International Civil Aviation Organization

Thirteenth Meeting of the Air Traffic Management Sub-Group (ATM/SG/13) of APANPIRG

Singapore, 25 – 29 August 2025

Agenda Item 3: Performance Frameworks and Metrics

FIT-ASIA AND RASMAG OUTCOMES

(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 Fifteenth Meeting of the FANS Interoperability Team-Asia (FIT-Asia/15) and the Thirtieth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/30) were held in Bangkok, Thailand, from 24 to 27 June 2025 and 14 to 17 July 2025 respectively.

1.2 RASMAG is a Sub-Group of APANPIRG, and the FIT-Asia reports to RASMAG.

1.3 Meeting documentation and the final reports of FIT-Asia/15 and RASMAG/30 can be found at the following webpages:

a) www2023.icao.int/APAC/Meetings/Pages/2025-FIT-Asia-15.aspx

b) www2023.icao.int/APAC/Meetings/Pages/2025-RASMAG-30.aspx

2. DISCUSSION

FIT-Asia Meeting Outcomes

Data Link Performance Reports

2.1 The FIT-Asia/15 meeting was provided with updated information of Data Link Performance Reports by various States and was reminded that the revised colour key code for "yellow – acceptable performance" had been discussed at FIT-Asia/14, and that RASMAG/29, ***Conclusion RASMAG/29-1****: Revised colour key codes for Asia/Pacific PBCS reporting templates* refers.

2.2 States were urged to use the latest template to ensure accurate data collection and analysis; therefore, all future submissions should align with the updated format.

2.3 The FIT-Asia/15 meeting recalled that the current version of ICAO Doc 9869 specified only DM0 WILCO for use in PORT data analysis, and noted that the next version was expected to include additional downlink message (DM) responses for this purpose. As ICAO Doc 9869 was a guidance document, the Meeting further noted that some air navigation service providers (ANSPs) had chosen to include other DMs such as DM1 UNABLE, DM2 STANDBY, DM3 ROGER, DM4 AFFIRM, and DM5 NEGATIVE in their PORT data analysis.

Asia/Pacific Region Combined PBCS Monitoring Report

2.4 Indonesia and Malaysia presented the aggregated data link performance monitoring report for the Asia/Pacific Region, prepared with support from Japan. **Table 1** showed the combined data for RSP across all media types in 2024. The 95 percent standard was achieved in all flight information regions (FIRs). None of the FIRs met the 99.9 percent standard, but all FIRs except Chennai and Kolkata achieved a clearance rate of 99.0 percent.

Table 1: RSP Aggregated Data (All Media Types)

REQUIRED SURVEILLANCE PERFORMANCE						
Region	Asia-Pacific Region					
Performance Criteria	RSP180					
Time Period	2024 January-June			2024 July-December		
Colour Key Meets Criteria 99.0%-99.89% Under Criteria	No. Messages	Criteria		No. Messages	Criteria	
		95% % < = 90sec	99.90% % <= 180sec		95% % < = 90sec	99.90% % <= 180sec
Aggregate All RGS						
KZAK	5971271	98.69%	99.61%	6372030	98.77%	99.63%
NFFF	323568	99.12%	99.64%			
NTTT	113440	99.59%	99.83%	98835	99.40%	99.67%
NZZO	491645	98.93%	99.73%	461189	98.45%	99.51%
YBBB	1450812	99.49%	99.83%	1397596	99.37%	99.77%
YMMM	1120452	99.48%	99.82%	1120452	99.48%	99.82%
VVTS	271764	98.74%	99.72%	289712	98.88%	99.72%
ZWWW	210283	98.40%	99.50%	155462	98.40%	99.50%
ZLLL	331337	98.20%	99.50%	312276	98.30%	99.50%
VOMF	287424	97.49%	98.92%	283528	96.83%	98.54%
VECF	557384	98.00%	98.96%	291377	97.58%	98.66%
VABF	774232	97.51%	99.11%	782999	96.91%	98.74%
RJJJ	3091247	98.41%	99.59%	3659783	98.45%	99.58%
WMFC	335522	98.65%	99.57%	253690	98.72%	99.55%
RPHI	627,080	98.38%	99.39%	680993	98.28%	99.29%
WSJC	810654	98.84%	99.76%	795579	98.92%	99.75%
VCCF	102604	98.83%	99.84%	402896	98.53%	99.65%
PAZA	1911481	98.74%	99.62%	2253510	98.87%	99.66%
WAAF	241952	98.96%	99.48%	277369	99.01%	99.48%

2.5 RCP240 performance in the Asia/Pacific region was generally robust in 2024, with most FIRs meeting or exceeding the 95% criteria for ACP and ACTP. However, performance against the 99.9% criteria showed greater variability, with several FIRs, including Kolkata, Kuala Lumpur, and Manila, underperforming in at least one half of the year (see **Table 2**).

Table 2: RCP Aggregated Data (All Media Types)

REQUIRED COMMUNICATIONS PERFORMANCE										
Region	Asia-Pacific Region									
Performance Criteria	RCP240									
Time Period	2024 January-June					2024 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	356648	99.37%	99.53%	99.60%	99.70%	392772	99.31%	99.46%	99.55%	99.65%
NFFF	10980	99.49%	99.74%	99.74%	99.80%					
NTTT	3902	99.67%	99.85%	99.77%	99.87%	3110	99.71%	99.74%	99.71%	99.81%
NZZO	92307	99.23%	99.50%	99.47%	99.68%	84705	98.96%	99.25%	99.30%	99.48%
YBBB	43673	99.54%	99.54%	99.67%	99.68%	42531	99.54%	99.57%	99.71%	99.73%
YMMM	46001	99.63%	99.63%	99.76%	99.75%	49595	99.72%	99.74%	99.81%	99.83%
VVTS	76964	98.36%	99.66%	98.89%	99.82%	76981	98.35%	99.61%	98.88%	99.80%
ZWWW	33	87.87%	87.87%	87.87%	87.87%	34	100.00%	100.00%	100.00%	100.00%
ZLLL	2164	98.38%	99.12%	98.75%	99.63%	2389	98.40%	98.15%	98.74%	98.95%
VOMF	145895	99.80%	99.80%	99.81%	99.62%	149114	99.63%	99.76%	99.74%	99.82%
VECF	17958	98.60%	98.92%	98.91%	99.21%	20325	98.77%	98.94%	99.01%	99.16%
VABF	147275	98.55%	99.24%	99.07%	99.65%	171155	98.41%	99.14%	99.01%	99.59%
RJJJ	67522	99.68%	99.70%	99.79%	99.80%	78527	99.61%	99.61%	99.76%	99.74%
WMFC	5833	98.75%	98.63%	99.14%	99.11%	5583	98.82%	98.85%	99.21%	99.28%
RPHI	23358	98.30%	98.69%	98.56%	98.87%	44358	98.44%	98.63%	98.65%	98.81%
WJSC	45233	99.28%	99.42%	99.51%	99.60%	51007	99.43%	99.47%	99.61%	99.65%
VCCF	5678	97.68%	99.51%	98.66%	99.70%	20337	96.84%	99.22%	99.01%	99.72%
PAZA	119296	99.39%	99.45%	99.59%	99.64%	138314	99.08%	99.53%	99.36%	99.67%
WAAF	42694	99.37%	99.80%	99.53%	99.85%	46592	99.31%	99.75%	99.43%	99.79%

2.6 **Table 3** illustrated that certain combinations of aircraft operators and aircraft types, each with over 1,000 message counts in either half of 2024, did not achieve PORT compliance.

Table 3: Combinations of Aircraft Operators and Types Confirmed Non-Compliance of PORT

Criteria		RCP240											
Period		Jan - Jun 2024						Jul - Dec 2024					
Colour Key: Meets Criteria / 99.0%-99.89% / Under Criteria		Message Counts	95% benchmark		99.9% Benchmark		95%	Message Counts	95% benchmark		99.9% Benchmark		95%
			ACP	ACTP	ACP	ACTP	PORT		ACP	ACTP	ACP	ACTP	PORT
			% < = 180sec	% <= 120sec	% < = 210sec	% <= 150sec	%<60secs		% < =180sec	% <= 120sec	% < = 210sec	% <= 150sec	%<60secs
FIR	By Aircraft Operator / Type (only message counts >100 recorded)												
KZAK	UAL/B738	6779	96.80%	97.43%	97.83%	98.97%	94.73%	7841	95.92%	96.88%	97.35%	98.55%	93.19%
KZAK	MIL/C17	2693	98.14%	99.70%	98.55%	99.85%	94.69%	2536	97.99%	99.53%	98.34%	99.72%	94.79%
KZAK	MIL/K35R	1456	97.46%	99.79%	98.15%	99.93%	90.18%	1676	97.37%	99.76%	98.15%	99.82%	91.29%
VVTS	AAR	1135	98.29%	99.74%	98.68%	100.00%	94.27%	838	98.10%	99.27%	99.50%	99.61%	93.80%
VVTS	CAL	2905	97.90%	99.40%	98.66%	99.54%	94.87%	2818	98.10%	99.10%	98.69%	99.44%	95.88%
VVTS	JAL	1522	98.14%	99.93%	98.90%	100.00%	95.20%	1377	97.97%	99.98%	98.68%	100.00%	93.92%
VVTS	KAL	3776	97.56%	99.13%	98.39%	99.62%	94.15%	3057	97.87%	99.54%	98.69%	99.73%	94.80%
VVTS	SJX	1525	98.37%	99.10%	98.76%	99.52%	95.68%	1411	97.43%	98.70%	98.37%	99.15%	94.47%
VABF	ALK/A21N	789	96.61%	99.11%	97.31%	99.41%	90.75%	1068	97.33%	98.83%	98.33%	99.23%	92.42%
VABF	ALK/A332	1347	98.22%	99.38%	99.10%	99.87%	94.28%	692	97.69%	98.96%	98.63%	99.74%	93.50%
VABF	ETD/A320	3140	97.44%	99.25%	98.22%	99.48%	91.24%	2633	95.71%	98.82%	97.85%	99.42%	88.49%
VABF	ETD/A321	4613	97.31%	99.45%	98.19%	99.71%	90.53%	5720	95.89%	98.74%	97.47%	99.44%	90.02%
VABF	KAC/A20N	1092	97.07%	99.11%	98.24%	99.97%	91.85%	1293	96.44%	97.76%	97.64%	98.70%	92.34%
VABF	MAU/A332							1300	98.86%	99.67%	99.31%	99.98%	94.31%
VABF	QTR/A332	900	98.01%	99.80%	98.40%	99.84%	90.22%	2009	98.06%	99.50%	98.82%	99.82%	91.29%
VABF	QTR/A333	2025	97.71%	99.58%	98.42%	99.74%	91.56%	2489	98.03%	99.46%	98.58%	99.65%	91.92%
VABF	QTR/B77W	9722	97.73%	97.92%	98.64%	98.94%	96.55%	11176	96.69%	97.19%	98.09%	98.35%	95.63%
VABF	SVA/A333	3057	97.17%	99.54%	97.96%	99.80%	88.06%	2969	97.00%	99.81%	97.91%	99.96%	86.09%
VABF	THY/A333	878	97.45%	99.48%	98.34%	99.85%	91.12%	1485	97.64%	99.09%	98.52%	99.39%	92.19%
VABF	VTI/A21N	1595	97.66%	100.00%	97.93%	100.00%	92.66%	1332	98.02%	99.81%	98.71%	99.87%	92.12%
RPHI	CAL/A359	830	94.10%	92.77%	94.54%	93.77%	92.53%	1300	93.24%	91.02%	93.64%	91.74%	91.62%
RPHI	CSN/B789	1737	95.75%	95.68%	96.06%	96.35%	93.96%	2365	96.14%	94.93%	96.44%	95.60%	94.29%
RPHI	SIA/A359	1384	94.67%	95.05%	95.16%	95.58%	92.73%	2721	95.69%	95.14%	95.96%	95.80%	93.38%
RPHI	SIA/B78X	1076	96.68%	95.57%	96.96%	96.33%	95.07%	2031	96.28%	96.12%	96.61%	96.73%	93.75%
WAAF	CPA/B77W	1759	98.64%	99.86%	99.39%	99.94%	92.33%	2375	98.78%	99.86%	99.24%	99.90%	94.40%
PAZA	CKS/B744	3154	97.94%	97.75%	98.57%	98.60%	96.07%	3931	96.51%	98.37%	97.69%	98.98%	94.38%
PAZA	CPA/B748	2571	98.02%	98.33%	99.07%	98.95%	95.76%	3061	94.51%	98.14%	96.21%	98.56%	91.44%
PAZA	DAL/A339	2220	98.47%	99.23%	99.05%	99.50%	95.90%	1774	98.76%	99.66%	99.27%	99.89%	94.59%
PAZA	CPA/B77W	1426	98.88%	99.09%	99.37%	99.37%	96.91%	2122	98.30%	98.87%	98.73%	99.48%	94.67%

Extension of the Network Outage Reporting and Impact Assessment (NORIA) Handbook for Global Applicability

2.7 The handbook aimed to standardize how Communication Service Providers (CSPs) and Satellite Service Providers (SSPs) report network outages, degradations, and maintenance to ANSPs, using a common format and taxonomy to support operational impact assessment. The current draft only covered the North Atlantic Region, but discussions were underway to expand its scope globally. EUROCONTROL had already supported its extension to continental Europe. The FIT-Asia meeting highlighted the need for regular updates to maintain data accuracy, and Operational Data Link Working Group (OPDLWG) members confirmed they would take responsibility for keeping the handbook current if adopted globally.

2.8 FIT-Asia acknowledged that while some States had expressed concerns, the proposed changes involved only the implementation of standardized reporting and broader notification procedures, without causing any disadvantage. FIT-Asia/15 supported the extension of the NORIA Handbook for global applicability, and Singapore would inform the OPDLWG of this support.

Air Navigation Deficiencies Relating to Data Link Performance Monitoring and Analysis

2.9 FIT-Asia/15 was informed that APANPIRG/35 had agreed to the following updates to the APANPIRG ATM and Airspace Deficiencies in the Data Link field:

a) Maldives – withdrawn. ICAO confirmed that Maldives had disabled the ADS-C function from its ATM system due to application issues, and CPDLC / HF is used beyond VHF coverage.

b) India – remain. Performance monitoring and analysis not reported for Mumbai FIR.

2.10 Given that India had submitted the data link performance report for all the three FIRs, including Mumbai FIR, and completed annual Survey of the Status of Current and Planned Implementation of Performance-Based Horizontal Separation Minima form for 2025, the FIT-Asia/15 meeting agreed to the proposal to remove India from the APANPIRG ATM and Airspace Deficiencies list in the Data Link field, which would be proposed to RASMAG for further consideration.

India – proposed to be removed.

Progress on Issues Related to the Central Reporting Agency (CRA)

2.11 The FIT-Asia/15 meeting noted the key roles and responsibilities of the Central Reporting Agency (CRA) as outlined in ICAO Doc 9869, which include managing and analyzing problem reports (PRs), coordinating with relevant stakeholders, and supporting both regional and global monitoring activities. The CRA was also tasked with identifying performance deficiencies, issuing recommendations, and maintaining a centralized database to ensure continued compliance with performance-based separation minima and the effectiveness of data link operations.

2.12 It was recalled that APANPIRG/34 had urged States to establish formal service agreements with APANPIRG-recognized CRAs, in accordance with ICAO Annexes 6 and 11. During FIT-Asia/14, discussions were held on the possibility of expanding the existing CRA service contract used in the IPACG, ISPACG, and NAT regions to include FIT-Asia States lacking formal CRA agreements. However, this initiative could not proceed due to unforeseen administrative changes, despite prior coordination, thereby impacting other States that had anticipated inclusion under the expanded arrangement.

2.13 In light of this, the FIT-Asia/15 meeting acknowledged the need for affected States to engage directly with APANPIRG-recognized CRAs to fulfil performance monitoring requirements. Boeing, as FIT-Asia CRA, was encouraged to remain flexible and provide support throughout this coordination process. Several FIT-Asia member States that had not yet established a formal service agreement with the CRA took the opportunity to hold side meetings with Boeing to discuss potential formal service agreement.

PBCS Seminar

2.14 A Performance-Based Communication and Surveillance (PBCS) Seminar was conducted in conjunction with FIT-Asia/15 on 26 June 2025. Presentations were delivered by China, Japan, New Zealand, Singapore, Boeing, Inmarsat and ICAO. The presentation materials are available on the ICAO meeting website: https://www.icao.int/APAC/Meetings/Pages/2025-FIT-Asia-15.aspx.

RASMAG/30 Meeting Outcomes

APAC Consolidated Safety Report

2.15 The Monitoring Agency for the Asian Region (MAAR) presented a combined summary of the safety analysis results for the Asia/Pacific Region, on behalf of the Asia/Pacific RMAs and En-route Monitoring Agency (EMA). The report was divided into the Pacific (PAC) area, and Asia area (**Figure 1**). The full 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).

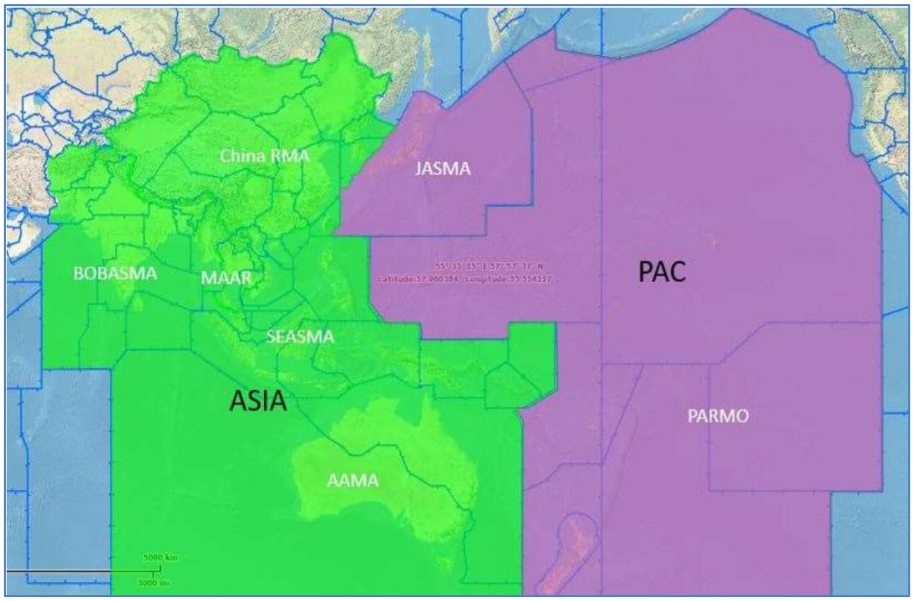

Figure 1: Asia and Pacific Safety Reporting Areas

Pacific Area Vertical Collision Risk

2.16 The estimated vertical collision risk for 2024 for the PAC area did not meet Target Level of Safety (TLS) (see **Table 4**).

Table 4: Pacific Area Vertical Collision Risk 2024

Pacific Area – annual flying hours = 3,727,882			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Vertical Technical Risk	0.20×10^{-9}	2.5×10^{-9}	Below Technical TLS
Vertical Operational Risk	15.33×10^{-9}	-	-
2023 Vertical Overall Risk	**15.53×10^{-9}**	5.0×10^{-9}	**Above TLS**

2.17 The PAC vertical collision risk estimates had been above TLS and trending upwards each year from 2016 to 2019. In 2024, there was an increase when compared to the previous year. (**Figure 2**).

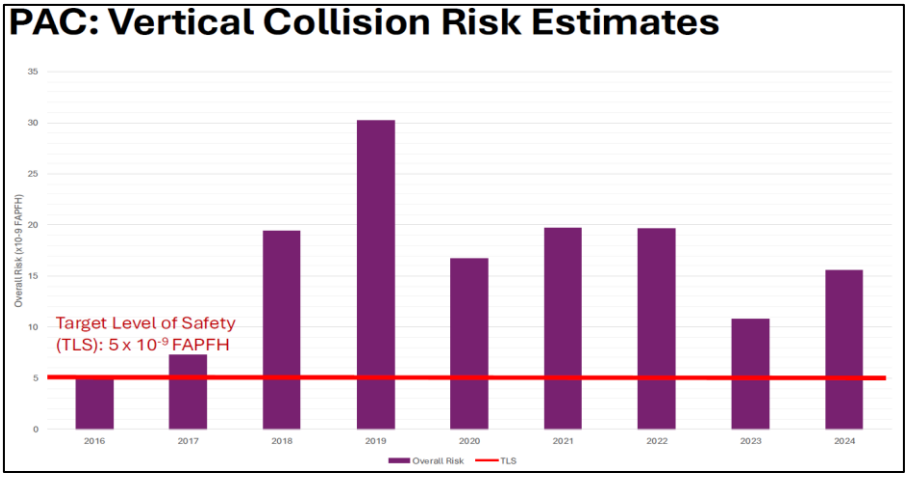

Figure 2: Pacific Area Vertical Collision Risk Estimates 2016 – 2024

2.18 There was a total of 139 LHDs in the Pacific area in 2024 (increased from 134 in 2023), with total duration 1,119 minutes and 75 levels crossed. 38 of the occurrences were Category A, B or C (27%), 65 were Category D, E or F (47%), two were Category G or H (1%), 15 in Category I (11%), 17 were Category J or K (12%), and two were Category L or M (1%).

Pacific Area Horizontal Collision Risk

2.19 The estimated horizontal collision risk for 2023 for the PAC area met TLS in all longitudinal and lateral risk categories. (**Table 5**)

Table 5: Pacific Area Horizontal Collision Risk 2023

2023 PAC Area	**Risk Estimation**	**Remarks**
Total Lateral Risk	0.24×10^{-9}	Below TLS
Total Longitudinal Risk	0.038×10^{-9}	Below TLS
2024 PAC Area	**Risk Estimation**	**Remarks**
Total Lateral Risk	1.22×10^{-9}	Below TLS
Total Longitudinal Risk	0.014×10^{-9}	Below TLS

2.20 There was a total of 171 LLDs and LLEs in the Pacific area in 2024 (increased from 141 in 2023), with a total duration of 2085 minutes and total horizontal deviation of 2015 NM. 48 occurrences were Category A, B or C (28%), 114 of the occurrences were Category D, E or F (67%), zero in Category G, 8 were Category H (5%) and one in Category I or J (0.6%).

Asia Vertical Collision Risk

2.21 The estimated vertical collision risk for 2024 for the Asia area met TLS (**Table 6** and **Figure 3**). The overall risk was below the TLS. There was a total of 763 LHDs reported in the Asia area in 2024 (decreased compared to 824 in 2023), with total duration 210 minutes and 225.2 levels crossed.

Table 6: Asia Area Vertical Collision Risk 2024

Asia Area – annual flying hours = 11,413,712 hours			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Vertical Technical Risk	0.70×10^{-9}	2.5×10^{-9}	Below Technical TLS
Vertical Operational Risk	1.29×10^{-9}	-	-
2024 Vertical Overall Risk	**1.99×10^{-9}**	5.0×10^{-9}	**Below TLS**

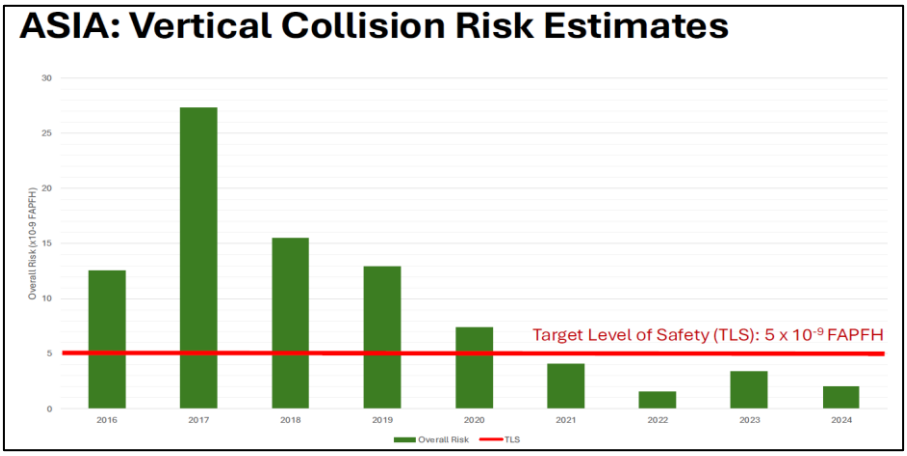

Figure 3: Asia Area Vertical Collision Risk Estimates 2016 –2024

Asia Area Horizontal Collision Risk

2.22 The estimated horizontal collision risk for 2024 for the Asia area met TLS in all longitudinal and lateral risk categories (**Table 7**). There were 3 LLDs and LLEs reported in the Asia area in 2024, with a duration of 114 minutes.

Table 7: Asia Area Horizontal Collision Risk 2024

Asia Area – annual flying hours = 789,118 hours		
2023 Asia Area	**Risk Estimation**	**Remarks**
Total Lateral Risk	1.517×10^{-9}	Below TLS
Total Longitudinal Risk	4.444×10^{-9}	Below TLS
2024 Asia Area	**Risk Estimation**	**Remarks**
Total Lateral Risk	**1.54 x 10^{-9}**	Below TLS
Total Longitudinal Risk	**1.62 x 10^{-9}**	Below TLS

Reporting Rate of LHDs, LLDs and LLEs

2.23 **Table 8** showed the number of LHD, LLD and LLE reports for 2018 to 2024, and the number of reports per flying hours. Total estimated flying hours had been increasing since 2020, at 16,087,567 in 2024, but total reports had decreased from 1,122 in 2023 to 1,077 in 2024.

2.24 The reporting rate for SEA, China and SA/IO had significantly decreased in 2024. No aircraft flying in the RVSM airspace of Democratic People's Republic of Korea in 2024. Nil reports submitted by Democratic People's Republic of Korea and Mongolia in 2024.

Table 8: Total LHD, LLD and LLE Reports, and Reports per Flying Hours, 2018 – 2024

Airspace	# Reports							1 Report : Flying Hrs						
	2018	2019	2020	2021	2022	2023	2024	2018	2019	2020	2021	2022	2023	2024
DPRK	0	0	0	0	0	0	0	-	-	-	-	-	-	-
Mongolia	1	2	0	1	0	0	0	1: 158,891	1: 82,138	-	1: 121,621	-	-	-
SEA	205	152	42	70	62	95	74	1: 17,757	1: 22,275	1: 25,106	1: 15,456	1: 32,620	1:29,400	1:42,001
Japan	76	77	66	80	75	67	76	1: 20,632	1: 20,762	1: 14,737	1: 13,528	1: 18,751	1:23,452	1:25,387
SA/IO	681	439	152	135	143	254	204	1: 3,783	1: 7,955	1: 7,907	1: 11,167	1: 21,018	1:10,242	1:20,309
SW Pacific	53	101	46	47	81	65	71	1: 17,817	1: 9,335	1: 6,954	1: 11,975	1: 5,352	1:18,186	1:17,538
China	110	79	85	105	72	223	190	1: 22,229	1: 31,119	1: 26,867	1: 15,477	1: 18,003	1:10,525	1:15,149
Pacific	43	173	134	176	179	203	234	1: 45,064	1: 10,139	1: 6,404	1: 6,638	1: 8,280	1:8,736	1:8,264
Indonesia	23	37	18	41	54	125	102	1: 53,603	1: 33,321	1: 17,346	1: 7,402	1: 8,060	1:6,099	1:5,376
ROK and AKARA	12	34	5	24	108	75	126	1: 28,365	1: 18,959	1: 25,965	1: 6,285	1: 1,056	1:2,220	1:1,568
Total	**1,204**	**1,094**	**548**	**679**	**774**	**1,122**	**1,077**	**1: 12,332**	**1: 14,330**	**1: 11,712**	**1: 11,200**	**1:13,230**	**1:12,135**	**1:14,937**

Hot Spots

2.25 **Table 9** summarized current LHD Hot Spots, the FIRs involved, the year of identification, and status remarks.

Table 9: LHD Hot Spots in the Asia/Pacific Region

Hot Spot	Involved FIRs	Identified	Remarks
A1	Chennai/Dhaka/Kolkata/Yangon	2015	Cat. E LHDs and risk decreasing
B1	Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)	2015	Cat. E LHDs increasing. Risk decreasing.
D1	Fukuoka/Manila	2015	Cat. E steady; risk decreasing. Mitigation in place. **Potential non-hotspot**.
D5	Ho Chi Minh/Manila	2015	Cat. E LHDs and risk slightly increasing.
D7	Kota Kinabalu/Manila	2015	Cat. E LHDs slightly increasing. Risk slightly decreasing.
D8	Manila/Ujung Pandang	2015	Cat. E LHDs and risk decreasing. Mitigation in place. **Potential non-hotspot**.

Hot Spot	Involved FIRs	Identified	Remarks
F	Mogadishu/Mumbai	2015	Cat. E LHDs decreasing. Risk slightly increasing.
G1	Mumbai/Muscat	2015	Cat. E LHDs slightly decreasing. Risk decreasing.
G2	Mumbai/Sanaa	2015	Cat. E LHDs slightly increasing. Risk decreasing.
J	Jakarta/Kota Kinabalu/Singapore	2018	Cat. E LHDs and risk decreasing. Mitigation in place. **Potential non-hotspot**.
N	Hawaii CEP/Oakland USA	2019	Cat. E LHDs and risk slightly increasing.
O	Bangkok/Ho Chi Minh/Kuala Lumpur/Singapore	2023	Cat. E LHDs and risk decreasing.

RVSM Risk Assessment in the Brisbane, Honiara, Melbourne, Nauru and Port Moresby FIRs and the Indonesian (Jakarta and Ujung Pandang) FIRs – 1 January to 31 December 2024

2.26 Australia Airspace Monitoring Agency (AAMA) presented the RVSM Risk Assessment for two Areas. Firstly in the Brisbane, Honiara, Melbourne, Nauru and Port Moresby FIRs, the total risk (0.93×10^{-9}) was less than the risks reported for the last two annual reporting periods (1.51×10^{-9} reported at RASMAG/29 and 1.73×10^{-9} reported at RASMAG/28). Category E was the most common LHD category (18), although only six were assessed as risk-bearing. The others mostly involved aircraft coordinated to the relevant FIR boundary at the wrong flight level – mistakes that were queried by receiving ATC and rectified before the aircraft transited the boundary. The number of estimated annual flight hours is 1,245,193 based on the December 2024 Traffic Sample Data (TSD).

2.27 For the Jakarta and Ujung Pandang FIRs, the total risk in 2024 (2.25×10^{-9}) has decreased from the value reported for calendar year 2023 (then 5.35×10^{-9}). Almost 83% of the operational risk was presented by 51 Category E LHDs (ATC coordination error as a result of human factor issues). Most involved aircraft flying on two-way routes, and they reported an average of 0.7 flight levels crossed and 0.3 minutes in duration.

2024 Analyses for the Transfer of Control Point Between Incheon ACC and Shanghai ACC, Hot Spot B1

2.28 There were 126 LHDs reported for calendar year 2024 representing a 66% increase in the overall number of reported LHDs compared to calendar year 2023 (74 reported occurrences in 2023 vs 126 occurrences reported in 2024). Most of the reported LHDs involved errors in ATC transitions and were attributed to LHD Category E - Coordination errors in ATC-to-ATC transfer of control responsibility due to human factors issues.

2.29 All reported LHDs were identified by the receiving ATC-unit prior to the aircraft entering their airspace, as a result all reported LHD occurrences were categorized as non-risk bearing. This means that all reported LHDs had zero duration and did not affect the operational vertical collision risk estimates. Therefore, the vertical operational risk estimate was zero for calendar year 2024 and the total vertical risk was 0.56×10^{-9} fapfh.

2.30 Both China RMA and the Republic of Korea provided the updates of the LHD reports sharing mechanism between the two states and agreed to continue bilateral discussion to discuss mitigations measures.

China RMA Vertical Safety Report

2.31 The 2024 RVSM risk estimates for the Chinese FIRs indicated that the TLS had been met, at 0.52 x 10^{-9} fapfh. According to the result of Hot spot identification, there was no Hot Spot in the Chinese FIRs.

2.32 For the Pyongyang FIR RVSM risk estimates, RASMAG noted the email response from ATMB of Democratic People's Republic of Korea, there was no LHD event (NIL report) and zero flying hours in in Pyongyang FIR in 2024, so the operational risk, the technical risk and the total risk remained 0.

JASMA Vertical Safety Report

2.33 The total risk for the reporting period from 1 January to 31 December 2024 was 4.91 x 10^{-9} fapfh, which met the TLS. The total traffic volume of Fukuoka FIR showed a solid recovery from 2021, in 2024 it was approximately 93% of it in 2019, which was a peak traffic volume before the COVID-19 pandemic. On the other hand, the traffic volumes of the RVSM altitude stratum in 2025 will be expected to exceed the volume in 2019.

2.34 One LHD of Category E occurred while transferring from Manila ACC to Fukuoka ACC in 2024. In order to mitigate transfer error caused by human factors at Hot Spot D1, regular bilateral meetings between Fukuoka and Manila ACCs had been held, encouraging mutual understanding of both ACCs and the next meeting would be held in the fall of 2025.

PARMO Vertical Safety Monitoring Report

Pacific Airspace

2.35 There was a total of 90 reported LHDs accounting for 880.5 minutes of operation at incorrect flight level in Pacific airspace. The 2024 RVSM risk estimate for Pacific airspace indicated that the TLS had not been met at 25.4 × 10^{-9} fapfh.

2.36 The highest contributor towards the vertical risk estimate was one long duration occurrence within the CENPAC traffic flow and the errors in ATC coordination between Oakland Center and Honolulu Control Facility. The overall vertical risk for the CEP in 2024 was 15.1 × 10^{-9} fapfh, a value that exceeded the TLS. This value represented a slight increase from that reported in 2023.

2.37 The reported ATC coordination occurrences between Oakland Center and Honolulu Control Facility were part of the Hot Spot N area and Various mitigations strategies had been implemented prior to the EnRoute Automation Modernization (ERAM) system implementation at the Honolulu Control Facility (HCF), expected by the end of 2025. Furthermore, the FAA's Air Traffic Safety Oversight Service was providing oversight of the development and implementation of additional mitigations aimed at reducing the vertical risk estimate in the CEP prior to ERAM implementation.

Northeast Asia Airspace

2.38 There was a total of 126 reported occurrences for North East Asia RVSM airspace. None of the reported LHDs in calendar year 2024 contributed towards the estimate of operational vertical risk. Therefore, the vertical operational risk estimate was zero for calendar year 2024. The total vertical risk 0.56 × 10^{-9} fapfh. These reported occurrences were also reflected in 2.29 - *2024 Analyses for the Transfer of Control Point Between Incheon ACC and Shanghai ACC, Hot Spot B*.

MAAR Safety Report

South Asia Indian Ocean Airspace

2.39 The 2024 RVSM risk estimate for SA/IO airspace indicated that the TLS had met at 2.21 x 10^{-9} fapfh.

Southeast Asia Airspace

2.40 The 2023 RVSM risk estimate for Southeast Asia (SEA) airspace indicated that the TLS for total risk had been met at 2.91x 10^{-9} fapfh, 85 of the 95 reported LHDs in SEA airspace were classified as Category E.

Mongolian Airspace

2.41 In 2024, the total risk was estimated as 0.72 x 10^{-9} fapfh. No LHD was reported within or at the boundary of the Mongolian airspace. Hence, the analysis of operational errors could not be conducted.

Reporting Culture

2.42 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 to use the LHD reporting template and submit their reports via email.

2.43 Furthermore, most reported LHDs in MAAR's area of responsibility were located at the boundary of FIRs and classified as Category E LHD, which refers to coordination errors in the ATC-to-ATC transfer of control responsibility. There were a small number of other LHD categories observed. Additionally, MAAR had received a number of NIL reports, indicating that no LHDs occurred on that particular month, from Delhi, Dhaka, Vientiane and Ulaanbaatar FIRs for the past three years. On the other hand, the number of NIL reports raised concerns whether all LHDs were being captured and reported, indicating the possibility of under-reporting.

2.44 Thus, MAAR encouraged the LHD POCs of the States to expand their focus on other LHD occurrences in addition to Category E, while promoting a positive safety reporting culture within their States/organizations.

JASMA Horizontal Safety Report

2.45 JASMA provided the horizontal risk assessment results of the Fukuoka FIR conducted by the Japan Airspace Safety Monitoring Agency (JASMA). A detailed report was also provided in RASMAG/30 WP/15. In this paper, the risk estimation results of the following four horizontal separation standards were reported and all four risk estimation met the TLS.

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).

2.46 There was a total of 27 Large Lateral Deviations (LLDs) and Large Longitudinal Errors (LLEs) reported to JASMA in 20243. Category B, "Flight crew incorrect operation or interpretation of airborne equipment" was the top contributor during the calendar year 2024.

BOBASMA Horizontal Safety Monitoring Report

2.47 The Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) presented the horizontal safety assessment for the Bay of Bengal/Arabian Sea Indian Ocean airspace during the period January to December 2024. The 50 NM lateral and longitudinal risks remained below the TLS. The 50NM lateral risk of 1.598×10^{-9} and longitudinal risk of 1.657×10^{-9} remained below the TLS.

2.48 There were nil LLD nor LLE reported in 2024.

SEASMA Safety Report

2.49 The Southeast Asia Safety Monitoring Agency (SEASMA) provided a horizontal safety assessment report for operations on ATS routes N892, L625, N884 and M767 over the South China Sea from 1 January to 31 December 2024. 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 presented in this paper contained the risk assessment of these two ATS routes. The lateral and horizontal risk for RNP10 were 0.194×10^{-9} and 0.375×10^{-9} respectively and lateral and horizontal risk for RNP 4 were 0.094×10^{-9} and 0.786×10^{-9} respectively, all met the TLS.

2.50 The number of LLDs decreased from five in calendar year 2023 to two in calendar year 2024, while the number of LLE remained at one. All occurrences reported in calendar year 2024 were categorized as Category E, involving coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues.

PARMO Horizontal Safety Monitoring Report

2.51 PARMO submitted its 2024 horizontal safety monitoring report for the Anchorage, Auckland, Nadi, Oakland, and Tahiti FIRs. The lateral, longitudinal risks were all estimated to meet the TLS. Of the 144 reported LLDs and LLEs, 105 (73%) were Category E.

2.52 In calendar year 2024, the data showed a trend in Category A LLDs for aircrews deviating in the horizontal dimension without ATC clearance. Nineteen 19 of the twenty-four 24 reported Category A LLDs indicated that weather (Category H) was a secondary causal factor. In these cases, the published procedures for weather deviations and other contingencies in oceanic controller airspace were not applied correctly.

2.53 The increasing trend of coordination occurrences between Honolulu Control Facility (HCF) and Oakland ARTCC was observed to continue in calendar year 2024. These occurrences affected multiple traffic flows within Pacific airspace due to the centric geographic location of the HCF were part of the Hot Spot N area. However, the metrics for the central east pacific (CEP) traffic flow were the most significant due to the high traffic density.

Outcomes of RASMAG/MAWG and RMACG Meetings

2.54 RASMAG/30 noted some salient points discussed during the Twelfth Meeting of the Regional Airspace Safety Monitoring Advisory Group Monitoring Agencies Working Group (RASMAG/MAWG/12) Meeting was held from 17 to 20 February 2025 in Tokyo, Japan and the Twentieth Meeting of RMA Coordination Group (RMACG/20) was held from 19 to 23 May 2025 in Bangkok, Thailand, in a hybrid format.

a) RVSM Minimum Monitoring Requirements (MMR) - The Reduced Vertical Separation Minimum (RVSM) Minimum Monitoring Requirements (MMR) Version 2025 was reviewed and adopted by the RMACG meeting, which could be found in the RASMAG/30 WP/3 Attachment 1.

b) Subcategory of Category E LHD - The Asia Pacific Monitoring Agencies decided to apply the following E sub-categories starting from RASMAG/30:

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

   ii) E-LT: Late Transfer;

   iii) E-RI: No or Late Revision of Transfer Information; and

   iv) E-OT: Any Other Types.

c) ASE Technical Interchange Meeting.

d) APAC Lateral Deviation Reporting.

e) RASMAG Safety Bulletin - the Team Resource Management (TRM).

RASMAG Safety Bulletin

2.55 JAMA presented the draft Safety Bulletin 03 developed by JASMA. JASMA considered Crew/Team Resource Management would be appropriate as the topic of this Safety Bulletin, because COVID-19 had been forced to keep social distance and caused division of human relationships. Crew/Team Resource Management was recognized to be important and necessary for strengthening human relationships.

2.56 The RASMAG/30 meeting agreed that the bulletin required further editing and additional comments should reach the Chair by end of September 2025 before publication on the ICAO APAC eDocument webpage by end of 2025.

Incorporation of Human Factors Assessment Questionnaire (HFAQ) into the Guidance Material for Continued Safety Monitoring of Asia and Pacific RVSM Airspace

2.57 MAAR and SEASMA jointly developed the revised version of the LHD Analysis Form (Form A) incorporating the elements from the Human Factors Assessment Questionnaire (HFAQ) to assist the analysis of occurrences where human factors issues are identified, especially Category E LHDs.

2.58 RASMAG noted that the analysis of Category E LHDs by the above-mentioned sub-categories did not consider the underlying human factors that contribute to the direct erroneous actions or inaction by the individuals involved in the occurrence. To address this gap, MAAR and SEASMA collaborated to integrate the elements of HFAQ into the LHD Analysis Form (Form A) as guidance on the Human Factors Assessment, which serves as guidelines to analyze occurrences where human factors issues were identified, especially Category E LHDs

2.59 The HFAQ comprised a three-tiered approach to data collection and analysis: States and ANSPs were encouraged to utilize the revised version of Form A, which incorporated the guidelines from the HFAQ and provide comments for the HFAQ and Form A by end of 2025 to further discussion in the MAWG meeting next year.

Classification and Reporting for Non-RVSM Approved Aircraft Operating in RVSM Airspace and Occurrences Caused by GNSS Radio Frequency Interference

2.60 MAAR provided some guidance to clarify the classification and reporting for both non-RVSM approved aircraft operating in RVSM airspace and occurrences caused by GNSS RFI.

2.61 LHD Category L scenarios involved situations where an aircraft was provided with RVSM separation despite not being RVSM approved. The possible scenarios that should be reported as LHD Category L. Several scenarios were provided and a mapping to the current LHD/LLE/LLD category was proposed.

2.62 However, after discussion, RASMAG/30 meeting agreed to formation of a new LHD/LLE/LLD category for the classification of GNSS RFI occurrences leading to LHD/LLE/LLD and agreed to **Conclusion RASMAG/30-1**: New LHD/LLE/LLD Category 'R' for GNSS RFI occurrences in Asia and Pacific Region.

What: That, Asia and Pacific Region to adopt a new Large Height Deviation/Large Longitudinal Error /Large Lateral Deviation (LHD/LLE/LLD) Category as Category R.

Why: To classify the emerging trends of GNSS RFI occurrences effectively for possible identification of prevention and mitigation measures.

Large Lateral Deviation Reporting Criteria in Asia and Pacific Region

2.63 RASMAG discussed the proposed revision of LLD reporting criteria in the Asia and Pacific Region, specifically considering the reduction of the current 10 NM threshold. Two previously proposed approaches: a 5 NM reporting threshold presented by JASMA at RASMAG/28 (IP/10) and the comprehensive deviation reporting (all lateral deviations regardless of deviation magnitude) suggested by PARMO at MAWG/12 (WP/13).

2.64 Both the 5 NM threshold approach and comprehensive reporting methodology present valuable perspectives for consideration. While comprehensive deviation reporting would ensure full data coverage, practical considerations such as implementation feasibility and resource allocation must be addressed. A structured 5 NM reporting threshold would enable monitoring agencies to focus resources on deviations with higher safety significance, support efficient data analysis by balancing data volume with safety relevance, and facilitate clear, consistent reporting criteria for operational staff.

2.65 In conclusion, the adoption of a 5 NM threshold for LLD reporting would align with existing ICAO standards while maintaining operational efficiency. This approach provides a structured evolution of current practices while accommodating future enhancements based on operational experience and regional requirements.

2.66 As a result of discussions, RASMAG agreed that the criteria could be flexible, and agreed with the following: **Conclusion RASMAG/30-2**: Large Lateral Deviation Reporting Criteria in Asia and Pacific Region.

What: 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 50NM. This revised value balances operational practicality with safety oversight requirements.

b) The 5NM reporting criteria for lateral separation minima less than 50NM 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.

Assessment of Non-RVSM/ Non-PBCS Approved Aircraft

2.67 China RMA, JASMA, MAAR, PARMO provided assessments of the non-RVSM approved aircraft within their areas of responsibility and the detailed reports could be found in the RASAMG/29 website. In addition, JASMA provided an assessment of non-PBCS approved aircraft in Fukuoka FIR.

2.68 Since India had not verified the RVSM approval status of 16 aircraft for over six months (since December 2024) and had not submitted the 2024 annual RVSM approval snapshot, India was proposed for inclusion in the APANPIRG ATM and Airspace Safety Deficiencies List, due to the continued failure to confirm RVSM approval status. India was in the process of completing verification of all the 16 identified aircraft before the recommendation for inclusion to the deficiencies list could be removed. It was noted that 15 out of 16 identified aircraft had been submitted.

2.69 At the time of the submission of this assessment, Bangladesh had not submitted the 2024 annual RVSM approval snapshot which may result in an inclusion in the APANPIRG List of Deficiencies in the ATM and Airspace Safety fields next year if the problem persists. During the Meeting, MAAR updated that Bangladesh had submitted the required RVSM data recently.

APAC Consolidated LTHM Compliance Status

2.70 MAAR presented the overview of LTHM compliance status in the APAC Region, including assessments of five APAC RMAs – AAMA, China RMA, JASMA, MAAR and PARMO. The assessment, based on RVSM approval data as of 31 May 2025, yielded a remaining monitoring burden in the APAC Region of 324 aircraft, an increase compared to the previous year.

2.71 The detailed LTHM burden estimate updates by individual RMAs can be found on the RASMAG/30 website.

APANPIRG List of Deficiencies Consideration

2.72 Based on the criteria for State Responsibility to comply with the Annex 6 Height-Keeping Monitoring Requirement Annex 6 Part I Section 7.2.9 (12th Ed.) and Part II Section 2.5.2.10 (11th Ed.) for Non-compliance with LTHM requirement (remaining monitoring burden 30% or more), the following recommendations were proposed to add, remove and retain their APANPIRG deficiency status in **Table 10**.

Table 10: List of States that could be subject to add, remove, and retain their APANPIRG deficiency status based on RVSM approval data as of 31st May 2025

State	2023	2024	RASMAG recommendation
Afghanistan (MAAR)	**50%**	**50%**	**Retain**
India (MAAR)	**48%**	**46%**	**Retain**
Nepal (MAAR)	**45%**	**45%**	**Retain**
DPRK (China RMA)	**0%**	**100%**	**Add**
Malaysia (MAAR)	**25%**	**31%**	**Add**
Philippines (MAAR)	**40%**	**22%**	**Remove**

2.73 During the RASMAG Meeting, Malaysia provided an update on the list of deregistered aircraft to MAAR. Accordingly, the monitoring burden for Malaysia would be recalculated.

2.74 China RMA planned to provide monitoring services, technical exchanges and training for Democratic People's Republic of Korea before APANPIRG this year in order to mitigate the current resultant monitoring burden. The proposal of deficiencies list would be removed after the completion of monitoring and information provided to ICAO before APANPIRG/36.

ATM and Airspace Safety Deficiencies List

2.75 The Meeting reviewed the APANPIRG ATM and Airspace Safety Deficiency List and agreed to make the following recommendation to APANPIRG/36, as recorded in Appendix E to this Report. The Meeting was informed that the deadline for submission of information (such as on reduction of the remaining monitoring burden or RVSM Approval Status verification) must reach MAAR and ICAO by 24 October 2025 in order to be processed in time for APANPIRG/36.

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/30).

ii) **India** (Remaining monitoring burden of 468%, RASMAG/30).

iii) **Nepal** (Remaining monitoring burden of 45%, RASMAG/30).

b) Removal of Deficiency:

Long Term Height Monitoring Requirement Deficiencies

i) **Philippines** (Remaining monitoring burden of 22%, RASMAG/30).

ATS Datalink Deficiencies

i) **India**: Post implementation monitoring not implemented (insufficient data/evidence). India had submitted the data link performance report for all the three FIRs, including Mumbai FIR in 2025.

c) Add new Deficiency

Safety Reporting Deficiencies

i) **India** (Failure to confirm RVSM approval status and RVSM Approval Annual snapshot).

ii) **Nepal (**Failure to submit annual TSD on time and in correct format).

Long Term Height Monitoring Requirement Deficiencies

i) **Democratic People's Republic of Korea** (Remaining monitoring burden of 100%, RASMAG/30).

ii) **Malaysia** (Remaining monitoring burden of 31%, RASMAG/30).

2.76 The RASMAG/30 meeting noted that this recommendation reflects the current status as of RASMAG/30 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 by the specified deadline.

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 and discuss:

i) **Conclusion RASMAG/30-1:** New LHD/LLE/LLD Category ‘R’ for GNSS RFI occurrences in Asia and Pacific Region;

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

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.

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2024 Asia Pacific Consolidated Safety Report

Thirtieth Meeting of the Regional Airspace Safety Monitoring Advisory Group

(RASMAG/30)

Bangkok, Thailand

14 – 17 July 2025

Prepared by APAC RMAs and EMAs

Outline

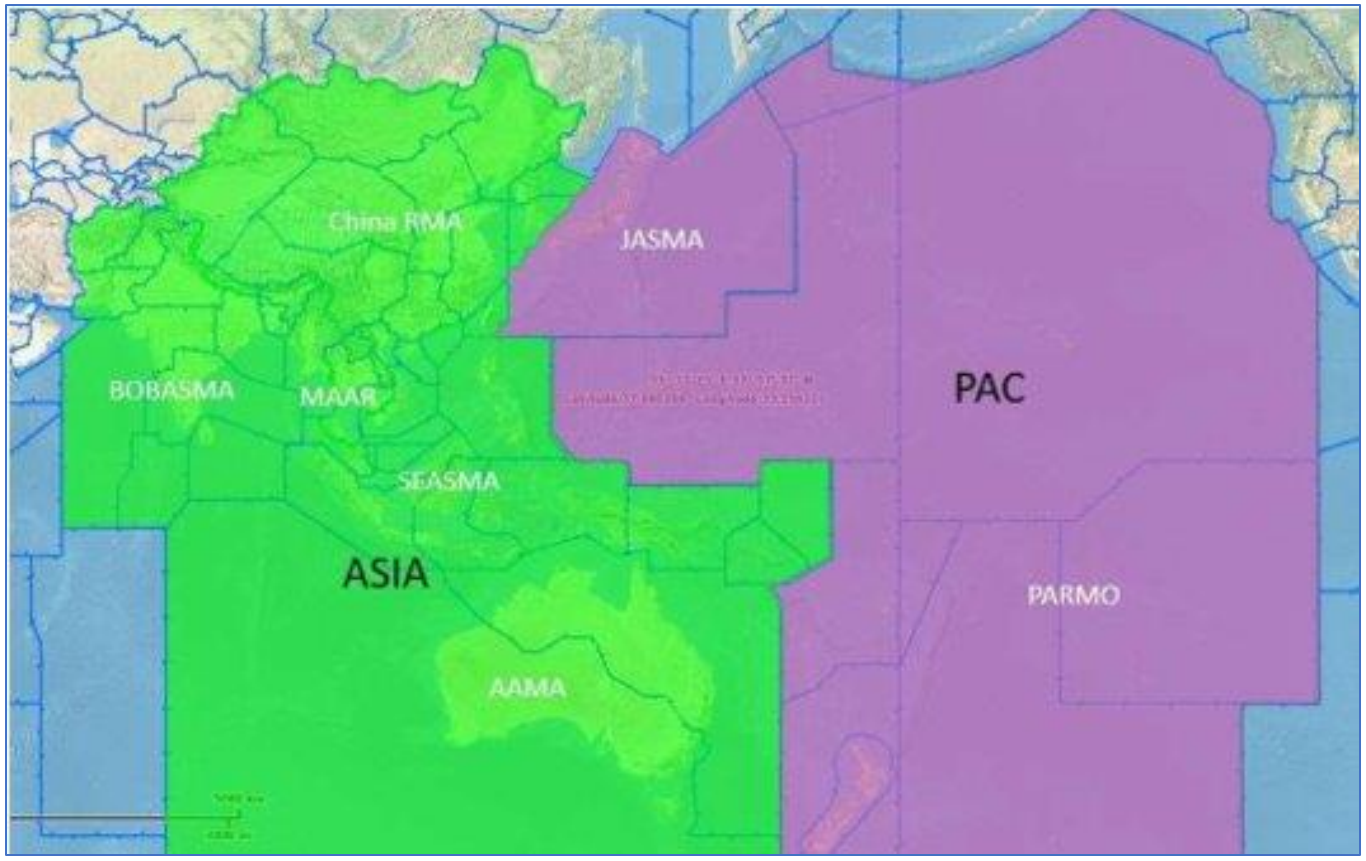
- Background
- PAC Area
  - Vertical Collision Risk Estimates and Summary of LHDs
  - Horizontal Collision Risk Estimates and Summary of LLDs and LLEs
  - Geolocations of LHDs/LLDs/LLEs
  - Hot Spots
- Asia Area
  - Vertical Collision Risk Estimates and Summary of LHDs
  - Horizontal Collision Risk Estimates and Summary of LLDs and LLEs
  - Geolocations of LHDs/LLDs/LLEs
  - Hot Spots
- Reporting Rate of LHDs/LLDs/LLEs
- Conclusion

Background

In 2019 (MAWG/6), APAC monitoring agencies agreed to consolidate key elements from their safety risk analysis into one report to give an overall picture of airspace safety risk in Asia Pacific.

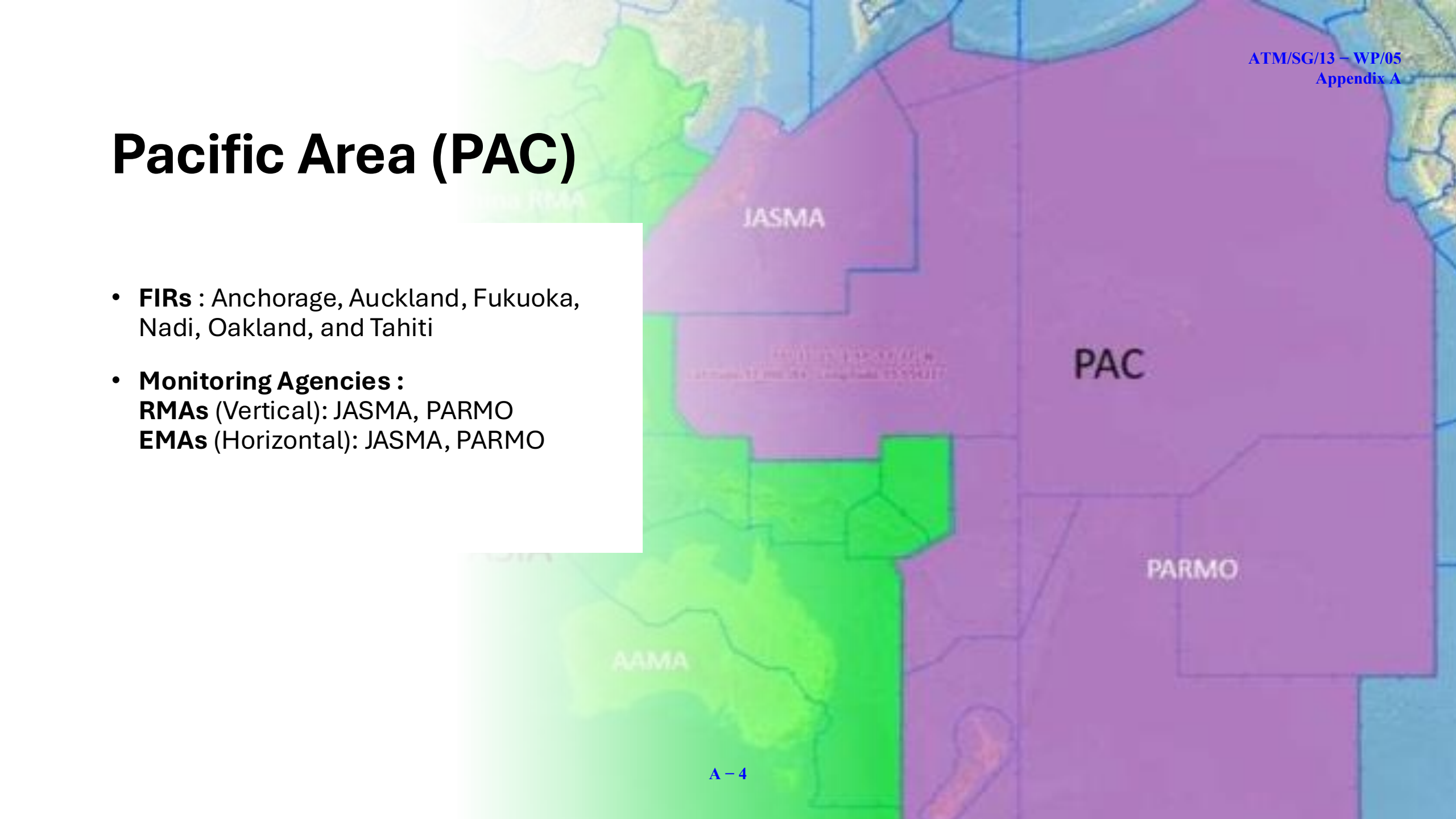
The report is divided into:

- **Pacific (PAC) Area**
- **Asia Area**

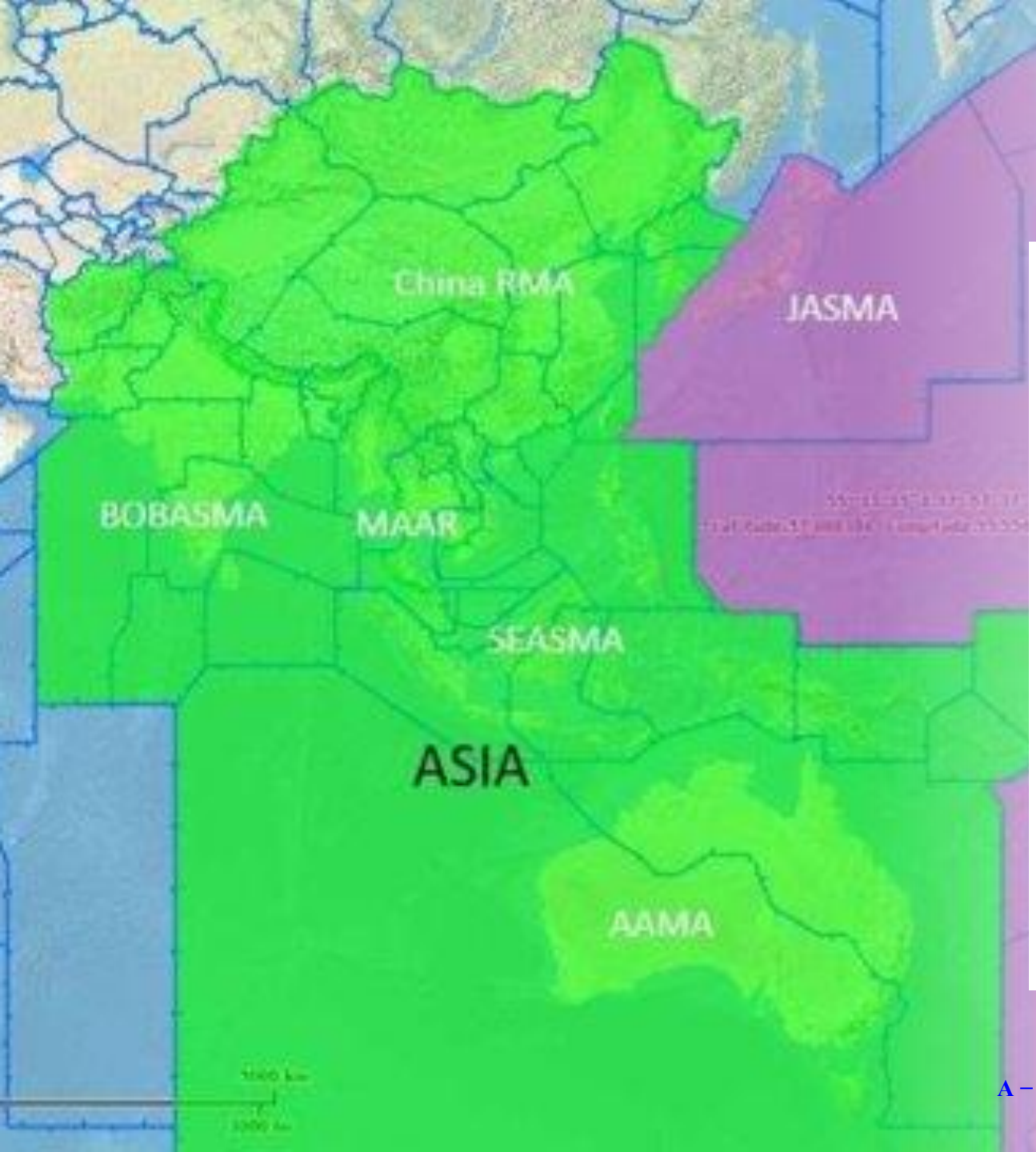


Pacific Area (PAC)

- **FIRs** : Anchorage, Auckland, Fukuoka, Nadi, Oakland, and Tahiti
- **Monitoring Agencies :**
  RMAs (Vertical): JASMA, PARMO
  EMAs (Horizontal): JASMA, PARMO



Asia Area (Asia)



- **FIRs** : Bangkok, Beijing, Brisbane, Chennai, Colombo, Dhaka, Delhi, Guangzhou, Hanoi, Ho Chi Minh, Hong Kong, Honiara, Incheon, Jakarta, Karachi, Kathmandu, Kolkata, Kota Kinabalu, Kuala Lumpur, Kunming, Lahore, Lanzhou, Male, Manila, Melbourne, Mumbai, Nauru, Phnom Penh, Port Moresby, Pyongyang, Sanya, Shanghai, Shenyang, Singapore, Taibei, Ujung Pandang, Ulaanbaatar, Urumqi, Vientiane, Wuhan, and Yangon
- **Monitoring Agencies :**
  RMAs (Vertical): AAMA, China RMA, MAAR, PARMO
  EMAs (Horizontal): BOBASMA, SEASMA

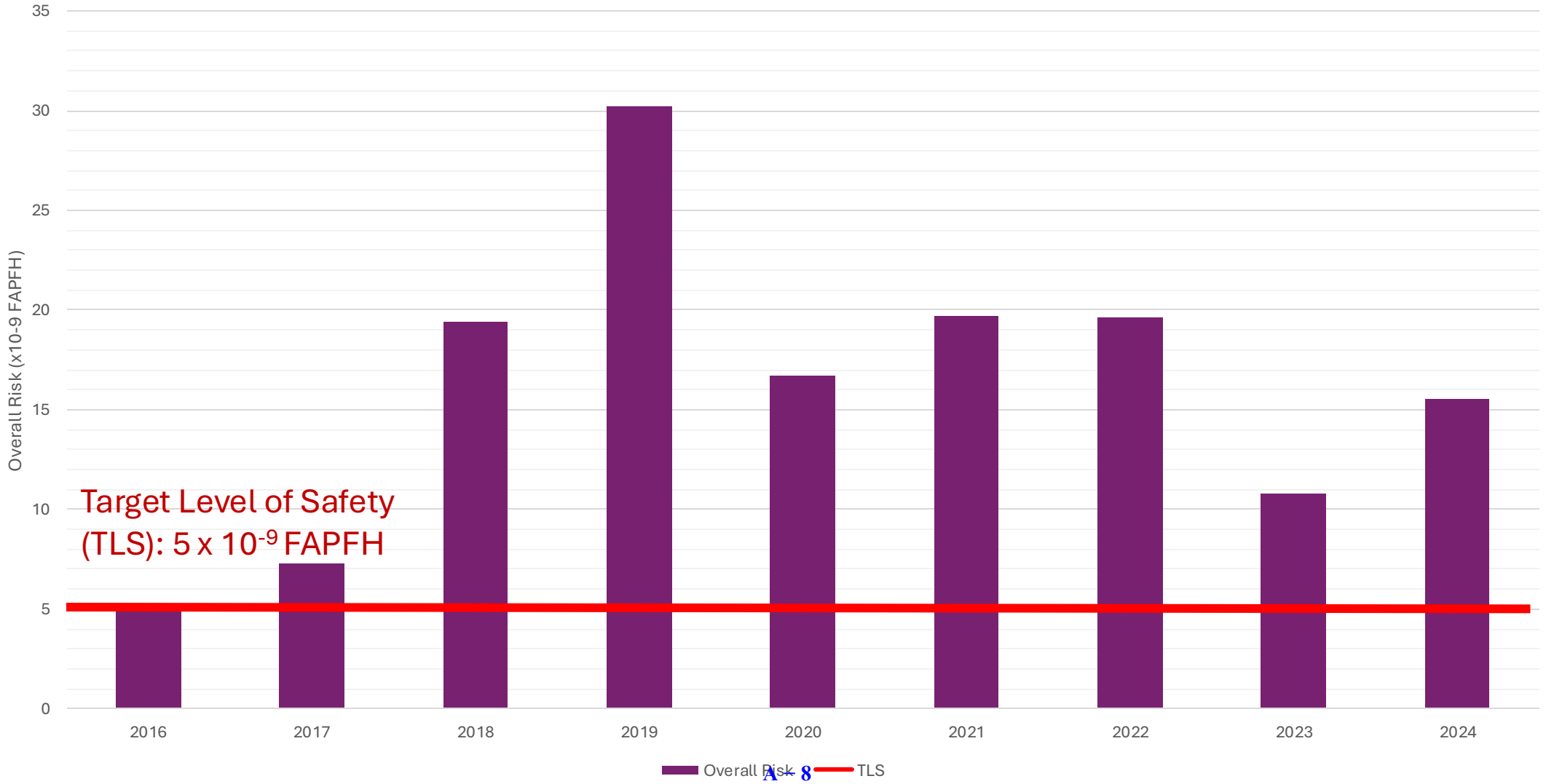
PAC : Vertical Collision Risk

PAC: Vertical Collision Risk Estimates

Annual flying hours: 3,727,882 hours/year

Risk Estimates		Remark
Vertical Technical Risk	0.20 x 10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	15.33 x 10^{-9} FAPFH	
Vertical Overall Risk	15.53 x 10^{-9} FAPFH	Above TLS

PAC: Vertical Collision Risk Estimates

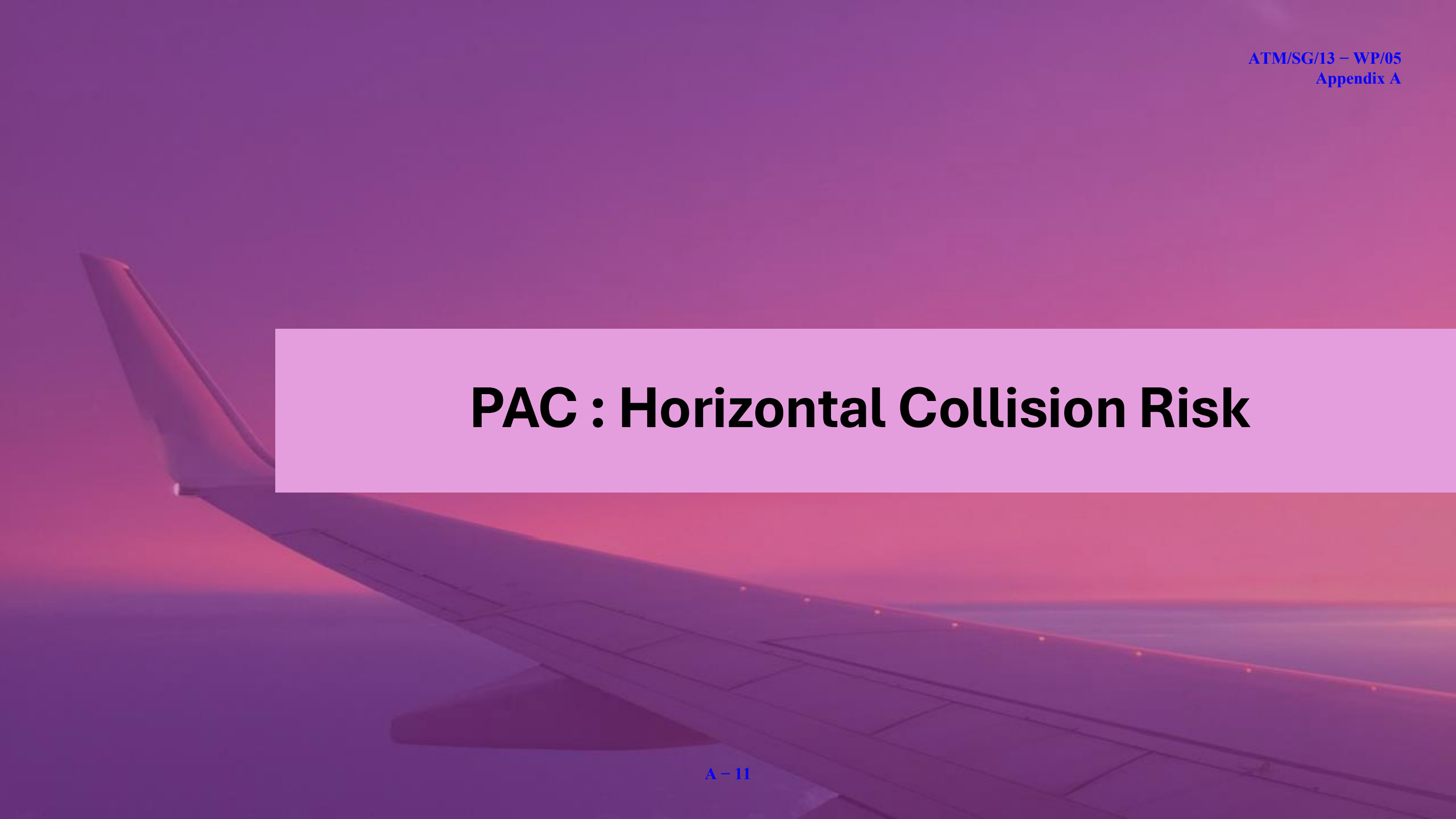


PAC: Summary of LHDs

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	7	5	3
	B	Flight crew climbing/descending without ATC Clearance	27	45	31
	C	Incorrect operation or interpretation of airborne equipment	4	352	6
ATC	D	ATC system loop error	6	67	3
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	55	442	1
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	4	108	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	1	28	25
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	1	1	0
Weather/ Turbulence	I	Turbulence or other weather-related causes leading to unintentional or undetected change of flight level	15	48	4
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	17	23	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	2	0	2
		Total	**139**	**1,119**	**75**



PAC : Horizontal Collision Risk

PAC: Horizontal Collision Risk Estimates

Annual flying hours: 2,069,133 hours/year

2024 Horizontal Risk Estimates		Remark
Total Lateral Risk	1.22×10^{-9} FAPFH	Below TLS
Total Longitudinal Risk	0.014×10^{-9} FAPFH	Below TLS
2023 Horizontal Risk Estimates		**Remark**
Total Lateral Risk	0.24×10^{-9} FAPFH	Below TLS
Total Longitudinal Risk	0.038×10^{-9} FAPFH	Below TLS

Note: JASMA's longitudinal risk estimates include values based on both the 30 NM and 10-minute separation standards. However, the PAC's total longitudinal risk value is based on the 30 NM separation standard.

PAC: Summary of LLDs and LLEs

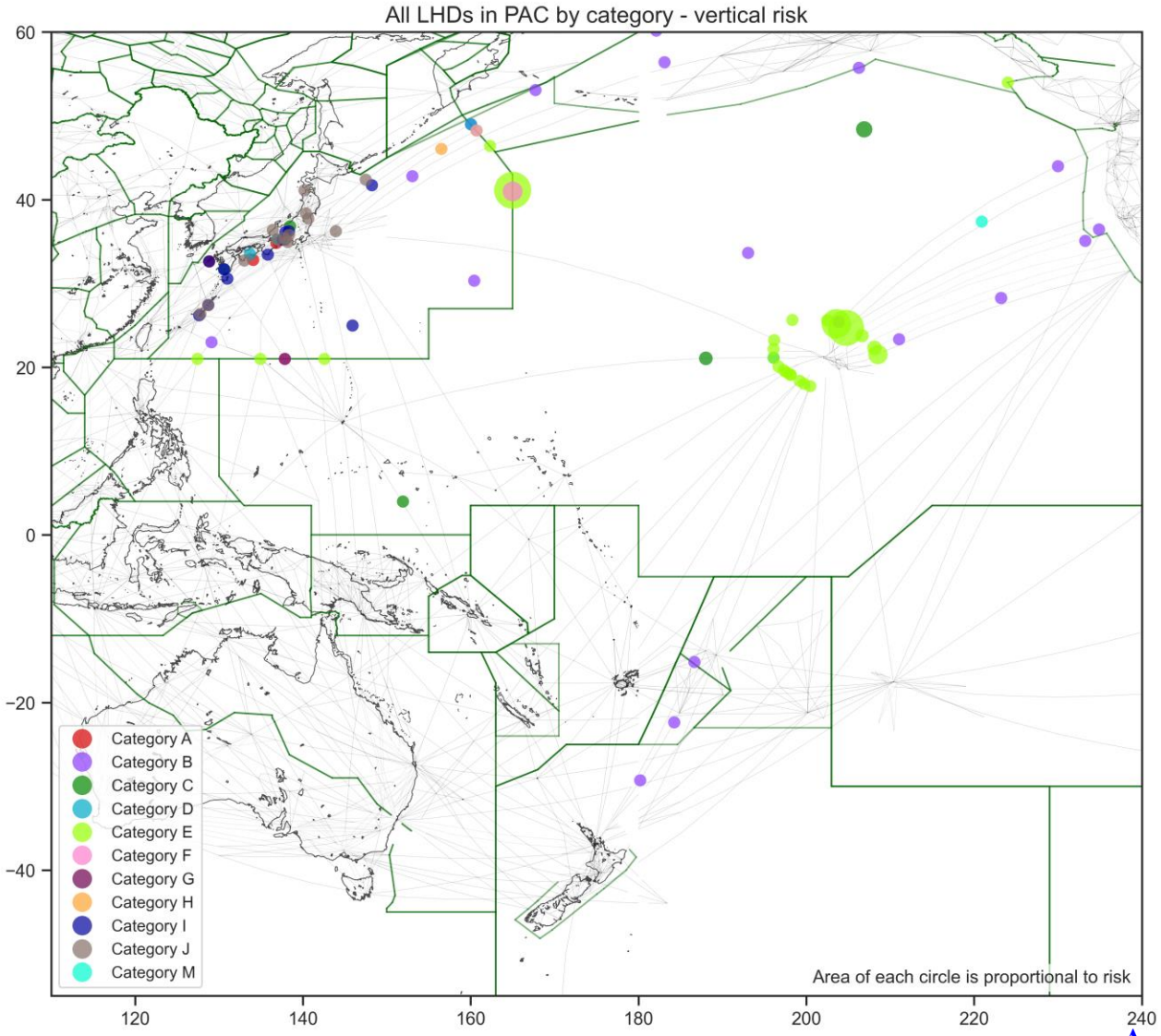
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	27	69	1100
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	12	438	93
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	9	162	420
ATC	D	ATC system loop error	5	64	5
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	107	1176	151
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	2	58	50

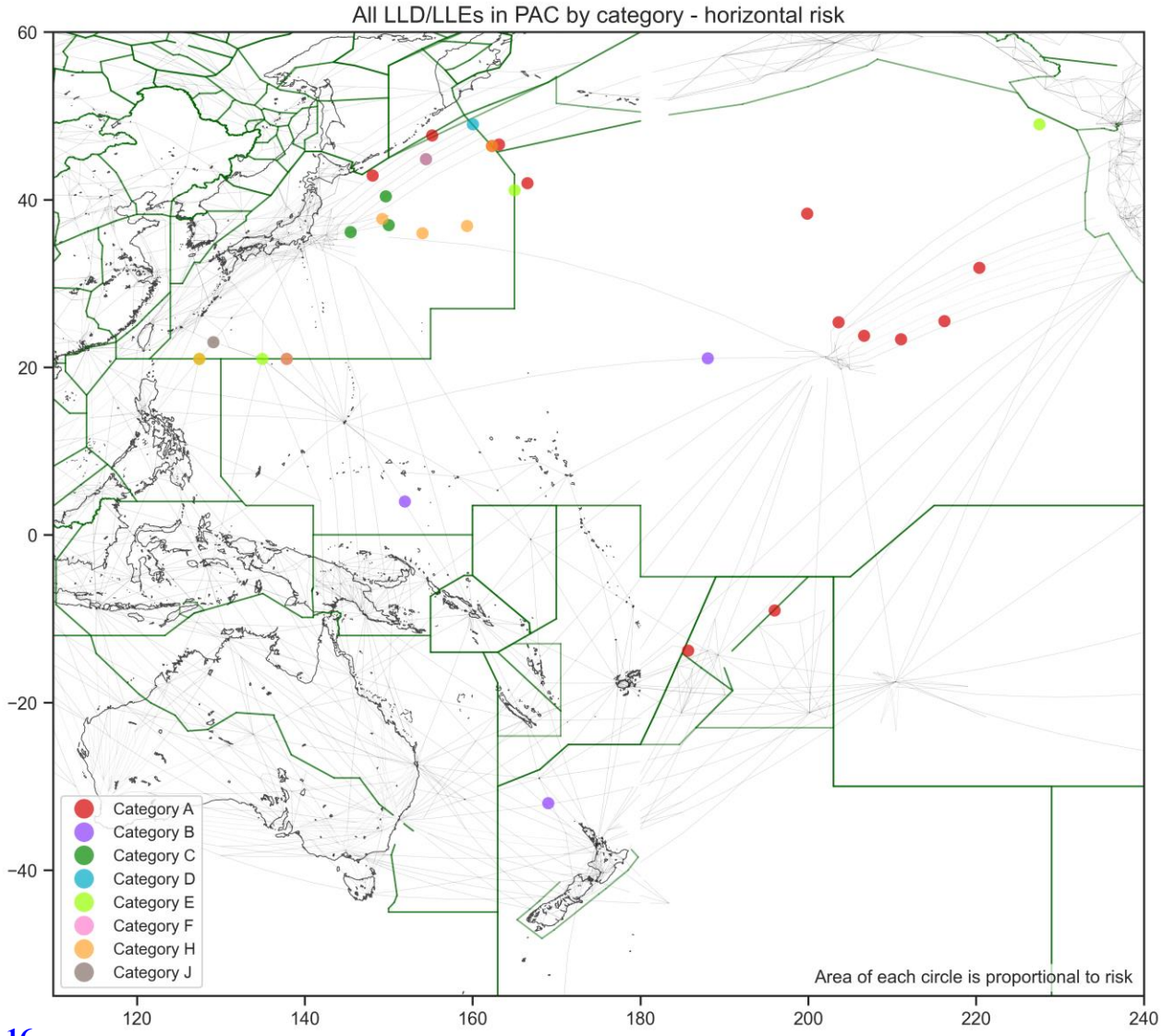
PAC: Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	0	0	0
Weather/ Turbulence	H	Turbulence or other weather-related causes leading to a deviation in the horizontal dimension	8	106	166
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	1	12	30
		Total	**171**	**2085**	**2015**

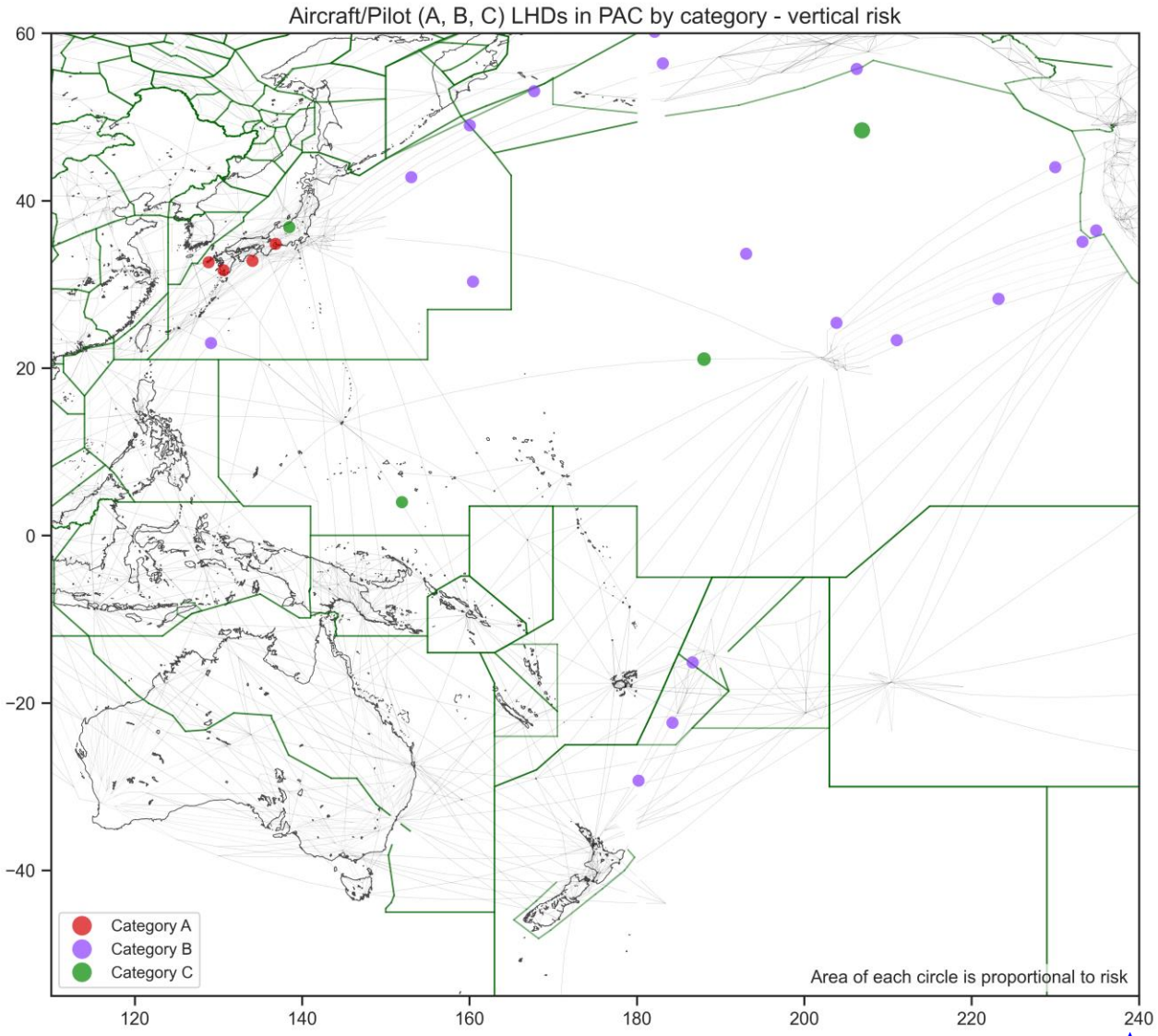
PAC : Geolocation of LHDs/LLDs/LLEs

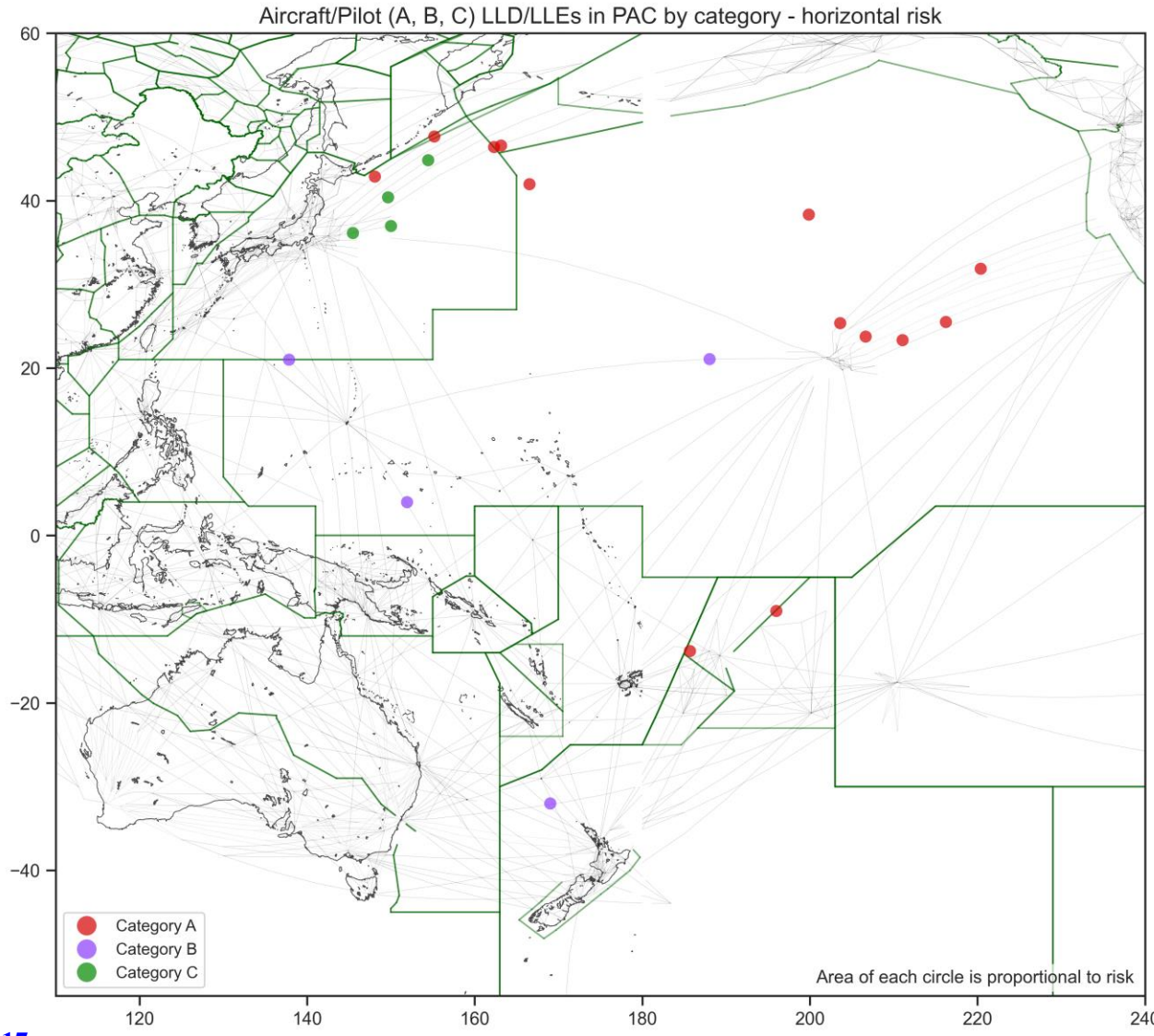
PAC: All Categories



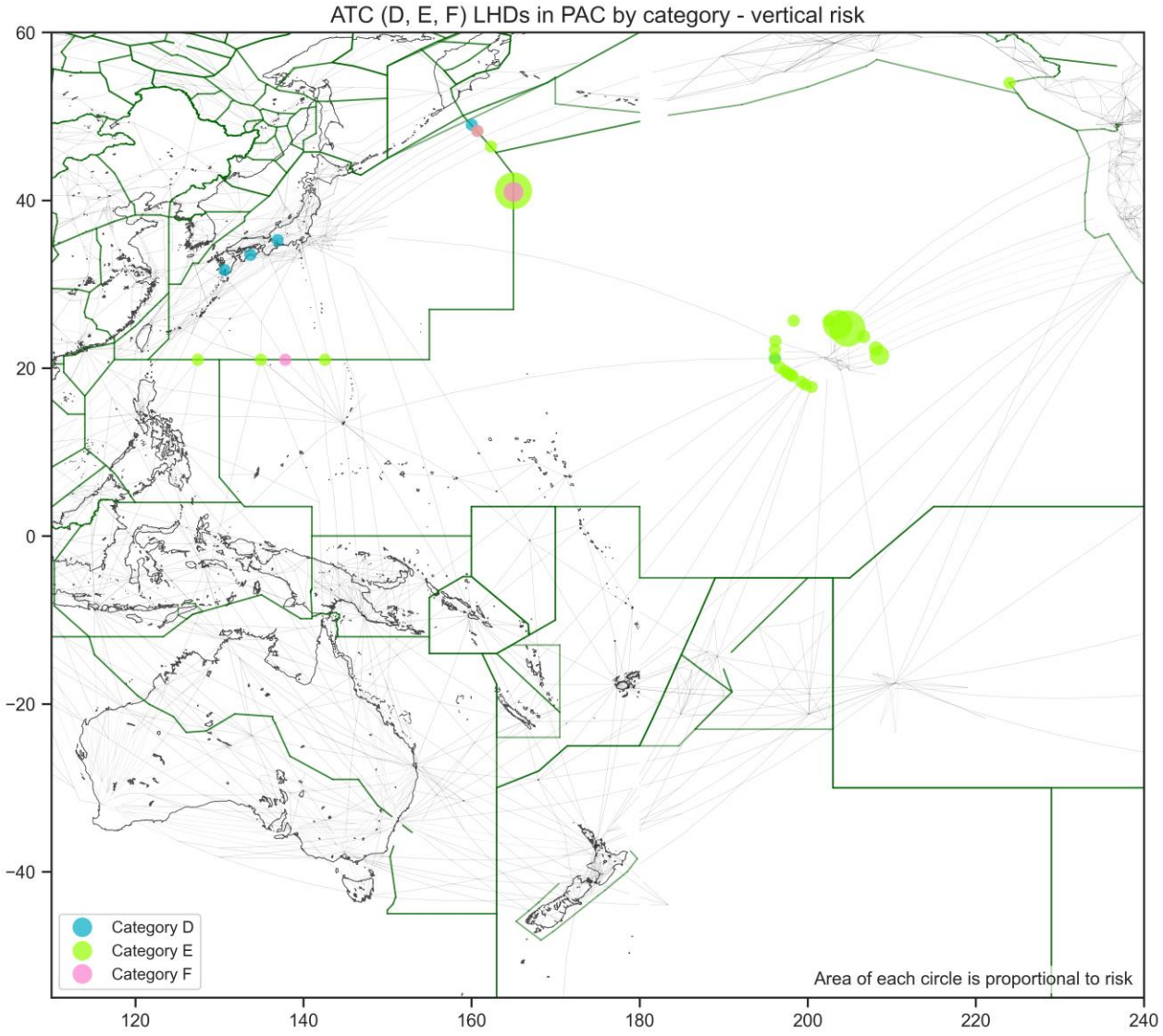


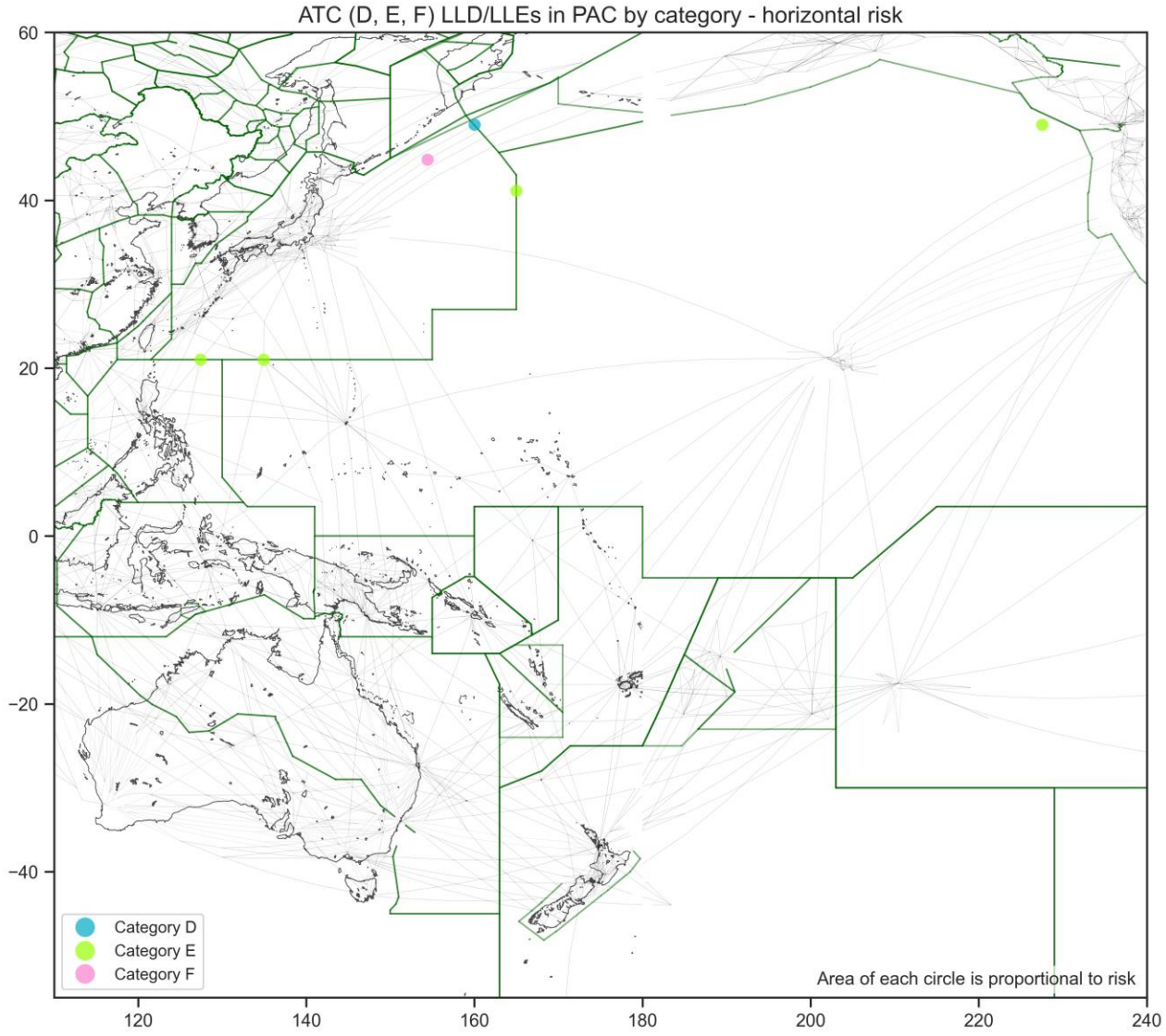
PAC: Aircrew/Pilot (A, B, C)



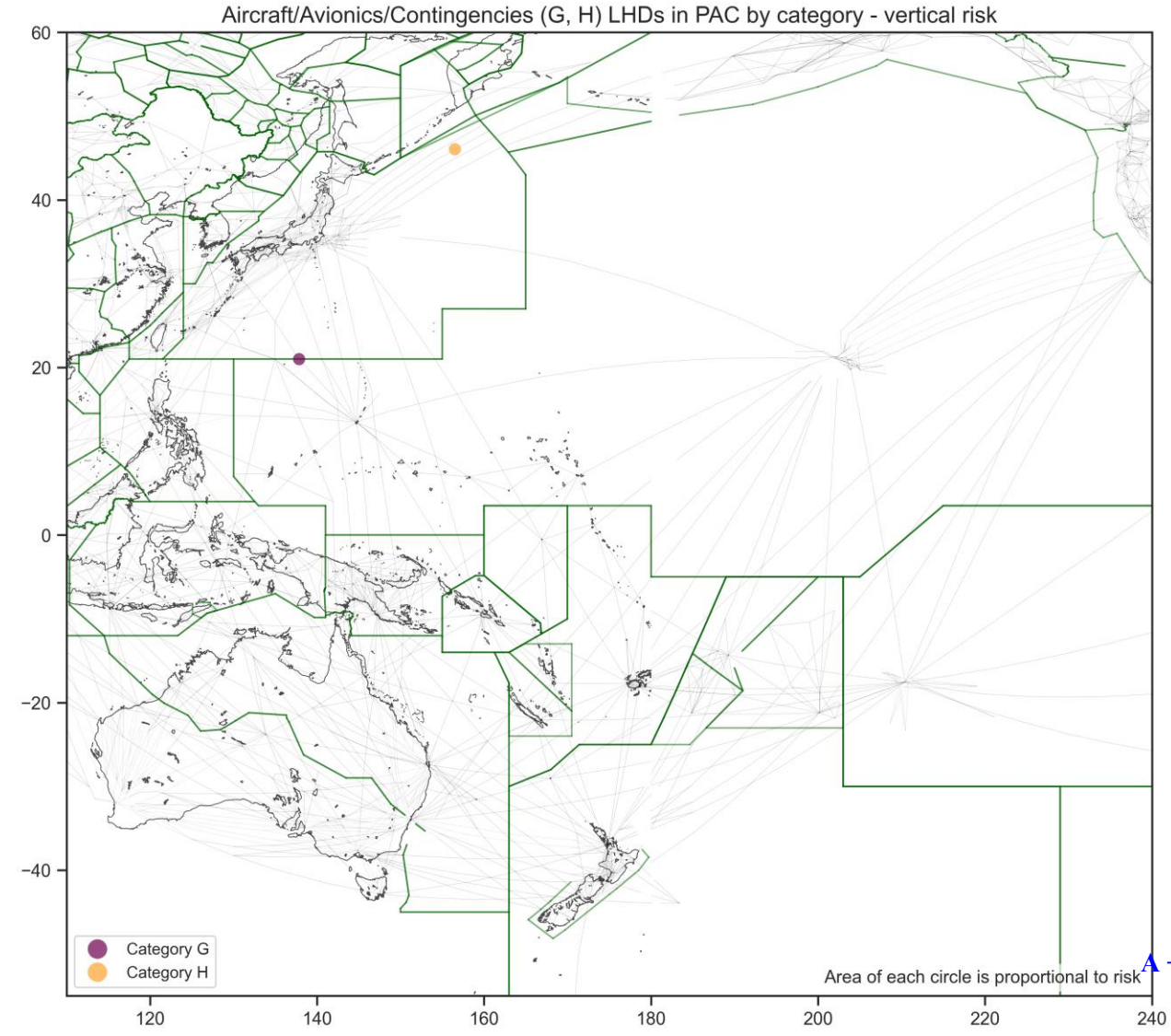


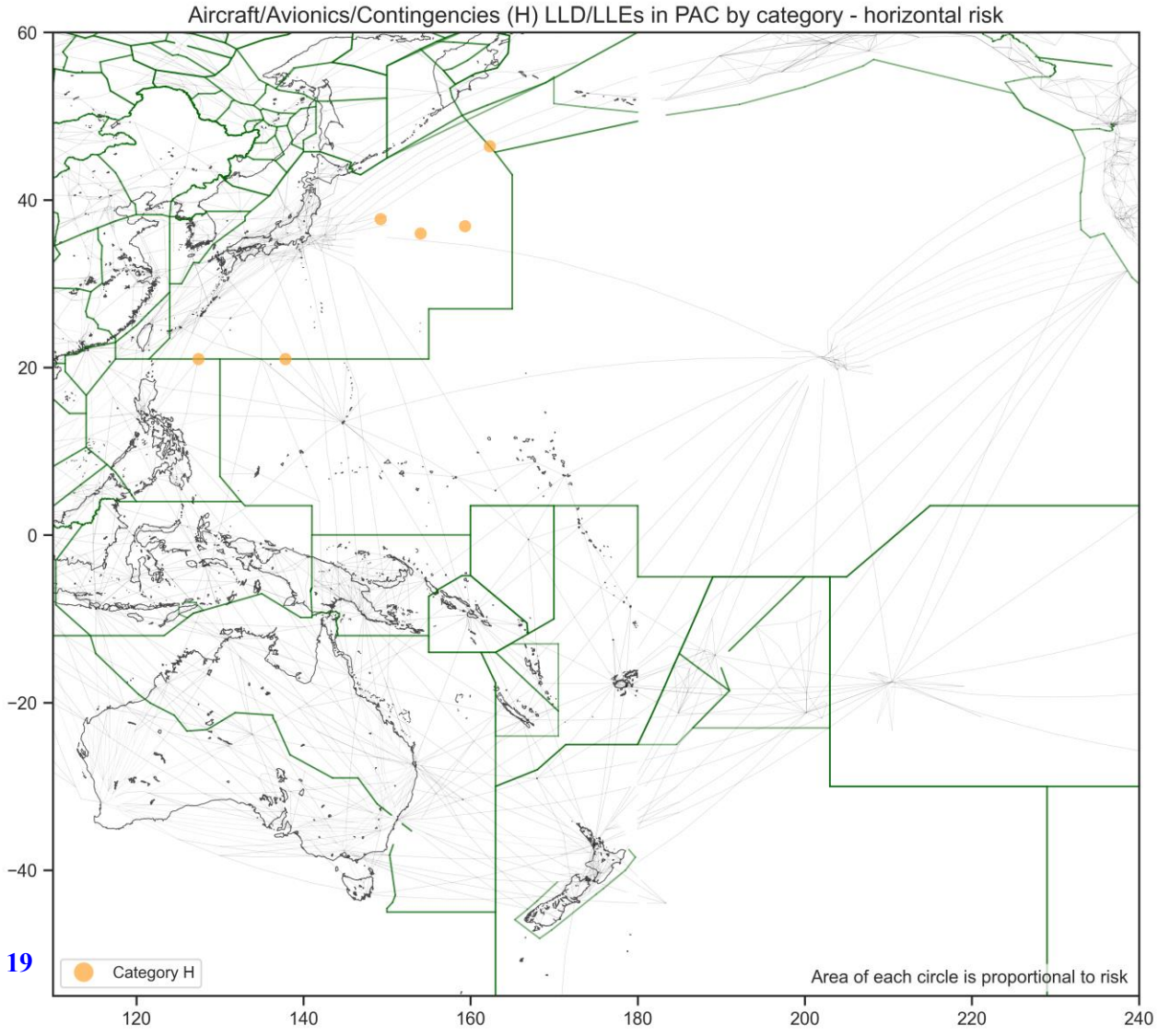
PAC: ATC (D, E, F)


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
Category E
Category F
Area of each circle is proportional to risk

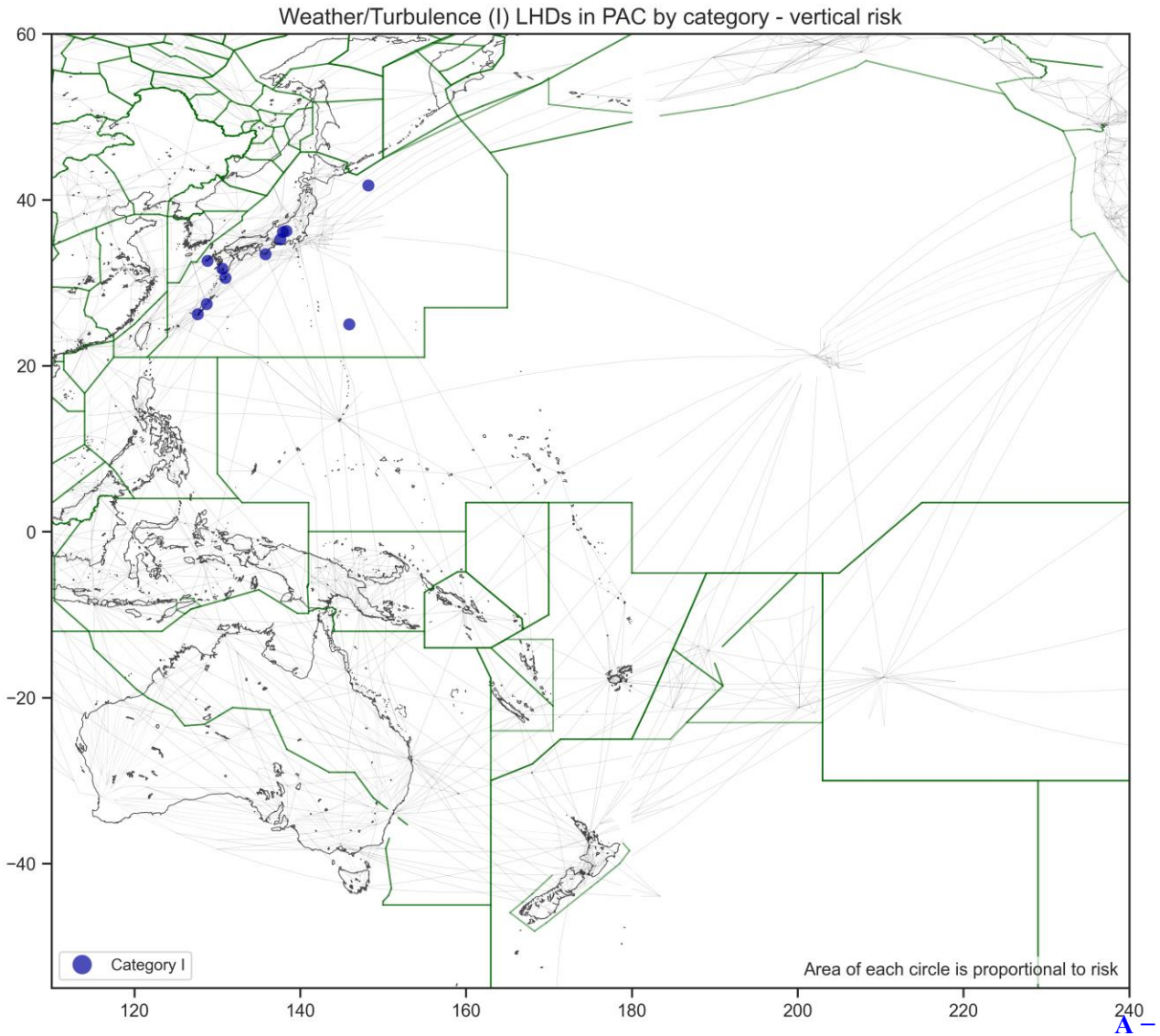

ATC (D, E, F) LLD/LLEs in PAC by category - horizontal risk
60
40
20
0
−20
−40
120
140
160
180
200
220
240
Category D
Category E
Category F
Area of each circle is proportional to risk

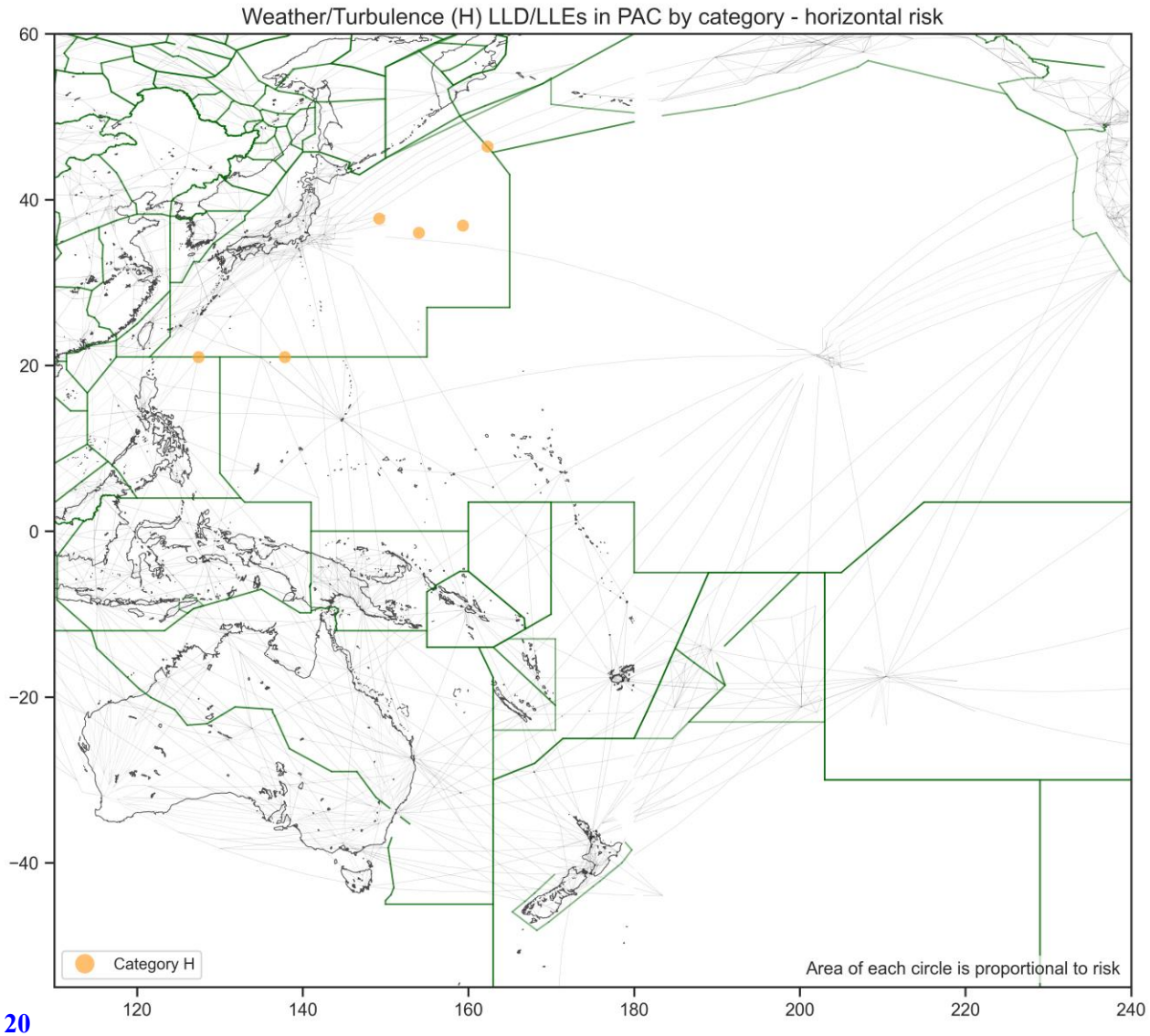
PAC: Aircraft Avionics/Contingencies
(LHD:G,H, LLD/LLE:H)



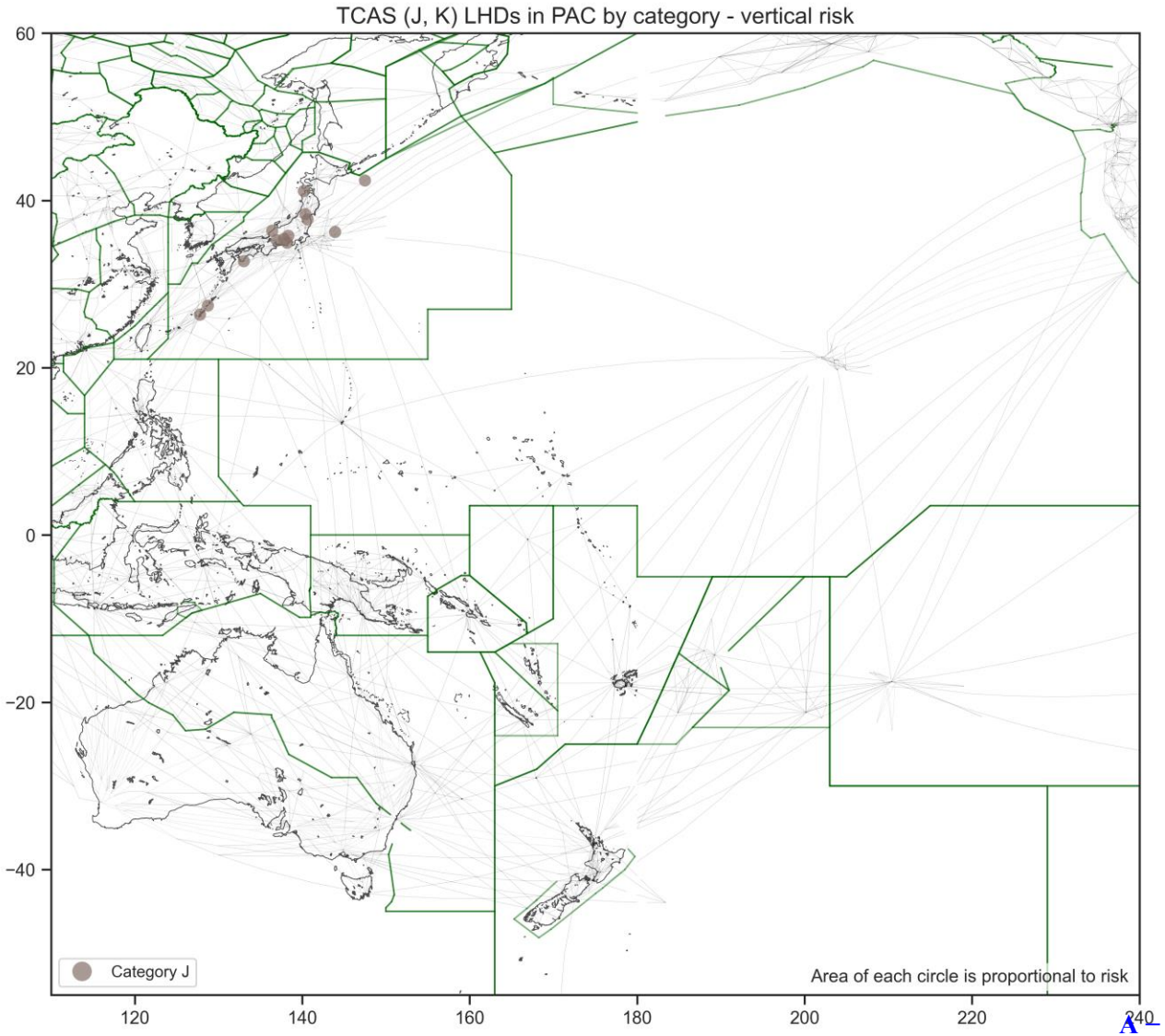


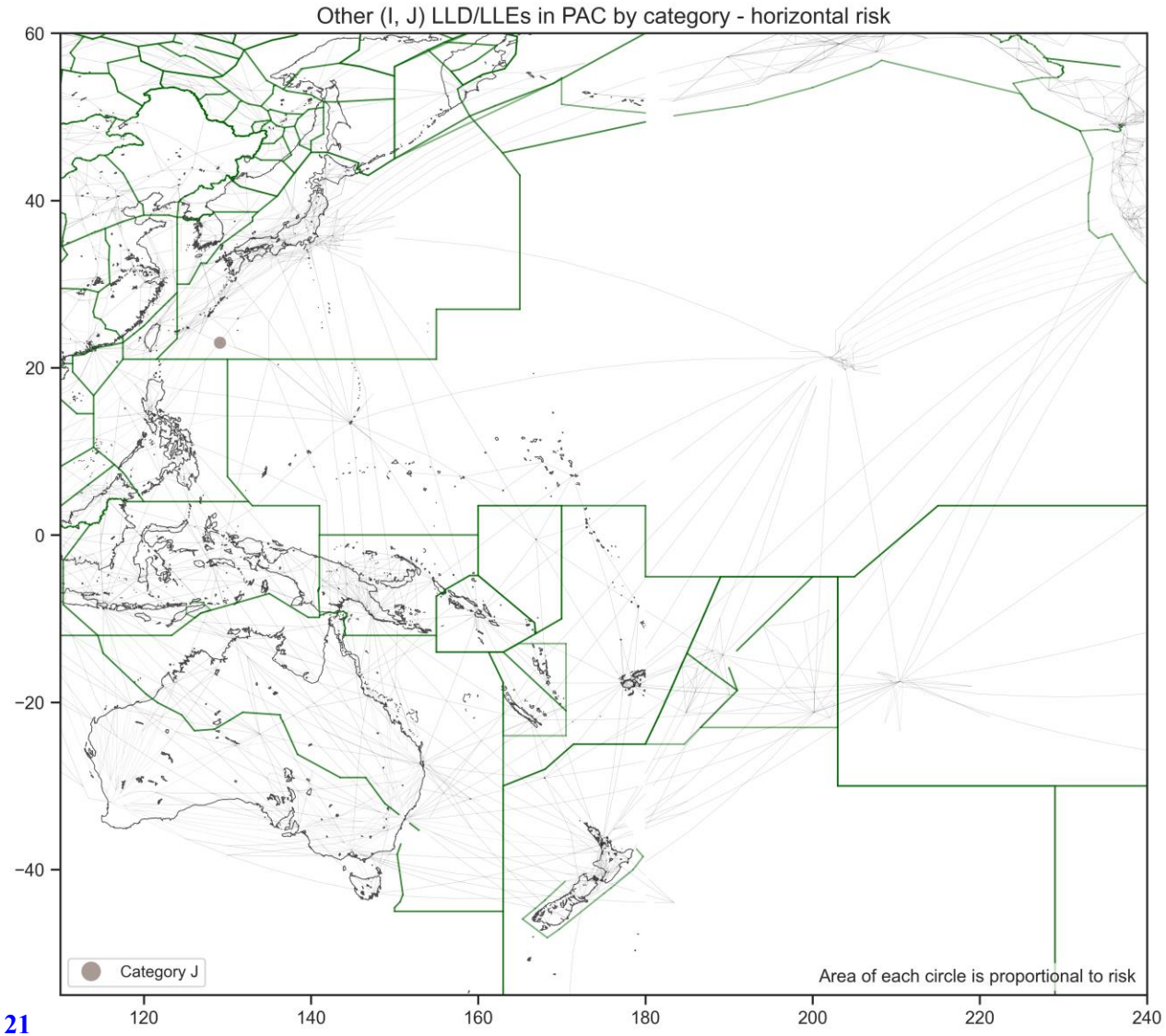
PAC: Weather/Turbulence (LHD:I, LLD/LLE:H)





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 factors issues (Category E)

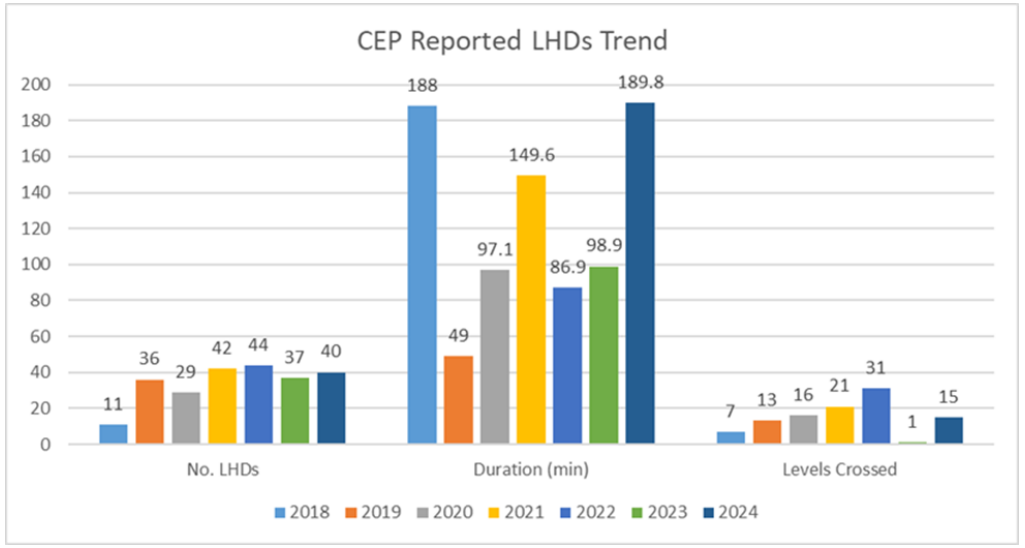
Contributing Factors : High-volume Central East Pacific (CEP) traffic flow and the user-preferred routes that cross the CEP airways.

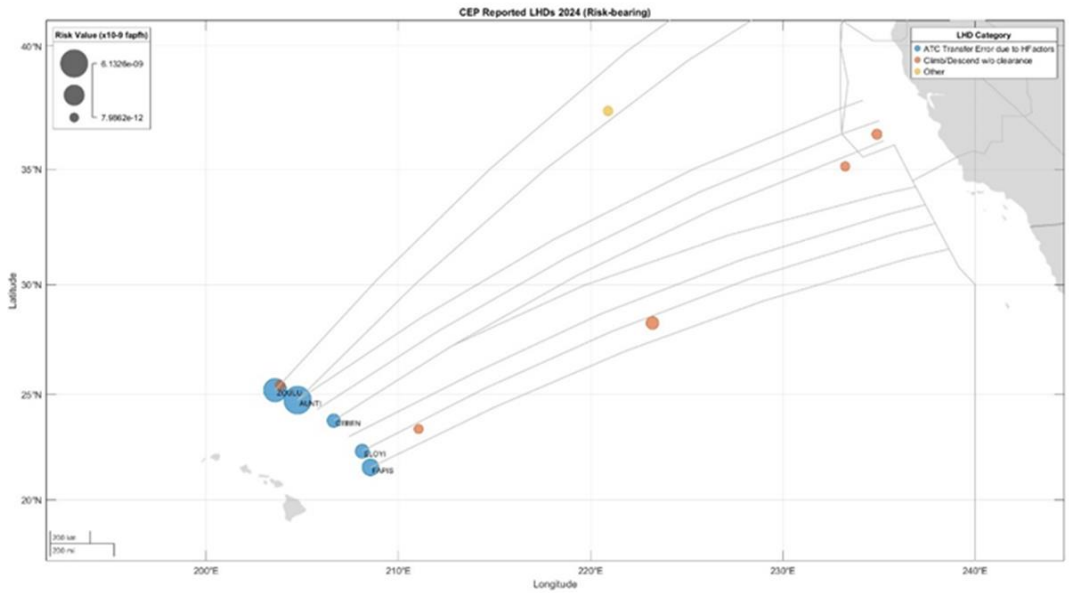
Trend: The number of LHDs in 2024 remained consistent with previous years.

Mitigations: Oakland ARTCC and Honolulu Control Facility (HCF) have developed mitigation procedures. The long term mitigation is a new ATC system scheduled to be implemented at the HCF in 2027.

Result from the hot spot identification process:

Hot Spot N remains on the list of hot spots 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

2024 Annual flying hours: 11,413,712 hours/year

Vertical Risk Estimates		Remark
Vertical Technical Risk	0.70 x 10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	1.29 x 10^{-9} FAPFH	
Vertical Overall Risk	1.99 x 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	22	6	15.5
	B	Flight crew climbing/descending without ATC Clearance	26	12	21.1
	C	Incorrect operation or interpretation of airborne equipment	19	4	14.5
ATC	D	ATC system loop error	14	6	9.5
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	488	156	80.3
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	13	3	1

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	4	4	9
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	2	0	2
Weather/ Turbulence	I	Turbulence or other weather-related causes leading to unintentional or undetected change of flight level	58	2	57.3
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	16	1	12
	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	101	16	3
		Total	**763**	**210**	**225.2**

ASIA : Horizontal Collision Risk

ASIA : Horizontal Collision Risk Estimates

2024 Annual flying hours: 789,118 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
2023 Horizontal Risk Estimates		**Remark**
Total Lateral Risk	1.517×10^{-9} FAPFH	Below TLS
Total Longitudinal Risk	4.444×10^{-9} FAPFH	Below TLS

ASIA : Summary of LLDs and LLEs

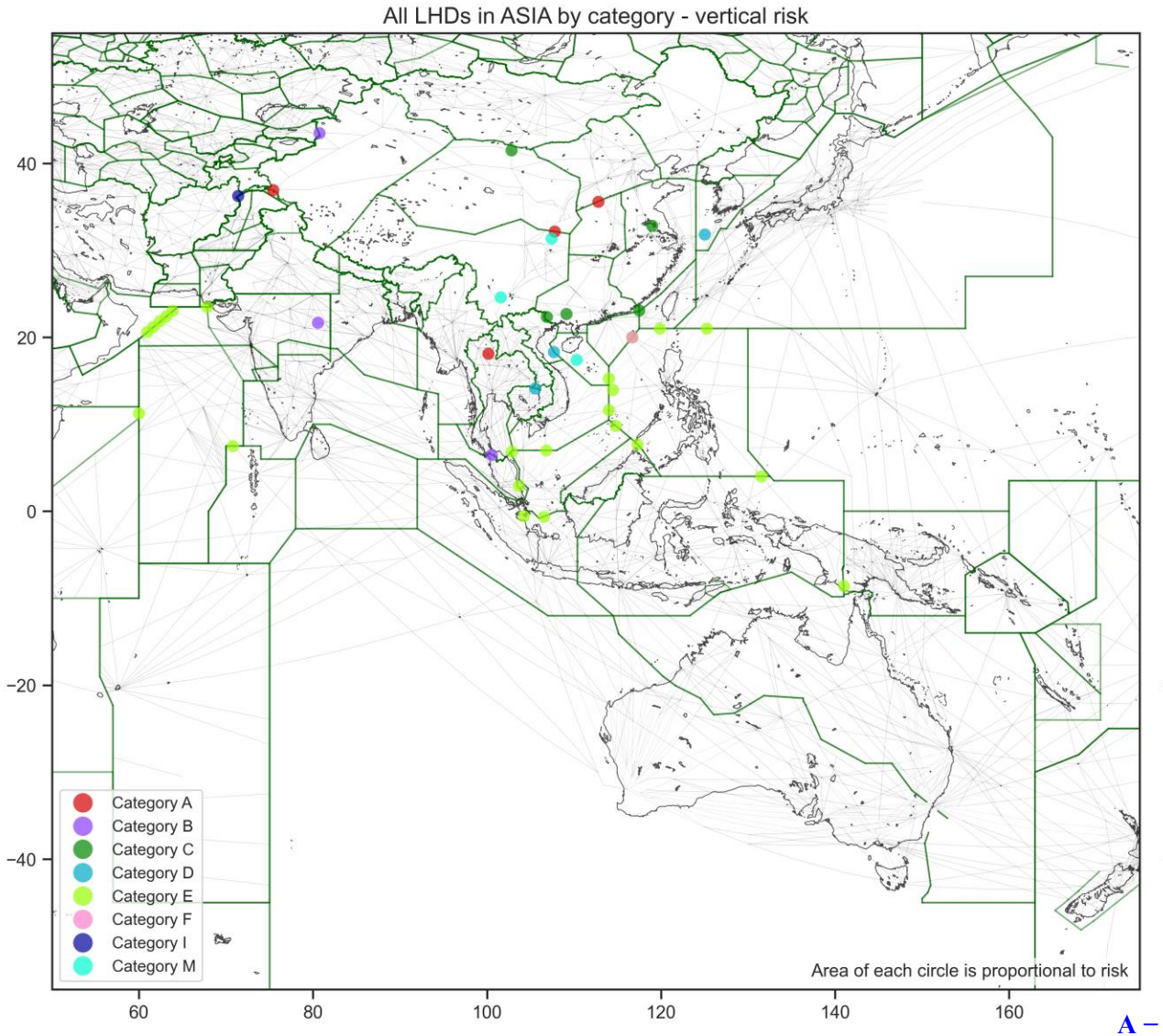
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	0	0	0
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	0	0	0
	C	Flight crew waypoint 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	3	0	114
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	0	0	0

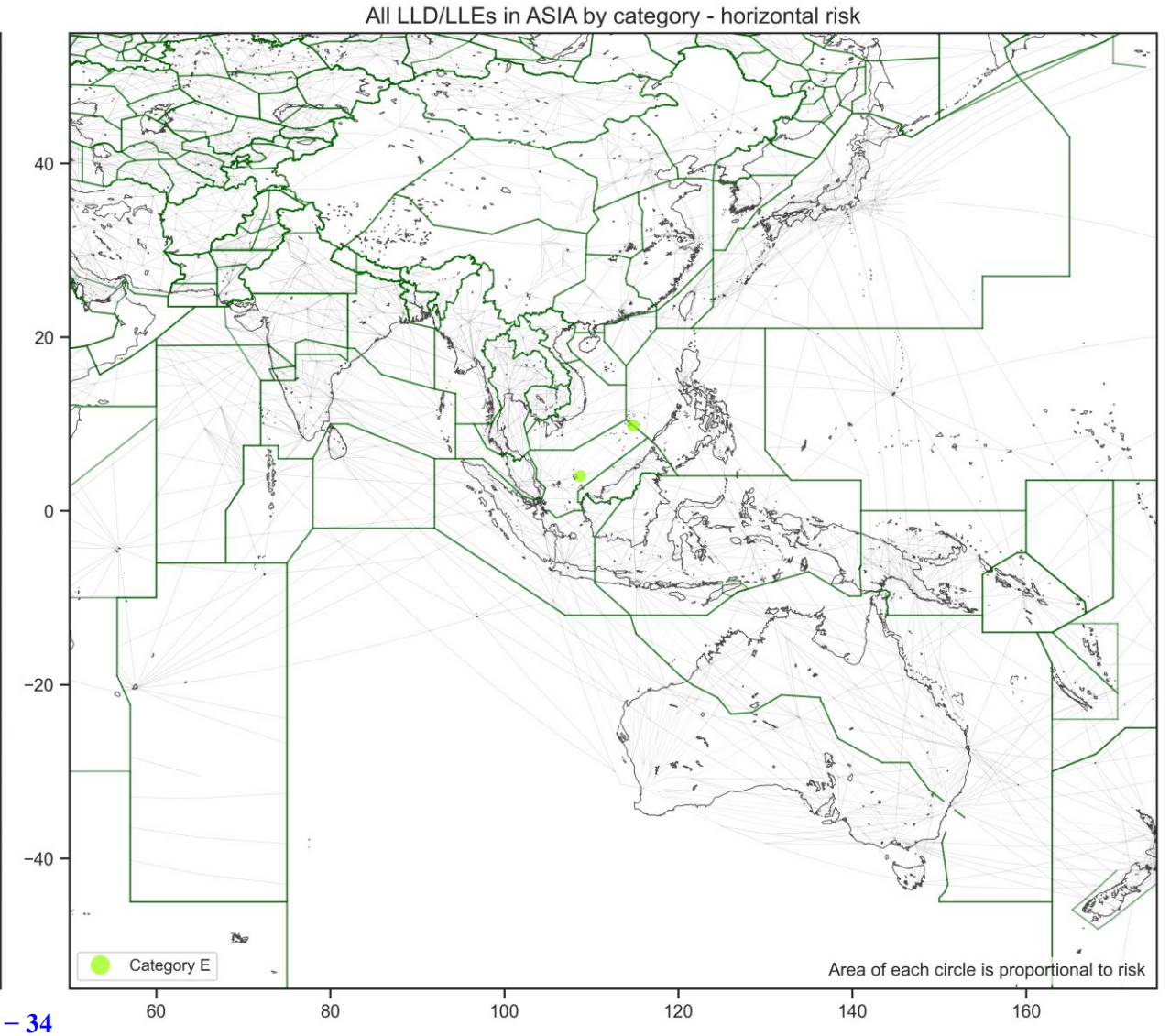
ASIA : Summary of LLDs and LLEs

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	**3**	**0**	**114**

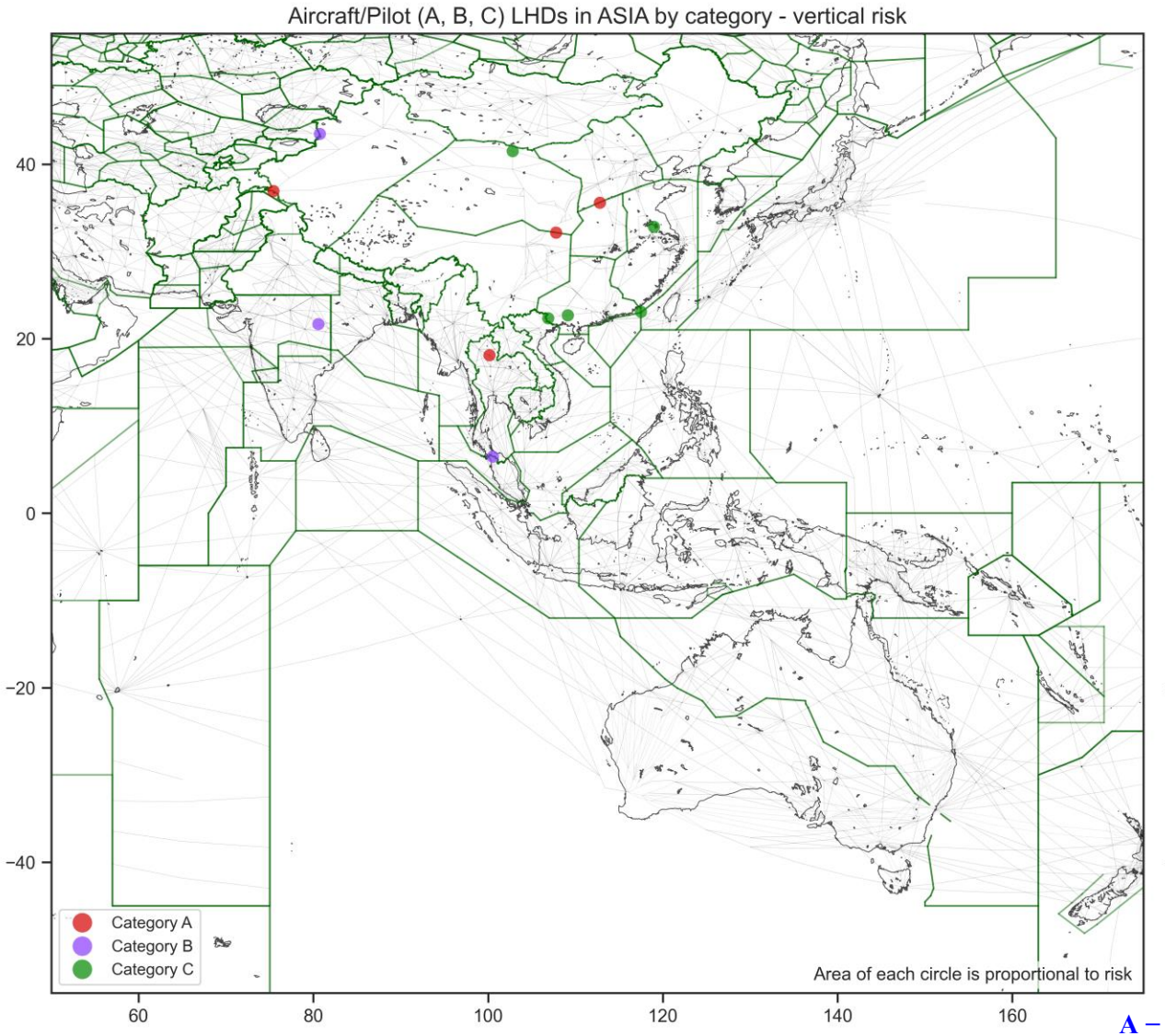
ASIA : Geolocation of LHDs/LLDs/LLEs

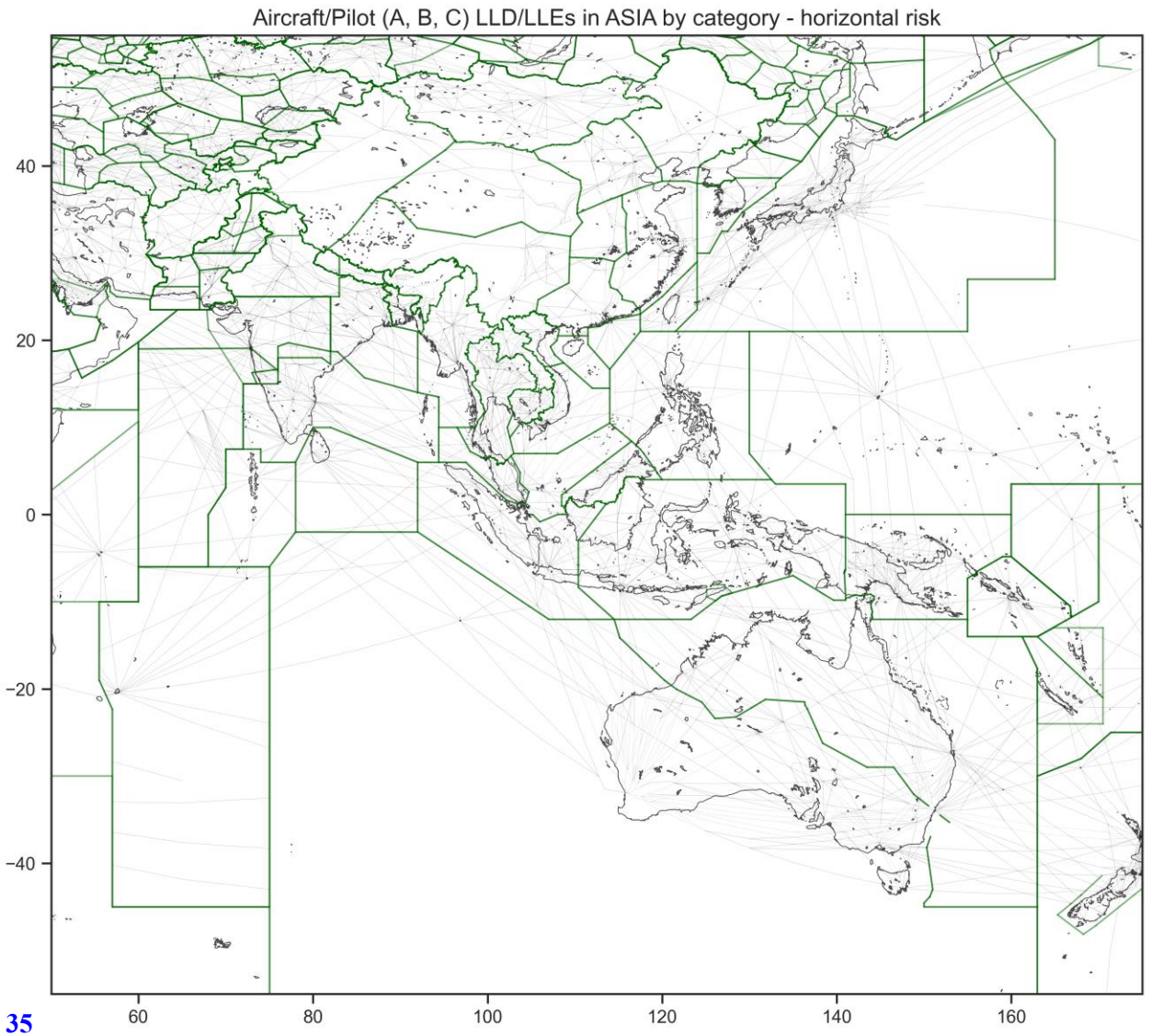
ASIA : All Categories



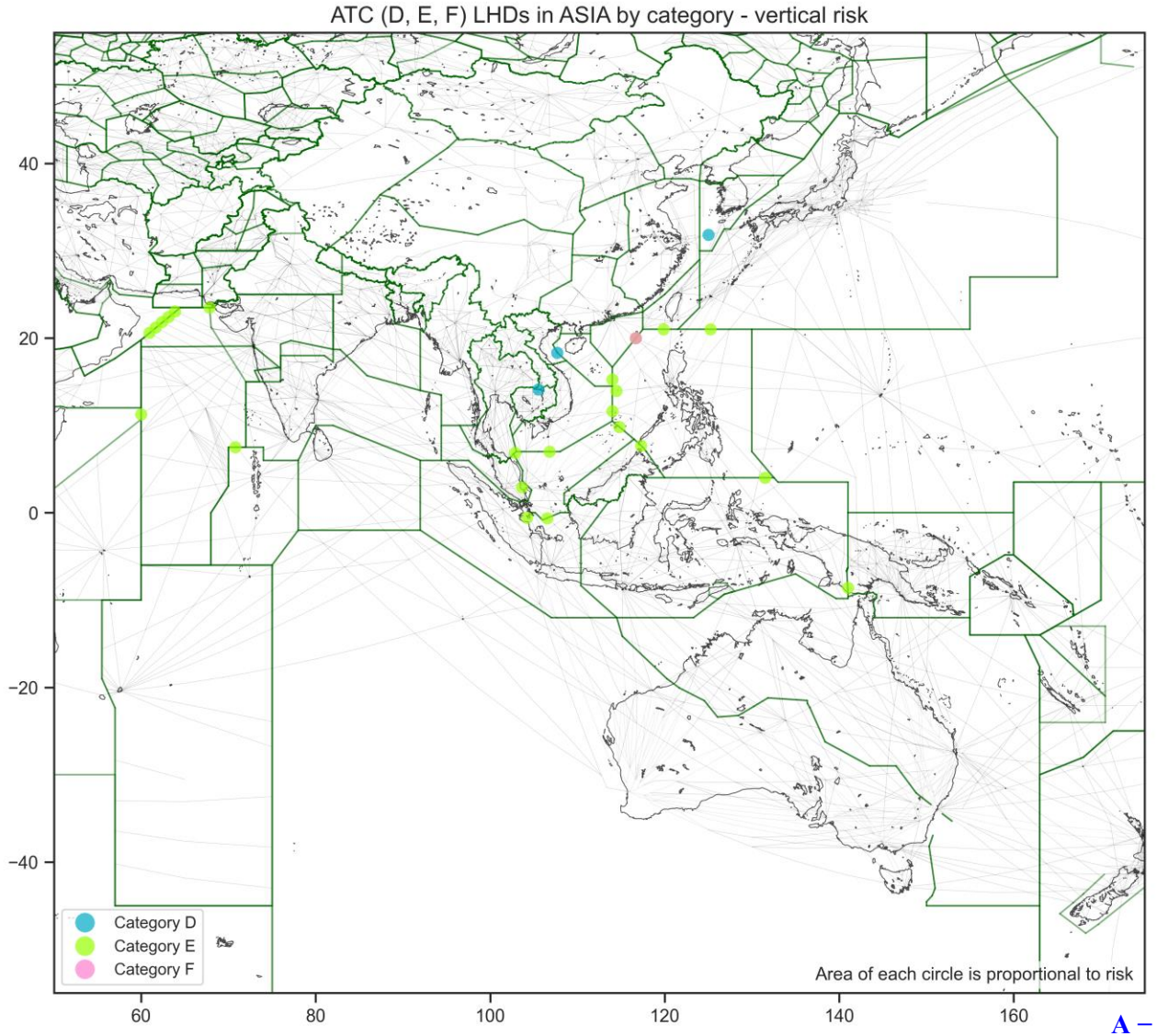


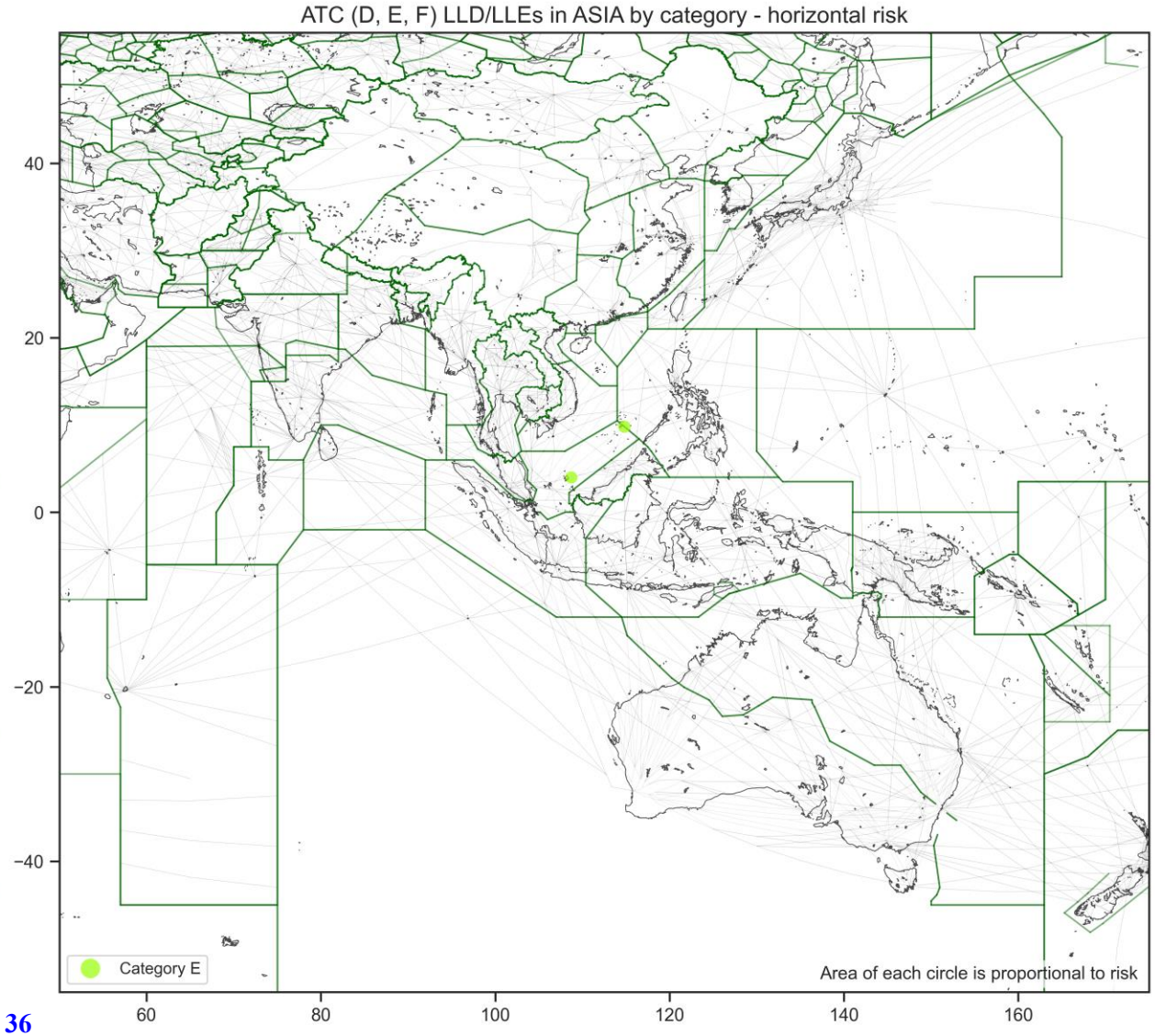
ASIA : Aircrew/Pilot (A, B, C)





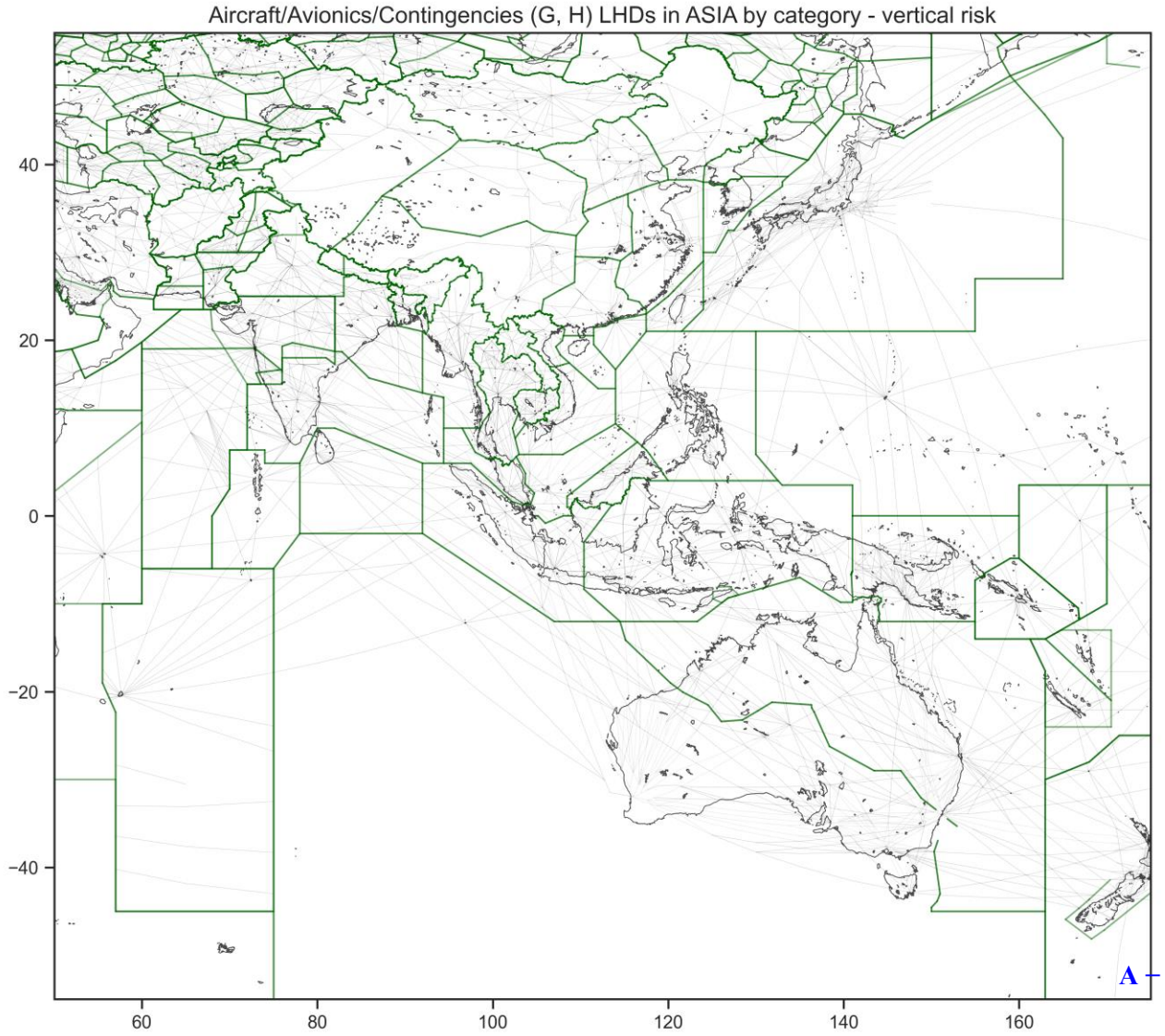
ASIA : ATC (D, E, F)

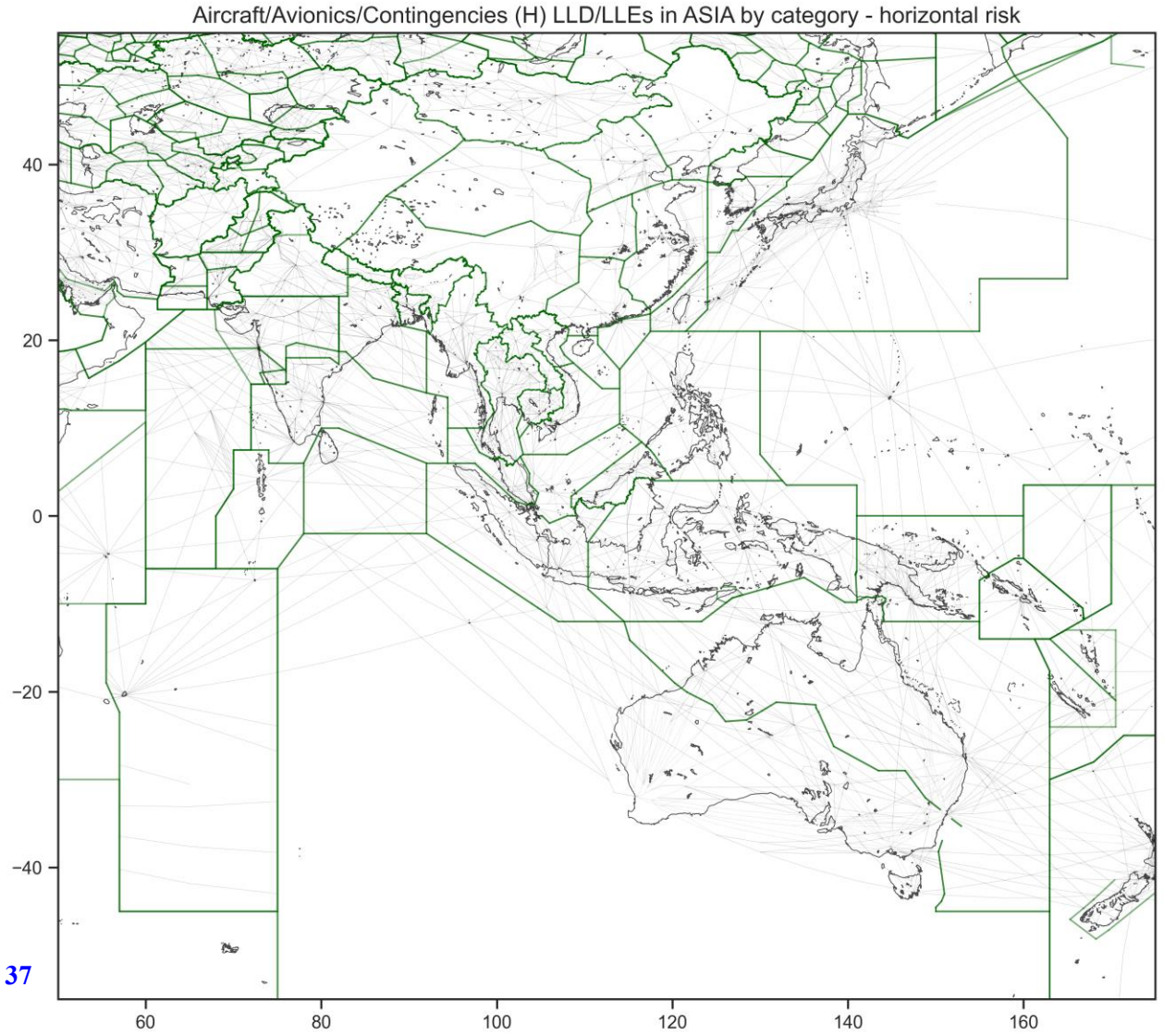

ATC (D, E, F) LHDs in ASIA by category - vertical risk
40
20
0
−20
−40
60
80
100
120
140
160
Category D
Category E
Category F
Area of each circle is proportional to risk


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

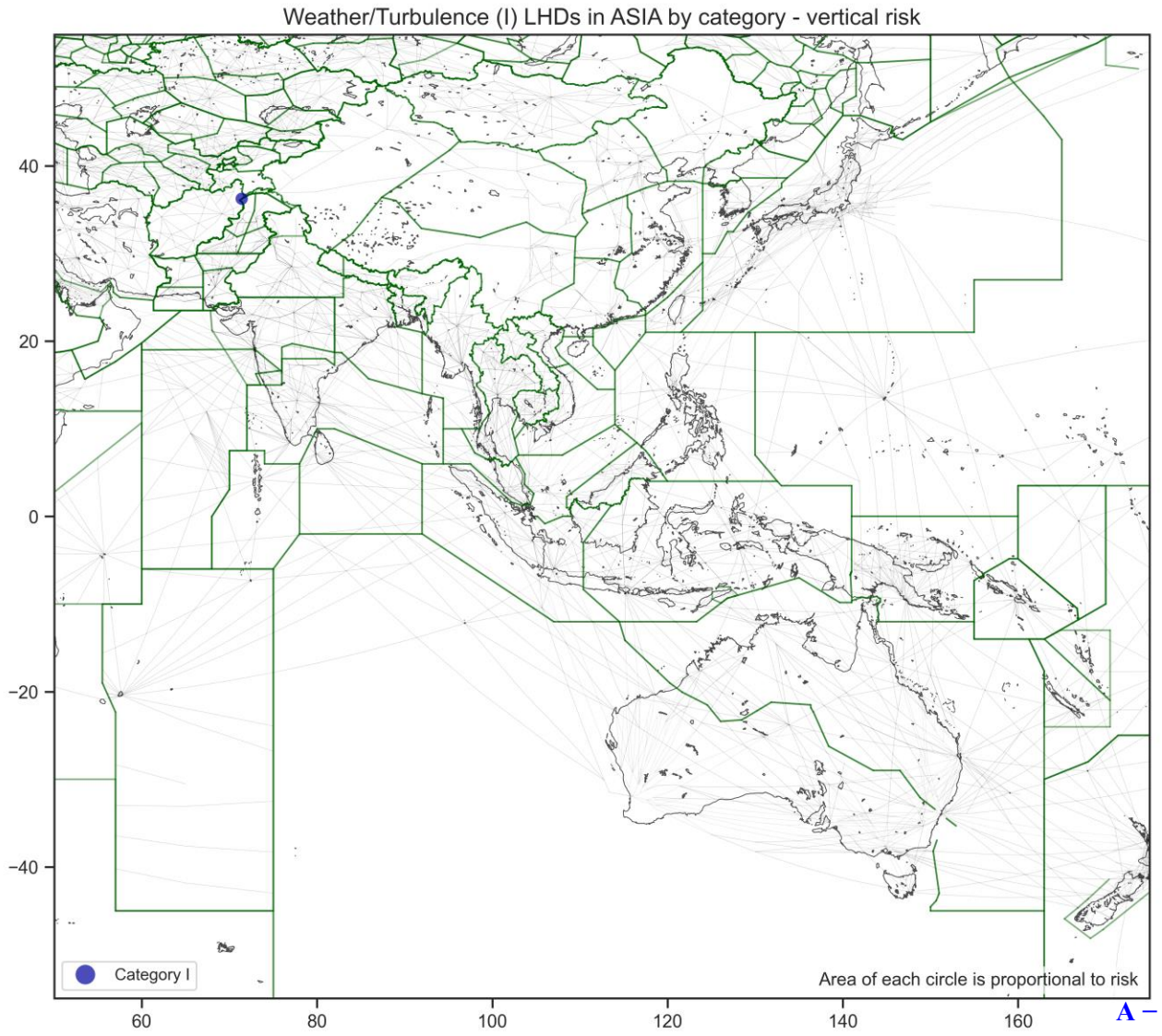
ASIA : Aircraft Avionics/Contingencies

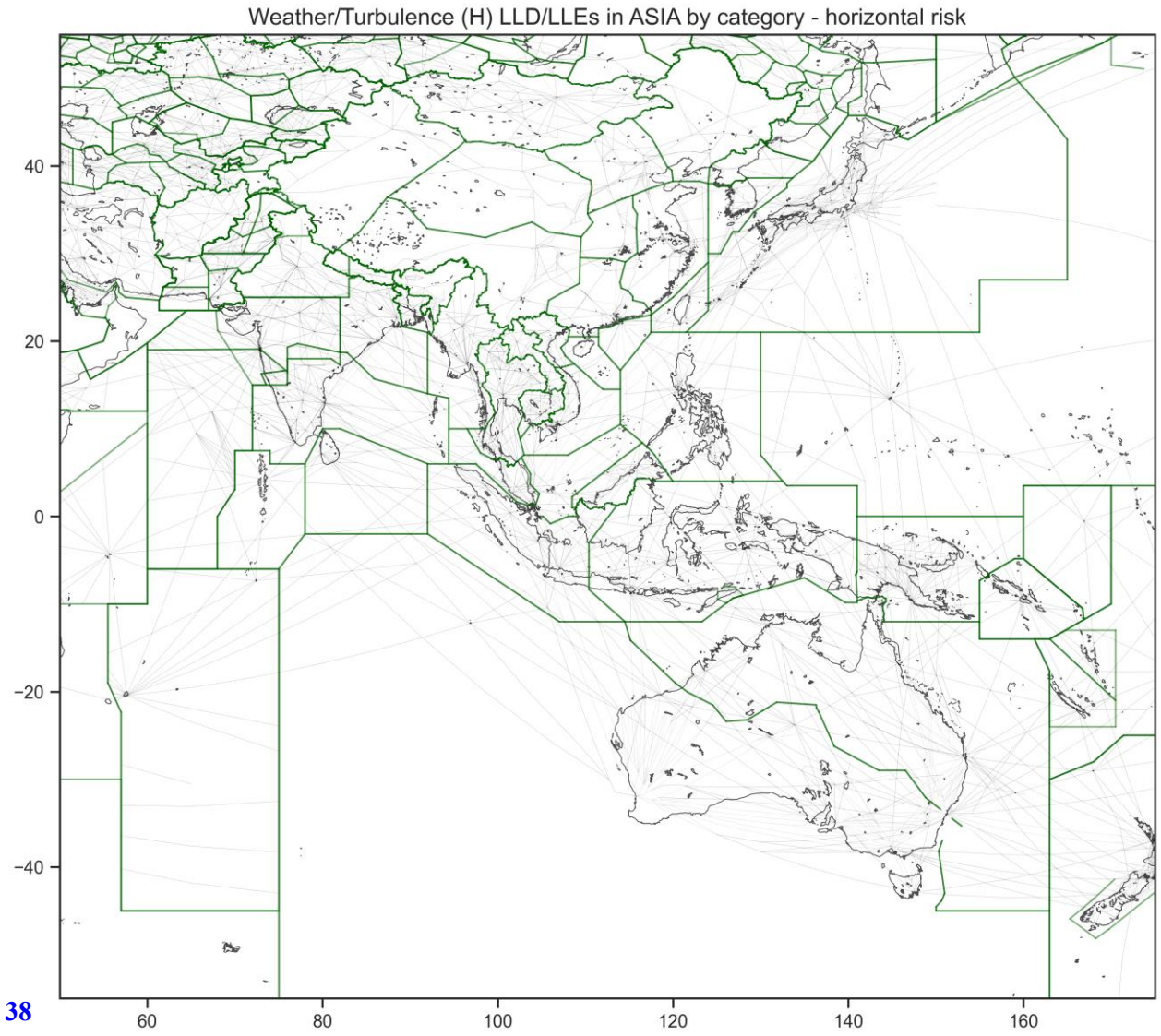
(LHD:G,H, LLD/LLE:H)



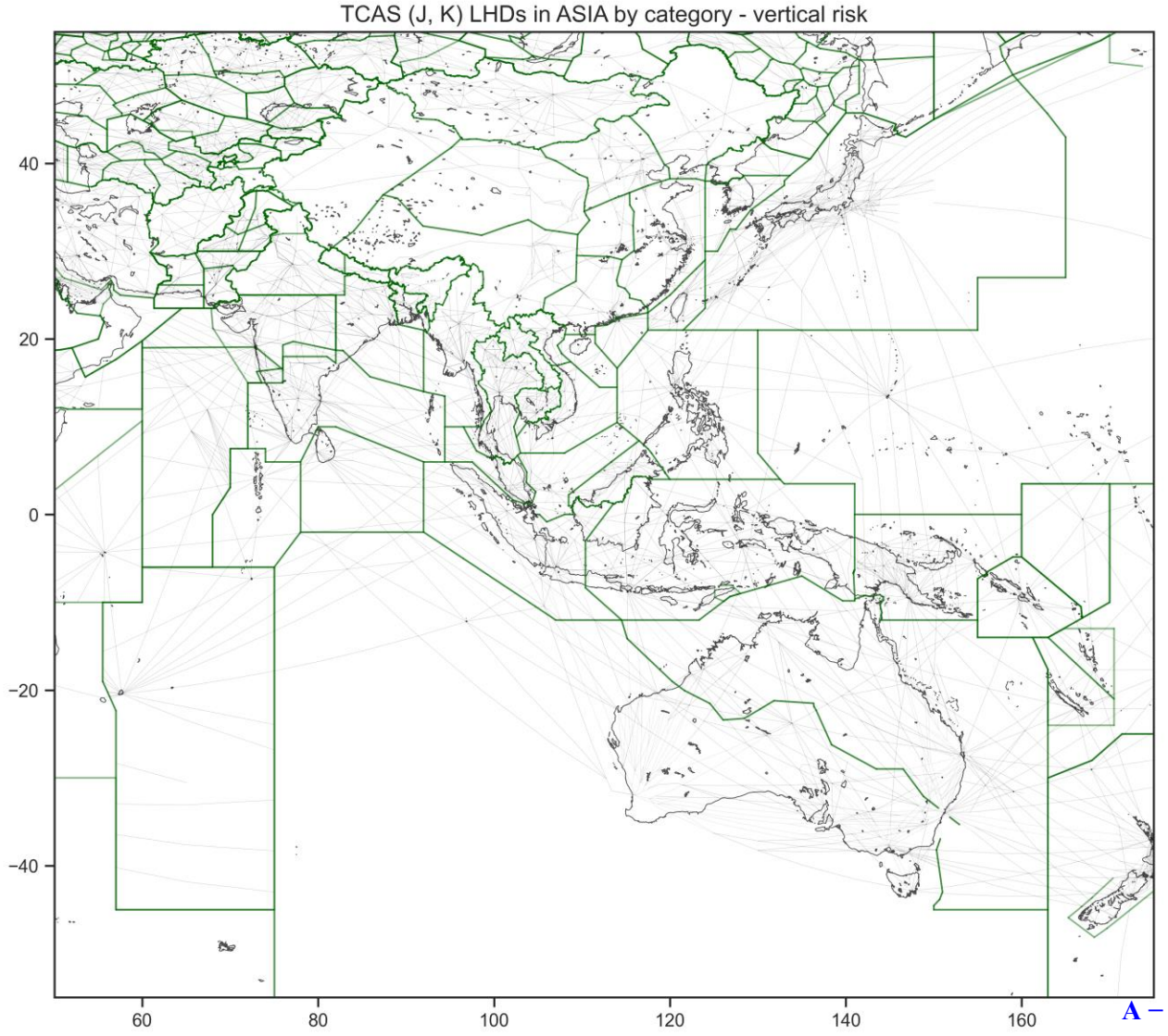


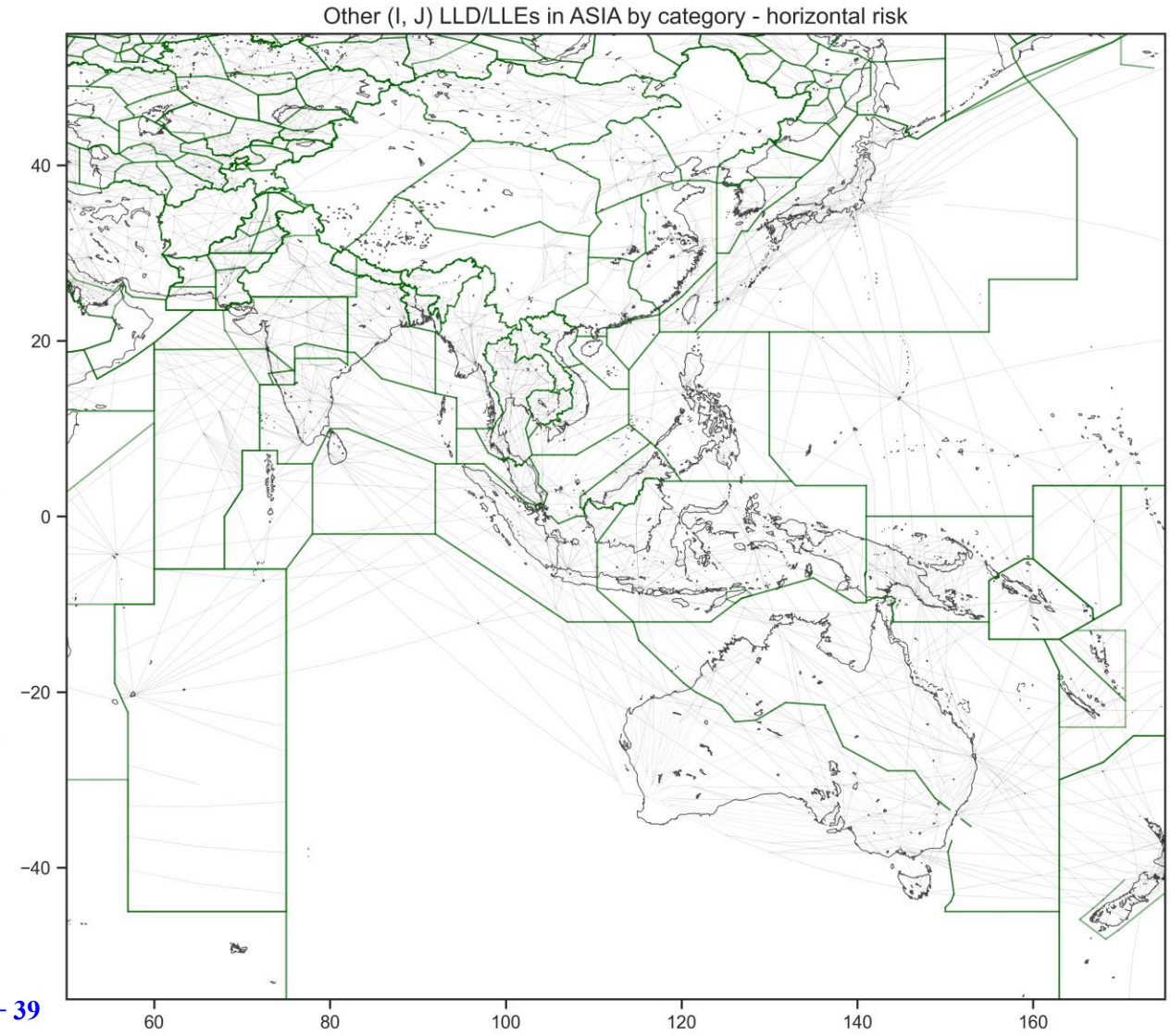
ASIA : Weather/Turbulence (LHD:I, LLD/LLE:H)





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.

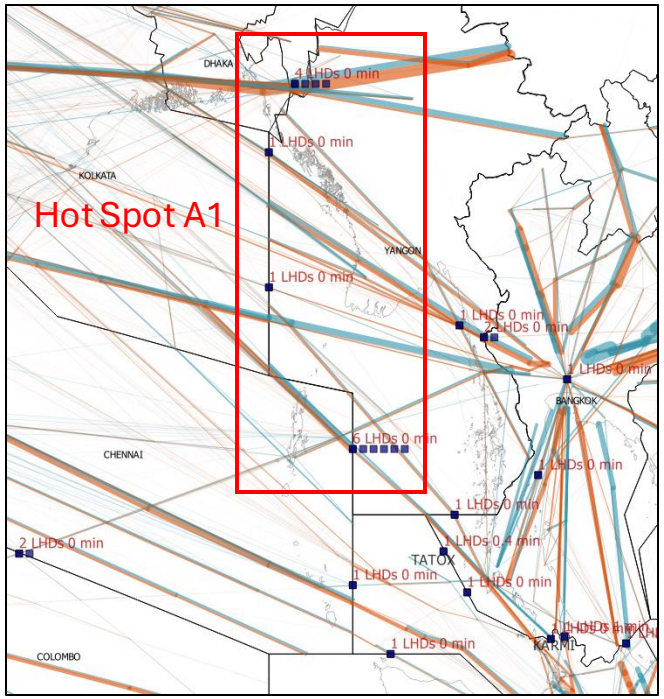
Trend:

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

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2022	2023	2024	2022	2023	2024
Kolkata/Yangon	17	11	6	0.00	0.00	0.00
Chennai/Yangon	23	15	6	0.02	0.06	0.00

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 ACC, 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 mitigation are implemented.

ASIA : LHD Hot Spot B1

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

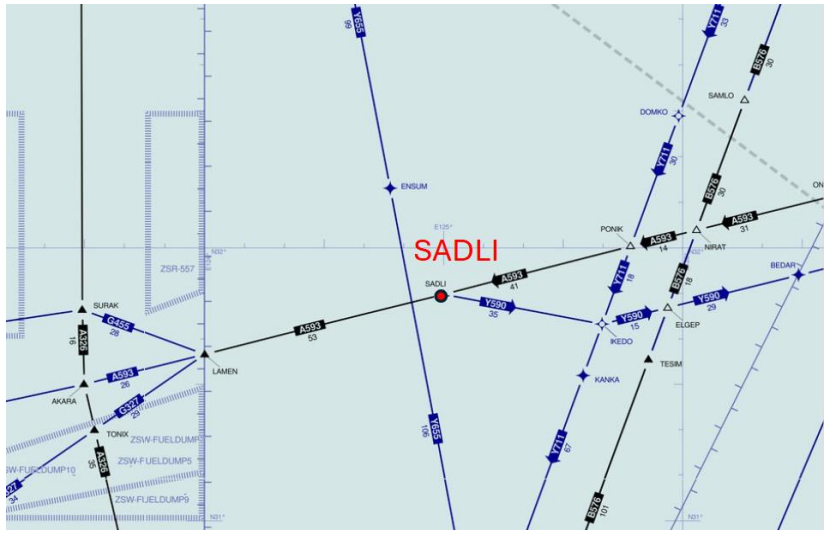
Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

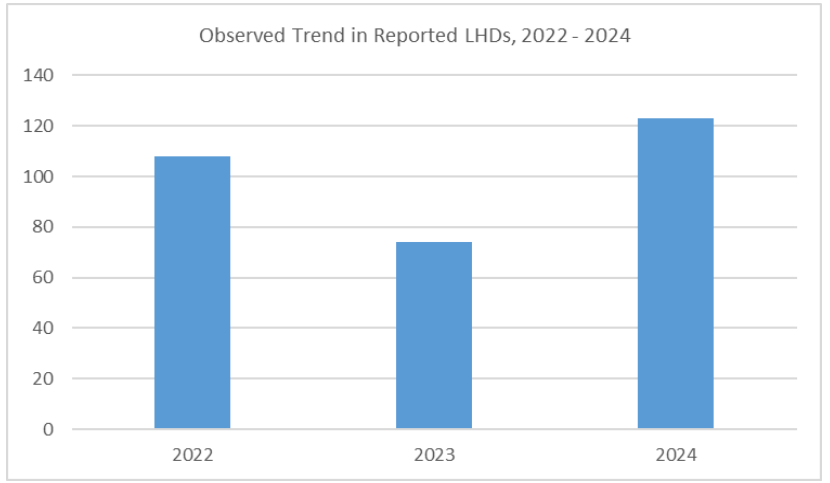
Contributing Factors:

- Lack of communication between stakeholders, including insufficient exchange and mutual understanding of LHD-related information
- High traffic demand through area with the existing airspace configuration

Trend :

- In 2024, the number of LHDs increased from 2023.
- The operational risk has been zero since 2021 because all reported occurrences were mitigated by available surveillance and direct speech circuit.





ASIA : LHD Hot Spot B1

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

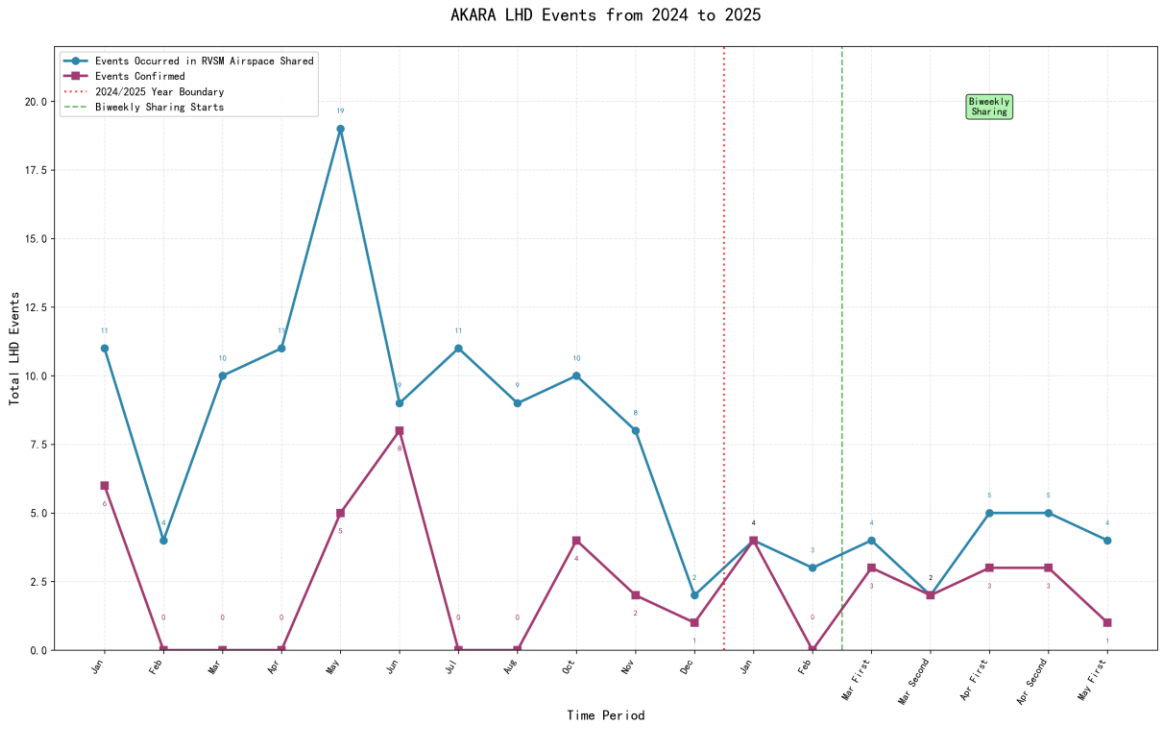
Mitigations :

- China and ROK held bilateral meetings to establish a mutual understanding of transfer errors and strengthened safety awareness.
- The LHD report-sharing mechanism was enhanced by doubling the data sharing frequency to enable more timely and effective validation.
- Route capacity has been improved since March 2021, by introducing the parallel airway Y590 on the eastern side of SADLI as Phase 1.
- Surveillance coverage was expanded. A direct speech circuit was established to support coordination.
- Bilateral meetings between ROK and China to discuss mitigation measures including Phase 2.

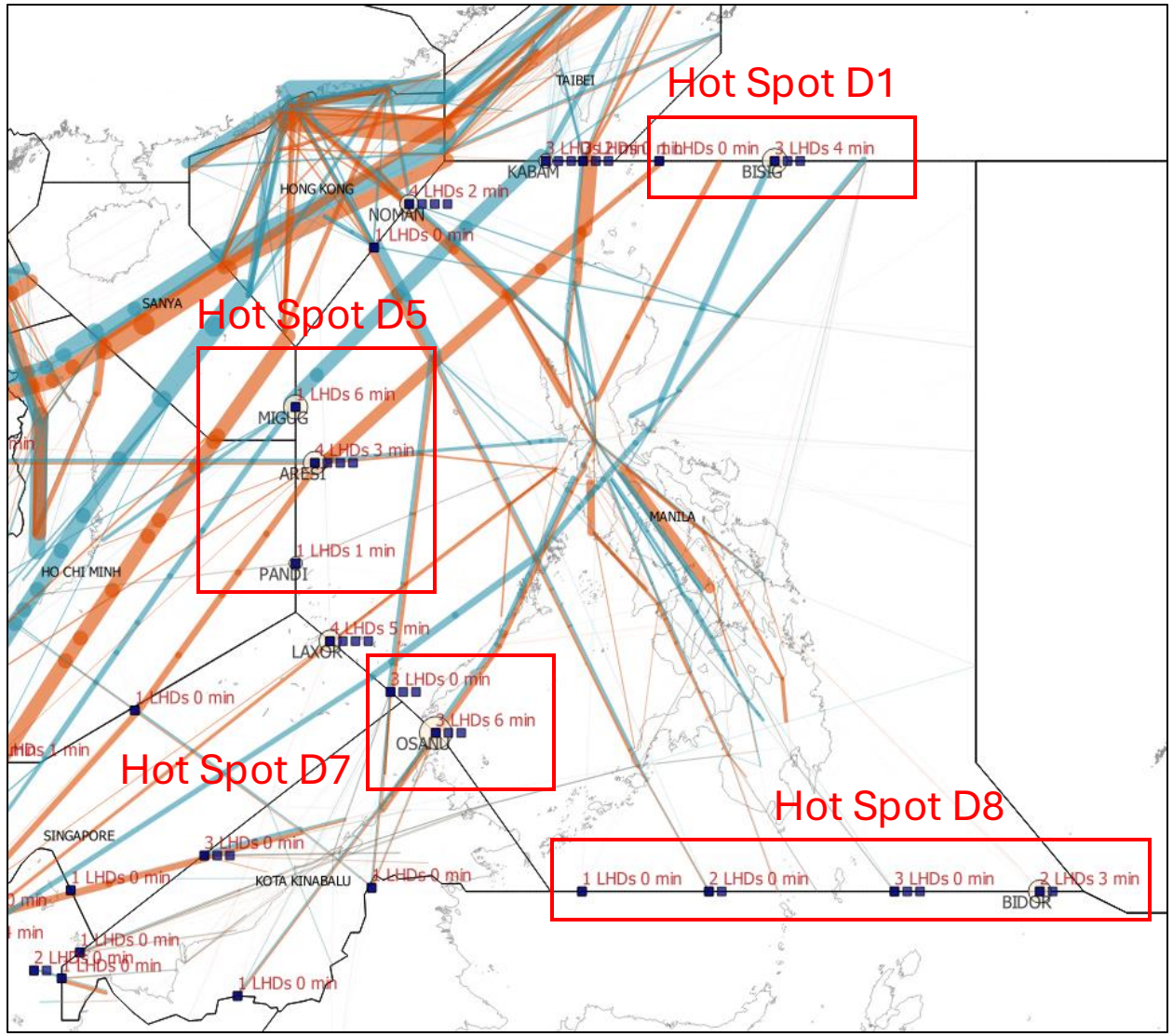
Result from the hot spot identification process:

- **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.

The trend of confirmed LHDs after doubling the report-sharing frequency among stakeholders



ASIA : LHD Hot Spot D1, D5, D7 and D8



Hot Spot D1: Fukuoka/Manila FIR boundary

Hot Spot D5: Ho Chi Minh/Manila FIR boundary

Hot Spot D7: Kota Kinabalu/Manila FIR boundary

Hot Spot D8: Manila/Ujung Pandang FIR boundary

Remark:

In 2024, Hot Spot D, which was represented the entire Manila FIR boundary, was subdivided into nine hot spots: D1 through D9.

Each subdivision was re-analyzed with the hot spot identification process using the historical data up to 2023. As a result, Hot Spots D2, D3, D4, D6, and D9 were removed from the list of hot spots due to continuous improvements achieved through existing mitigations.

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)		
	2022	2023	2024	2022	2023	2024
Hot Spot D1 (Fukuoka/Manila)	7	6	5	1.74	0.96	0.22

Note: The number of LHDs and operational risk include submissions from both the Manila FIR (MAAR) and the Fukuoka FIR (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 marked as a potential non-hotspot**.

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 increased.

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2022	2023	2024	2022	2023	2024
Hot Spot D5 (Ho Chi Minh/Manila)	3	2	6	0.05	0.10	0.14

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 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 slightly increased.
- Operational risk slightly decreased.

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2022	2023	2024	2022	2023	2024
Hot Spot D7 (Kota Kinabalu/Manila)	3	5	6	0.04	0.13	0.12

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.
- However, AIDC implementation is currently in the operational trial phase, with full implementation expected in the fourth quarter of 2025.
- Consequently, **Hot Spot D7 remains on the list of hot spots** and should continue to be monitored until further safety improvement initiatives are implemented.

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 and operational risk decreased.

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2022	2023	2024	2022	2023	2024
Hot Spot D8 (Manila/Ujung Pandang)	2	15	8	0.11	0.41	0.06

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 D8 does not satisfy the hot spot criteria.
- In addition, AIDC has been successfully operated since 2020.
- Thus, **Hot Spot D8 is marked as a potential non-hotspot**.

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.

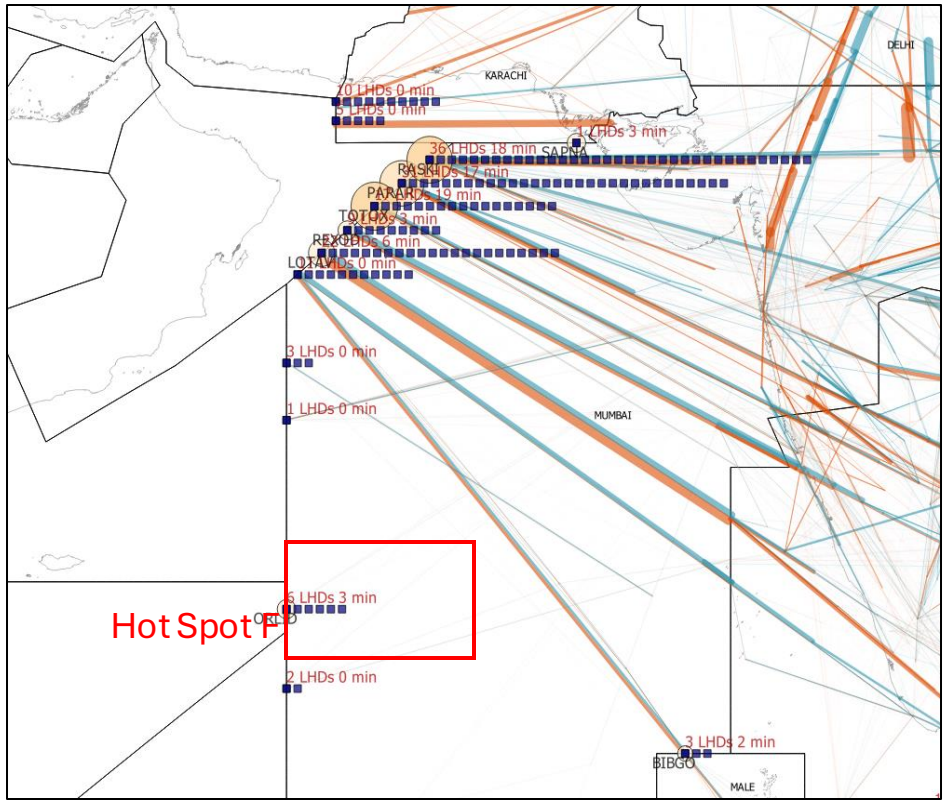
Trend:
- The number of LHDs slightly decreased.
- Operational risk increased, but remains at a low level.

Mitigations:
- Surveillance coverage was enhanced through Space-Based ADS-B in Indian FIRs.
- AIDC implementation between Mogadishu and Mumbai was initiated but remained in the testing phase.

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)		
	2022	2023	2024	2022	2023	2024
Hot Spot F (Mogadishu/Mumbai)	9	10	7	0.02	0.00	0.05



ASIA : LHD Hot Spot G1 (Mumbai/Muscat)

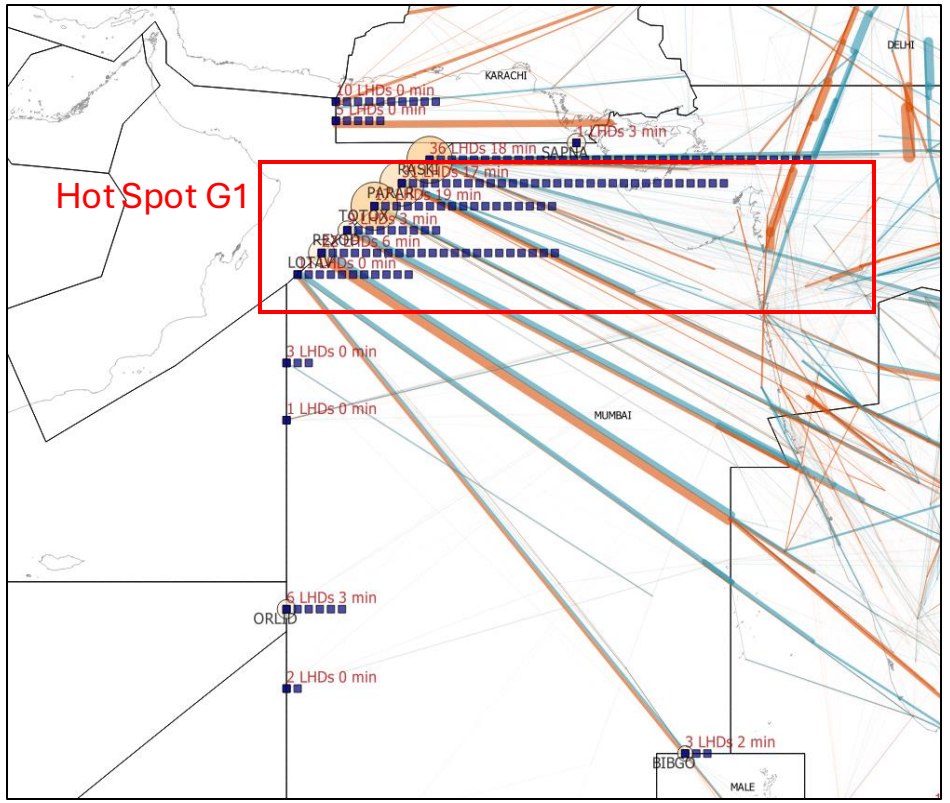
Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

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

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2022	2023	2024	2022	2023	2024
Hot Spot G1 (Mumbai/Muscat)	43	138	132	0.79	2.79	1.09

Trend:
- The number of LHDs slightly decreased from 2023, but remains high.
- Operational risk decreased.

Mitigations:
- Surveillance coverage was enhanced through Space-Based ADS-B in Indian FIRs.
- The AIDC implementation between Mumbai and Muscat ACCs was initiated but remained in the testing phase.



Result from the hot spot identification process:

- Hot Spot G1 satisfies the hot spot criteria in terms of the number of LHDs and operational risk.
- 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.

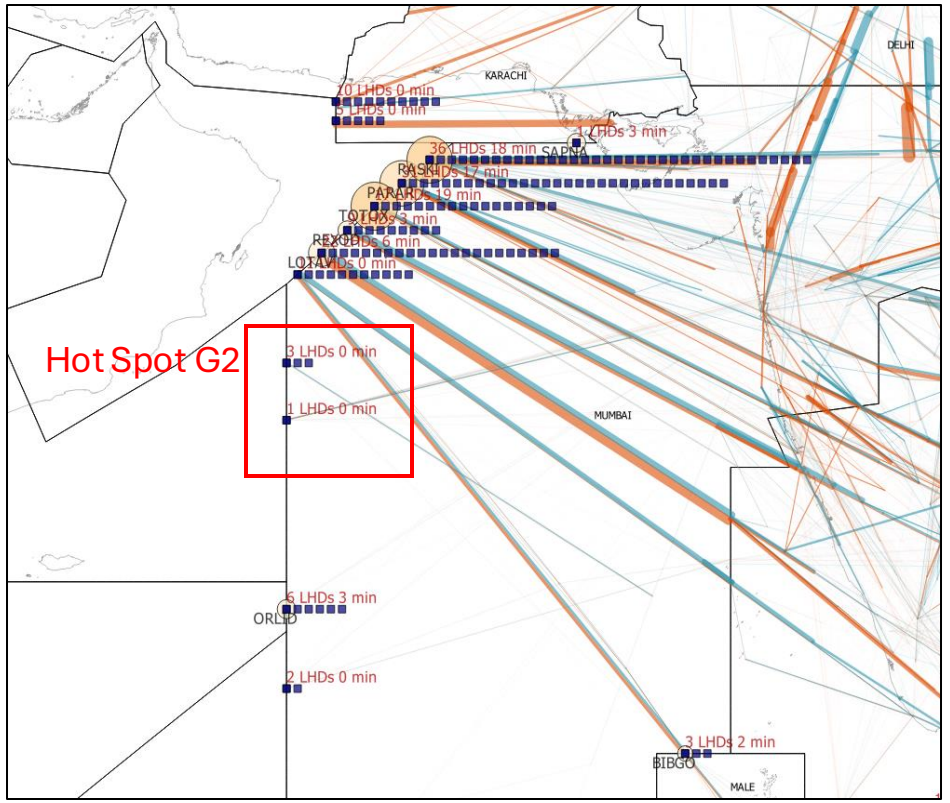
Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2022	2023	2024	2022	2023	2024
Hot Spot G2 (Mumbai/Sanaa)	2	3	4	0.00	0.00	0.00

Trend:
- The number of LHDs slightly increased
- Operational risk was zero.

Mitigations:
- Surveillance coverage was enhanced through Space-Based ADS-B in Indian FIRs.

Result from the hot spot identification process:

- Hot Spot G2 does not satisfy the hot spot criteria.
- However, further mitigation such as AIDC implementation have not been planned.
- Therefore, **Hot Spot G2 remains on the list of hot spots** and should continue to be monitored until further safety improvement initiatives or mitigation measures, such as AIDC, are completed.



ASIA : LHD Hot Spot J (Jakarta/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 and operational risk significantly decreased.

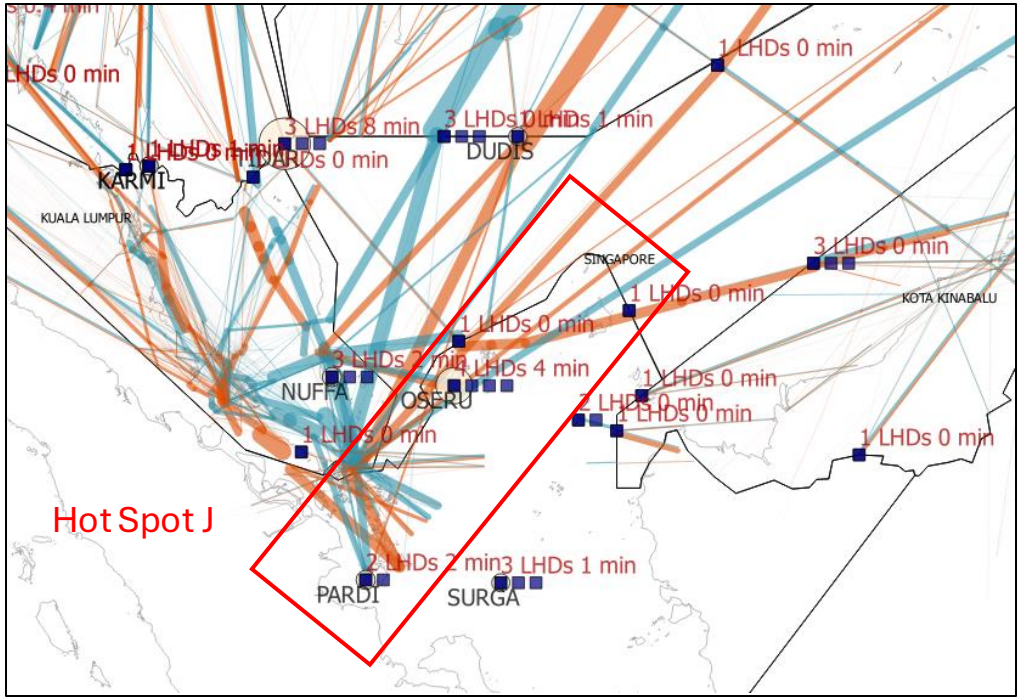
Mitigations:

- As of 21 March 2024, the FIR boundary between Jakarta and Singapore was realigned. To support the transition and maintain safety, the operational coordination meetings between both ACCs were regularly held since 2024, and planned to continue in 2025.
- 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 marked as a potential non-hotspot**.

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2022	2023	2024	2022	2023	2024
Jakarta/Singapore (Hot Spot J)	14	27	11	0.18	0.33	0.12



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 and operational risk decreased.

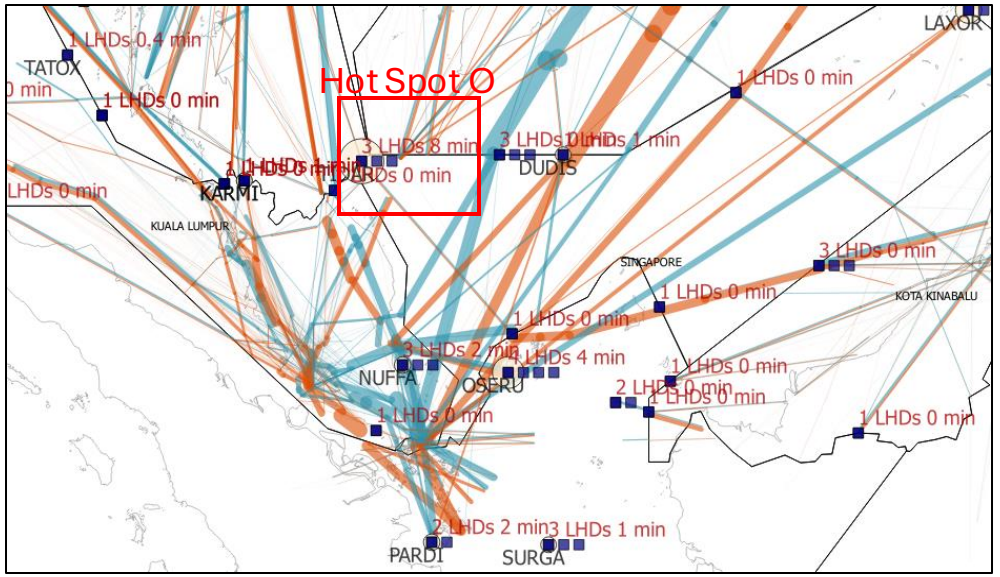
Mitigations:

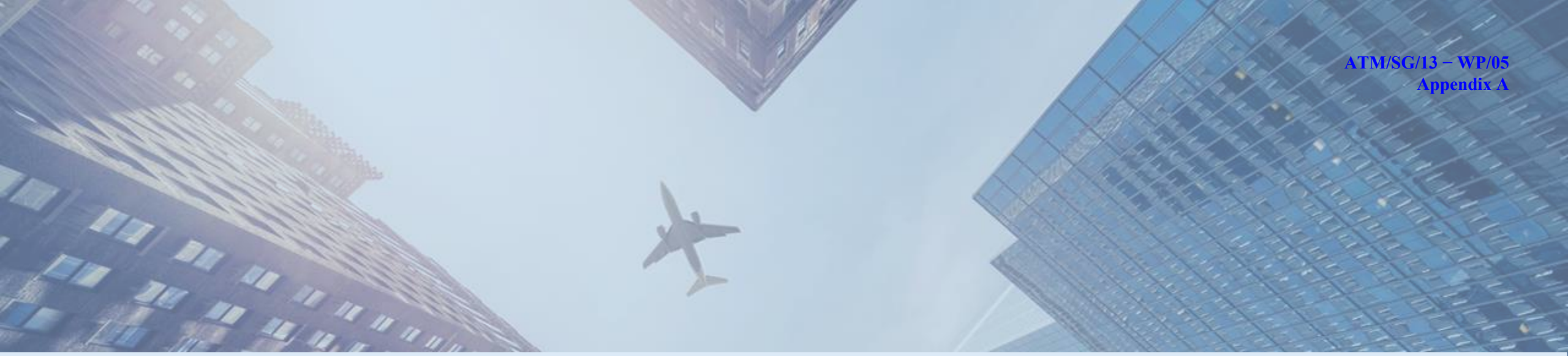
- Regular LHD analysis sharing with controllers and operational aids such as visual reminders on the Air Situational Display to enhance situational awareness have been implemented to mitigate the risk.
- Other collaborative improvement initiatives to prevent LHD occurrences are being explored.

Result from the hot spot identification process:

- Hot Spot O has satisfied the hot spot criteria in terms of the operational risk since 2022. Therefore, **Hot Spot O remains on the list of hot spots.**

Area	Number of LHDs			Operational Risk (10^{-9} FAPFH)		
	2022	2023	2024	2022	2023	2024
Hot Spot O (Bangkok/Ho Chi Minh /Kuala Lumpur/ Singapore)	7	5	3	0.58	0.51	0.15





Reporting Rate of LHDs/LLDs/LLEs

Reporting Rate of LHDs/LLDs/LLEs in 2024

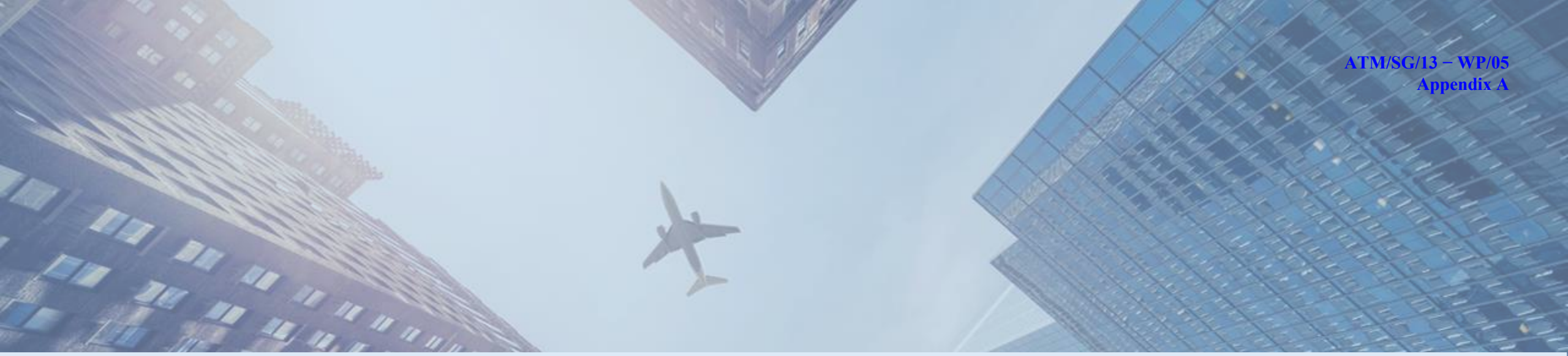
Airspace	Flying Hours	Aircrew/Pilot		ATC		Other		Total	
		# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs
DPRK	-	0	-	0	-	0	-	0	-
Mongolia	103,477	0	-	0	-	0	-	0	-
SEA	3,108,056	0	-	74	1: 42,001	0	-	74	1: 42,001
Japan	1,929,397	24	1:80,392	10	1: 192,940	42	1: 45,938	76	1: 25,387
SA/IO	4,143,123	3	1:1,381,041	194	1: 21,356	7	1: 591,875	204	1: 20,309
SW Pacific	1,245,193	35	1:35,577	25	1: 49,808	11	1: 113,199	71	1: 17,538
China	2,878,308	11	1:261,664	19	1: 151,490	160	1: 17,989	190	1: 15,149
Pacific	1,933,809	62	1:31,190	169	1: 11,443	3	1: 644,603	234	1: 8,264
Indonesia	548,638	18	1:30,480	84	1: 6,531	0	-	102	1: 5,379
ROK and AKARA	197,566	0	-	123	1: 1,606	3	-	126	1: 1,568
Total	16,087,567	153	1:105,147	689	1: 23,048	226	1: 71,184	1,077	1: 14,937

Note:

- There was no flying hours for DPRK in 2024, as no aircraft operated in its RVSM airspace.
- Both DPRK and Mongolia submitted NIL reports for all months in 2024.

Reporting Rate of LHDs/LLDs/LLEs in 2024

Airspace	# Reports							1 Report : Flying Hours						
	2018	2019	2020	2021	2022	2023	2024	2018	2019	2020	2021	2022	2023	2024
DPRK	0	0	0	0	0	0	0	-	-	-	-	-	-	-
Mongolia	1	2	0	1	0	0	0	1: 158,891	1: 82,138	-	1: 121,621	-	-	-
SEA	205	152	42	70	62	101	74	1: 17,757	1: 22,275	1: 25,106	1: 15,456	1:32,620	1:29,400	1: 42,001
Japan	76	77	66	80	75	72	76	1: 20,632	1: 20,762	1: 14,737	1: 13,528	1:18,751	1:23,452	1: 25,387
SA/IO	681	439	152	135	143	258	204	1: 3,783	1: 7,955	1: 7,907	1: 11,167	1:21,018	1:10,242	1: 20,309
SW Pacific	53	101	46	47	81	65	71	1: 17,817	1: 9,335	1: 6,954	1: 11,975	1:5,352	1:18,186	1: 17,538
China	110	79	85	105	72	223	190	1: 22,229	1: 31,119	1: 26,867	1: 15,477	1:18,003	1:10,525	1:15,149
Pacific	43	173	134	176	179	203	234	1: 45,064	1: 10,139	1: 6,404	1: 6,638	1:8,280	1:8,736	1:8,264
Indonesia	23	37	18	41	54	125	102	1: 53,603	1: 33,321	1: 17,346	1: 7,402	1:8,060	1:6,099	1:5,379
ROK and AKARA	12	34	5	24	108	75	126	1: 28,365	1: 18,959	1: 25,965	1: 6,285	1:1,056	1:2,220	1:1,568
Total	**1,204**	**1,094**	**548**	**679**	**774**	**1,122**	**1,077**	**1: 12,332**	**1: 14,330**	**1: 13,202**	**1: 11,200**	**1:13,230**	**1:12,135**	**1:14,937**



Conclusion

RVSM TLS Compliance - Vertical

- **The 2024 PAC vertical overall risk is 15.53 x 10^{-9} FAPFH, above the TLS,** driven by Hot Spot N (Hawaii CEP/Oakland, USA). To address this hot spot, the responsible units have implemented mitigation procedures and are planning an ATM system upgrade, scheduled to be implemented in 2027.
- **The 2024 ASIA vertical overall risk is 1.99 x 10^{-9} FAPFH, below the TLS.**

RVSM TLS Compliance - Horizontal

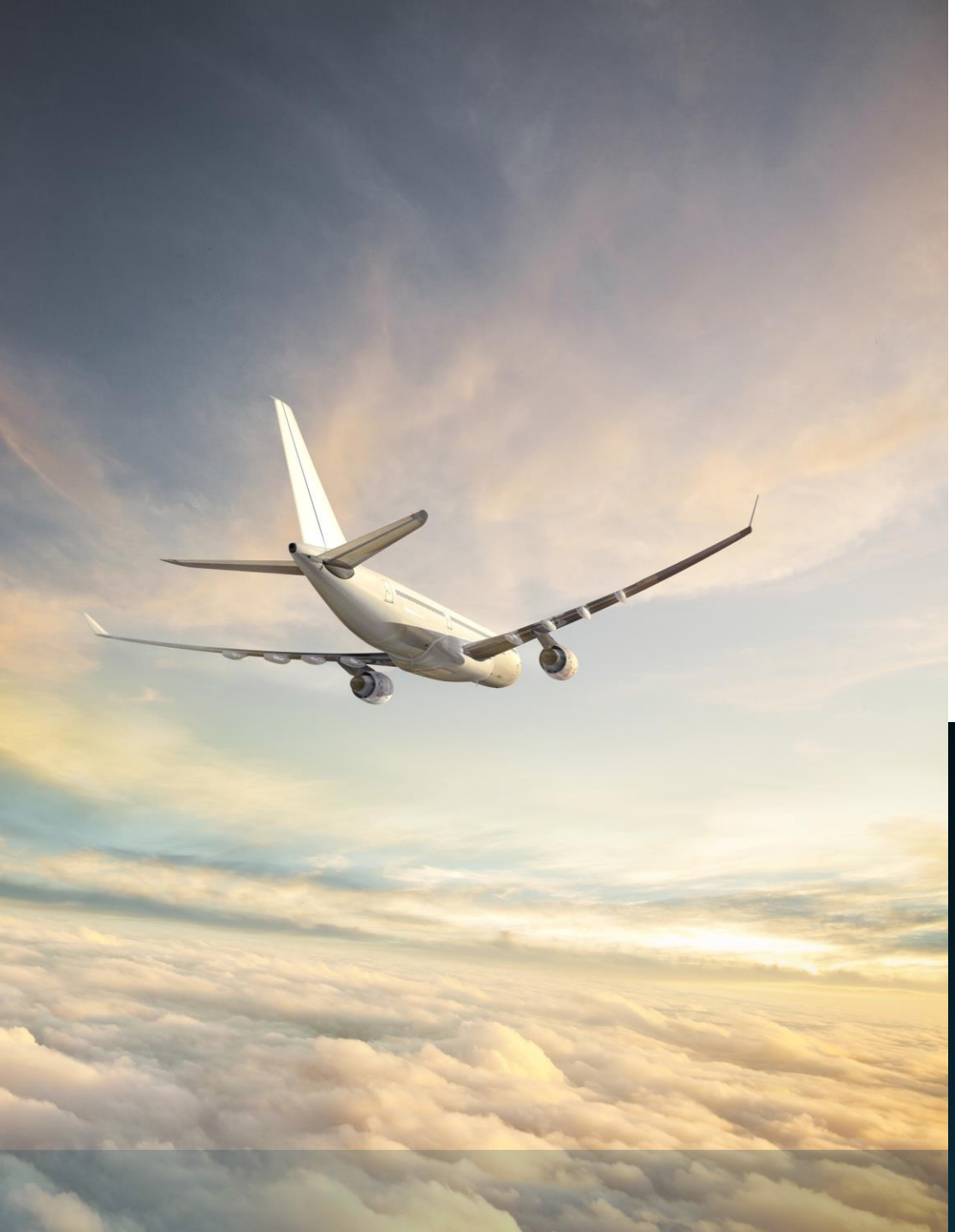
- **All horizontal risk estimates in 2024 are below the TLS.**

RASMAG's Hot Spot List

Hot Spot	Involved FIRs	Identified	Remarks
A1	Chennai/Dhaka/Kolkata/Yangon	2015	Cat. E LHDs and risk decreasing.
B1	Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)	2015	Cat. E LHDs increasing. Risk decreasing.
D1	Fukuoka/Manila	2015	Cat. E steady; risk decreasing. Mitigation in place. **Potential non-hotspot**.
D5	Ho Chi Minh/Manila	2015	Cat. E LHDs and risk slightly increasing.
D7	Kota Kinabalu/Manila	2015	Cat. E LHDs slightly increasing. Risk slightly decreasing.
D8	Manila/Ujung Pandang	2015	Cat. E LHDs and risk decreasing. Mitigation in place. **Potential non-hotspot**.
F	Mogadishu/Mumbai	2015	Cat. E LHDs decreasing. Risk slightly increasing
G1	Mumbai/Muscat	2015	Cat. E LHDs slightly decreasing. Risk decreasing.
G2	Mumbai/Sanaa	2015	Cat. E LHDs slightly increasing. Risk decreasing.
J	Jakarta/Kota Kinabalu/Singapore	2018	Cat. E LHDs and risk decreasing. Mitigation in place. **Potential non-hotspot**.
N	Hawaii CEP/Oakland USA	2019	Cat. E LHDs and risk slightly increasing.
O	Bangkok/Ho Chi Minh/Kuala Lumpur/ Singapore	2023	Cat. E LHDs and risk decreasing.

Reporting Rate of LHDs/LLDs/LLEs

- **The estimated flying hours significantly increased** from
  13,615,545 hours in 2023 to
  16,087,567 hours in 2024.
- **The overall reporting rate of LHDs/LLDs/LLEs slightly degraded**, from
  1 report per 12,135 hours in 2023 to
  1 report per 14,937 hours in 2024.
- The reporting rate for **SEA, China, and SA/IO significantly dropped in 2024** due to the decrease in the number of LHDs with the increase in flying hours.
- The reporting rates for **other areas in 2024** were **close to 2023 values**.
- The reporting rate for **DPRK could not be calculated**, as there were no flying hours and no reported occurrence. No aircraft operated in DPRK's RVSM airspace in 2023 and 2024, and DPRK submitted NIL reports for all months in 2024.
- The reporting rate for **Mongolia could not be calculated**, as no occurrence were reported. Mongolia submitted NIL reports for all months in 2024.



THANK YOU

Thirtieth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/30)
Bangkok, Thailand
14 – 17 July 2025

Link for RASMAG meeting:
https://www.icao.int/APAC/Meetings/Pages/2025-RASMAG-30.aspx