



International Civil Aviation Organization

ICAO **Fourteenth Meeting of the Air Traffic Management Sub-Group (ATM/SG/14) of APANPIRG**

Bangkok, Thailand, 3 – 7 August 2026

Agenda Item 2: Review of Related High Level Meetings

OUTCOMES FROM FIT-ASIA/16 AND RASMAG/31

(Presented by the Secretariat)

SUMMARY

This paper presents outcomes relevant to the ATM/SG from the Future Air Navigation Services (FANS) Interoperability Team – Asia (FIT-Asia) and the Regional Airspace Safety Monitoring Advisory Group (RASMAG).

1. INTRODUCTION

1.1 The Sixteenth Meeting of the FANS Interoperability Team-Asia (FIT-Asia/16) and the Thirty-First Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/31) were held in Bangkok, Thailand, from 9 to 11 June 2026 and 29 June to 3 July 2026, respectively.

1.2 RASMAG is a Sub-Group of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG), and the FIT-Asia reports to RASMAG.

1.3 Meeting documentation and the final reports of FIT-Asia/16 and RASMAG/31 can be found at:

- a) [FIT-Asia/16 Report](#)
- b) [RASMAG/31 Report](#)

2. DISCUSSION

Outcomes from FIT-Asia/16

Asia/Pacific Region Combined PBCS Monitoring Report

2.1 Indonesia and Malaysia presented the aggregated data link performance monitoring report for the Asia and Pacific (APAC) region. **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	No. Messages	Criteria		No. Messages	Criteria	
		95%	99.90%		95%	99.90%
		% <= 90sec	% <= 180sec		% <= 90sec	% <= 180sec
Aggregate All RGS						
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%

2.2 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 2. 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%
		% <= 180sec	% <= 210sec	% <= 120sec	% <= 150sec		% <= 180sec	% <= 210sec	% <= 120sec	% <=150sec
Aggregate All RGS										
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%

Regional PBCS Implementation Update

2.3 FIT-Asia/16 noted that only 20 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.

Air Navigation Deficiencies Relating to Data Link Performance Monitoring and Analysis

2.4 FIT-Asia/16 participants noted that formal service agreement with APANPIRG-recognized Central Reporting Agencies (CRAs) were an essential component of PBCS implementation, enabling States to submit Problem Reports (PRs) and obtain technical support for performance investigations. In response to an enquiry regarding the establishment of a national CRA, ICAO advised that the recognition of a new CRA would require further study and demonstration of technical capability through the appropriate ICAO processes. States/Administrations were encouraged to continue their coordination with the Boeing CRA 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

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

Outcomes from RASMAG/31

APAC Consolidated Safety Report

2.6 The Monitoring Agency for the Asian Region (MAAR) presented a combined summary of the safety analysis results for the APAC region, on behalf of the APAC Regional Monitoring Agencies (RMAs) and En-route Monitoring Agencies (EMAs). The report was divided into Asia area and Pacific (PAC) area (**Figure 1**). The complete 2025 APAC Consolidated Safety Report can be found in **Appendix A**.

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

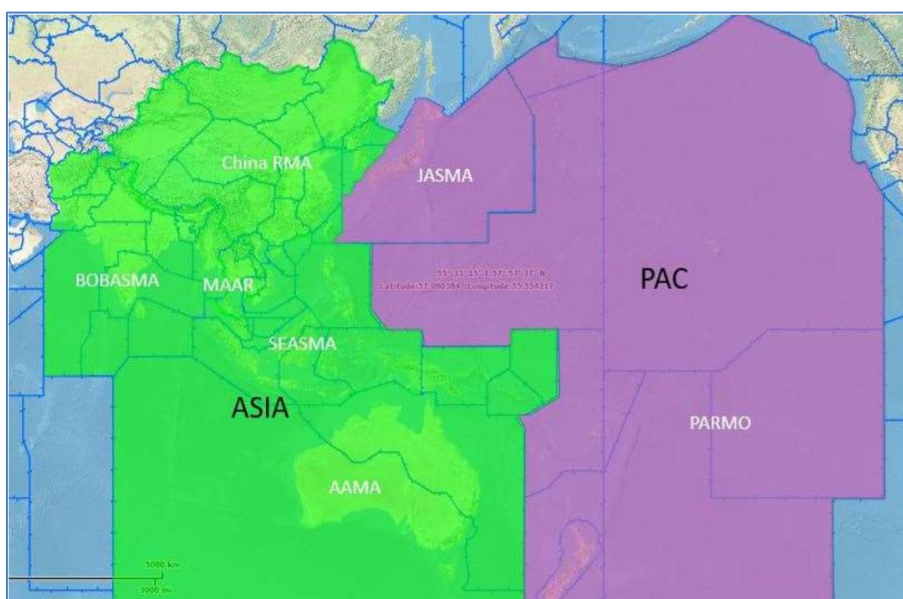


Figure 1. Asia and PAC Safety Reporting Areas

PAC Area Vertical Collision Risk

2.7 The estimated vertical collision risk for 2025 for the PAC area did not meet Target Level of Safety (TLS) (**Table 3**).

Table 3. PAC Area Vertical Collision Risk 2025

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

2.8 The PAC vertical collision risk estimates had been above TLS and trended upwards each year from 2016 to 2019. In 2025, there was a decrease when compared to 2024 (**Figure 2**).

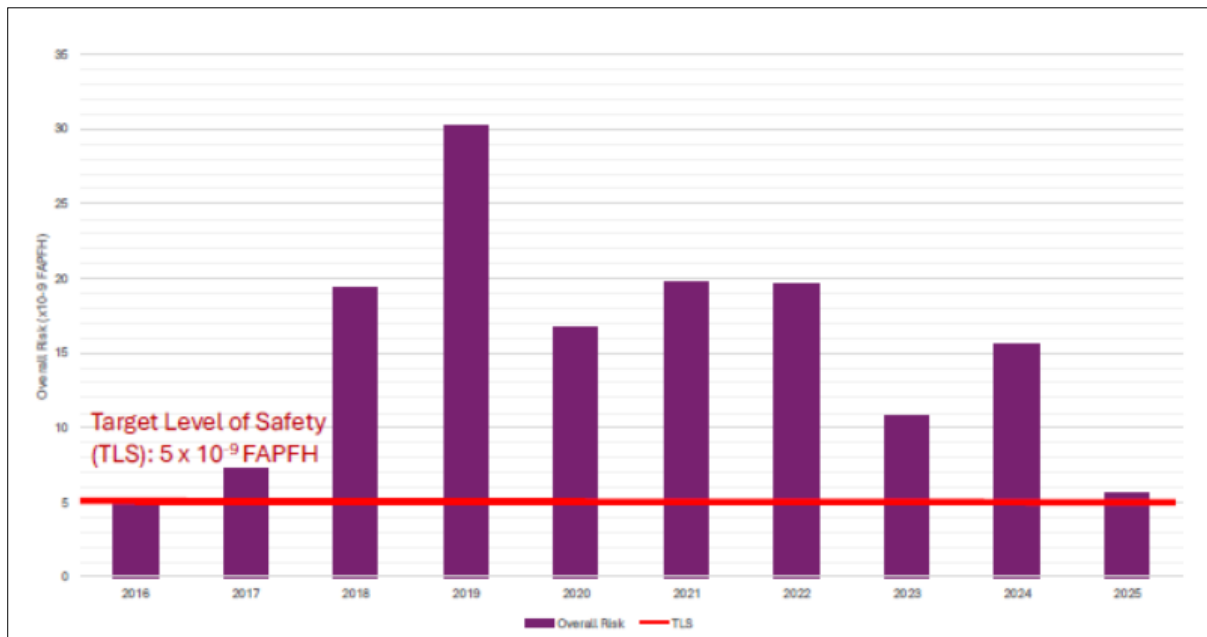


Figure 2. PAC Area Vertical Collision Risk Estimates 2016 – 2025

2.9 There was a total of 147 Large Height Deviations (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.

PAC Area Horizontal Collision Risk

2.10 The estimated horizontal collision risk for 2025 for the Pacific area met TLS in all lateral and longitudinal risk categories. **Table 5** presented a comparison of the estimated horizontal collision risks for 2024 and 2025.

Table 5. PAC Area Horizontal Collision Risk Estimates (2024 vs 2025)

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

2.11 There was a total of 221 Large Lateral Deviations (LLDs) and Large Longitudinal Errors (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

2.12 The estimated vertical collision risk for 2025 for the Asia area met TLS (**Table 4** and **Figure 3**). 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%).

Table 4. Asia Area Vertical Collision Risk 2025

Asia Area Estimated annual flying hours = 11,115,453 hours <i>(Note: estimated hours based on December 2025 TSD)</i>		
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

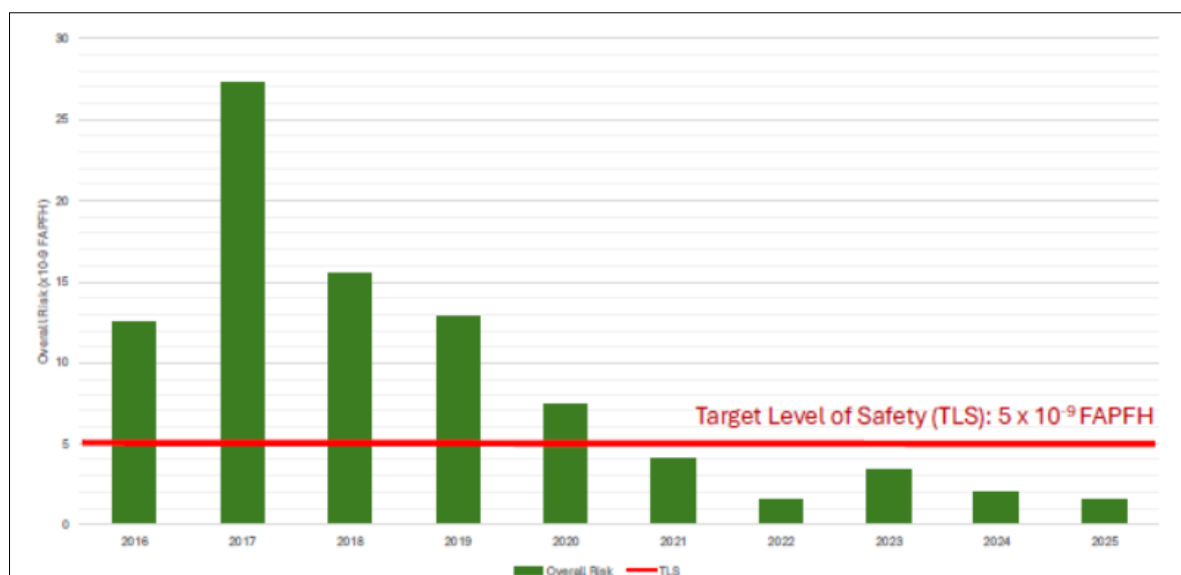


Figure 3. Asia Area Vertical Collision Risk Estimates 2016 –2025

Asia Area Horizontal Collision Risk

2.13 The estimated horizontal collision risk for 2025 for the Asia area met TLS in all lateral and longitudinal risk categories. **Table 7** presented a comparison of the estimated horizontal collision risks for 2024 and 2025.

Table 7. 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 x 10 ⁻⁹	Below TLS
Total Longitudinal Risk	1.45 x 10 ⁻⁹	Below TLS

2.14 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

2.15 **Table 5** showed the number of LHD, LLD and LLE reports for 2019 to 2025, and the number of reports per flying hours. The estimated 15,783,908 flying hours in 2025 were close to the 16,087,567 hours in 2024.

Table 5. 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

2.16 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. RASMAG/31 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.

Hot Spots List

2.17 **Table 6** summarized current LHD hot spots, the FIRs involved, the year of identification, and status remarks.

Table 6. 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

Hot Spot	Involved FIRs	Identified	Remarks
			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.
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.

2.18 Detailed reports from individual RMAs and EMAs can be found on the RASMAG/31 webpage.

Outcomes of RASMAG/MAWG and RMACG Meetings

2.19 RASMAG/31 noted some salient points discussed during the Thirteenth Meeting of the Regional Airspace Safety Monitoring Advisory Group Monitoring Agencies Working Group (RASMAG/MAWG/13, Bangkok, Thailand, 3 – 6 February 2026) and the Twenty-First Meeting of RMA Coordination Group (RMACG/21, Brussels, Belgium, 8 – 12 June 2026):

- a) the *Reduced Vertical Separation Minimum (RVSM) Minimum Monitoring Requirements (MMR) Version 2026* was reviewed and adopted by the RMACG/21. A copy of the document was provided in **RASMAG/31 WP/03 Appendix A** and would also be published in the respective RMAs' websites;
- b) a total of 278 aircraft were identified with large Altimetry System Error (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;
- c) RMACG/21 reviewed the 2025 ASE Technical Interchange Meeting and 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; and
- d) promotion of new LHD/LLD/LLE Category R for Global Navigation Satellite System (GNSS) Radio Frequency Interference (RFI) for occurrence reporting in APAC region, recognizing its value in enhancing data collection, facilitating trend analysis, and supporting the development of mitigation measures.

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

4.1 RASMAG/31 agreed that, since the *Manual on Monitoring the Application of Performance-based Horizontal Separation Minima* (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**.

4.2 In view of the *EMA Handbook* removal, RASMAG/31 determined that a mechanism was required to record regionally agreed changes to ICAO Doc 10063 pending formal amendment, and consequently 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.*

2.20 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.

Revision of the Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace

2.21 The *Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace* 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.

2.22 To ensure that recent developments and decisions endorsed by APAC monitoring agencies and relevant RASMAG meetings are accurately reflected, MAAR presented a proposed revision to the guidance material incorporating three major enhancements introduced in Version 4.0:

- a) 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;
- b) new Category R was introduced to capture LHD events associated with GNSS RFI, including jamming and spoofing occurrences; and
- c) 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.

2.23 Following the review, RASMAG/31 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

2.24 With reference to ***RASMAG Task List Action Item 29/1*** on the identification and de-identification of safety reports for wider distribution, which arose from requests by international organizations for access to more detailed safety occurrence data, particularly LHD events, RASMAG/31 recalled that current practices required sensitive information, especially aircraft call signs, to be treated as confidential and de-identified prior to external distribution. While summarized and categorized safety information could be shared with a broader range of stakeholders, detailed event descriptions that could reveal the identities of operators or other entities were not disclosed. Aggregate safety reports and hot spot information were already made publicly available with sensitive details removed, whereas data containing identified information remained restricted to monitoring agencies, States, ANSPs, and operators for safety-related purposes.

2.25 RASMAG/31 discussed the proposal to extend data sharing to international aviation organizations, such as IATA and IFALPA, which could assist in addressing safety issues with operators. It was noted that one RMA had already implemented a controlled data-sharing arrangement, providing reviewed LHD/LLD/LLE reports to authorized stakeholders through a password-protected database with tiered access levels.

2.26 However, several States raised legal and privacy concerns over sharing data with external parties. Consequently, RASMAG/31 agreed that a more detailed proposal should be developed, including a clearly defined data-sharing mechanism and a requirement for requesting organizations to specify the intended use of the data before States could consider and provide their views on the proposal.

Transfer of RVSM Safety Assessment and Monitoring Responsibilities of Hong Kong China and Macao China to China RMA

2.27 RASMAG/31 reviewed and discussed the proposal from China RMA for the transfer of RVSM safety assessment and monitoring responsibilities for Hong Kong, China and Macao, China from MAAR to China RMA. The proposal was developed in support of increasing collaboration within the Greater Bay Area (GBA) and aimed to enhance regional coordination by consolidating monitoring responsibilities under China RMA. It was noted that MAAR had provided these services for the Hong Kong FIR since 2002 and that the proposal had been presented at APANPIRG/36, and discussed at RASMAG/MAWG/13 and RMACG/21, where it received support from all relevant stakeholders.

2.28 The Meeting noted that the transfer would consolidate RVSM safety assessment and monitoring services under China RMA, leveraging existing coordination mechanisms and regional cooperation to strengthen safety oversight. A structured transition plan was presented, under which MAAR would retain responsibilities until RASMAG/31, followed by a data handover and transition period from mid-2026 to the end of 2026. China RMA would progressively assume operational duties with MAAR's support, with full implementation scheduled for 1 January 2027.

2.29 Following discussion, 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.*

Assessment of Non-RVSM Approved Aircraft

2.30 The Australian Airspace Monitoring Agency (AAMA), China RMA, Japan Airspace Safety Monitoring Agency (JASMA), MAAR, and Pacific Approvals Registry and Monitoring Organization (PARMO) provided assessments of the non-RVSM approved aircraft within their areas of responsibility and the detailed reports could be found in the respective working papers available on RASMAG/31 webpage.

2.31 With reference to **RASMAG Task List Action Item 30/61** on the development of a formal process to maintain a consolidated non-RVSM approved list for sharing with States/Administrations, RASMAG/31 was informed that MAAR had initiated preliminary discussions on the matter. The need to establish consistent terminology to clearly distinguish between aircraft with pending RVSM approval verification and those confirmed as non-RVSM approved was highlighted. It was agreed that the Action Item should focus on aircraft confirmed as non-RVSM approved. RASMAG/31 agreed that further discussions on this matter would continue at future RASMAG/MAWG meetings.

2.32 MAAR emphasized that annual RVSM approval snapshots submitted by States were essential for verifying RVSM approval status, identifying aircraft pending verification, detecting missing approval records, and removing de-registered aircraft from the database to avoid unnecessary monitoring burden. RASMAG/31 noted that Mongolia and Pakistan had not submitted their 2025 RVSM approval snapshots and agreed that, should the issue persist, it could be raised as an APANPIRG Air Navigation Deficiency in the ATM and Airspace Safety fields.

APAC Consolidated Long Term Height Monitoring (LTHM) Compliance Status

2.33 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.

2.34 The detailed LTHM burden estimate updates by individual RMAs can be found on the RASMAG/31 website.

2.35 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 Deficiencies list. These recommendations were derived from assessments of RVSM approval data as of 30 April 2026 and were summarized in **Table 10**, which identified States subject to changes in their deficiency status.

Table 10. 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

APANPIRG ATM and Airspace Safety Deficiencies List

2.36 The following recommendations to be submitted to APANPIRG/37 based on the outcomes of RASMAG/31, together with additional information provided by States and MAAR, as of 17 July 2026:

- 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)].
 - 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).

2.37 The recommendation reflects the status as of 17 July 2026. Should accurate updates be provided to the Secretariat and MAAR, by 19 October 2026, the Secretariat would exclude such items from the recommendations to APANPIRG/37.

RASMAG Terms of Reference (TOR)

2.38 RASMAG/31 agreed to the following Draft Decision to revise the RASMAG TOR to more accurately reflect RASMAG's objectives and responsibilities as an APANPIRG sub-group, particularly in relation to the identification, review, and updating of the APANPIRG Air Navigation Deficiencies List:

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.

Airspace Safety Seminar

2.39 An Airspace Safety Seminar was conducted in conjunction with RASMAG/31 on 29 June 2026. Presentations were delivered by AAMA, China RMA, JASMA, MAAR, PARMO, South East Asia Safety Monitoring Agency (SEASMA) and ICAO. The presentation materials are available on the RASMAG/31 webpage (<https://www.icao.int/APAC/meetingdocs?fid=59631>).

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the current LHD hot spots and removal of hot spots;
- b) note the following Draft Conclusion, Conclusions and Draft Decision arising from RASMAG/31:
 - i) ***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;***
 - ii) ***Conclusion RASMAG/31-1: Establishment of RASMAG Conclusions/Decisions Tracking List on Monitoring the Application of Performance-based Horizontal Separation Minima;***
 - iii) ***Conclusion RASMAG/31-2: Guidance Material for the Continued Safety Monitoring of the Asia Pacific RVSM Airspace Version 4.0;*** and
 - iv) ***Draft Decision RASMAG/31-4: Update Regional Airspace Safety Monitoring Advisory Group (RASMAG) Terms of Reference (TOR);***
- c) note the retention of existing, deletion and addition of new, APANPIRG ATM and Airspace Safety Deficiencies; and
- d) discuss any relevant matters as appropriate.

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

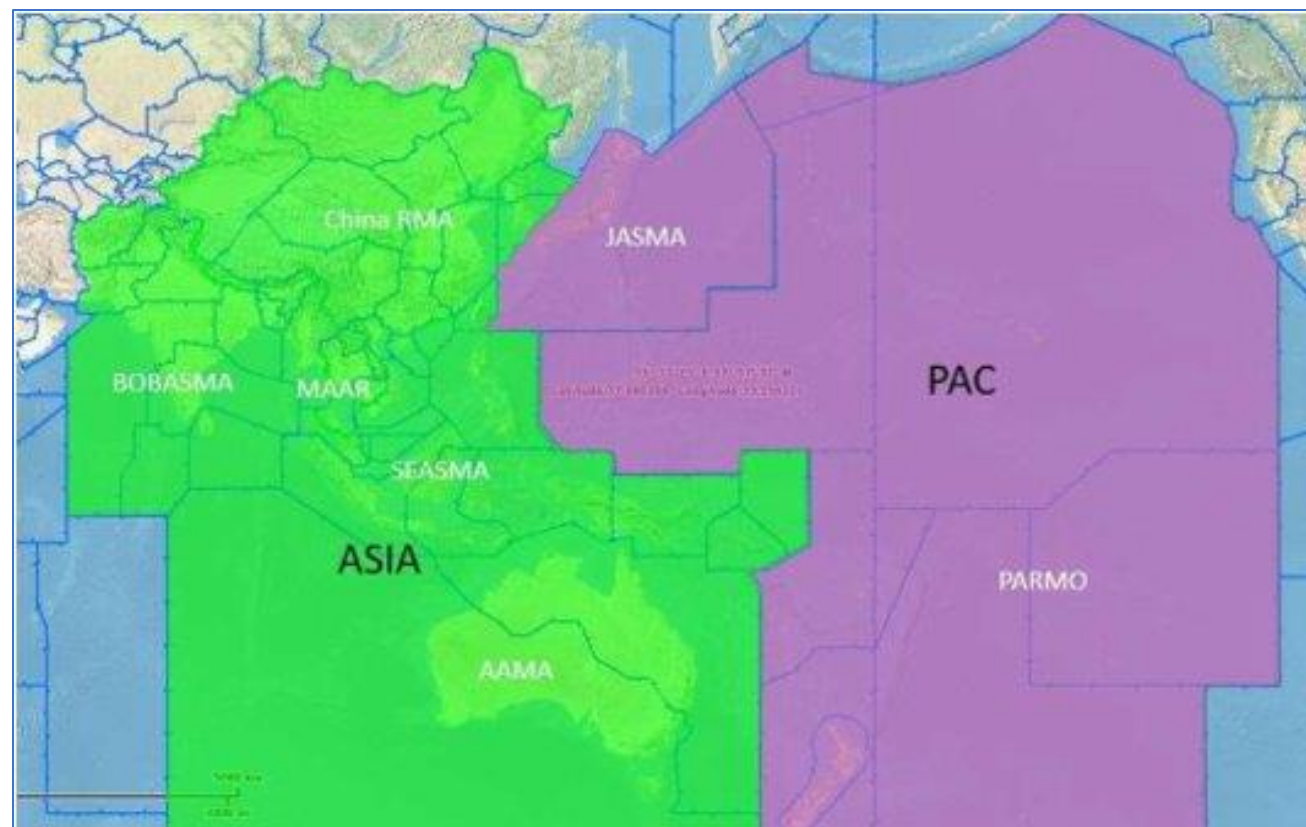
is produced by APAC monitoring agencies to deliver a comprehensive overview of airspace safety risks in the Asia Pacific region.

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.

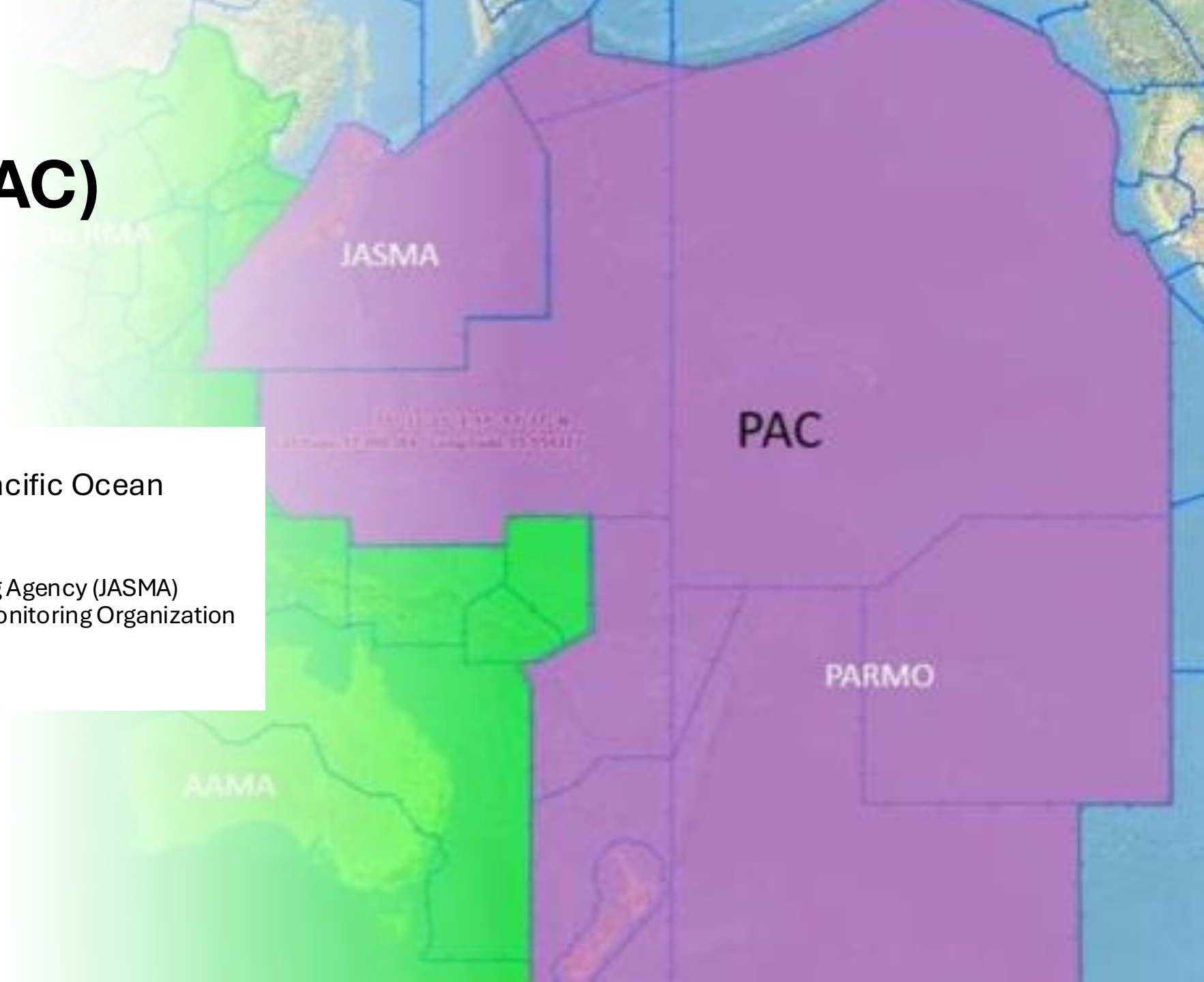
The report covers two areas:

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



Pacific Area (PAC)

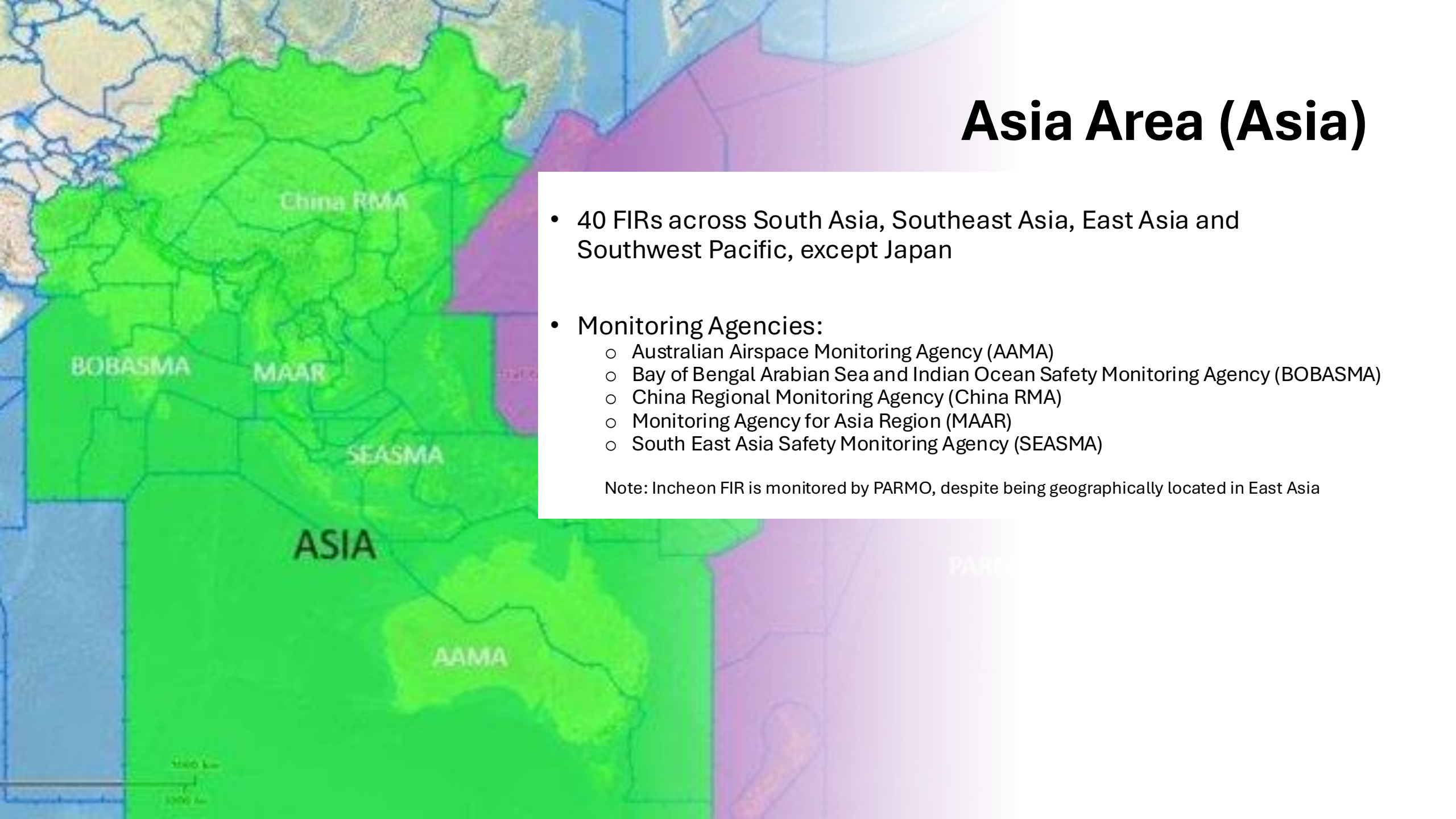
- 6 FIRs across Japan and the Pacific Ocean
- Monitoring Agencies:
 - Japan Airspace Safety Monitoring Agency (JASMA)
 - Pacific Approvals Registry and Monitoring Organization (PARMO)



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

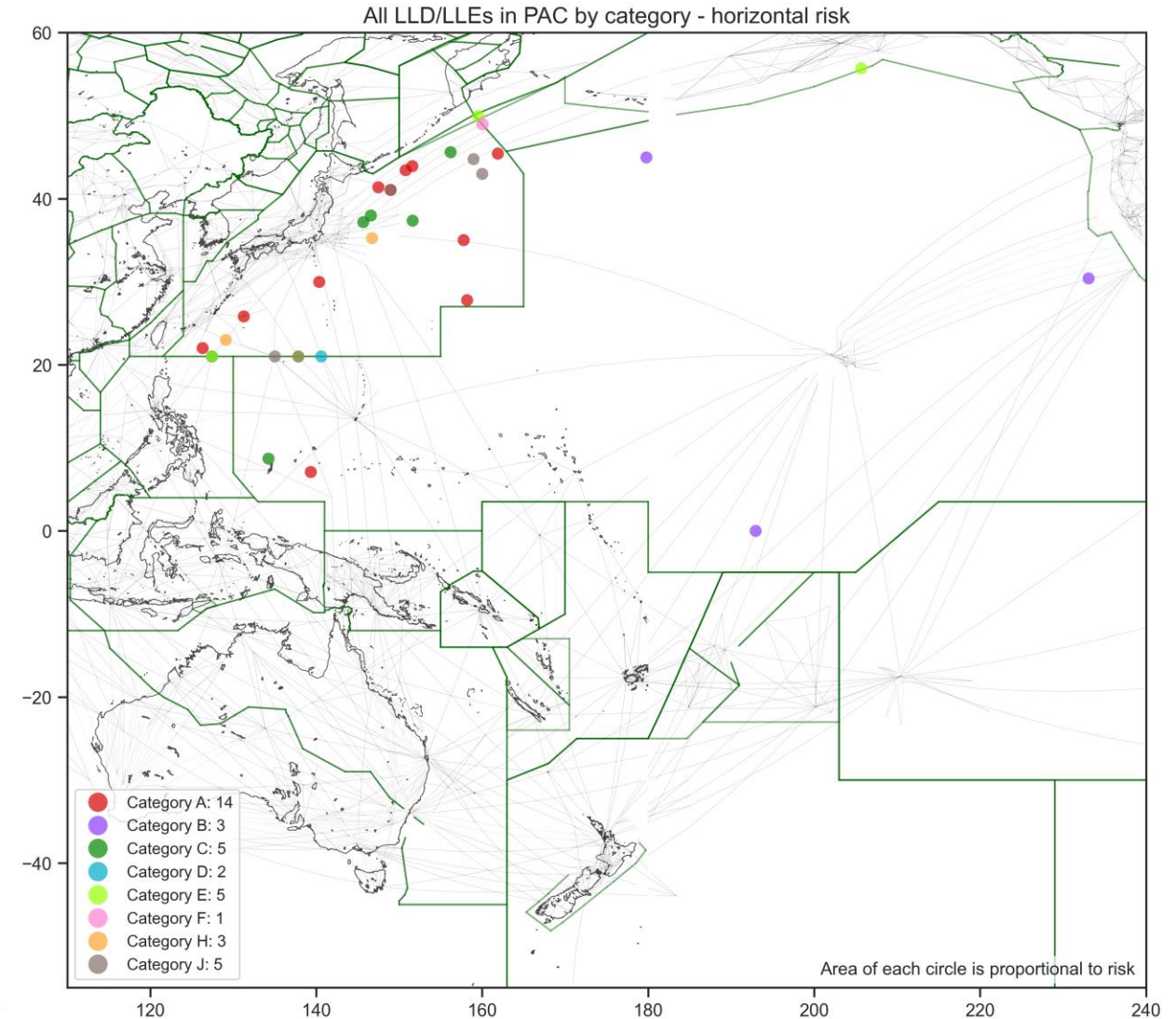
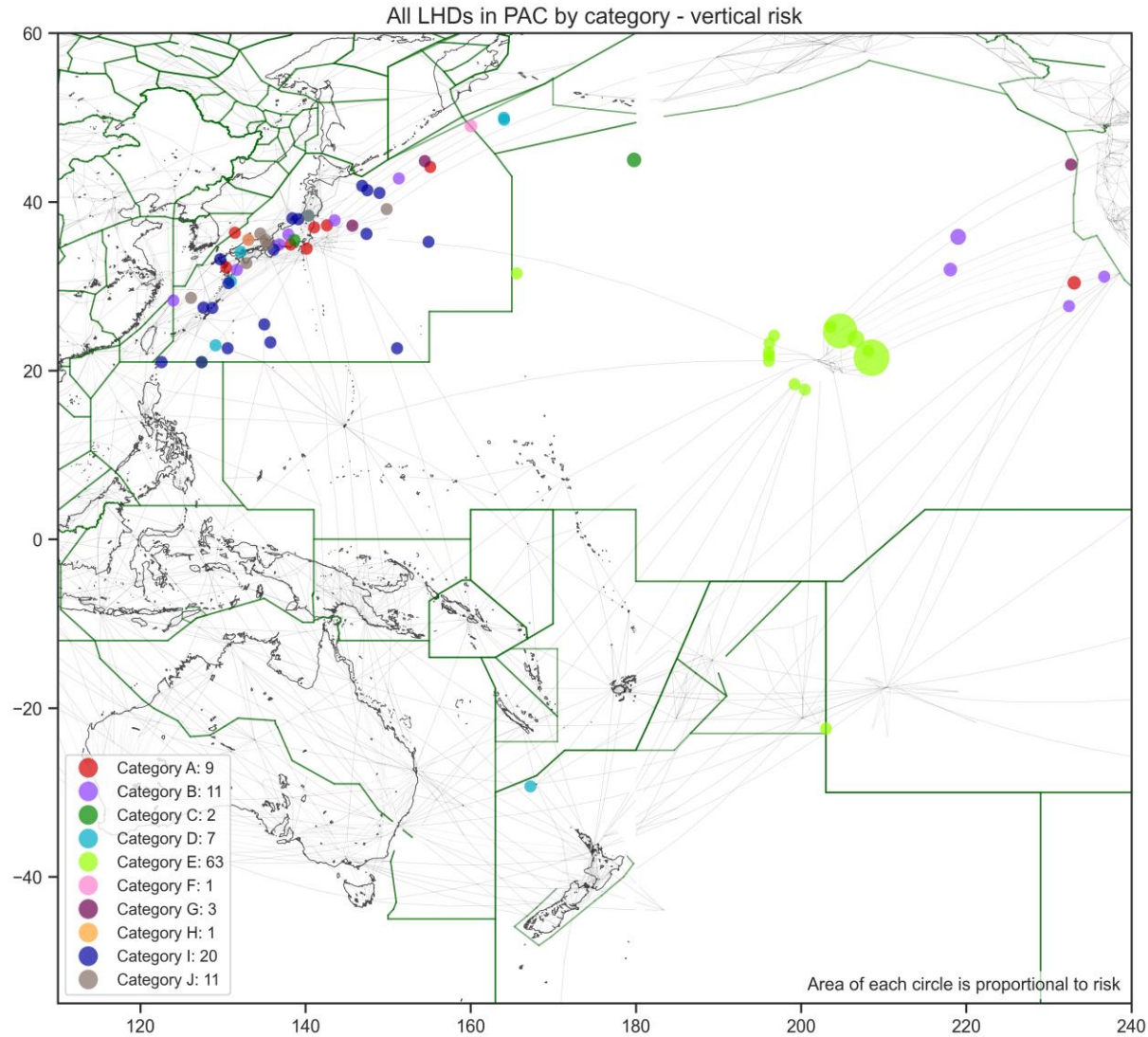
PAC: Summary of LLDs and LLEs

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



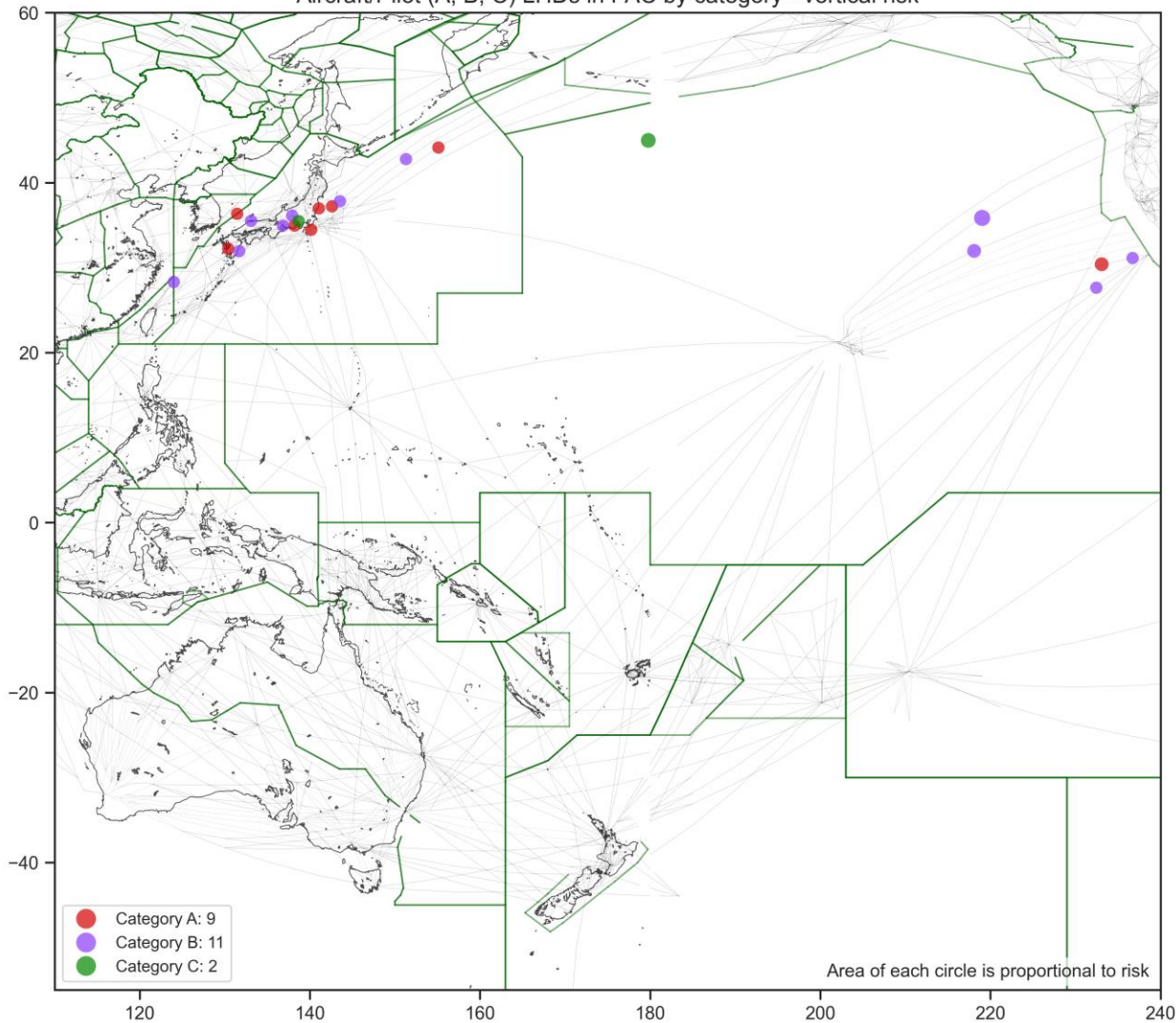
PAC : Geolocation of LHDs/LLDs/LLEs

PAC: All Categories

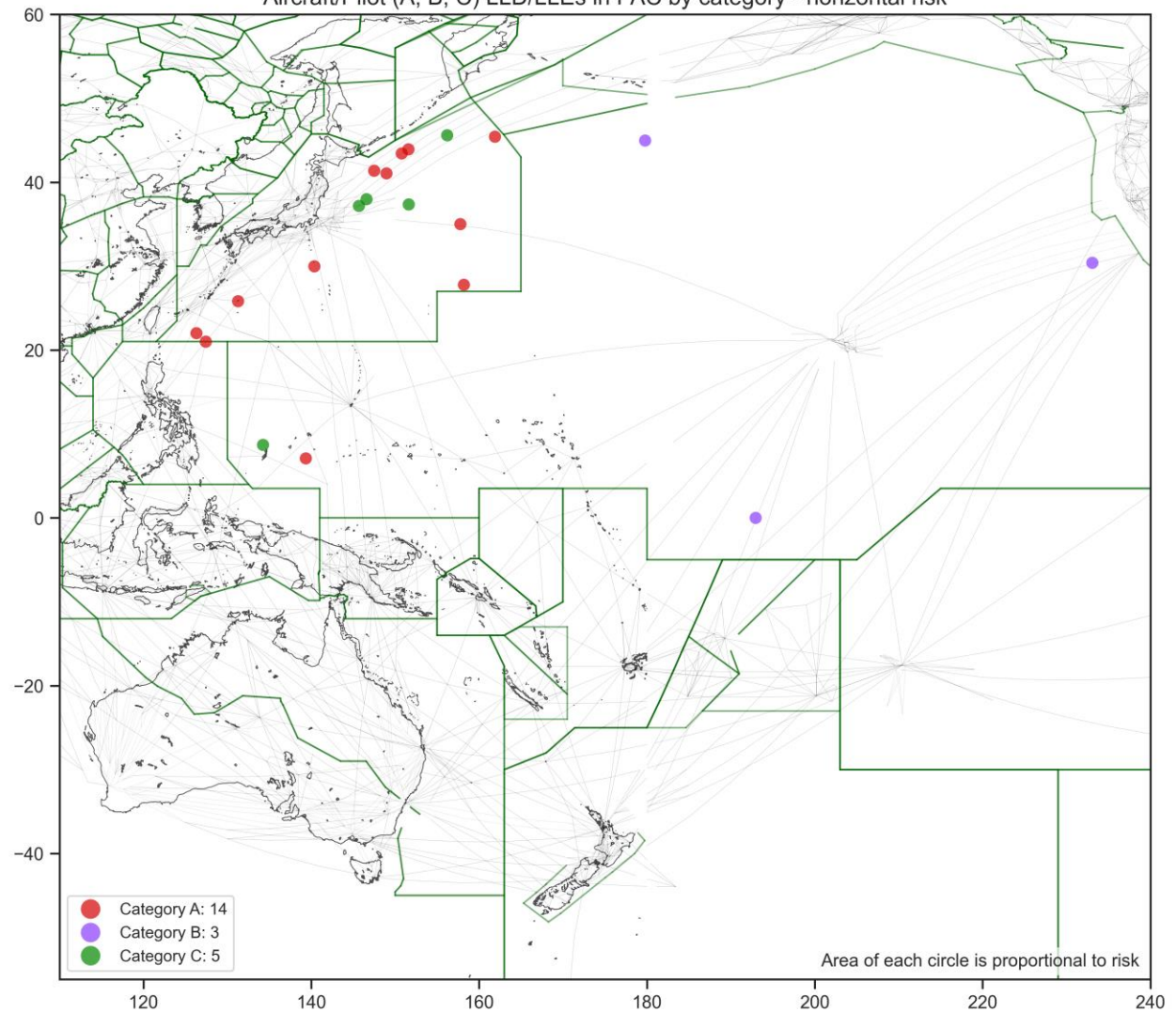


PAC: Aircrew/Pilot (A, B, C)

Aircraft/Pilot (A, B, C) LHDs in PAC by category - vertical risk

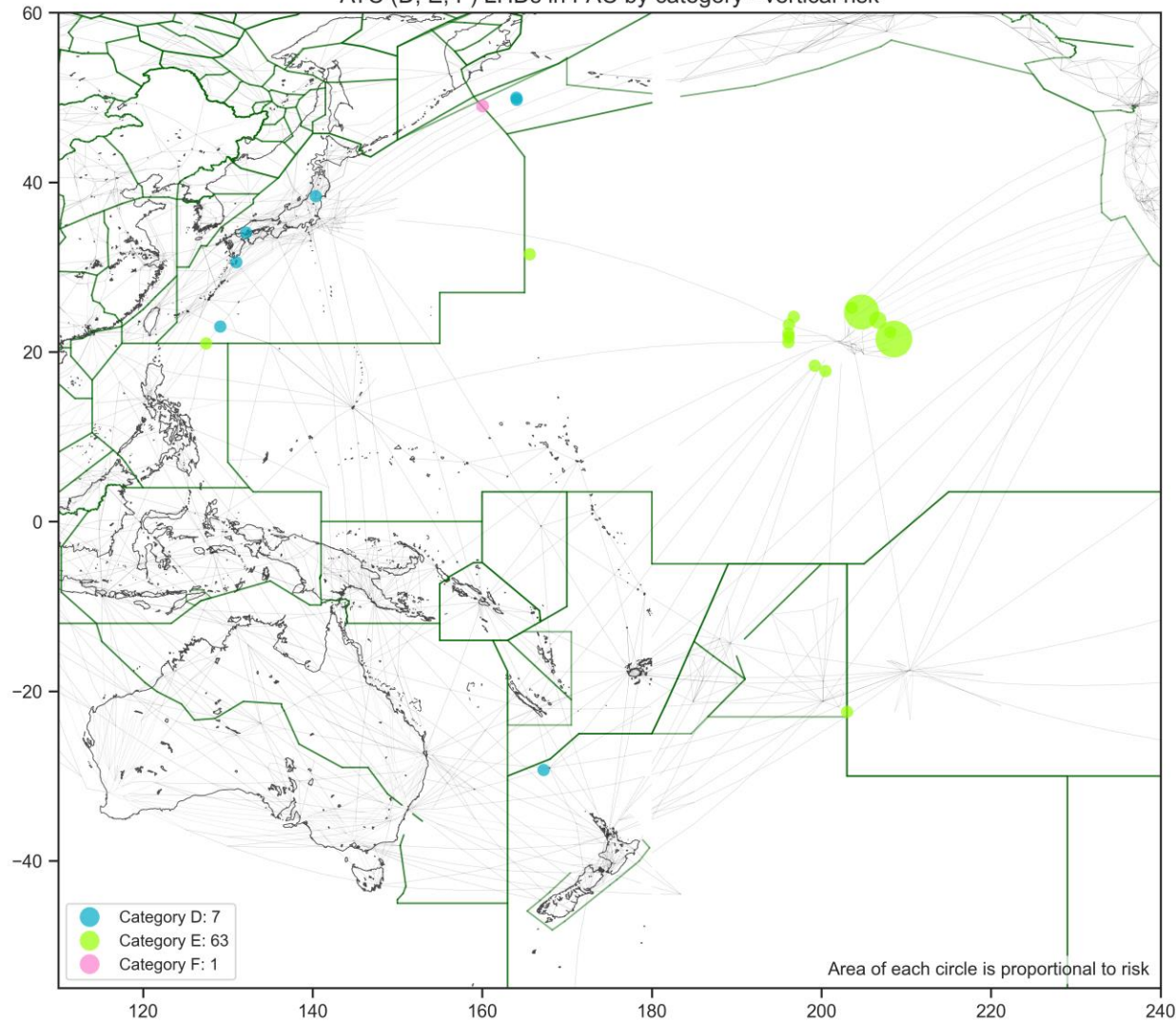


Aircraft/Pilot (A, B, C) LLD/LLEs in PAC by category - horizontal risk

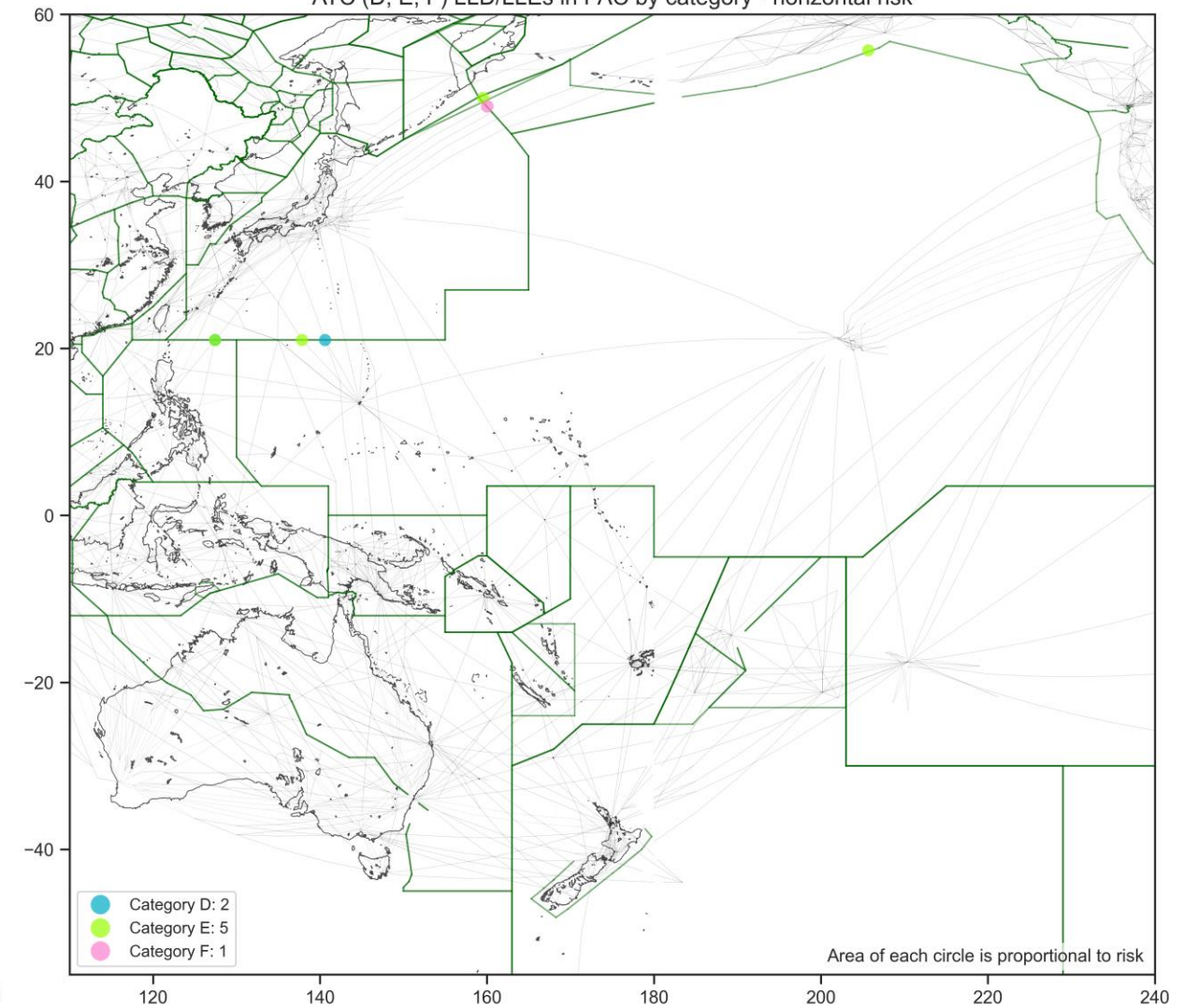


PAC: ATC (D, E, F)

ATC (D, E, F) LHDs in PAC by category - vertical risk



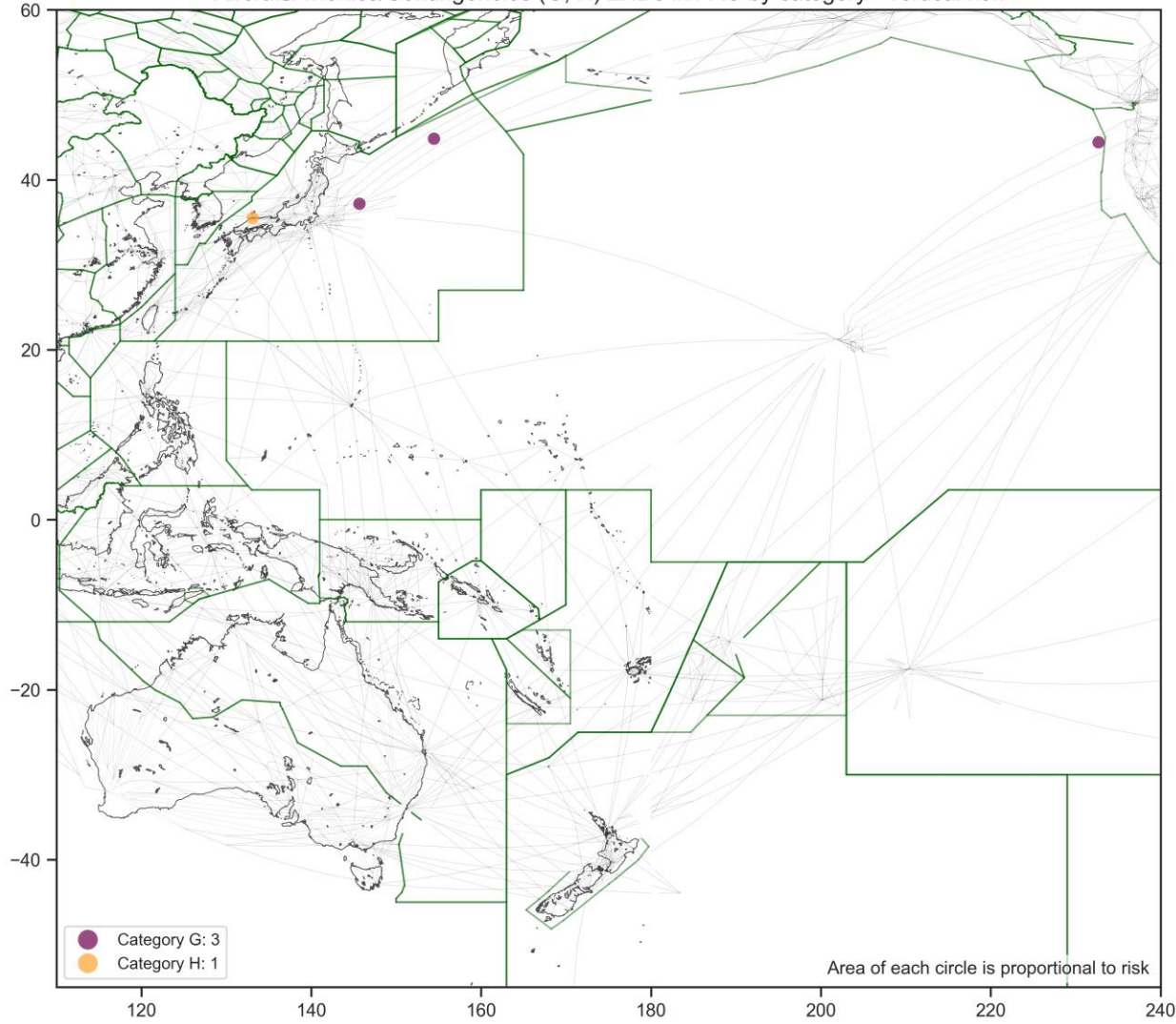
ATC (D, E, F) LLD/LLEs in PAC by category - horizontal risk



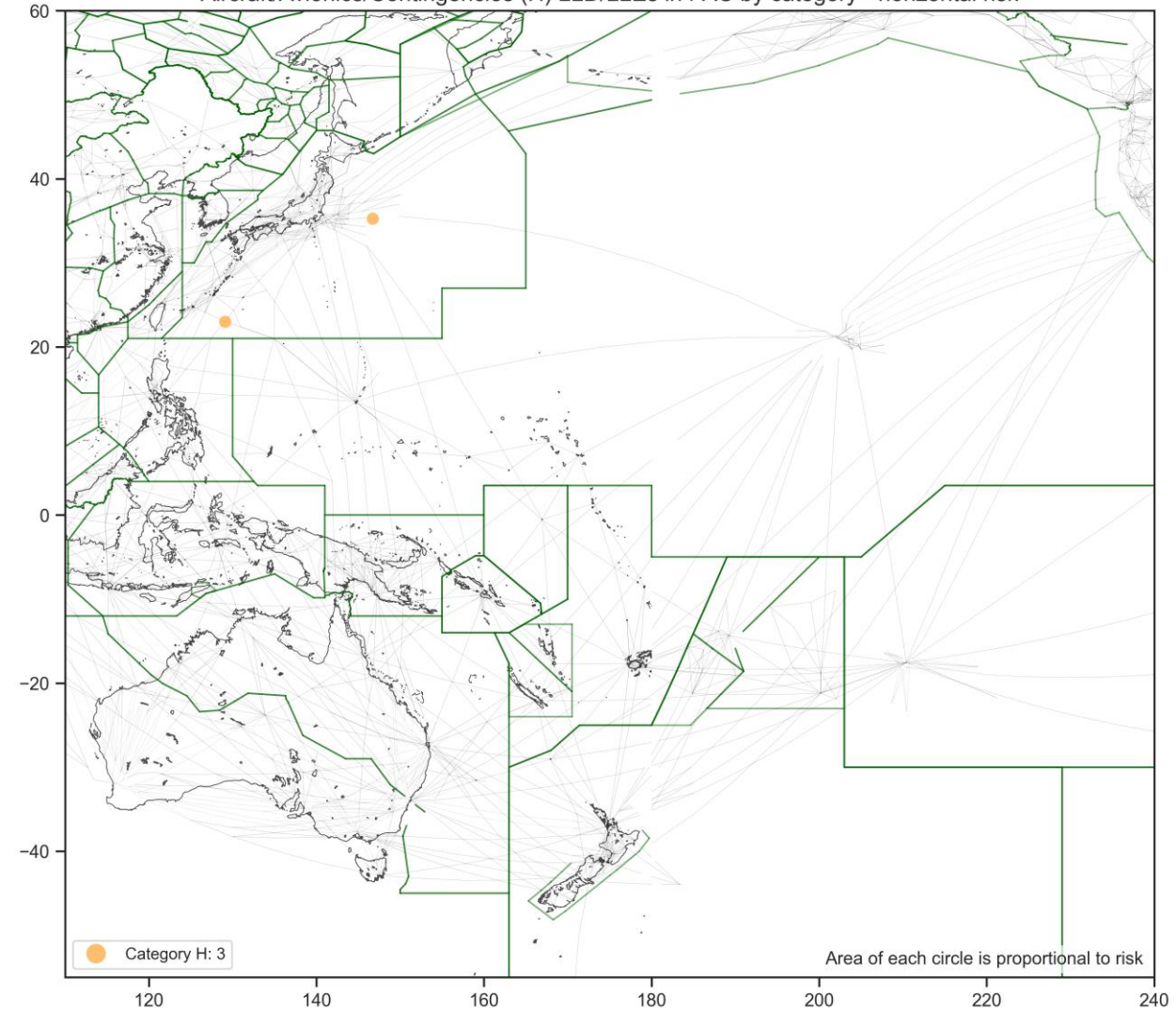
PAC: Aircraft Avionics/Contingencies

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

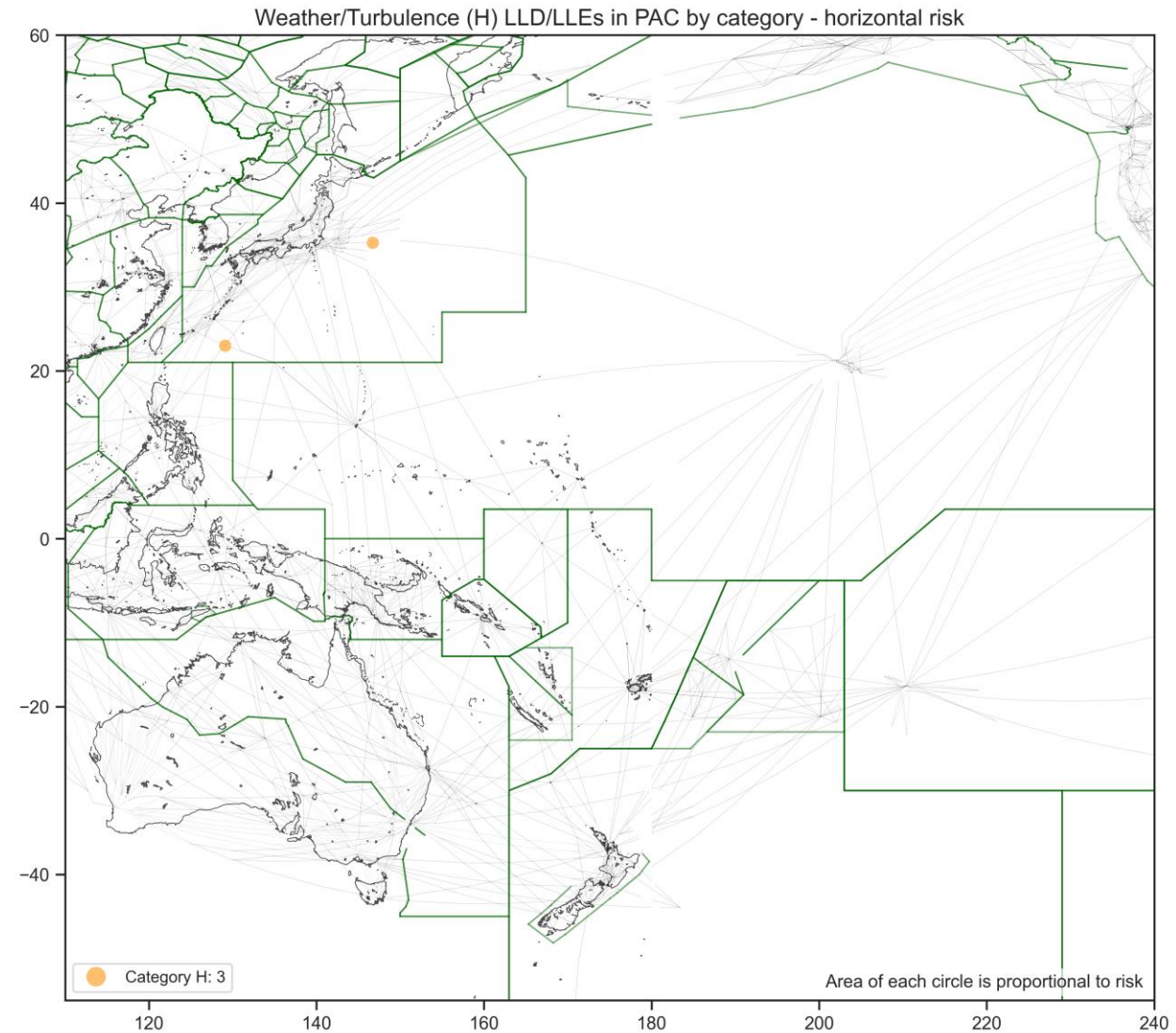
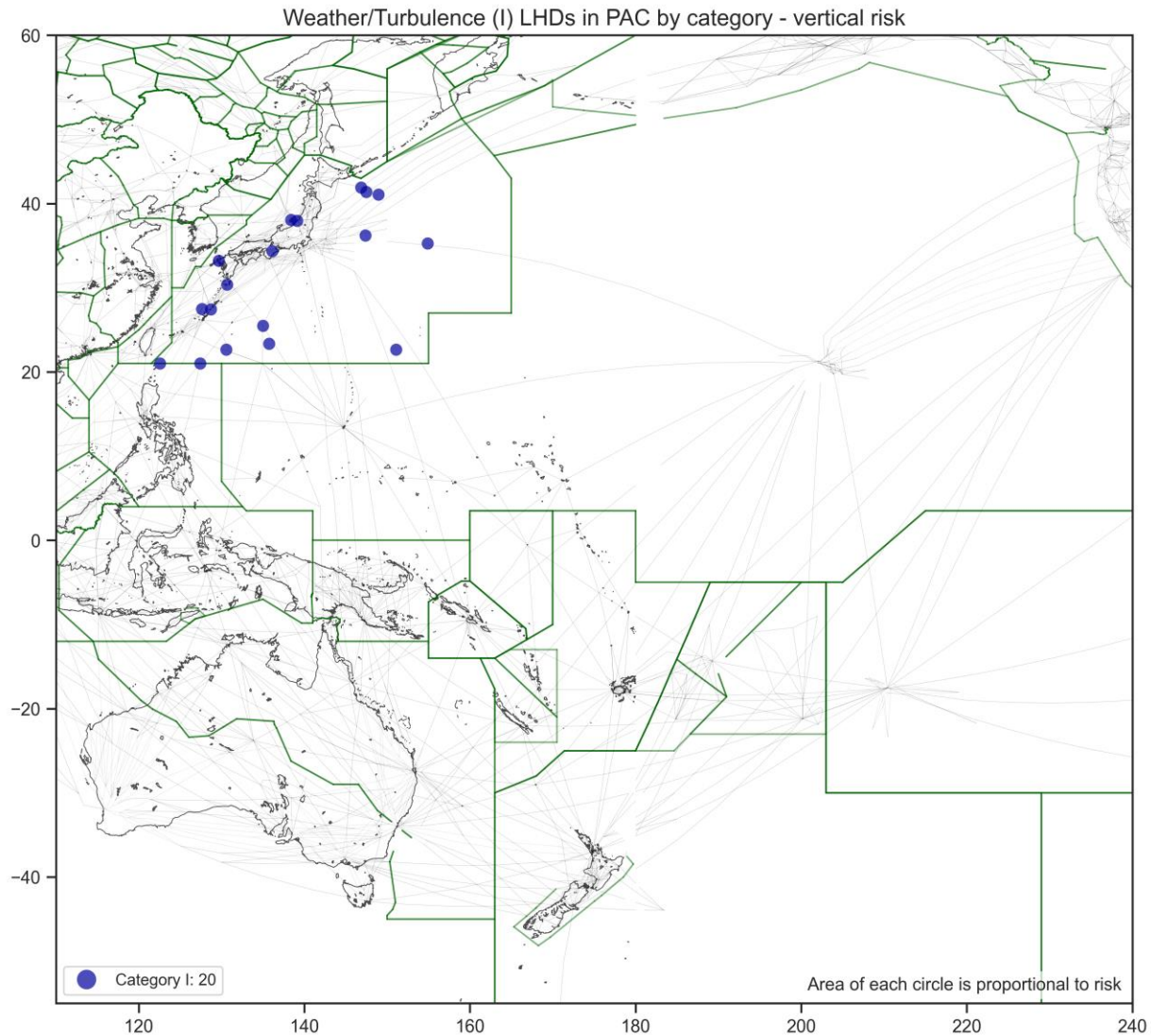
Aircraft/Avionics/Contingencies (G, H) LHDs in PAC by category - vertical risk



Aircraft/Avionics/Contingencies (H) LLD/LLEs in PAC by category - horizontal risk

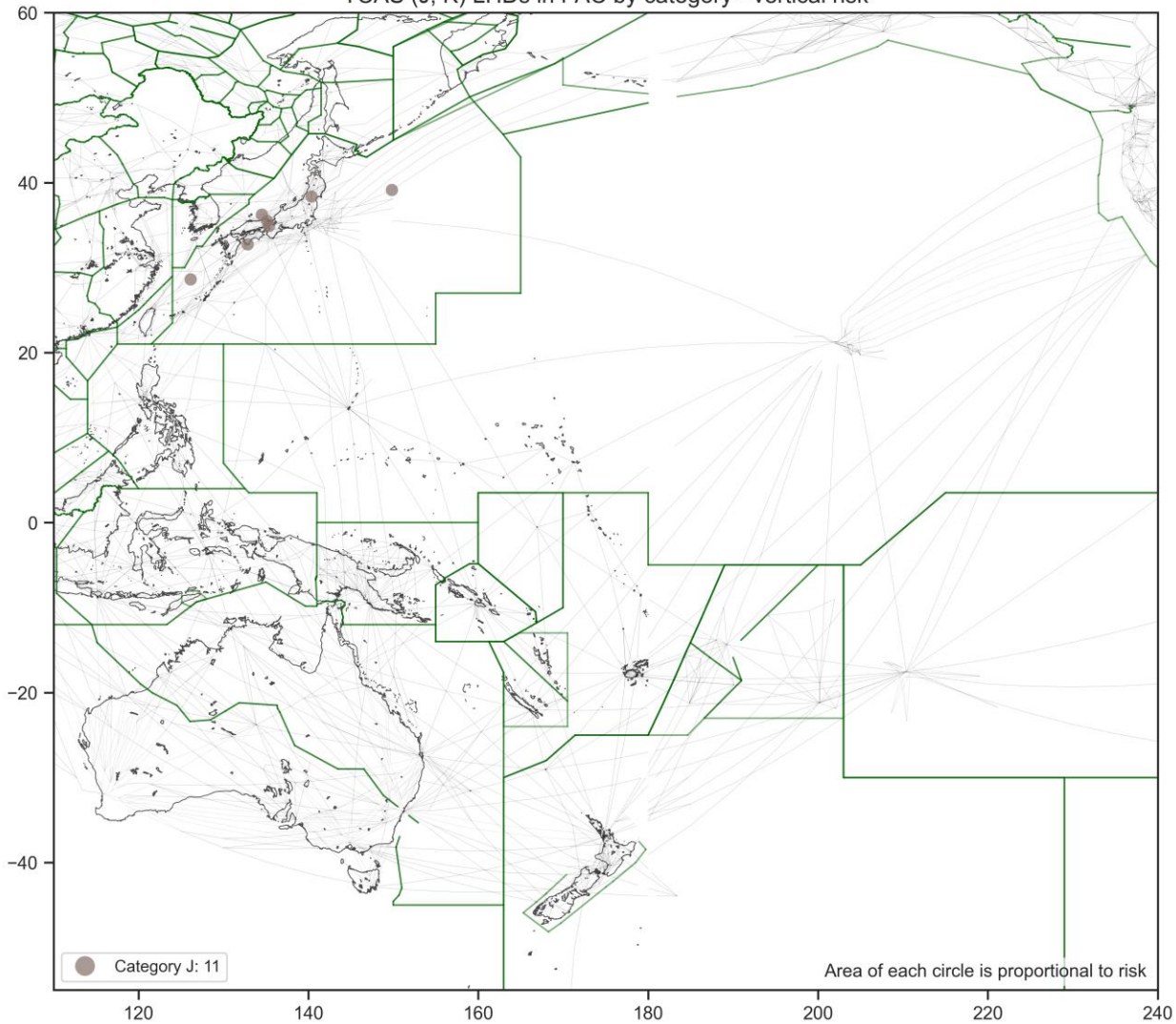


PAC: Weather/Turbulence (LHD: I; LLD/LLE: H)

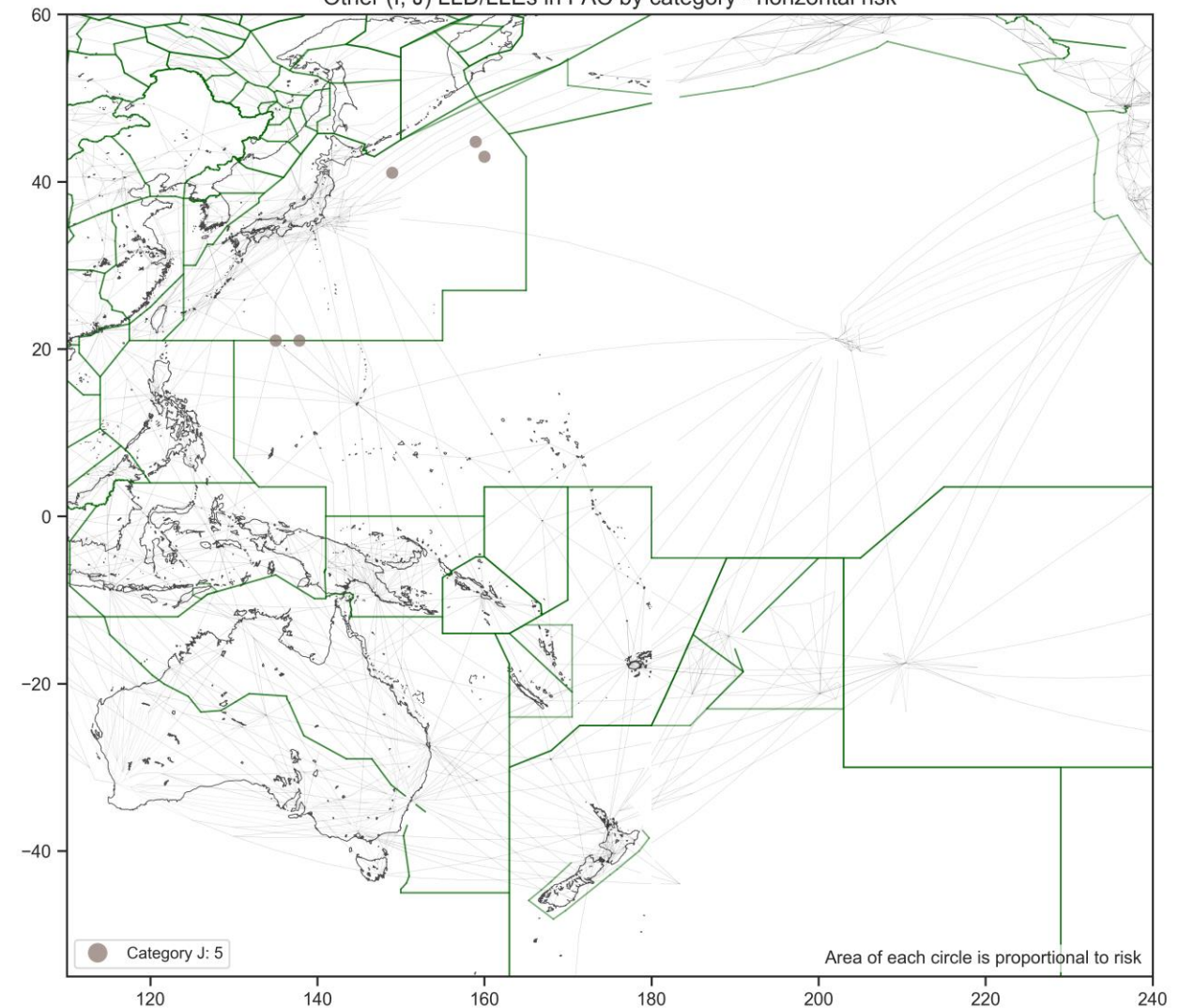


PAC: TCAS (LHD: J, K; LLD/LLE: I, J)

TCAS (J, K) LHDs in PAC by category - vertical risk



Other (I, J) LLD/LLEs in PAC by category - horizontal risk





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)

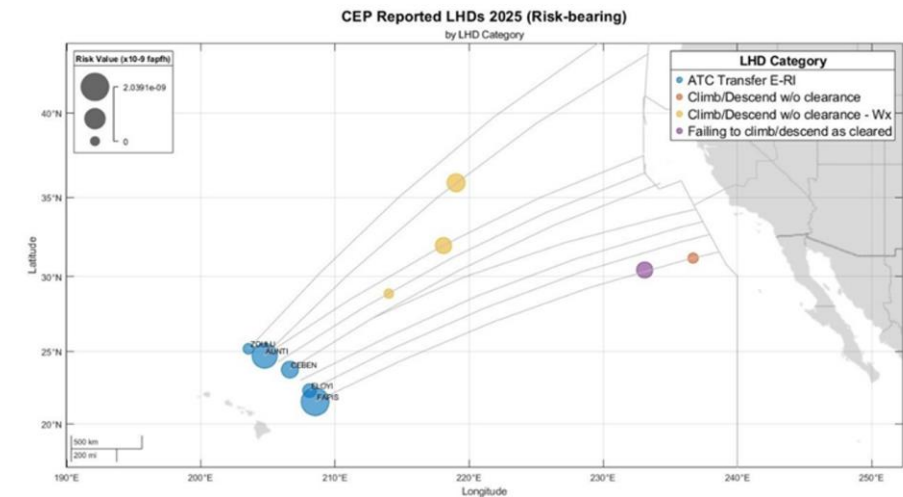
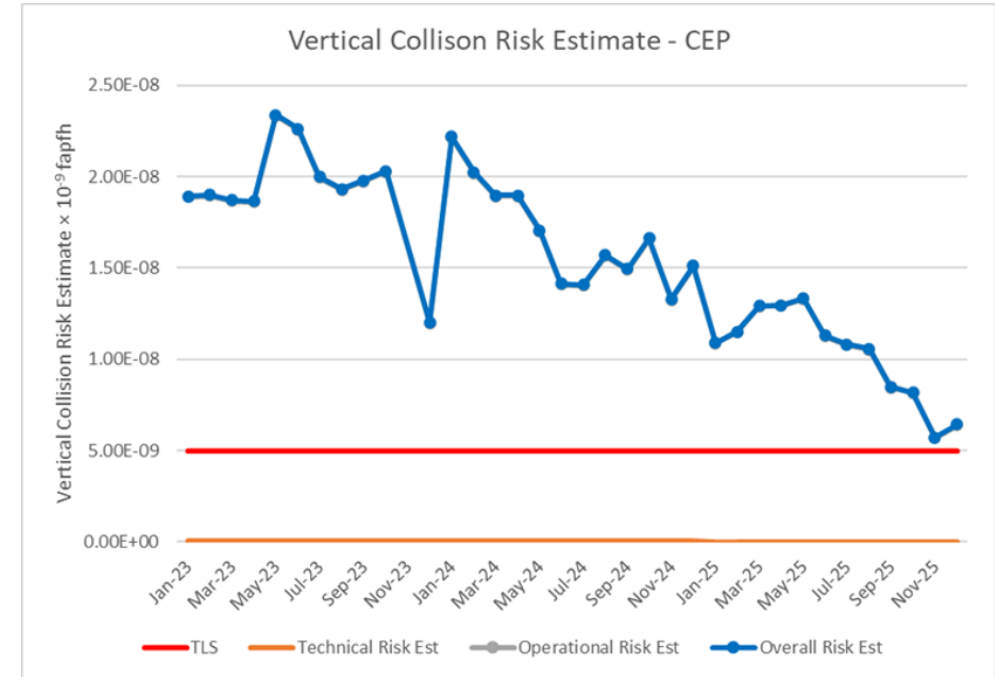
Contributing Factors: High traffic volume Central East Pacific (CEP) traffic flow and user-preferred routings that cross CEP airways

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

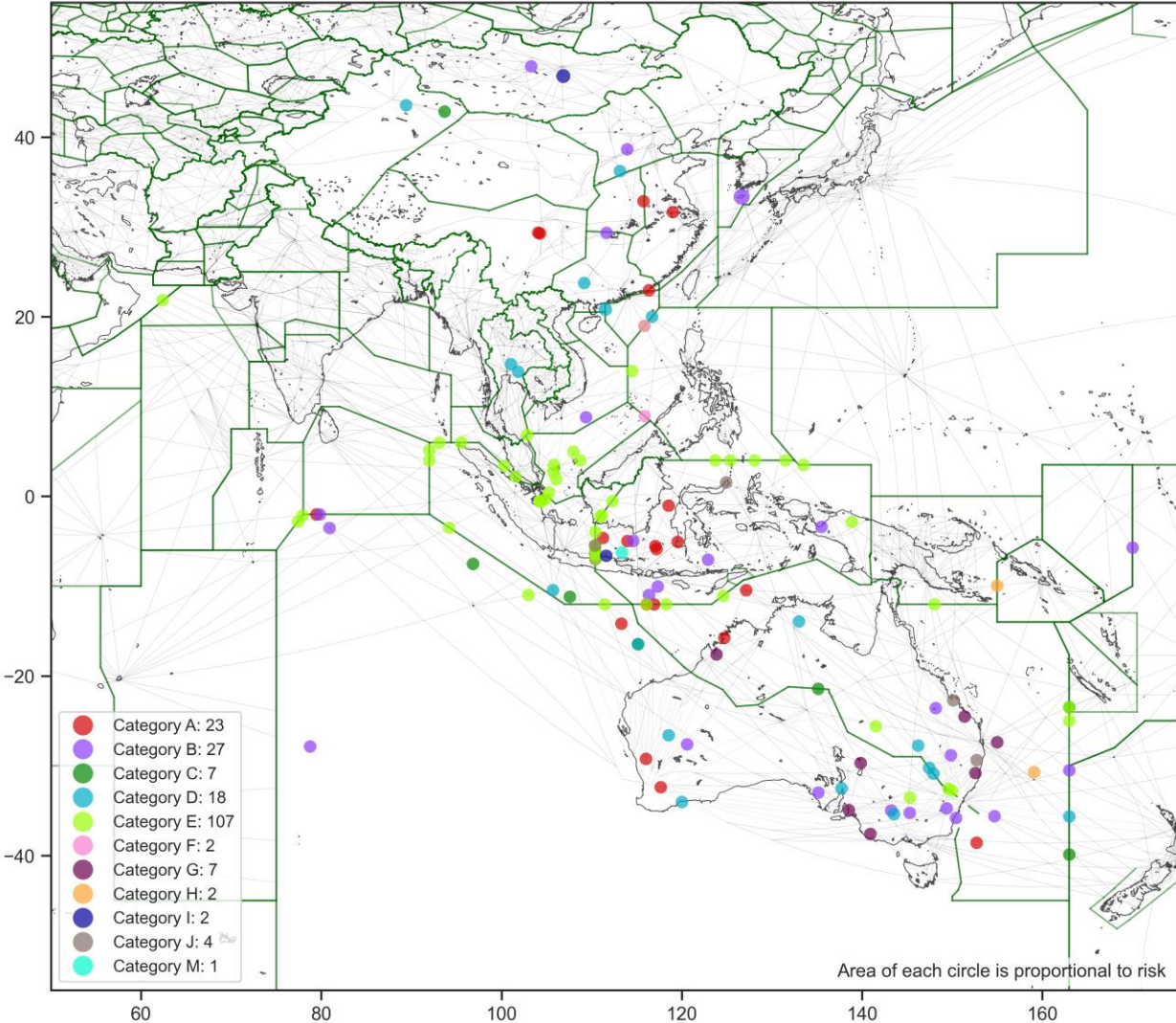
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	0	0	0
Weather/ Turbulence	H	Turbulence or other weather-related causes leading to a deviation in the horizontal 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

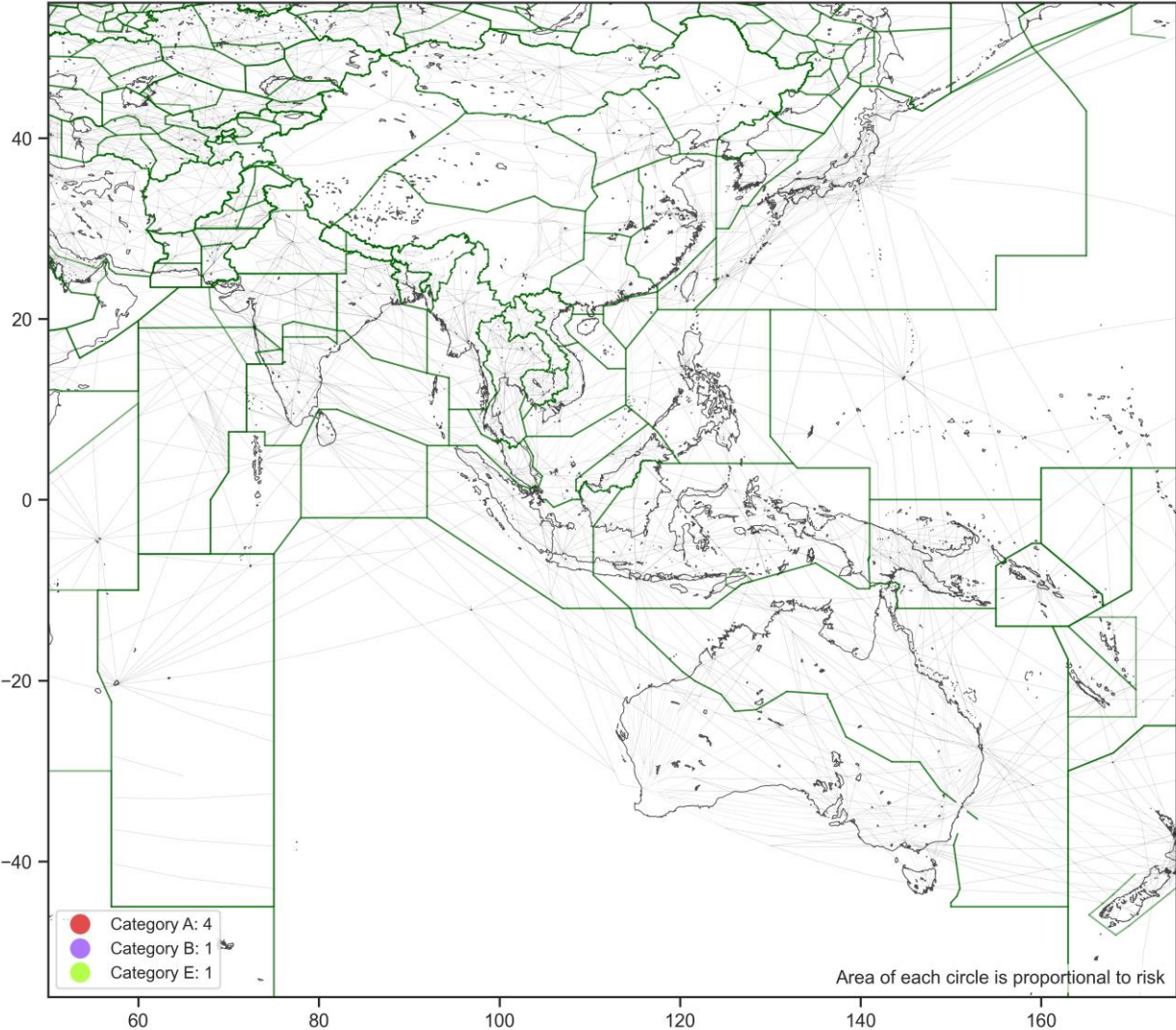


ASIA : All Categories

All LHDs in ASIA by category - vertical risk

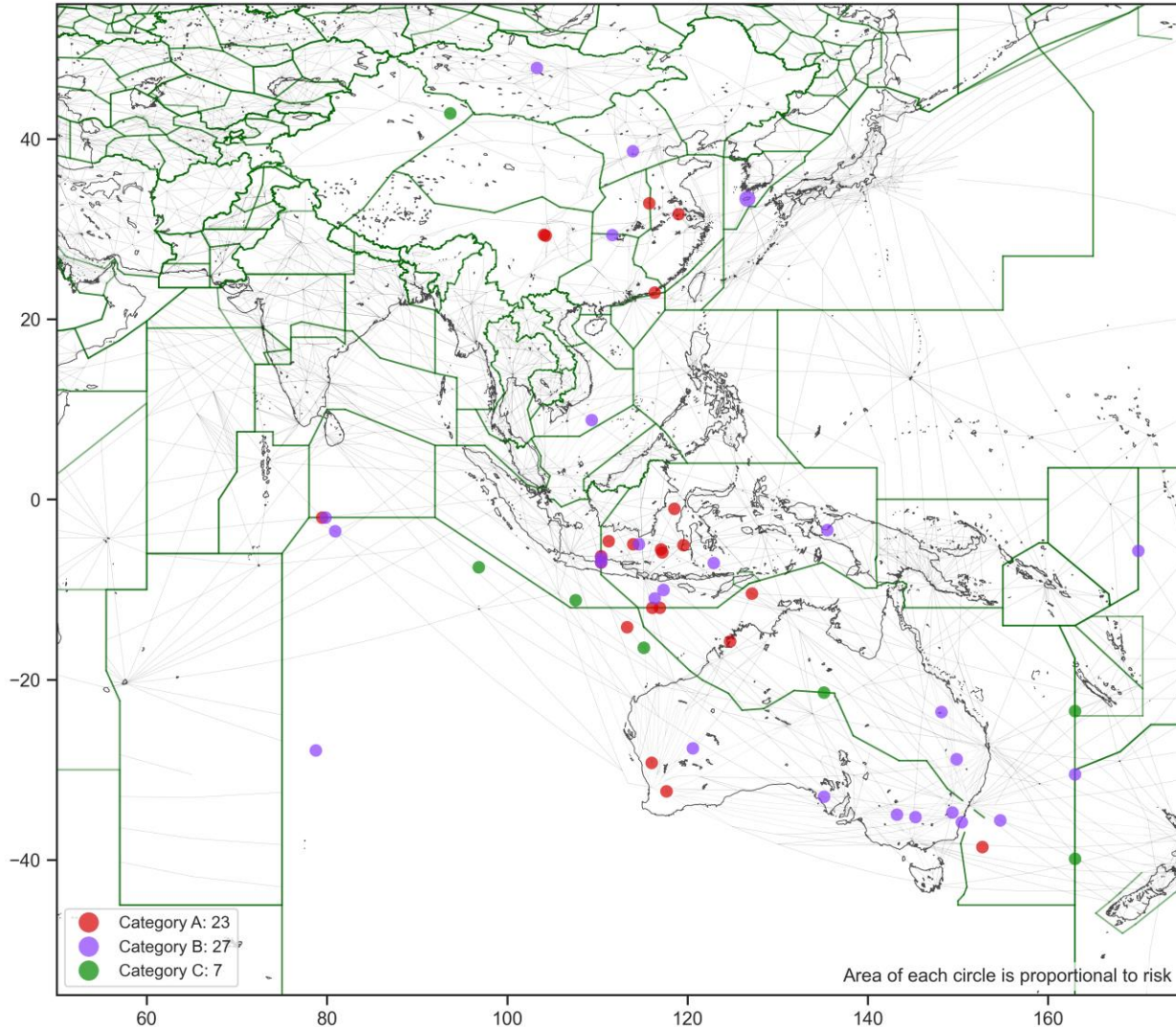


All LLD/LLEs in ASIA by category - horizontal risk

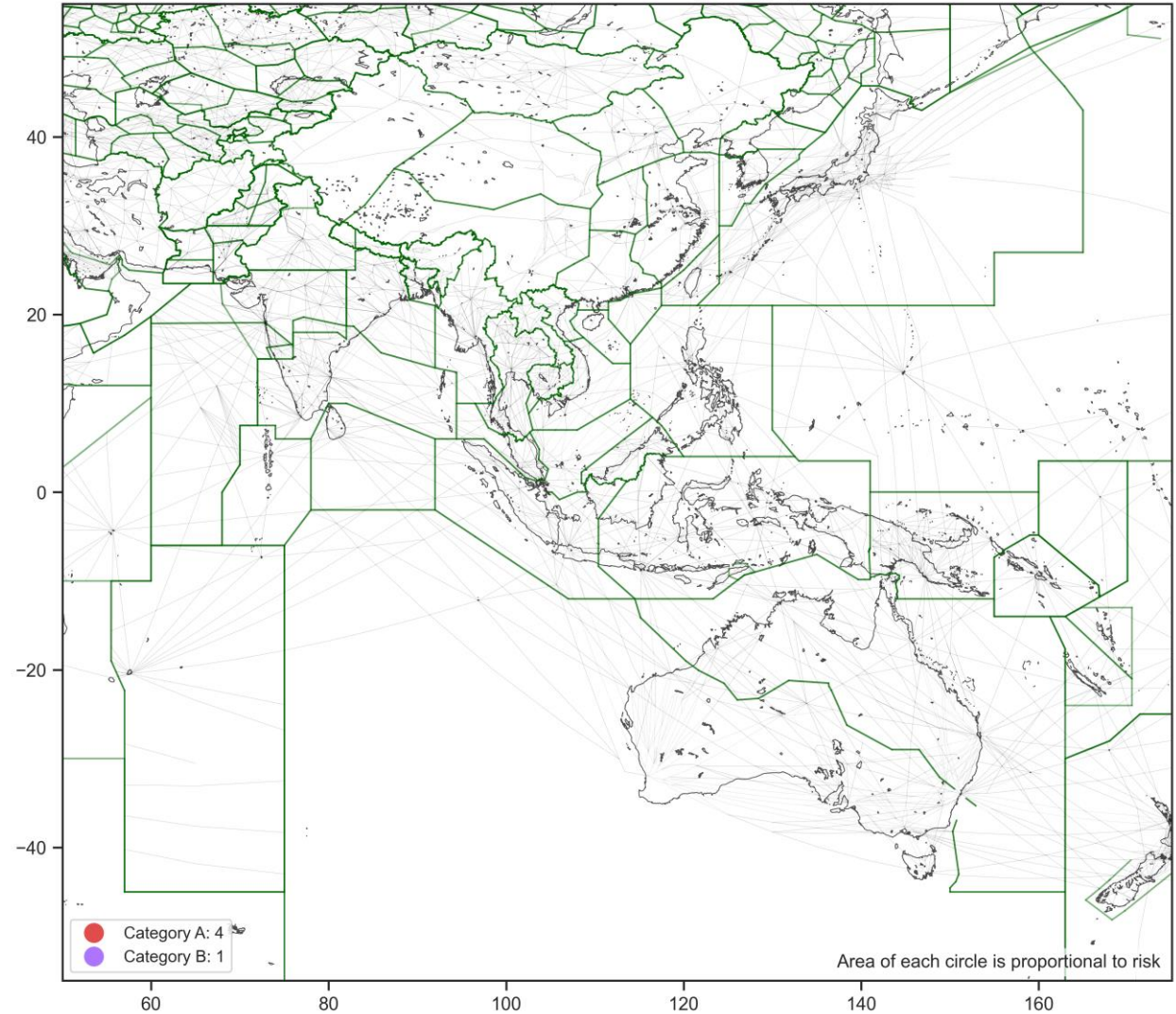


ASIA : Aircrew/Pilot (A, B, C)

Aircraft/Pilot (A, B, C) LHDs in ASIA by category - vertical risk

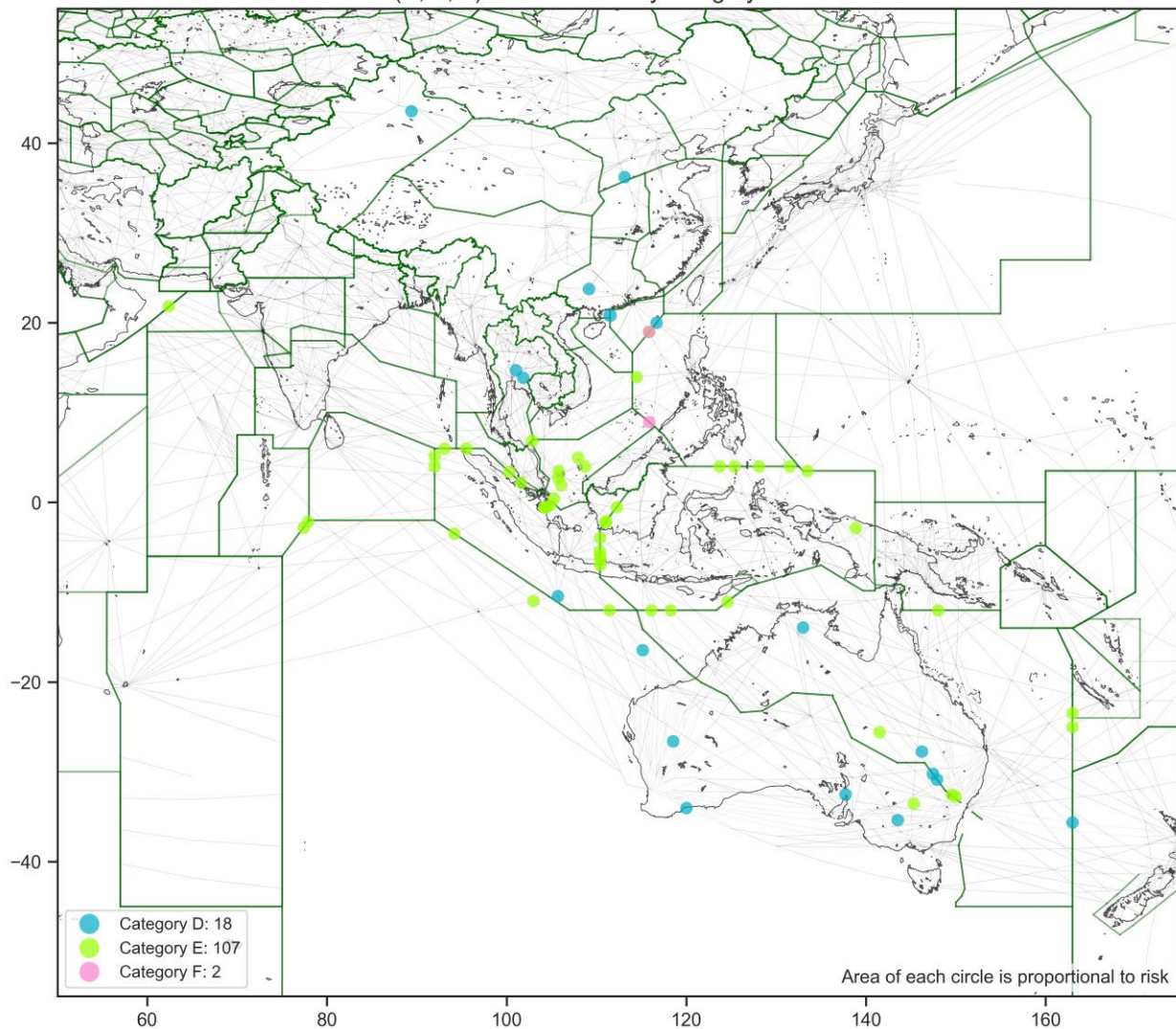


Aircraft/Pilot (A, B, C) LLD/LLEs in ASIA by category - horizontal risk

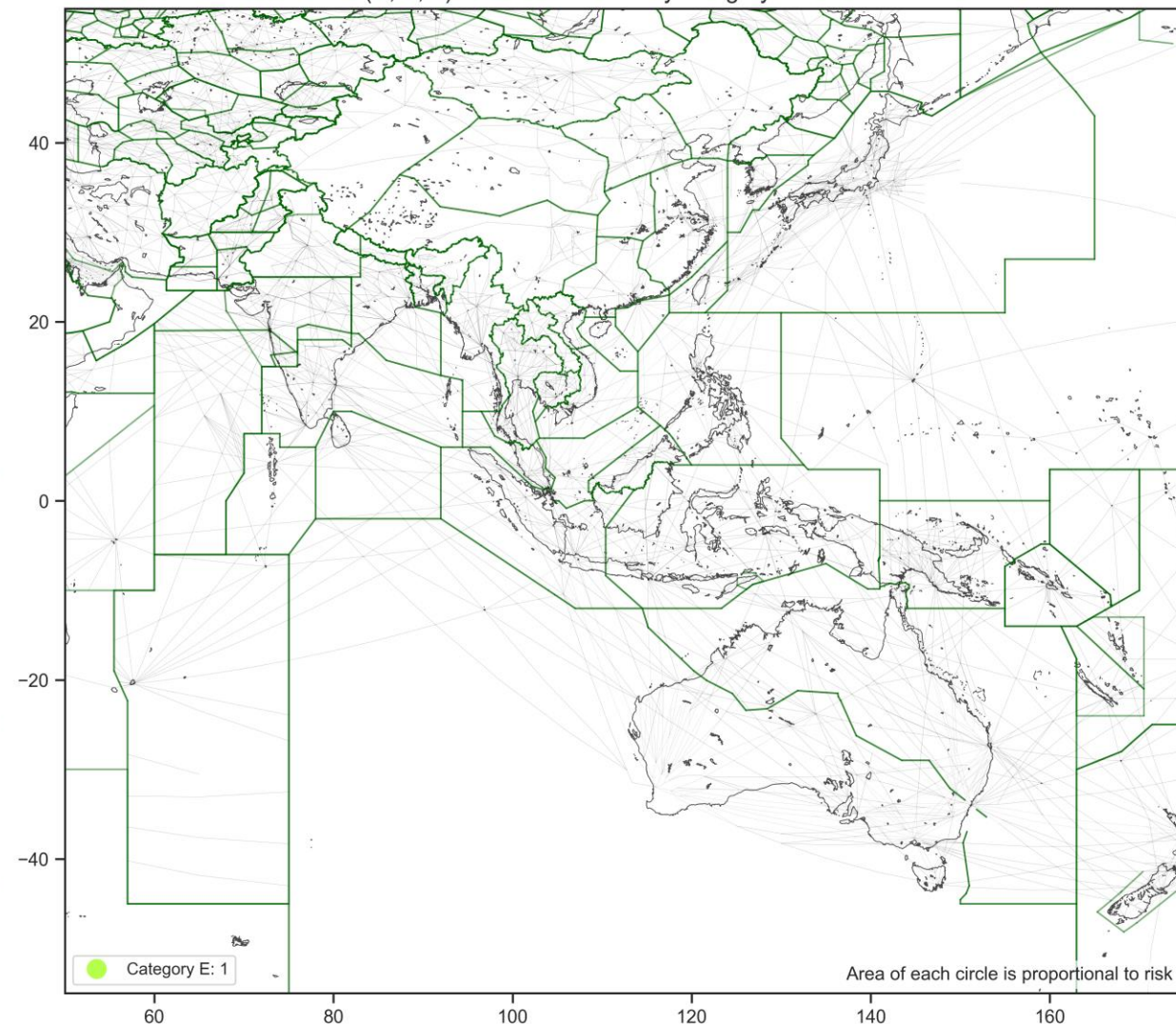


ASIA : ATC (D, E, F)

ATC (D, E, F) LHDs in ASIA by category - vertical risk



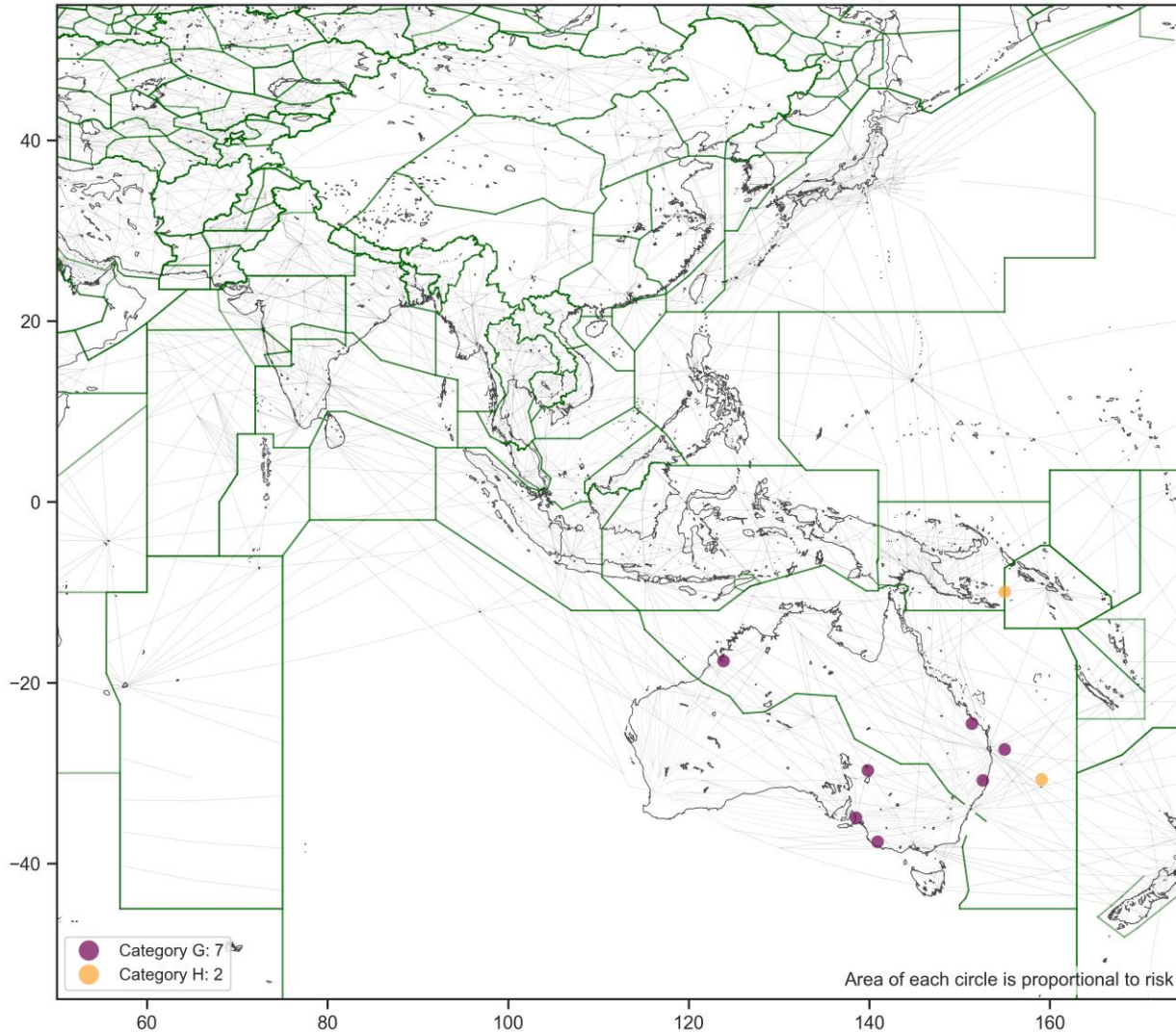
ATC (D, E, F) LLD/LLEs in ASIA by category - horizontal risk



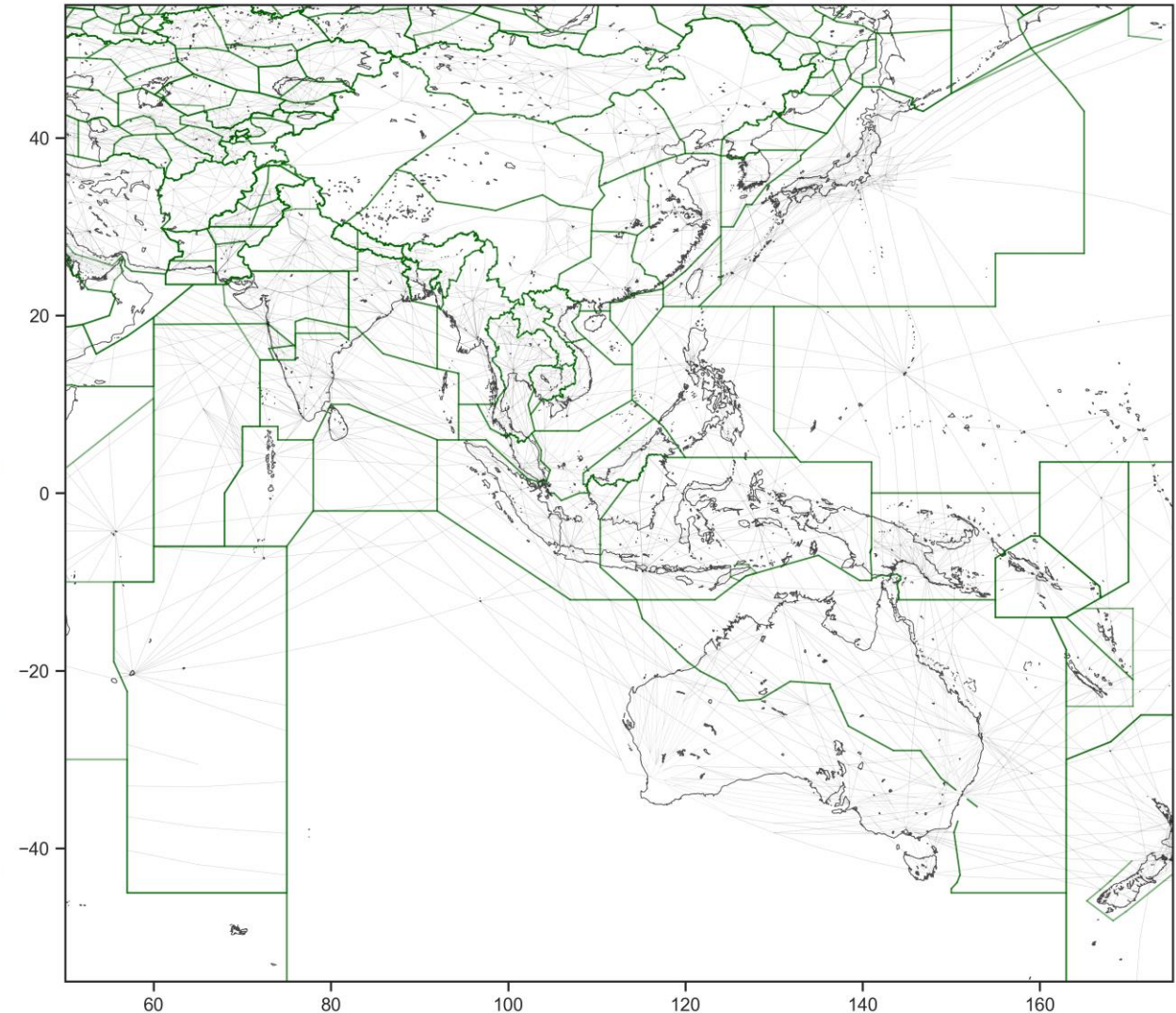
ASIA : Aircraft Avionics/Contingencies

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

Aircraft/Avionics/Contingencies (G, H) LHDs in ASIA by category - vertical risk

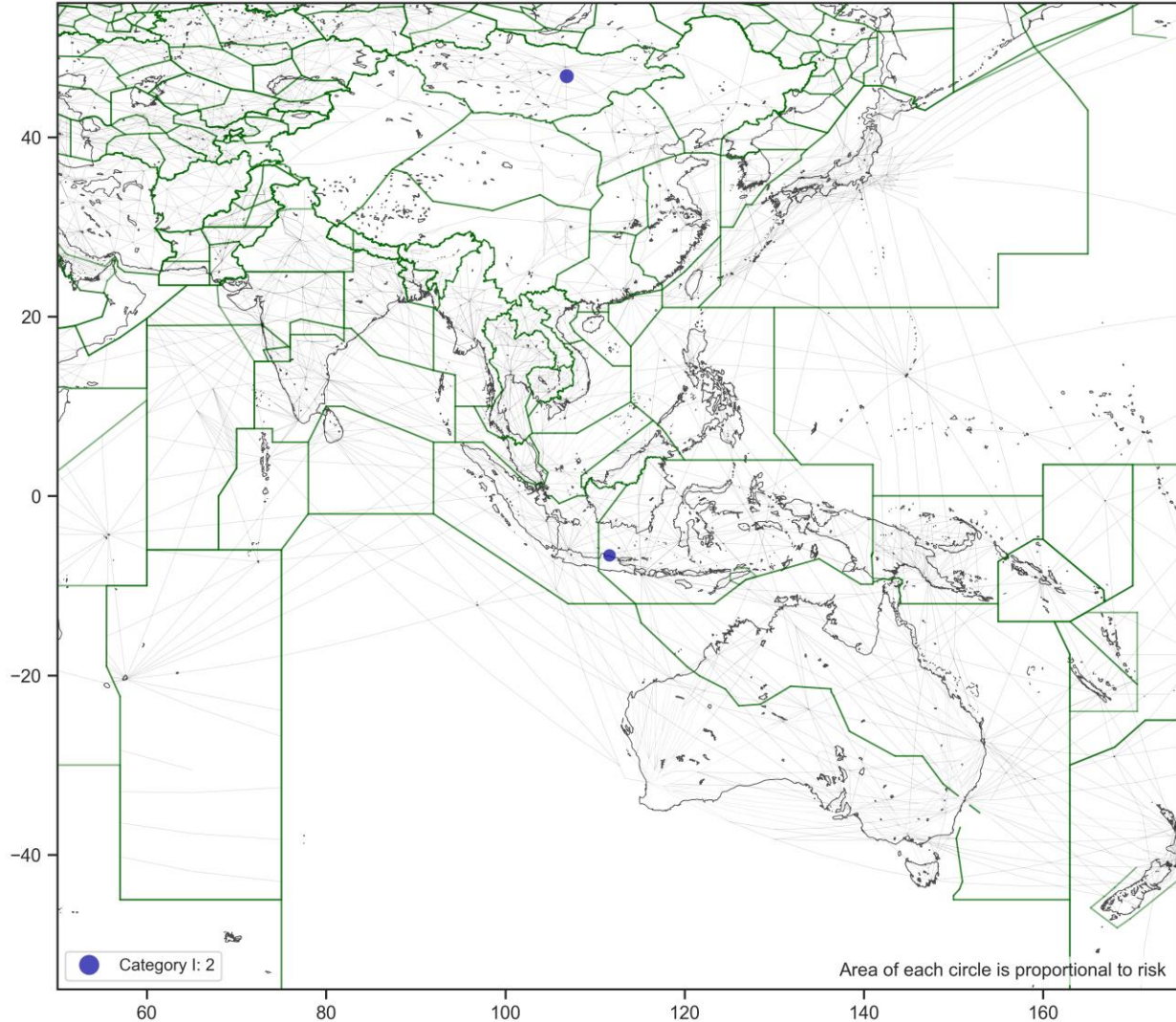


Aircraft/Avionics/Contingencies (H) LLD/LLEs in ASIA by category - horizontal risk

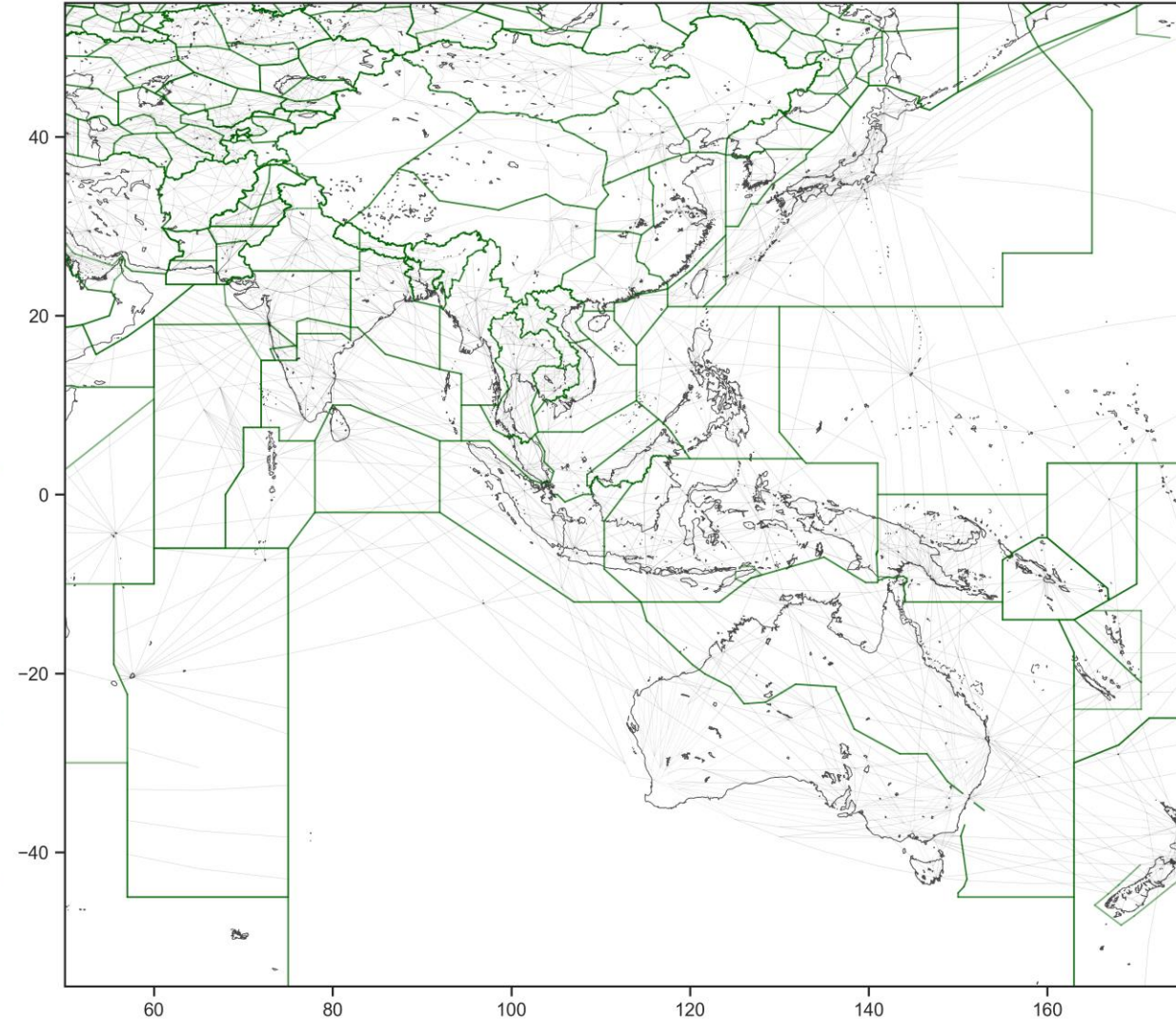


ASIA : Weather/Turbulence (LHD: I; LLD/LLE: H)

Weather/Turbulence (I) LHDs in ASIA by category - vertical risk

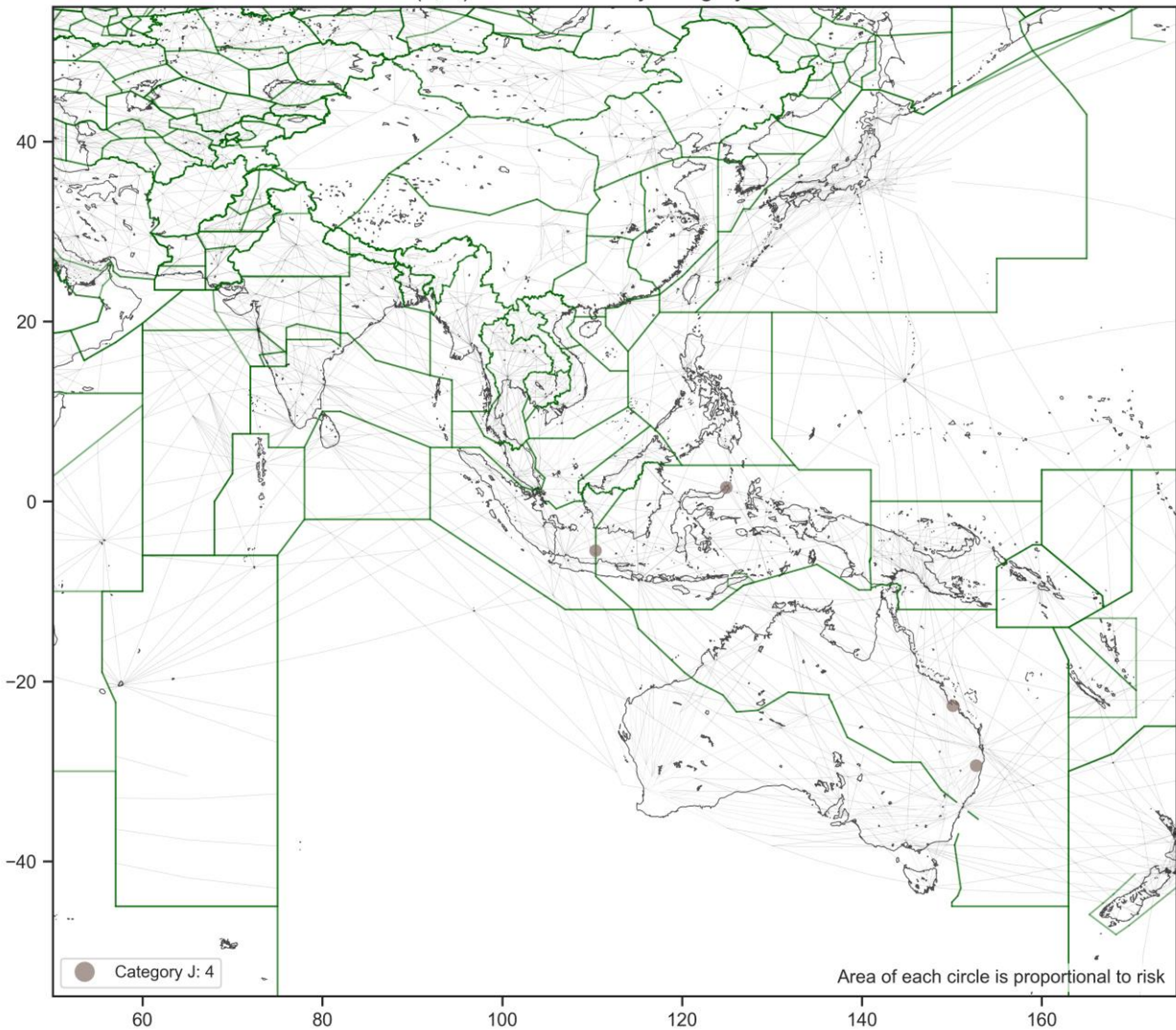


Weather/Turbulence (H) LLD/LLEs in ASIA by category - horizontal risk

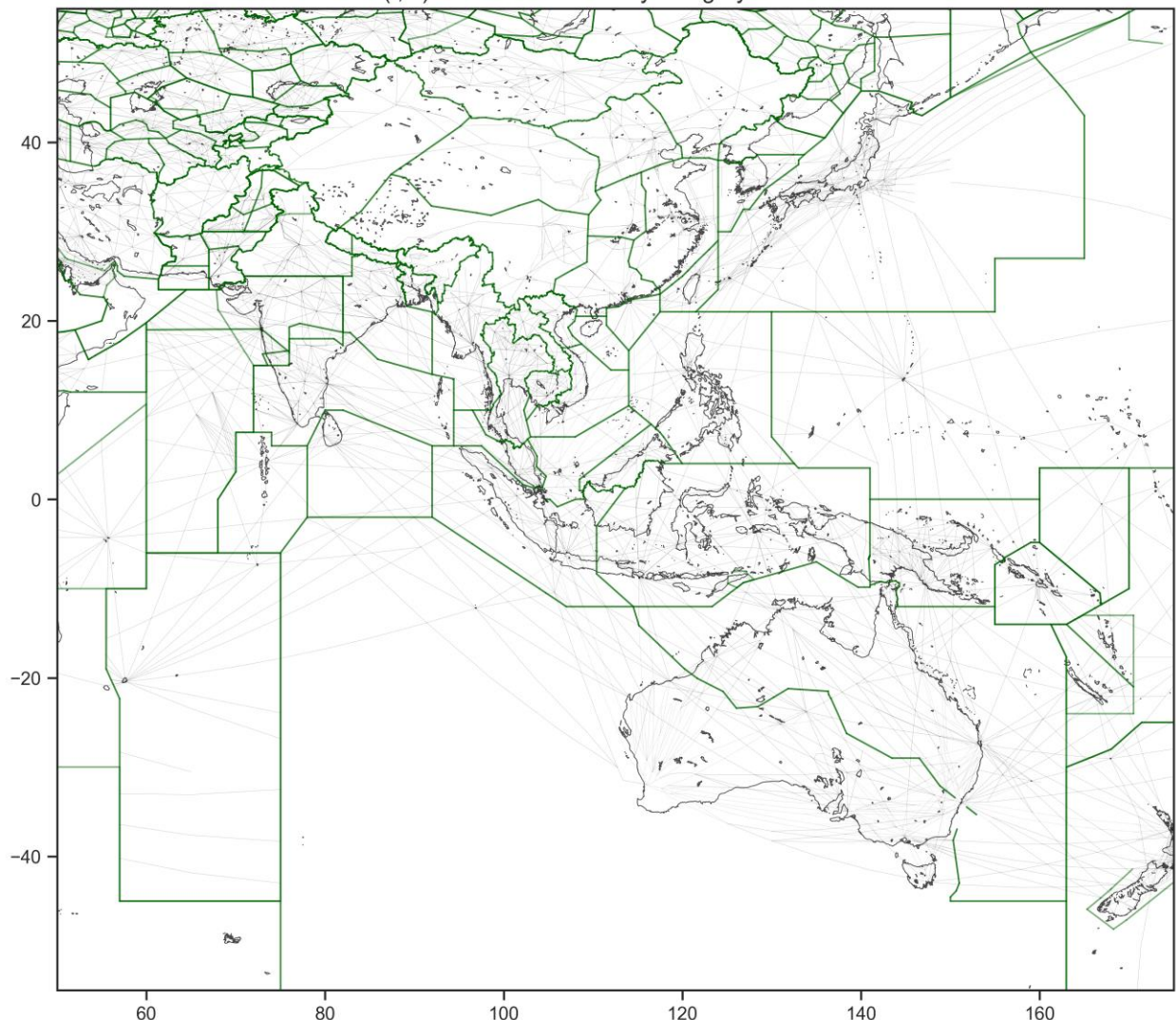


ASIA : TCAS (LHD: J, K; LLD/LLE: I, J)

TCAS (J, K) LHDs in ASIA by category - vertical risk



Other (I, J) LLD/LLEs in ASIA by category - horizontal risk



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.

Trend:

- The number of LHDs gradually decreased.
- The operational risk has reduced to zero since 2024.

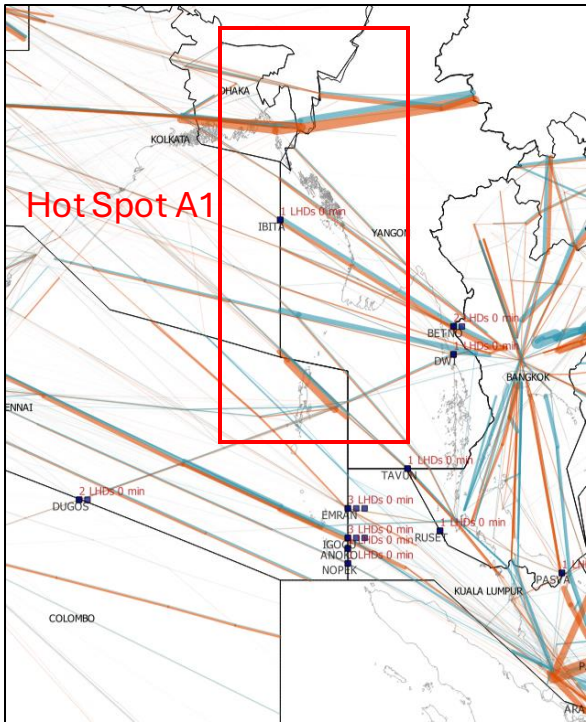
Mitigations:

- 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.

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



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:

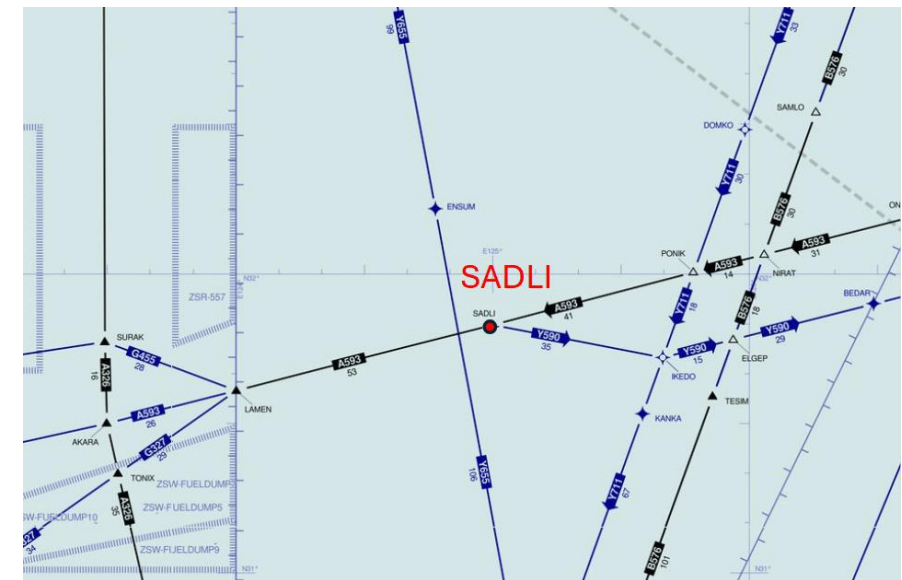
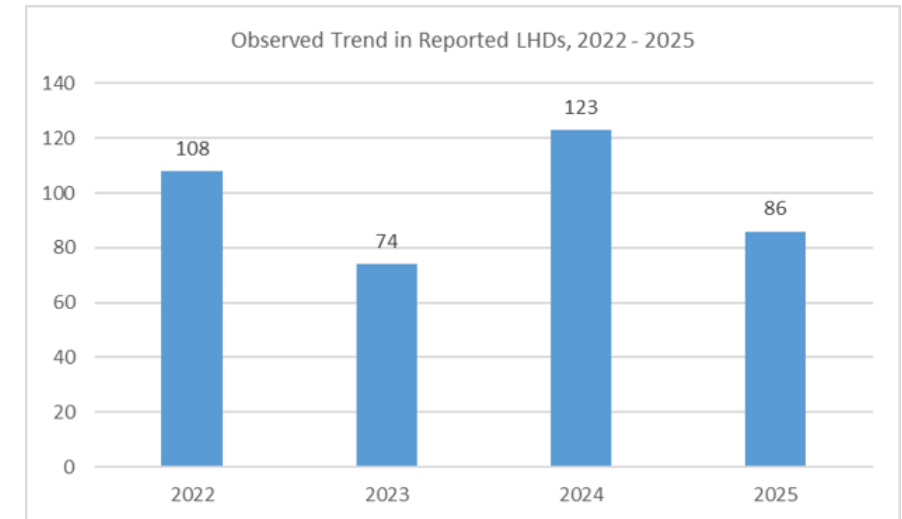
- High traffic volume with limited route capacity

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.

Mitigations:

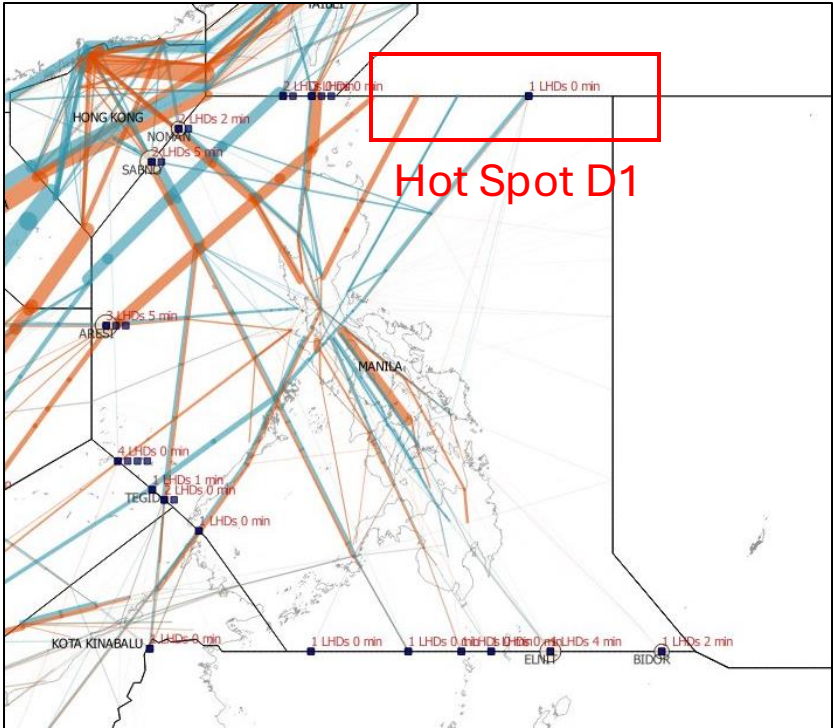
- The timing for sending transfer information from Manila ACC to Fukuoka ACC was adjusted from 30 minutes to 20 minutes prior to the estimated time over the FIR boundary. This change reduced the complexity by allowing the transfer to be coordinated within a single sector instead of across two sectors.

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.**

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.



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.

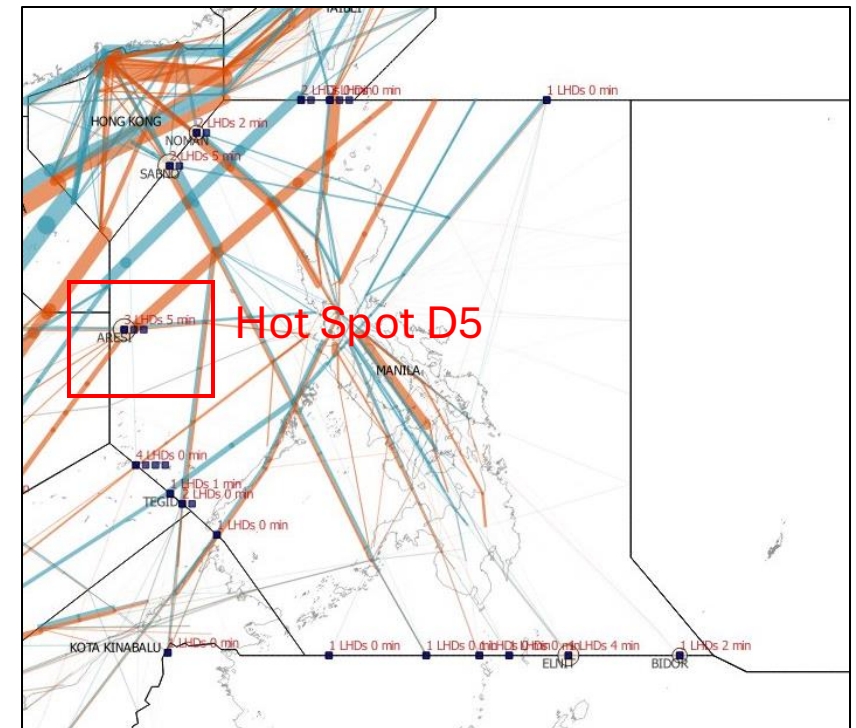
Mitigations:

- 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.

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



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.

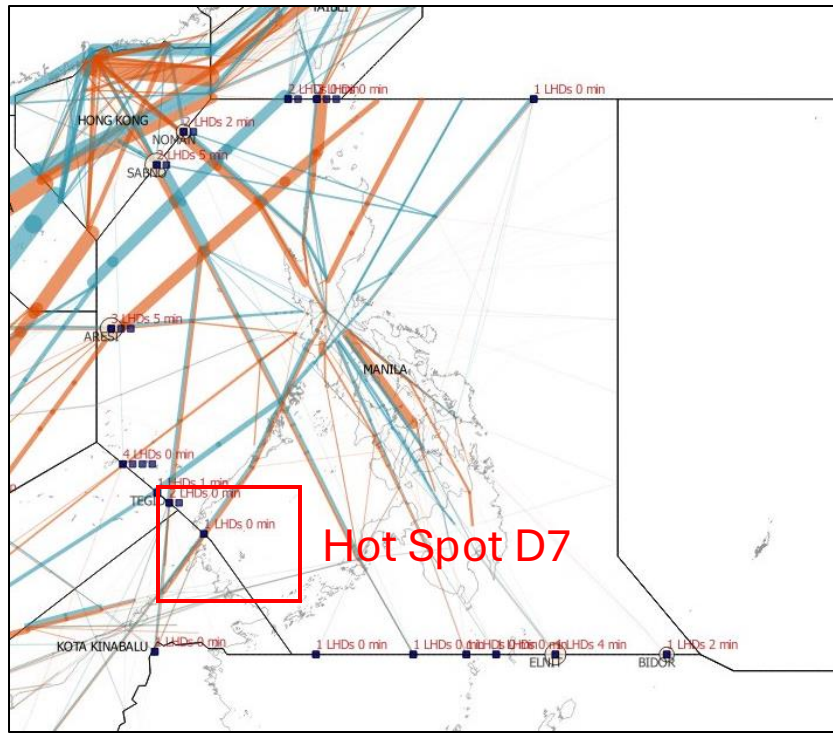
Mitigations:

- 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.**

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



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.

Trend:

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

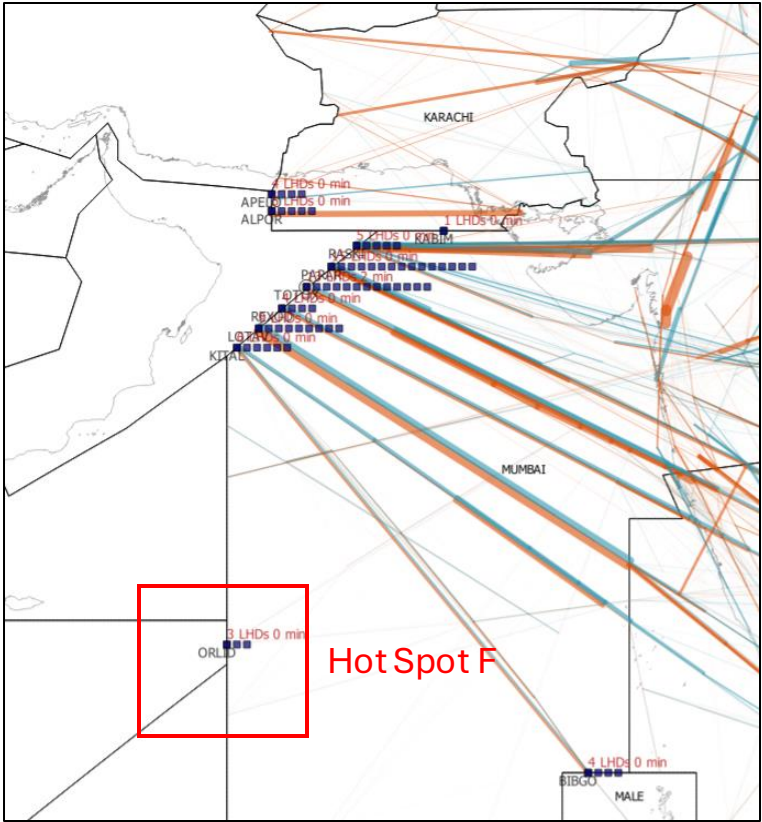
Mitigations:

- 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.**

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



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.

Trend:

- The number of LHDs and operational risk significantly decreased.

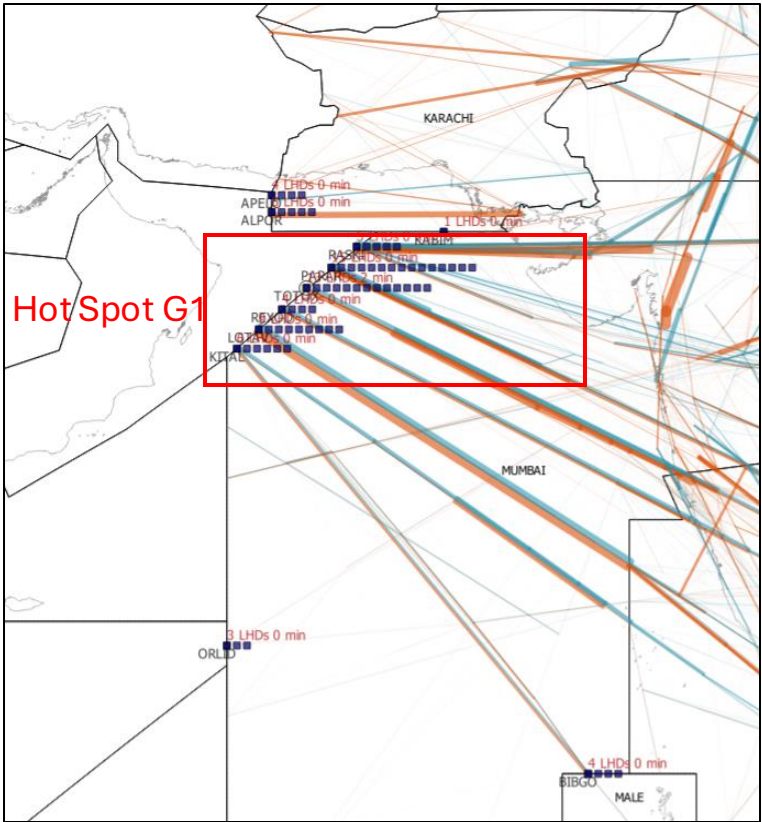
Mitigations:

- 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.

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



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.

Trend:

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

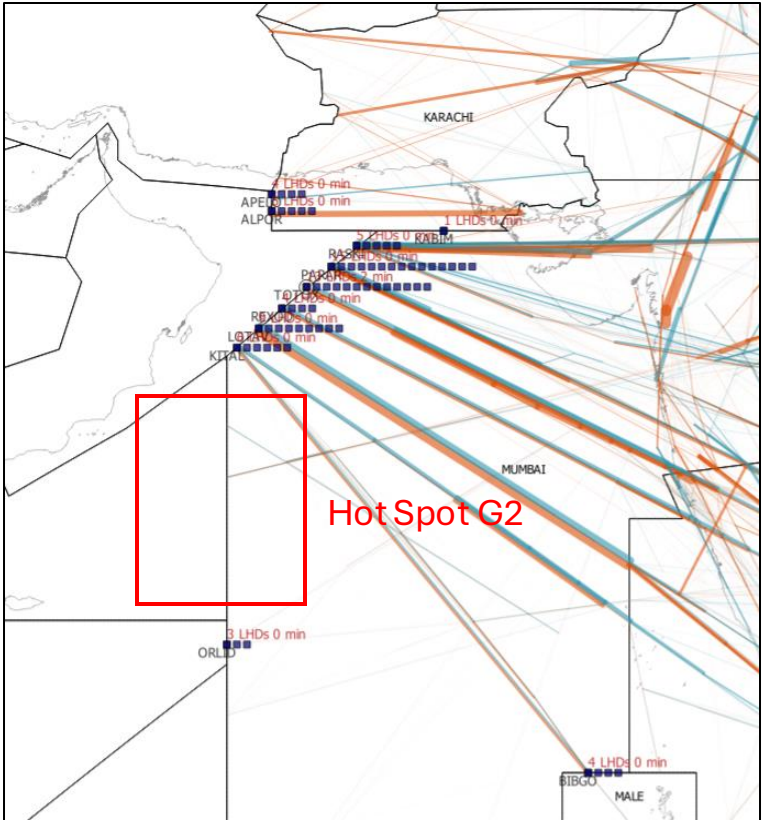
Mitigations:

- 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.**

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



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.

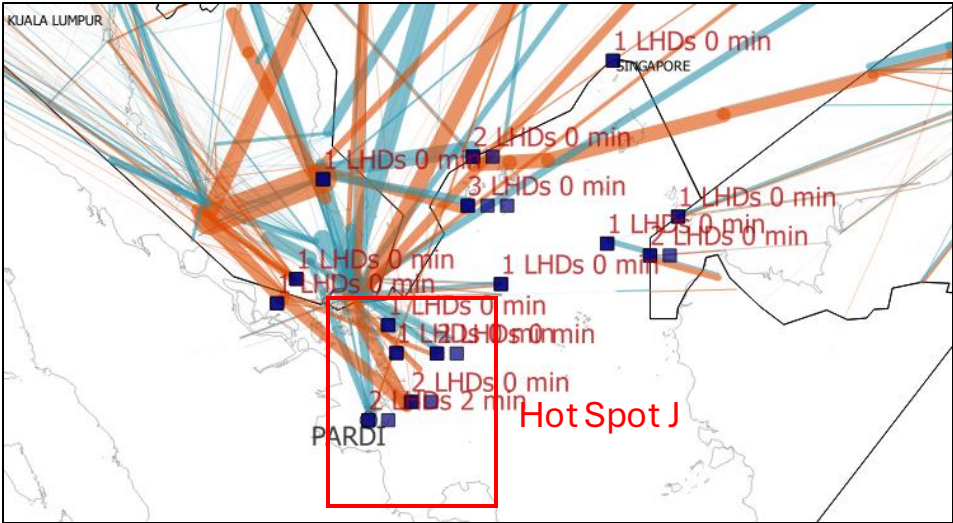
- Trend:**
- The number of LHDs slightly increased.
 - The operational risk significantly decreased.

- 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.

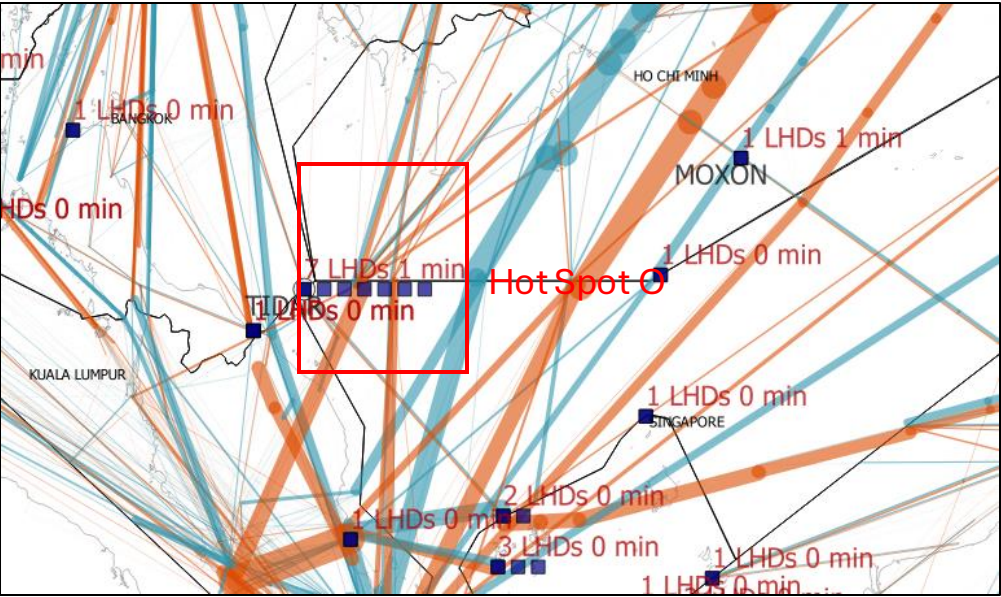
Mitigations:

- 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:

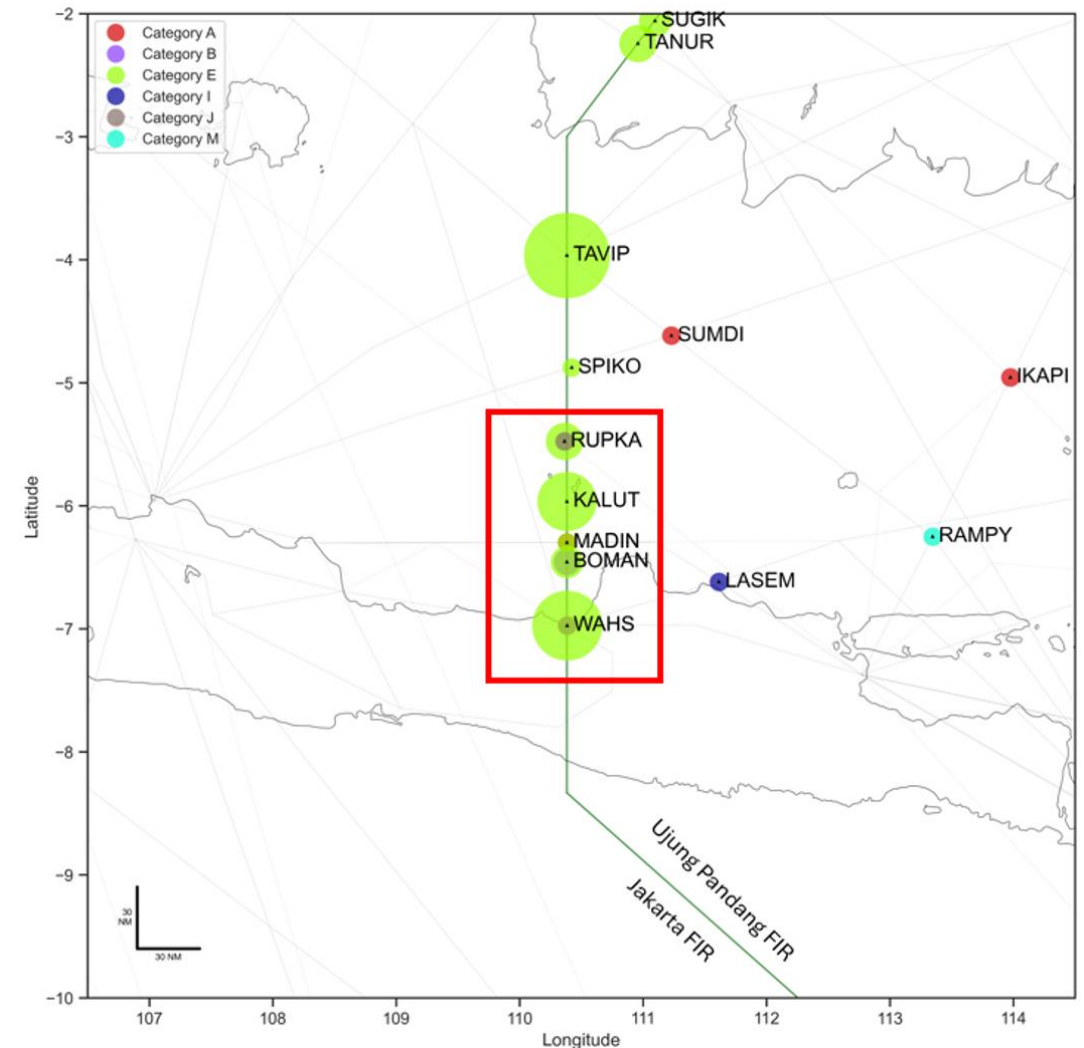
- Gap in communication and high traffic density

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 2.68×10^{-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 **5.67×10^{-9} FAPFH**, slightly above the TLS (5.00×10^{-9} FAPFH).
 - o The level of risk significantly decreased from **15.53×10^{-9} FAPFH** in 2024
 - o 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 1.55×10^{-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>