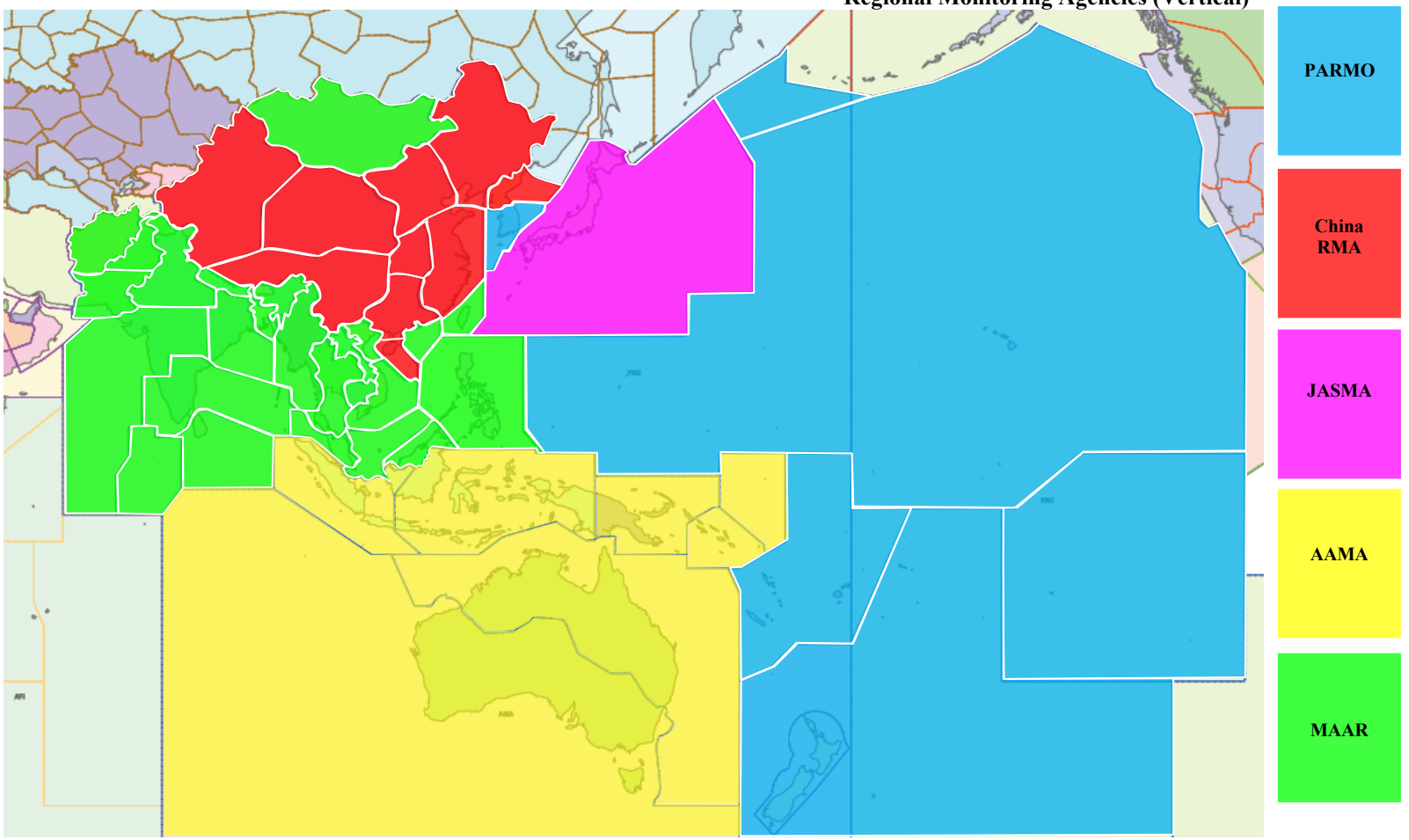
Organization *(including contact officer)*	State	Competency	Status	Airspace Assessed (FIRs)
Mr. Motochika Ichikawa Email: ichikawa-m03c3@mlit.go.jp;				
Monitoring Agency for the Asia Region (MAAR) – Aeronautical Radio of Thailand LTD (AEROTHAI) http://www.aerothai.co.th/maar Ms. Saifon Obromsook Director, Safety Management Department & MAAR AEROTHAI Email: maar@aerothai.co.th;	Thailand	RMA	Current	Bangkok, Kolkata, Chennai, Colombo, Delhi, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, Kabul, Karachi, Kathmandu, Kota Kinabalu, Kuala Lumpur, Lahore, Male, Manila, Mumbai, Phnom Penh, Singapore, Taibei, Ulaan Bataar, Vientiane, and Yangon FIRs
Pacific Approvals Registry and Monitoring Organization (PARMO) – Federal Aviation Administration (US FAA) http://www.faa.gov/air_traffic/separation_standards/parmo/ Ms. Christine Falk Manager, Separation Standards & Analysis Branch Federal Aviation Administration WJH Technical Center for Advanced Aerospace PARMO Email: parmo@faa.gov;	USA	RMA and EMA	Current	RMA for: Anchorage Oceanic, Auckland Oceanic, Incheon, Nadi, Oakland Oceanic, and Tahiti FIRs EMA for: Anchorage Oceanic, Auckland Oceanic, Nadi, Oakland Oceanic, and Tahiti FIRs
South East Asia Safety Monitoring Agency (SEASMA) - Civil Aviation Authority of Singapore (CAAS)	Singapore	EMA and CRA	Current	EMA for: Hong Kong, Ho Chi Minh, Kota Kinabalu, Kuala

Organization *(including contact officer)*	State	Competency	Status	Airspace Assessed (FIRs)
https://www.caas.gov.sg/operations-safety/airspace/south-east-asia-safety-monitoring-agency ~~Mr. Tai Chee Hui~~ ~~Senior Air Traffic Control Manager (Safety Intelligence)~~ ~~Email: TAI_Chee_Hui@caas.gov.sg;~~ Dr. Chan Teck Kai Lead Data Scientist Air Navigation Services Safety Division Email : chan_teck_kai@caas.gov.sg;				Lumpur, Manila, Jakarta, Sanya, Singapore, and Ujung Pandang FIRs CRA for: Singapore, Viet Nam and Philippines
FIT-ASIA ICAO Asia and Pacific Regional Office Email: apac@icao.int; htakata@icao.int; Mr. Hong Yang Chair, FIT-Asia Email: hongyang@adcc.com.cn; Mr. Michael Matyas Boeing Engineering Email: michael.matyas@boeing.com; Mr. Rami Ayari Boeing Engineering Email: rami.ayari@boeing.com;	FIT-Asia States Boeing USA	FIT CRA	Current Current	FIRs in the Asian Region not covered by IPACG/FIT and ISPACG/FIT FIRs in the Asian Region not covered by IPACG/FIT, ISPACG/FIT, JASMA or SEASMA

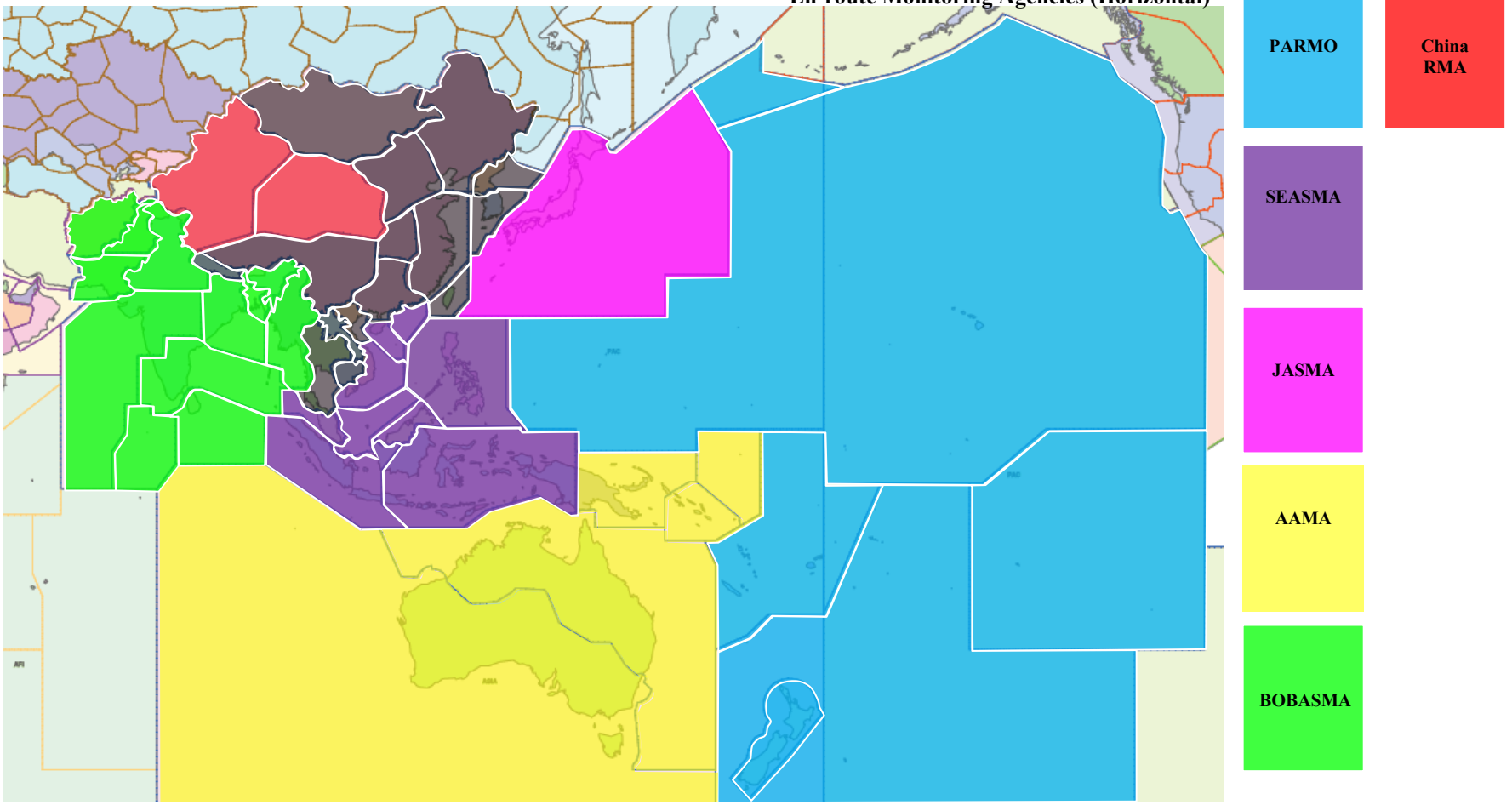
Organization *(including contact officer)*	State	Competency	Status	Airspace Assessed (FIRs)
IPACG/FIT Mr. Motochika Ichikawa IPACG/FIT Co-Chair (JCAB) Email: ichikawa-m03c3@mlit.go.jp; Mr. Sam El Zoobi FAA ISPACG Co-Chair Email: Sam.El-Zoobi@faa.gov; Mr. Michael Matyas Boeing Engineering IPACG CRA Email: michael.matyas@boeing.com; Mr. Noah Inahara Boeing Engineering IPACG CRA Email: noah.inahara@boeing.com;	Japan and USA Boeing USA	FIT CRA	Current	North & Central Pacific (Oceanic airspace within Fukuoka FIR, and Anchorage & Oakland FIRs) Oakland Oceanic, Anchorage Continental, and Anchorage Oceanic FIRs
ISPACG/FIT ~~Mr. Todd Kendall~~ ~~Airways New Zealand~~ ~~ISPACG Co-Chair~~ ~~Email: Todd.Kendall@airways.co.nz;~~ Mr. Yuri van den Bongard	ISPACG States	FIT and CRA	Current	South Pacific FIRs and members of the Informal South Pacific ATS Coordination Group (ISPACG)

Organization *(including contact officer)*	State	Competency	Status	Airspace Assessed (FIRs)
Airways New Zealand Email: yuri.vandenbongard@airways.co.nz; Mr. Sam El Zoobi FAA ISPACG Co-Chair Email: Sam.El-Zoobi@faa.gov; Ms. Lisa Bee Inmarsat Aviation ISPACG/FIT Chair Email: Lisa.Bee@inmarsat.com; Mr. Michael Matyas Boeing Engineering ISPACG CRA Email: michael.matyas@boeing.com; Mr. Christopher Jirucha Boeing Engineering ISPACG CRA Email: christopher.j.jirucha@boeing.com;	Inmarsat Boeing USA	FIT CRA		

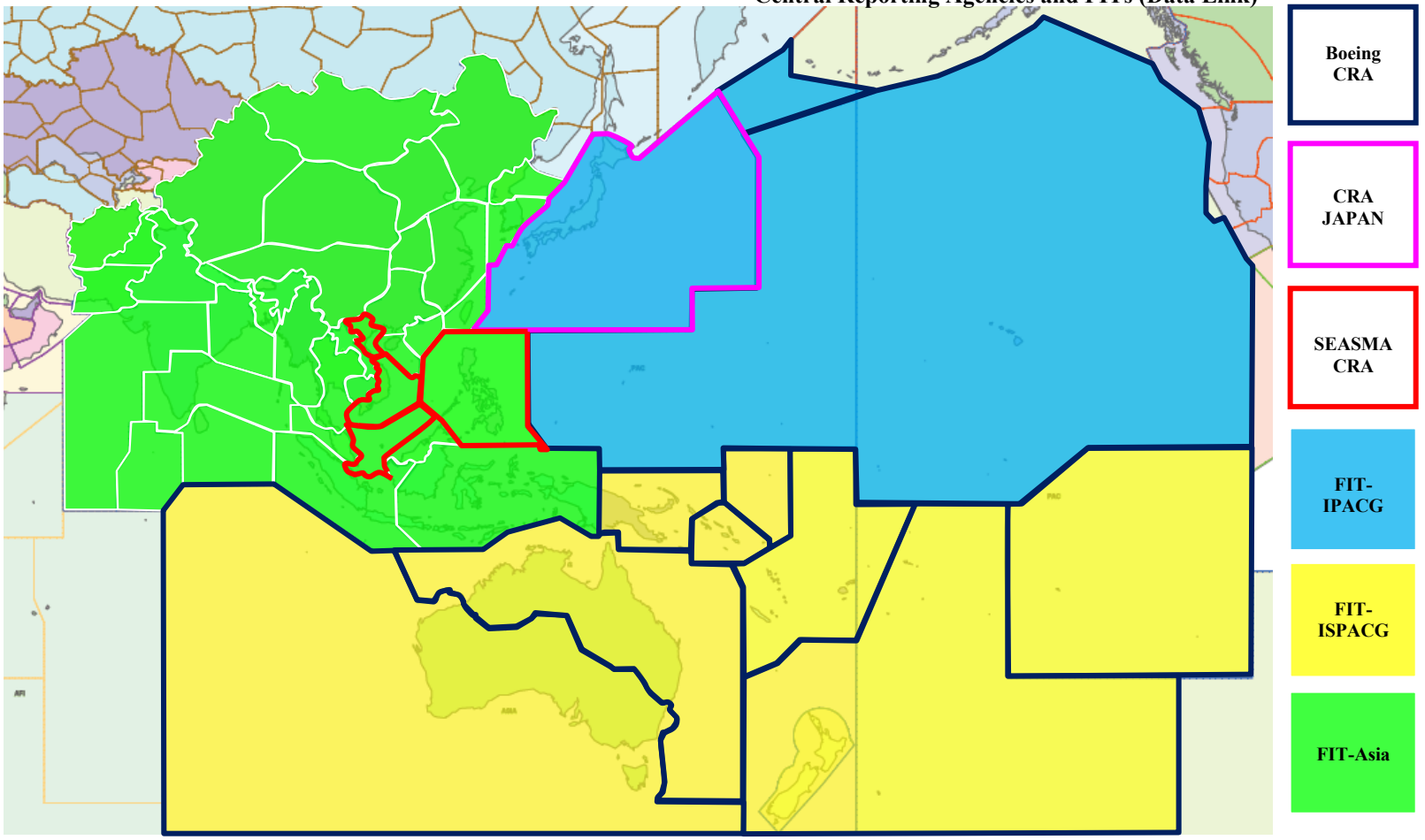
Regional Monitoring Agencies (Vertical)



En-route Monitoring Agencies (Horizontal)



Central Reporting Agencies and FITs (Data Link)



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APANPIRG ATM AND AIRSPACE SAFETY DEFICIENCIES LIST

(Updated 21 October 2025 + RASMAG/31)

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
	Non Provision of Safety-related Data Requirement of Paragraph 3.3.5.1 of Annex 11 (provision of data for monitoring the height-keeping performance of aircraft) and APANPIRG Conclusion 16/6 – Non Provision of safety related data by States					
Afghanistan	Non-provision of safety related data	12/07/2019	Failure to submit Kabul LHD data for January-December 2018 and 2020. Afghanistan had submitted data for the period January to July 2021, but no further LHD reports were received after August 2021.	Afghanistan	TBD	U
Myanmar	Non-provision of safety related data	RASMAG/31	Failure to submit Yangon LHD data for January–December 2025.	Myanmar	TBD	U
	State Responsibility to comply with the Annex 6 Height-Keeping Monitoring Requirement Annex 6 Part I Section 7.2.9 (10th Ed.) and Part II Section 2.5.2.10 (9th Ed.)					
Afghanistan	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/23	Remaining monitoring burden of 50% (RASMAG/29) MAAR informed ICAO that all known airframes in Afghanistan have complied with the monitoring requirement (November 2022).	Afghanistan	TBD	A

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
			Deficiency retained due to the unknown status of the Afghanistan aeronautical authority responsible for ensuring monitoring is conducted.			
Cook Islands	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/31	Remaining monitoring burden of 100% (RASMAG/31)	Cook Islands	TBD	A
India	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/29	~~Remaining monitoring burden of 46% (RASMAG/30)~~ Remaining monitoring burden of 48% (RASMAG/31)	India	TBD	A
~~Nepal~~	~~Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)~~	~~RASMAG/28~~	~~Remaining monitoring burden of 45% (RASMAG/30)~~ Remaining monitoring burden of 11% (RASMAG/31)	~~Nepal~~	~~TBD~~	~~A~~
Pakistan	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/31	Remaining monitoring burden of 32% (RASMAG/31)	Pakistan	TBD	A
Vanuatu	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/31	Remaining monitoring burden of 100% (RASMAG/31)	Vanuatu	TBD	A

** Note: In accordance with the *APANPIRG Handbook - Asia/Pacific Supplement to the Uniform Methodology for the Identification, Assessment and Reporting of Air Navigation Deficiencies*, priority for Air Navigation Deficiencies is guided by the principle that a deficiency with respect to an ICAO Standard is accorded a "U" status, while a non-compliance with a Recommended Practice or a PANS is considered as "A" or "B" subject to additional expert evaluation. The final prioritization of deficiencies is the prerogative of APANPIRG.

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~~**REGIONAL AIRSPACE SAFETY MONITORING ADVISORY GROUP (RASMAG)**~~
~~TERMS OF REFERENCE OF THE RASMAG~~

Terms of Reference of Regional Airspace Safety Monitoring Advisory Group (RASMAG)

The objectives of the Group are to:

a) facilitate the safe implementation of reduced separation minima and CNS/ATM applications within the Asia and Pacific (APAC) region in regard to airspace safety monitoring; and

b) assist States to achieve the established levels of airspace safety for international airspace within the ~~Asia and Pacific~~ APAC region.

To meet these objectives the Group shall:

a) review airspace safety performance in the ~~Asia and Pacific~~ APAC region at the regional level and within international airspace;

b) review and develop as necessary, guidance material for airspace safety monitoring, assessment and reporting activities, including the duties, responsibilities and scope of regional monitoring entities;

c) recommend, and facilitate as necessary, the implementation of airspace safety monitoring and performance assessment services;

d) review and recommend on the competency and compatibility of monitoring organizations and recommend to APANPIRG specific airspace responsibility for individual regional monitoring entities;

e) review, coordinate and harmonize regional and inter-regional airspace safety monitoring activities;

f) review regional and global airspace planning and developments in order to anticipate requirements for airspace safety monitoring and assessment activities;

g) address other airspace safety related issues as necessary;

h) facilitate the distribution of safety-related information to States; ~~and~~

i) identify air navigation deficiencies in the field of airspace safety and ensure States develop and implement appropriate corrective action plans to resolve those deficiencies;

j) review and update the air navigation deficiencies in the field of airspace safety (as listed in the APANPIRG database) to reflect the current situation; and

k) provide to APANPIRG comprehensive reports on regional airspace safety and coordinate with other contributory bodies of APANPIRG as appropriate.

TASK LIST

To review the safety monitoring programmes in the ~~Asia and Pacific~~ APAC region for implementation and operation of:

a) reduced vertical separation minimum (RVSM);

b) reduced horizontal (lateral and longitudinal) separation minima using PBN;

c) aircraft separation applications using data link, e.g. ADS and CPDLC; and

d) ATS unit to ATS unit operational messaging using AIDC.

(Last updated ~~APANPIRG/18, September 2007~~ APANPIRG/37, November 2026)

RASMAG — TASK LIST

(Last amended RASMAG/31, 3 July 2026)

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
28/3	Review the data sharing procedure of additional data to support non-compliance reports	~~FIT-Asia/16~~ FIT-Asia/17	China RMA	Open	RASMAG/28 report para 4.7.
29/1	Discuss a process of identification and de-identification of reports meant for sharing with stakeholders other than monitoring agencies	~~MAWG/13~~ MAWG/14	Monitoring Agencies	Open	RASMAG/29 report. MAWG/12 WP/04. RASMAG/31 WP/20.
29/3	States to complete annual PBCS implementation Survey	Ongoing	All States	Open	Tracked as part of Annual PBCS implementation Survey to ICAO.
30/1	Utilise the revised Category E sub-categories and hot spot identification method for future risk assessments	RASMAG/31	AAMA	~~Open~~ Completed	RASMAG/30 report para 3.14. RASMAG/31 WP/04 and WP/05.
30/2	Include additional description of LHD occurrences involving flight crew for the benefit of international organizations representing airspace users. This action should be undertaken in parallel with Action Item 29/1	~~RASMAG/31~~ MAWG/14	Monitoring Agencies	Open	RASMAG/30 report para 3.82.
30/3	Provide comments for the draft RASMAG Safety Bulletin to the Chair and Secretariat prior to the publication on the ICAO eDocuments webpage	30 September 2025	All	~~Open~~ Completed	RASMAG/30 report para 4.3. RASMAG/31 report para 2.26.
30/4	Provide comments for the HFAQ and Form A to MAAR and SEASMA by end of 2025 for further discussion in the MAWG meeting next year	31 December 2025	All	~~Open~~ Completed	RASMAG/30 report para 4.10. RASMAG/31 report para 4.8.

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
30/5	Promote awareness of GNSS RFI reporting so that their effects on safety risk are assessed for possible identification of prevention and mitigation measures	~~RASMAG/31~~ RASMAG/32	States/Administrations	Open	RASMAG/30 report para 5.5. RMAs to promote the updated version of the *Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace* and highlight the need for GNSS RFI reporting.
30/6	Develop a formal process to maintain a consolidated non-RVSM approved list for sharing with States/Administrations	~~MAWG/13~~ MAWG/14	Monitoring Agencies	Open	RASMAG/30 report para 5.31. RASMAG/31 WP/20.
30/7	Consider organizing a workshop in conjunction with RASMAG/31	RASMAG/31	ICAO and Chair	~~Open~~ Completed	RASMAG/30 report para 7.2. Airspace Safety Seminar conducted on 29 June 2026.
31/1	Review and define the various terminologies used in RASMAG meetings, including “non-approved RVSM operations,” “non-RVSM approved aircraft,” and “RVSM approval status pending verification. This review should be undertaken in parallel with Action Item 30/6	MAWG/14	Monitoring Agencies (Lead: MAAR)	Open	RASMAG/31 report para 2.29.
31/2	Review RMAs responsibilities related to PBCS authorization verification and to consider removing these tasks from their TORs	MAWG/14	Monitoring Agencies (Lead: PARMO)	Open	RASMAG/31 report para 2.31.
31/3	Provide update on AIDC implementation at Mumbai ACC	RASMAG/32	India	Open	RASMAG/31 report para 3.50.
31/4	Provide outcomes of coordination meeting to explore collaborative improvement initiatives to prevent LHD occurrences at Hot Spot O	RASMAG/32	Malaysia, Singapore and Thailand	Open	RASMAG/31 report para 3.105.

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
31/5	Promote the use of revised version of the LHD Analysis Form (Form A)	RASMAG/32	States/Administrations	Open	RASMAG/31 report para 4.8. RMAs to promote the updated version of the *Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace* and highlight the revised version of the LHD Analysis Form (Form A)
31/6	To ensure submission of annual RVSM approval snapshot. Failure in submission may be considered for inclusion in the APANPIRG Air Navigation Deficiencies List	RASMAG/32	States/Administrations	Open	RASMAG/31 report para 5.33.

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