



ICAO

International Civil Aviation Organization
**Thirty-Sixth Meeting of the Asia/Pacific Air Navigation
Planning and Implementation Regional Group
(APANPIRG/36)**
Bangkok, Thailand, 24 to 26 November 2025
**Agenda Item 3: Performance Framework for Regional Air Navigation Planning and
Implementation**
3.3: RASMAG
RASMAG OUTCOMES

(Presented by Chairperson of RASMAG)

SUMMARY

This paper provides a summary of the key outcomes from the Thirtieth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/30), including the RASMAG/30 discussion of the outcomes of its contributory body, Future Air Navigation Services (FANS) Interoperability Team – Asia (FIT-Asia/15).

Strategic Objectives:

- A: **Safety** – Enhance global civil aviation safety*
- B: **Air Navigation Capacity and Efficiency** — Increase the capacity and improve the efficiency of the global aviation system*

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

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

- a) [APAC Meetings | FIT Asia/15](#)
- b) [APAC Meetings | RASMAG/30](#)

1.3 **DISCLAIMER:** The presentation of material in this report does not imply the expression of any opinion whatsoever on the part of ICAO, APANPIRG or the RASMAG of APANPIRG concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

2. DISCUSSION

FIT-Asia Meeting Outcomes

Data Link Performance Reports

2.1 The FIT-Asia/15 was provided with updated information of Data Link Performance Reports by FIT-Asia member 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 recalled that the current version of ICAO Doc 9869 specified only DM0 WILCO for use in pilot operational response time (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 required surveillance performance (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		
<div> <div>Colour Key</div> <div> <div>Meets Criteria</div> <div>99.0%-99.89%</div> <div>Under Criteria</div> </div> </div>	No. Messages	Criteria		No. Messages	Criteria	
		95%	99.90%		95%	99.90%
		% <= 90sec	% <= 180sec		% <= 90sec	% <= 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 actual communication performance (ACP) and actual communications technical performance (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				
<div>Colour Key</div> <div><div></div> Meets Criteria</div> <div><div></div> 99.0%-99.89%</div> <div><div></div> Under Criteria</div>	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	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					
<div>Colour Key</div> <div><div></div> Meets Criteria</div> <div><div></div> 99.0%-99.89%</div> <div><div></div> Under Criteria</div>	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 (NAT) Region, and 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 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 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)

2.10 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 Region 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.

2.11 In light of this, the FIT-Asia/15 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 agreements.

PBCS Seminar

2.12 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 were available on the FIT-Asia/15 webpage.

RASMAG/30 Meeting Outcomes

APAC Consolidated Safety Report

2.13 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 **Attachment A**.

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

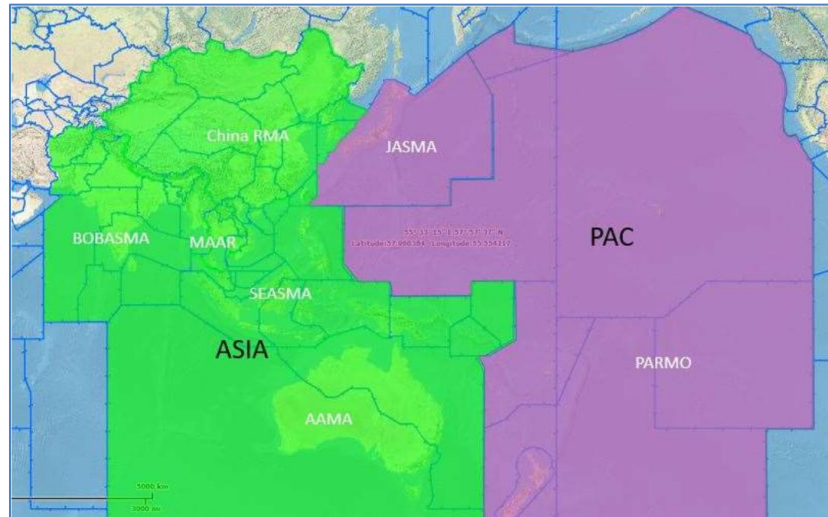


Figure 1: Asia and Pacific Safety Reporting Areas

Pacific Area Vertical Collision Risk

2.14 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}	-	-
2024 Vertical Overall Risk	15.53×10^{-9}	5.0×10^{-9}	Above TLS

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

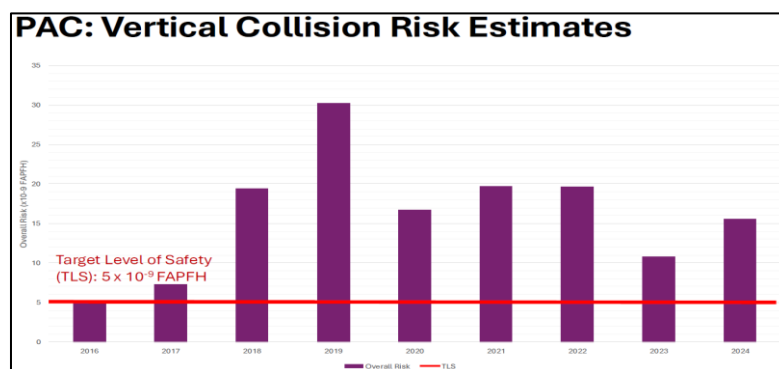


Figure 2: Pacific Area Vertical Collision Risk Estimates 2016 – 2024

2.16 There was a total of 139 Large Height Deviations (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 Category¹ A, B or C (27%), 65 were Category D, E or F (47%), two were Category

¹ Categories of LHD events as recognized by RMAs were:

Category A: Flight crew fails to climb or descent the aircraft as cleared;
Category B: Flight crew climbing or descending without ATC clearance;
Category C: Incorrect operation or interpretation of airborne equipment;
Category D: ATC system loop error;

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

2.17 The estimated horizontal collision risk for 2024 for the PAC area met TLS in all longitudinal and lateral risk categories. (**Table 5**)

Table 5: Pacific Area Horizontal Collision Risk 2024

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

2.18 There was a total of 171 Large Lateral Deviations (LLDs) and Large Longitudinal Errors (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, eight were Category H (5%) and one in Category I or J (0.6%).

Asia Vertical Collision Risk

2.19 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

Category E: Coordination errors in ATC-to-ATC transfer of control responsibility as a result of human factors issues;

Category F: ATC transfer of control coordination errors due to technical issues;

Category G: Aircraft contingency leading to sudden inability to maintain level;

Category H: Airborne equipment failure and unintentional or undetected level change;

Category I: Turbulence or other weather-related cause leading to unintentional or undetected change of flight level;

Category J: TCAS RA – flight crew correctly climb or descend following the RA;

Category K: TCAS RA – flight crew incorrectly climb or descend following the RA;

Category L: An aircraft being provided with RVSM separation is not approved; and

Category M: Others.

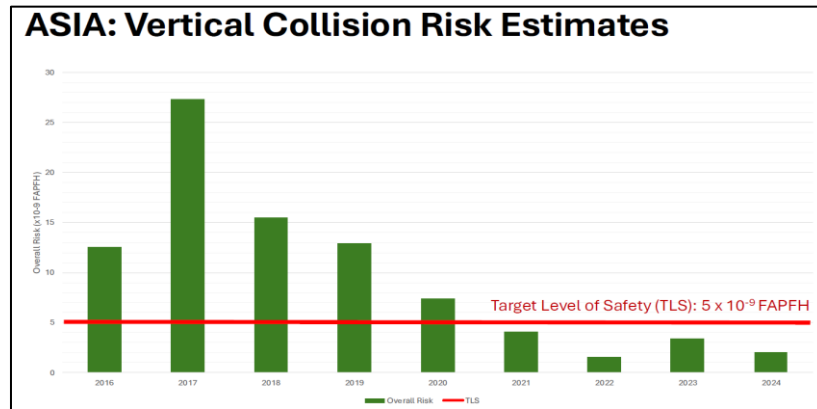


Figure 3: Asia Area Vertical Collision Risk Estimates 2016 –2024

Asia Area Horizontal Collision Risk

2.20 The estimated horizontal collision risk for 2024 for the Asia area met TLS in all longitudinal and lateral risk categories (**Table 7**). There were three 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	1.54×10^{-9}	Below TLS
Total Longitudinal Risk	1.62×10^{-9}	Below TLS

Reporting Rate of LHDs, LLDs and LLEs

2.21 **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.

2.22 The reporting rate for Southeast Asia (SEA), China and South Asia/Indian Ocean (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	The Number of 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	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
SW Pacific	53	101	46	47	81	65	204	1: 17,817	1: 9,335	1: 6,954	1: 11,975	1: 5,352	1:18,186	1:20,309
China	110	79	85	105	72	223	71	1: 22,229	1: 31,119	1: 26,867	1: 15,477	1: 18,003	1:10,525	1:17,538

Airspace	The Number of Reports							1 Report: Flying Hours						
	2018	2019	2020	2021	2022	2023	2024	2018	2019	2020	2021	2022	2023	2024
SA/IO	681	439	152	135	143	254	190	1: 3,783	1: 7,955	1: 7,907	1: 11,167	1: 21,018	1:10,242	1:15,149
Pacific	43	173	134	176	179	193	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

2.23 **Table 9** summarised the current LHD Hot Spots, the FIRs involved, the year of identification, and status remarks. Three Hot Spots were identified as Potential non-Hot Spots.

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-hot spot.
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-hot spot.
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-hot spot.
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.

RASMAG Safety Bulletin

2.24 JASMA developed the draft Safety Bulletin 03 with the topic of Crew/Team Resource Management. Crew/Team Resource Management was recognized to be important and necessary for strengthening human relationships because COVID-19 had been forced to keep social distance and caused division of human relationships

2.25 RASMAG/30 agreed that the bulletin required further editing and additional comments should reach the Chairperson by end of September 2025 before publication on the ICAO APAC eDocuments 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

2.26 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.

2.27 RASMAG noted that the analysis of Category E LHDs and its 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.

2.28 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

2.29 MAAR provided some guidance to clarify the classification and reporting for both non-RVSM approved aircraft operating in RVSM airspace and occurrences caused by global navigation satellite system (GNSS) radio frequency interference (RFI).

2.30 The current 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.

2.31 However, after discussion, RASMAG/30 meeting agreed to the formation of a new LHD/LLE/LLD category for classifying the emerging trends of GNSS RFI occurrences effectively for possible identification of prevention and mitigation measures. RASMAG agreed to the following Conclusion:

Conclusion RASMAG/30-1: *New LHD/LLE/LLD Category 'R' for GNSS RFI occurrences in Asia and Pacific Region.*

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.

Large Lateral Deviation Reporting Criteria in Asia and Pacific Region

2.32 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.

2.33 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.

2.34 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.

2.35 As a result of discussions, RASMAG agreed that the criteria could be flexible and adopting a 5 NM reporting threshold harmonized the requirements between the ADS-C downlink reports and manual reporting. Subsequently, RASMAG agreed with the following Conclusion:

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

That,

- a) *Asia and Pacific Region to adopt a Large Lateral Deviation Reporting Criteria 5 NM threshold when applying or planning to implement lateral separation minima less than 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.*

APANPIRG List of Deficiencies Consideration

2.36 Based on the criteria for State Responsibility to comply with the Height-Keeping Monitoring Requirement described in Annex 6 Part I Section 7.2.9 (12th Ed.) and Annex 6 Part II Section 2.5.2.10 (11th Ed.) for non-compliance with Long Term Height Monitoring (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: Recommendations on APANPIRG Deficiency Status based on remaining monitoring burden of LTHM requirement, as of 31 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

State	2023	2024	RASMAG recommendation
Philippines (MAAR)	40%	22%	Remove

2.37 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.

2.38 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

2.39 RASMAG/30 reviewed the APANPIRG ATM and Airspace Safety Deficiency List and agreed to make the following recommendation to APANPIRG/36. 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.

2.40 Since RASMAG/30 in July 2025, India's RVSM approval status and annual snapshot have already been confirmed to MAAR. Nepal's traffic sample data (TSD) has been submitted, and the files have been adjusted to the correct format. Malaysia's remaining monitoring burden has decreased from 31% at RASMAG/30 to 28% as of 10 October 2025 and Democratic People's Republic of Korea monitoring burden has decreased from 100% to zero after monitoring was conducted by China RMA. Therefore, these four States would not be recommended for new deficiencies.

2.41 The following are RASMAG proposed retention of existing, deletion and addition of new, APANPIRG ATM and Airspace Safety Deficiencies:

- 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 46%, 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:

- i) Nil.

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.

— — — — —

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

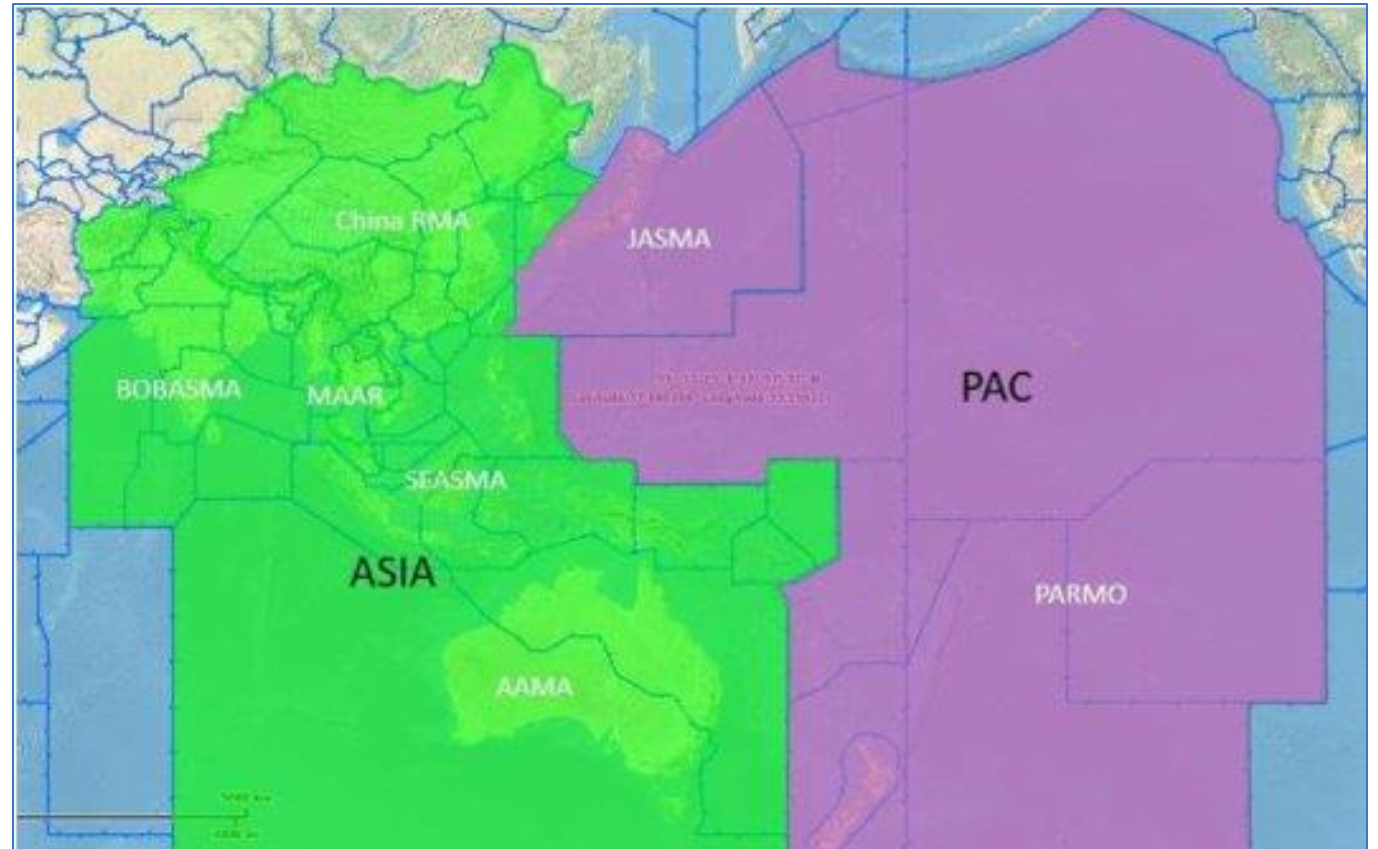
Conclusion

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.

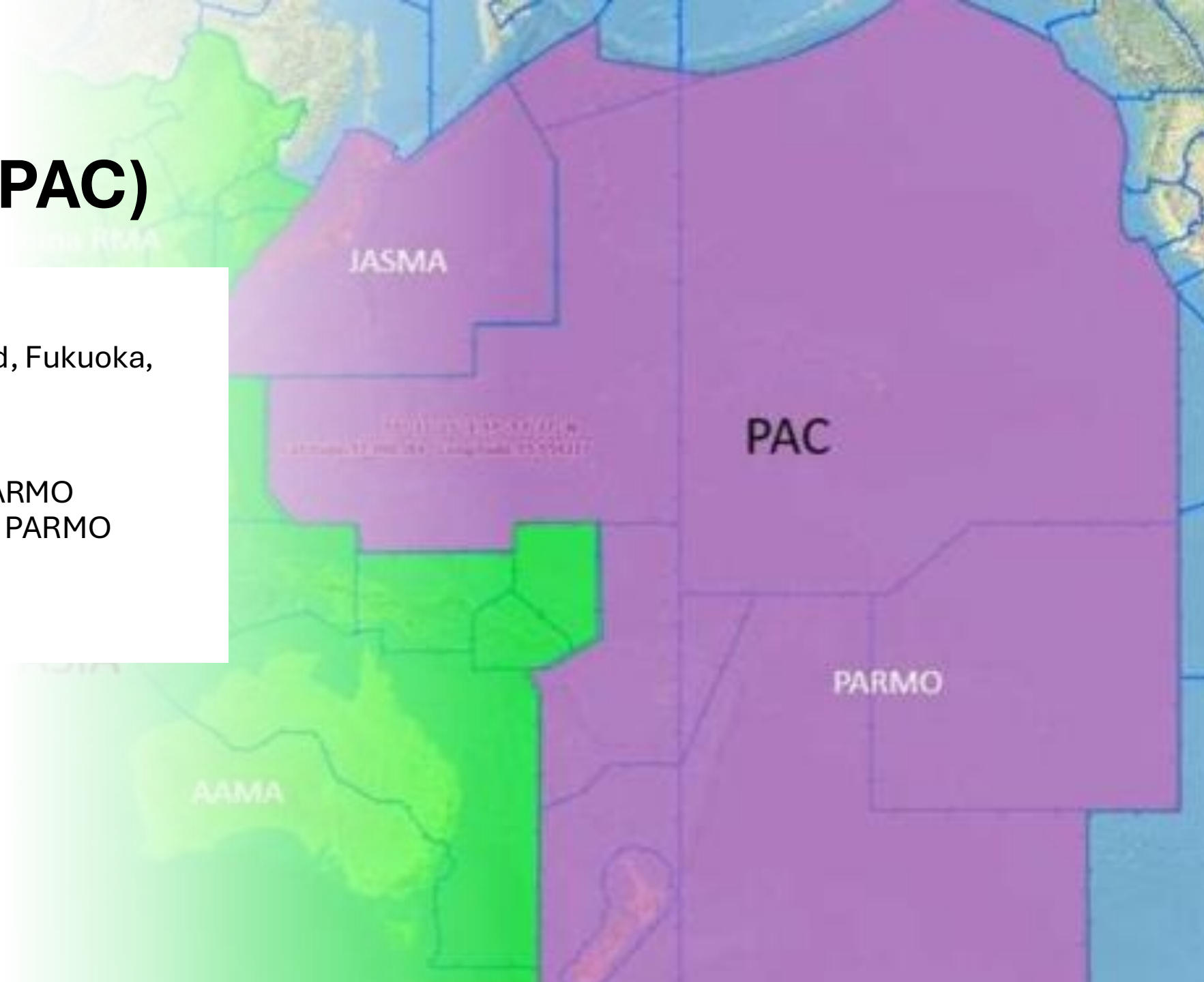
The report is divided into:

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

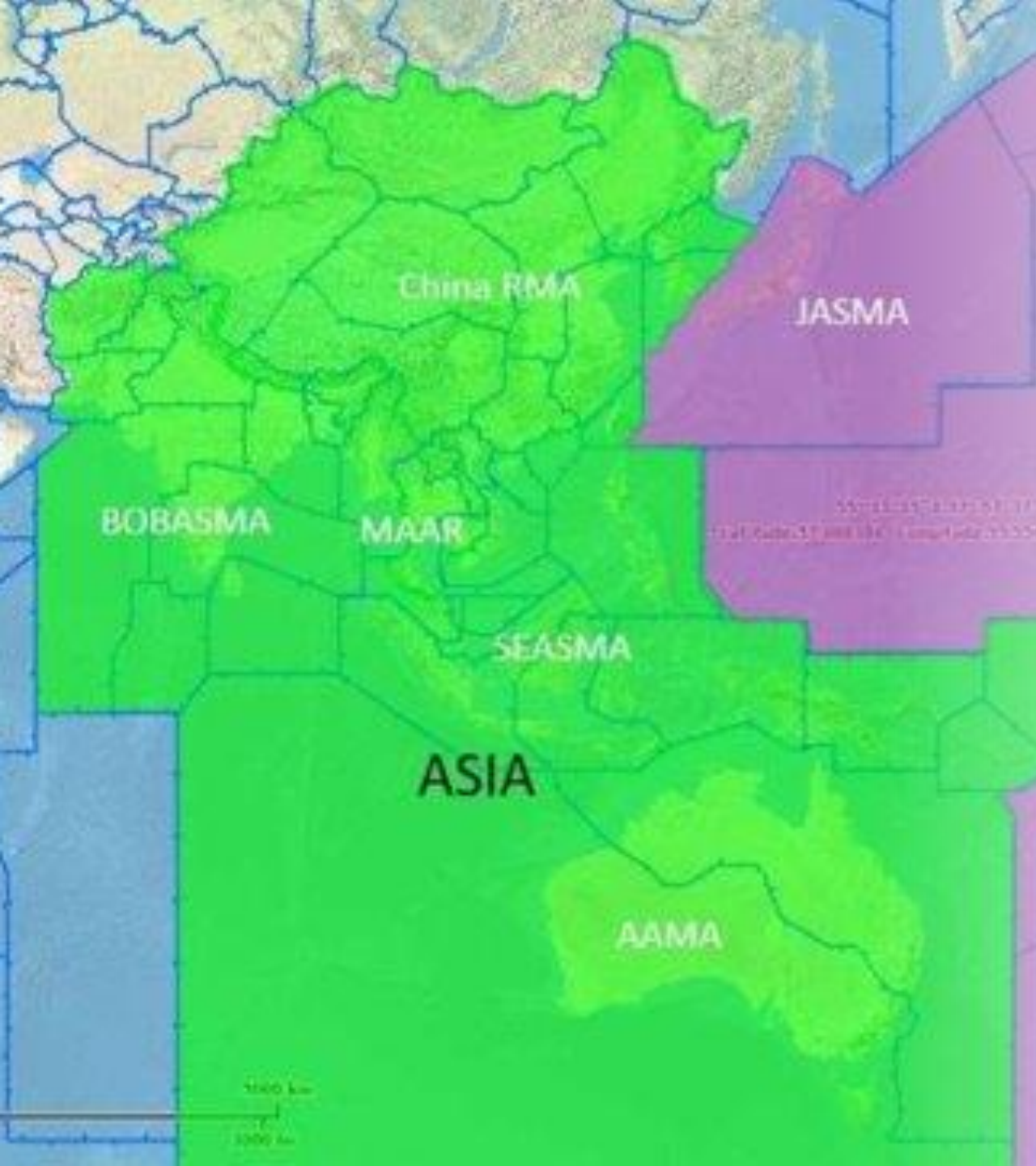


Pacific Area (PAC)

- **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, Taipei, Ujung Pandang, Ulaanbaatar, Urumqi, Vientiane, Wuhan, and Yangon
- **Monitoring Agencies** :
RMAs (Vertical): AAMA, China RMA, MAAR, PARMO
EMAs (Horizontal): BOBASMA, SEASMA



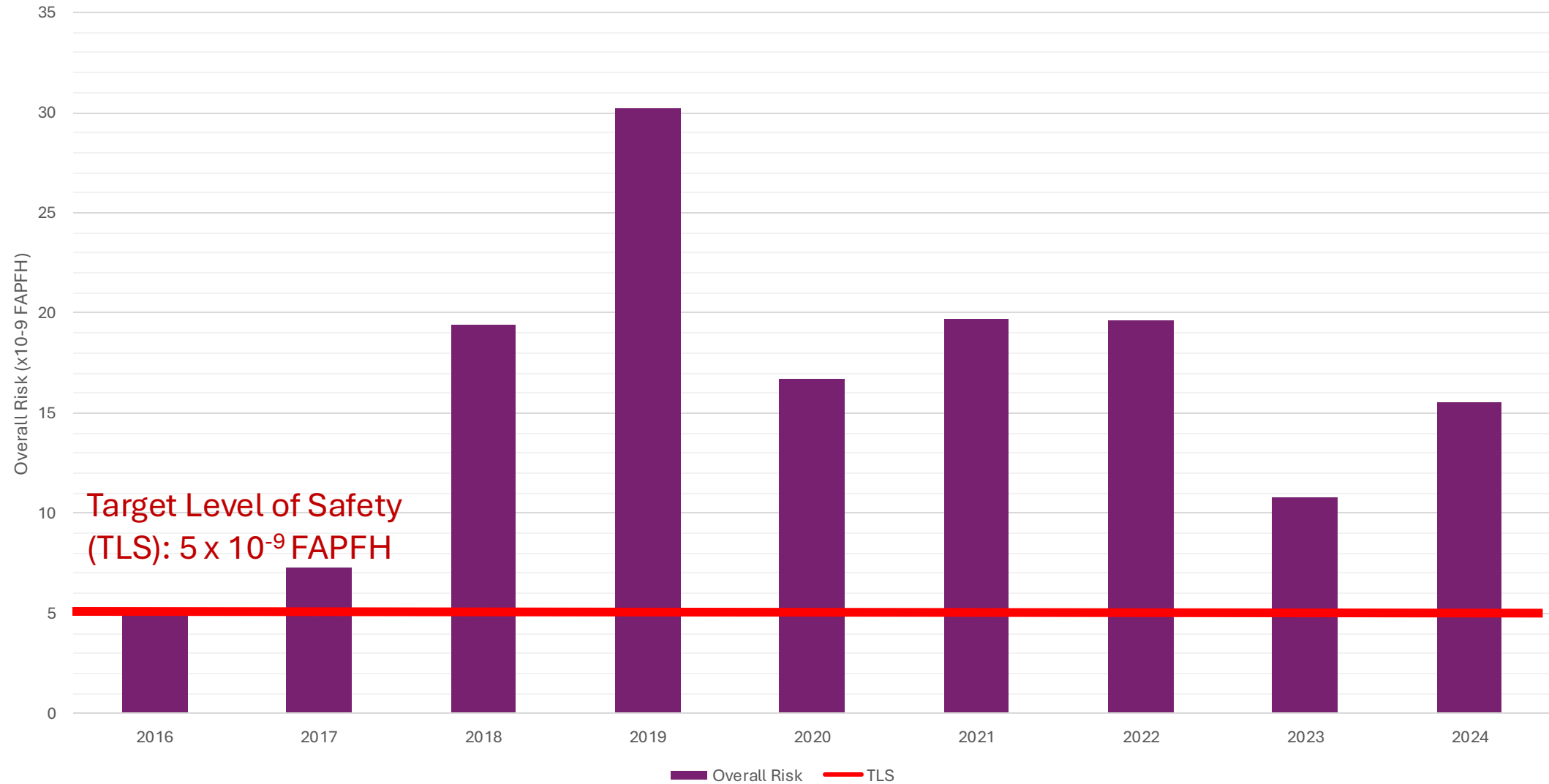
PAC : Vertical Collision Risk

PAC: Vertical Collision Risk Estimates

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

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

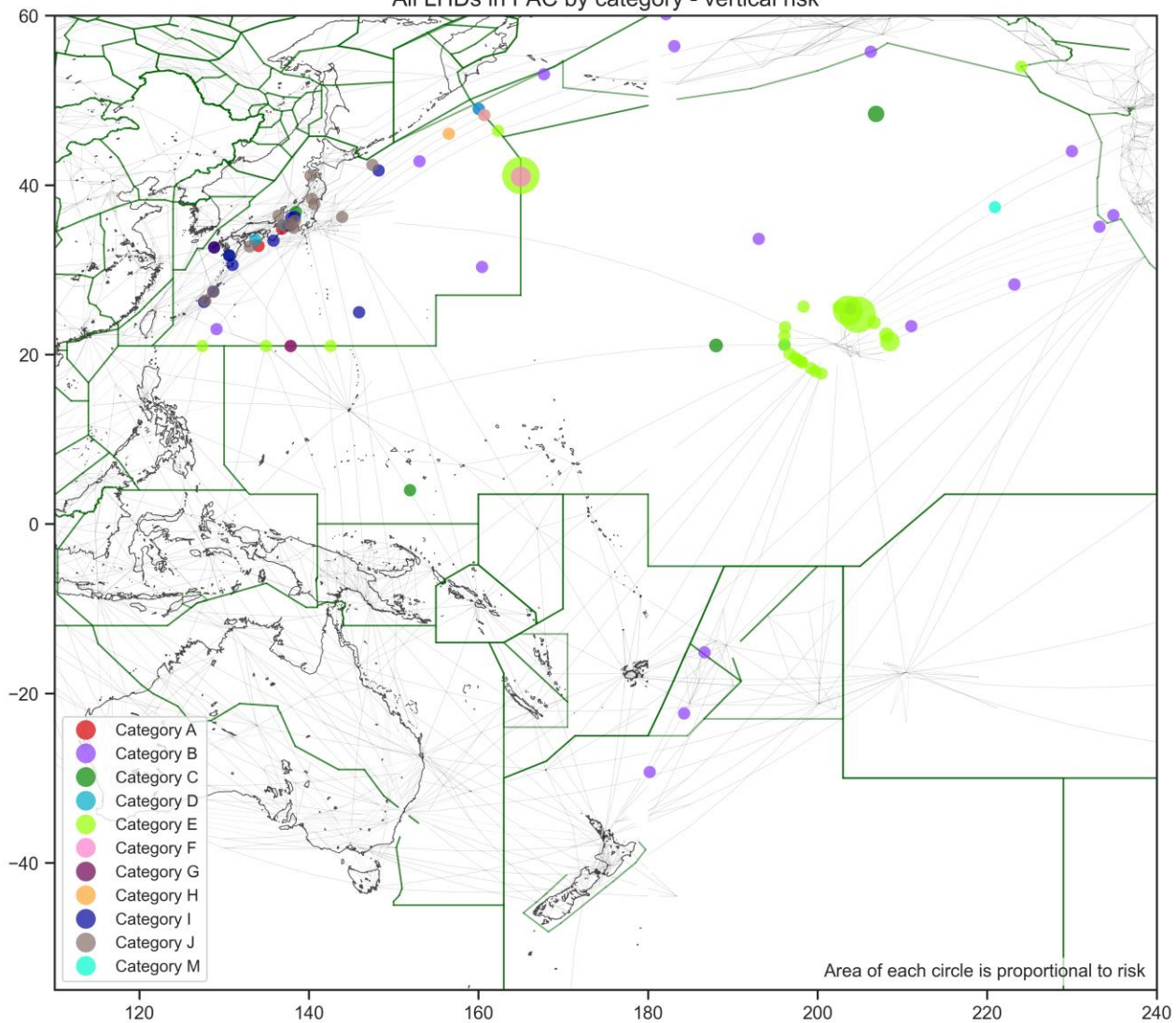
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	0	0	0
Weather/ Turbulence	H	Turbulence or other weather-related causes leading to a deviation in the horizontal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



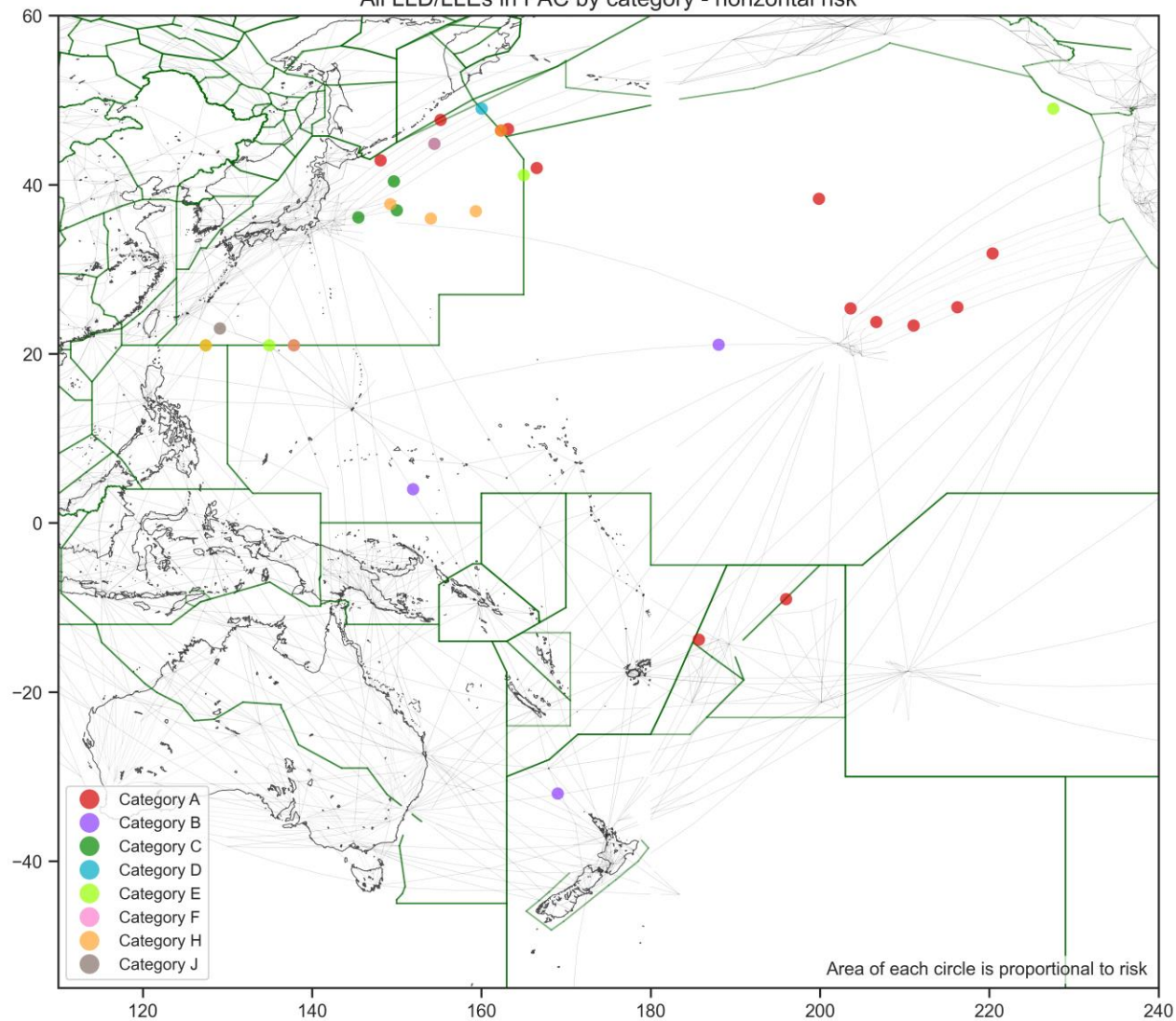
PAC : Geolocation of LHDs/LLDs/LLEs

PAC: All Categories

All LHDs in PAC by category - vertical risk

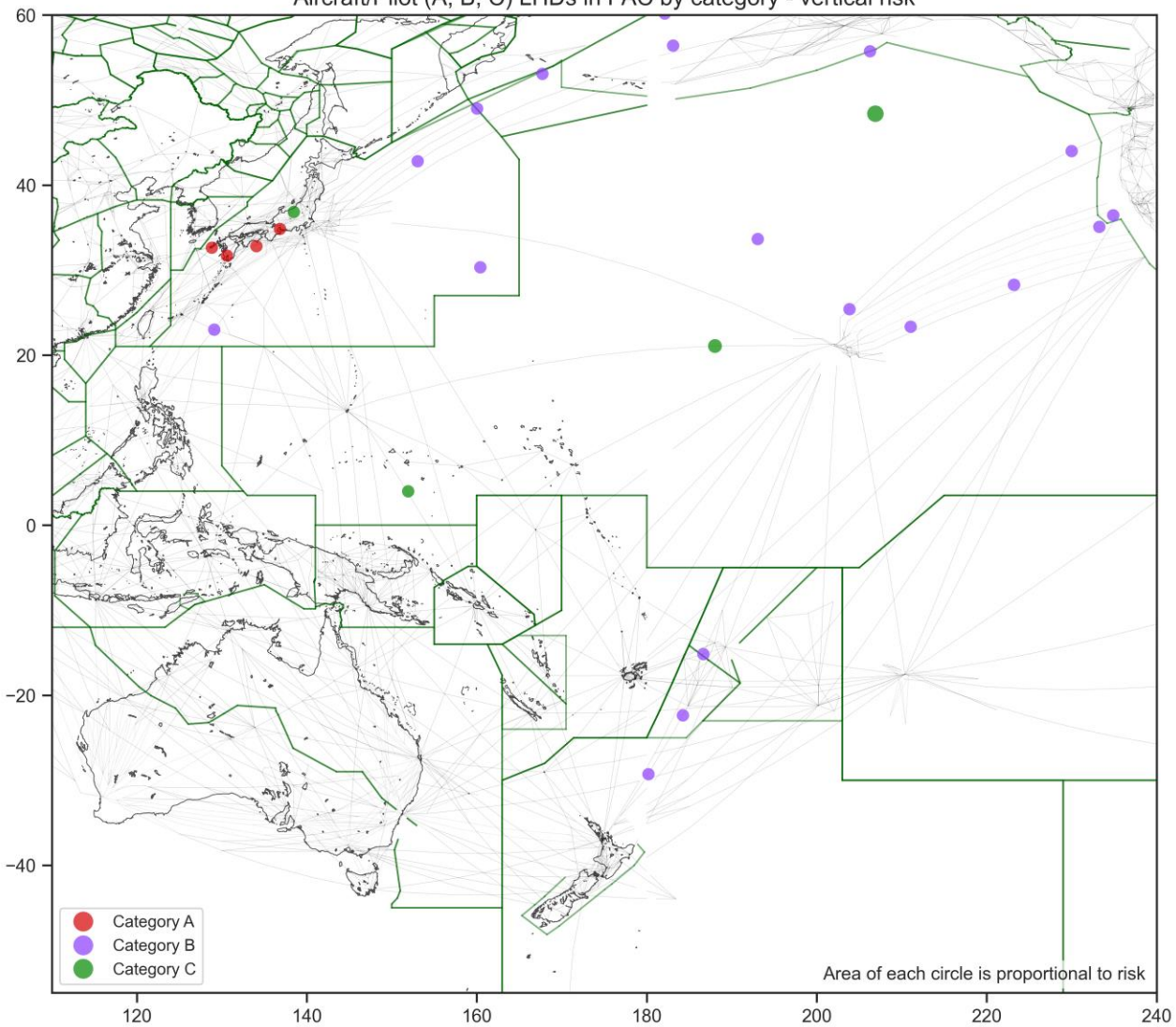


All LLD/LLEs in PAC by category - horizontal risk

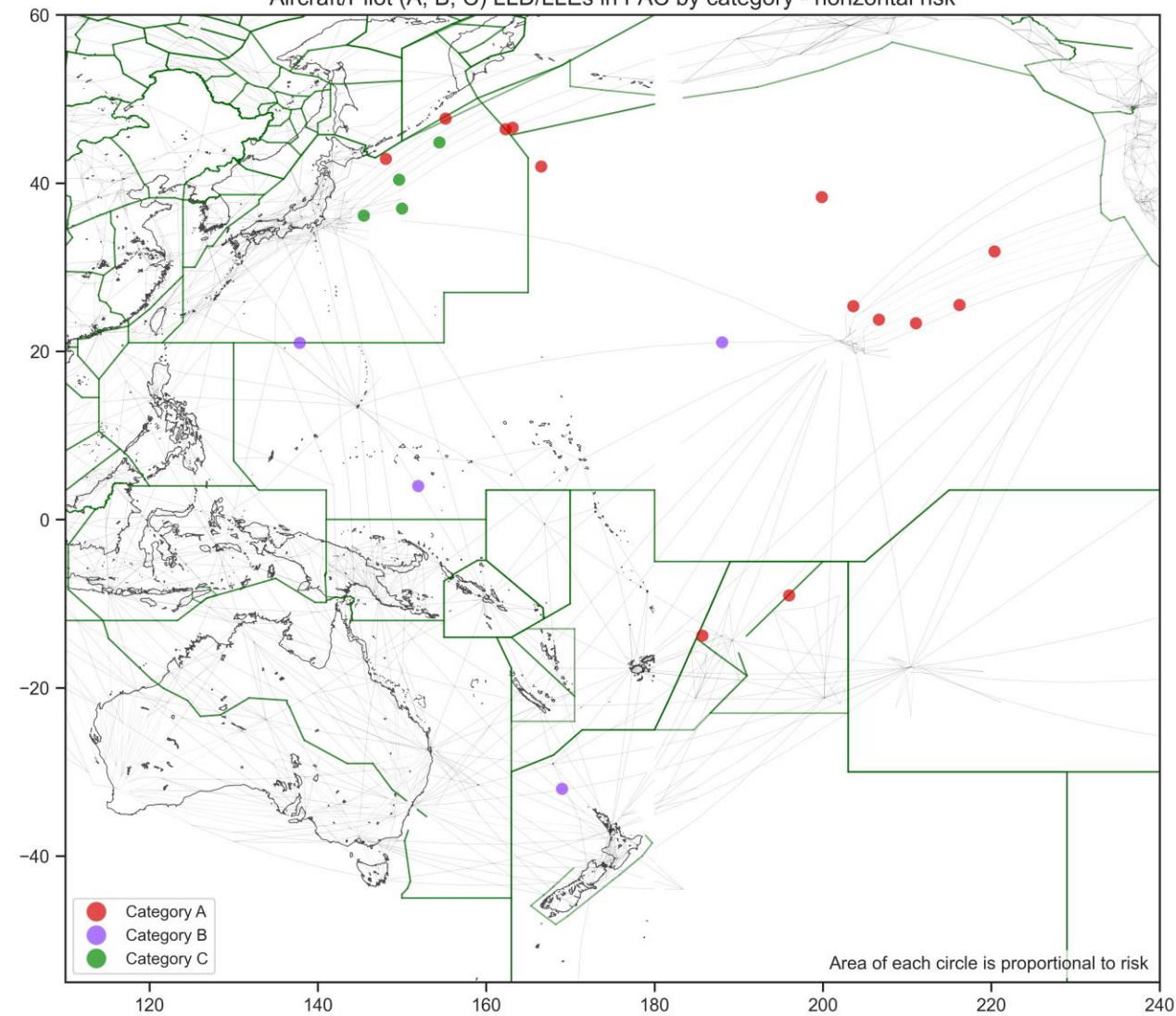


PAC: Aircrew/Pilot (A, B, C)

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

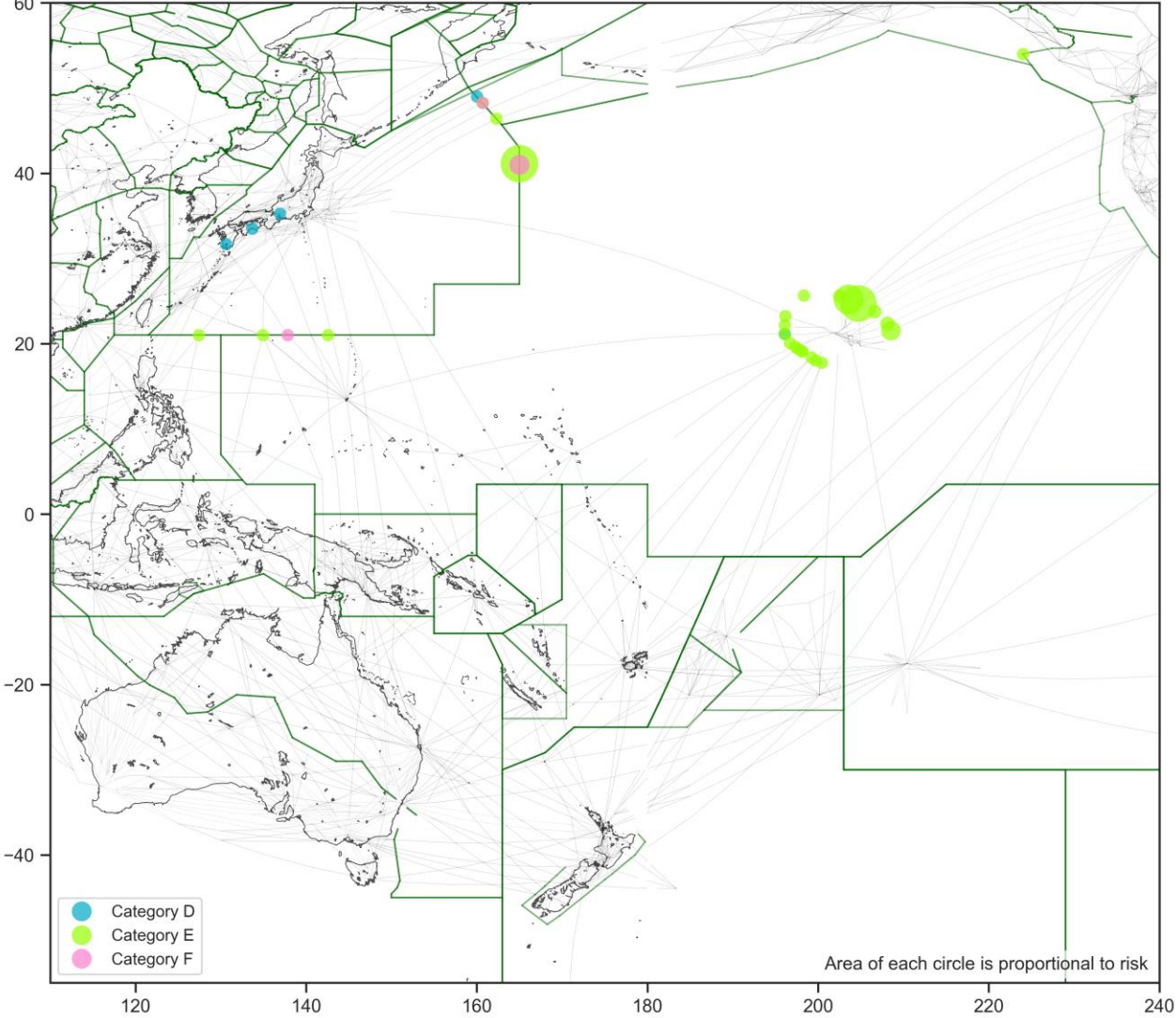


Aircraft/Pilot (A, B, C) LLD/LLEs in PAC by category - horizontal risk

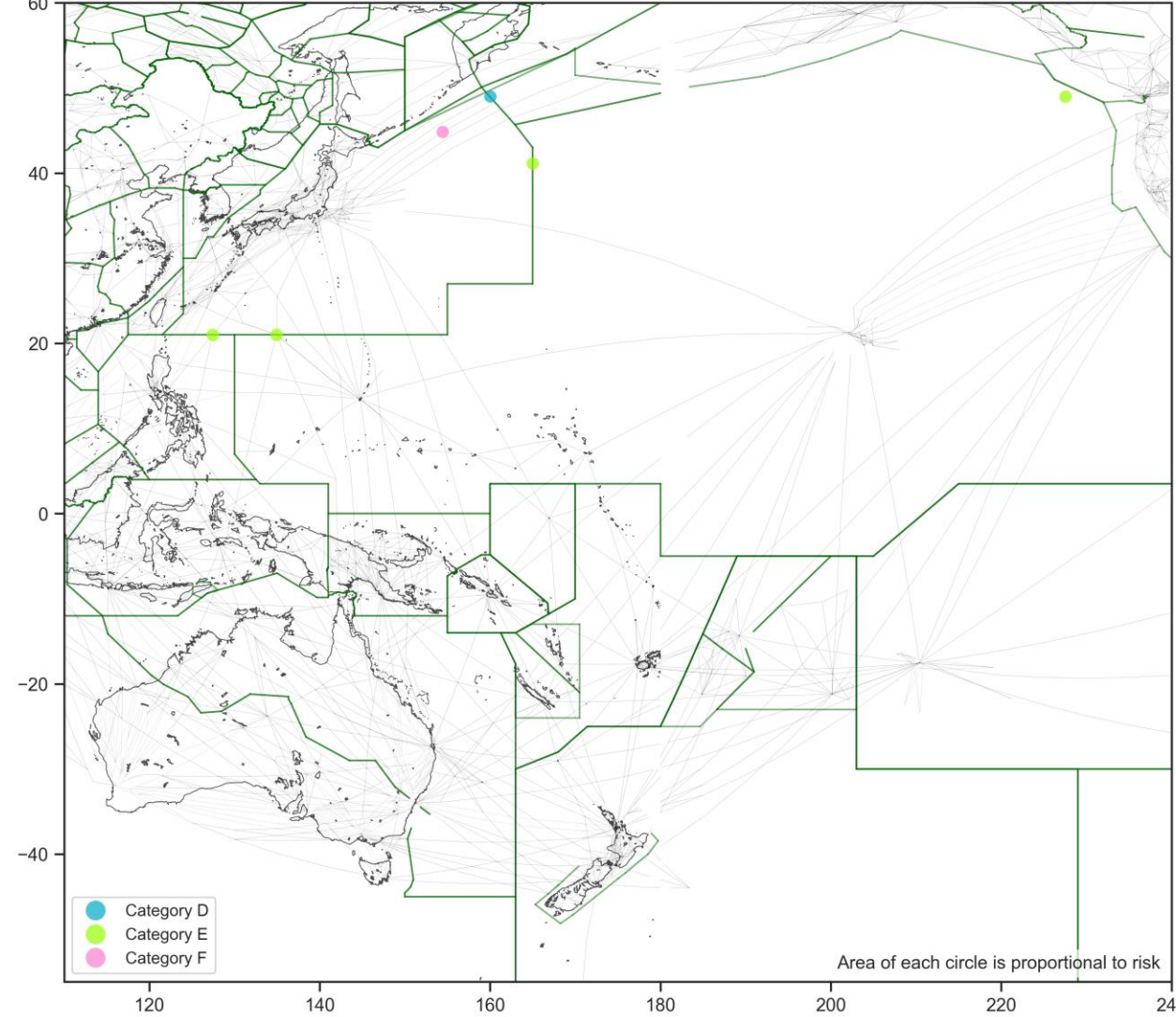


PAC: ATC (D, E, F)

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

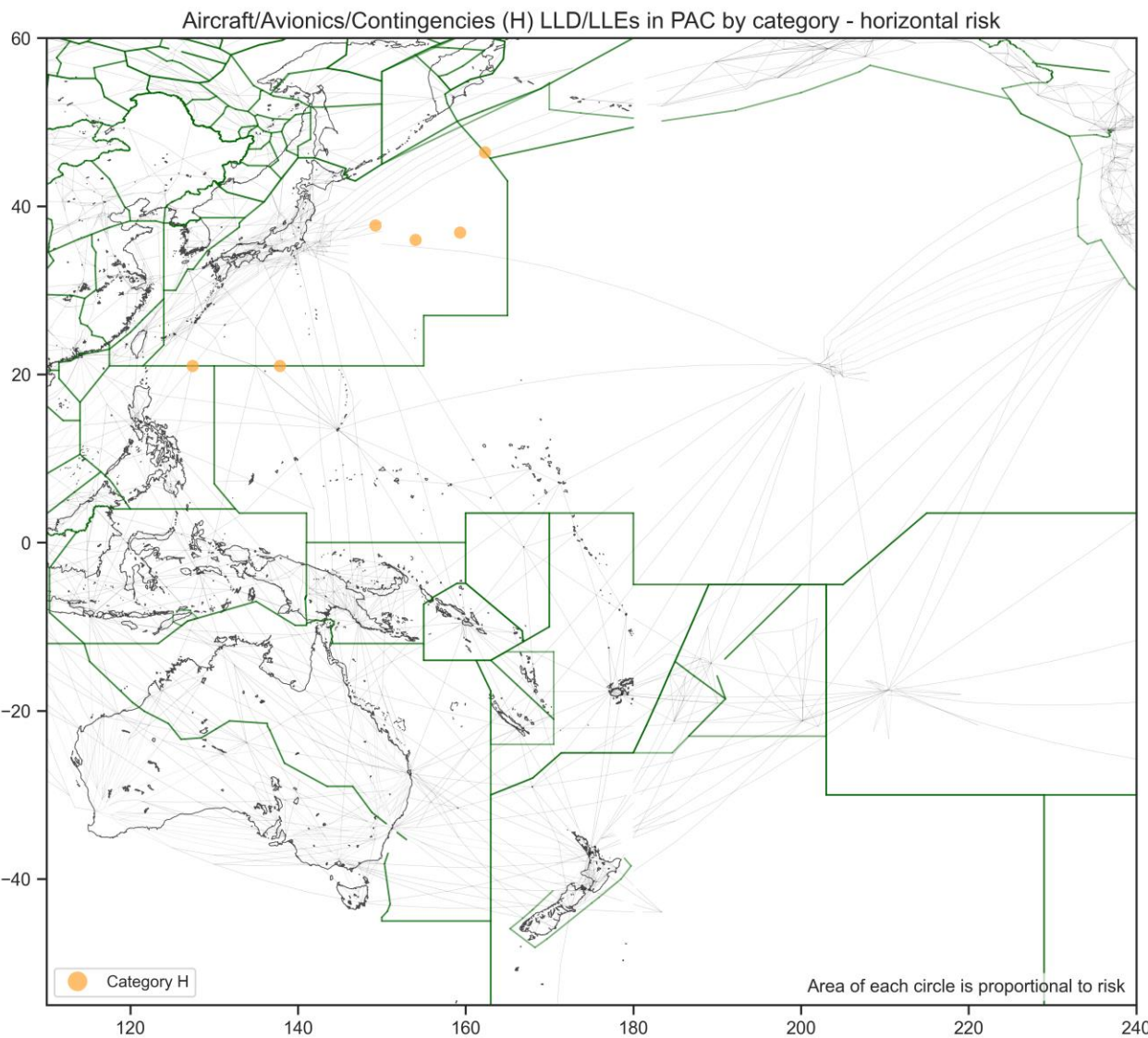
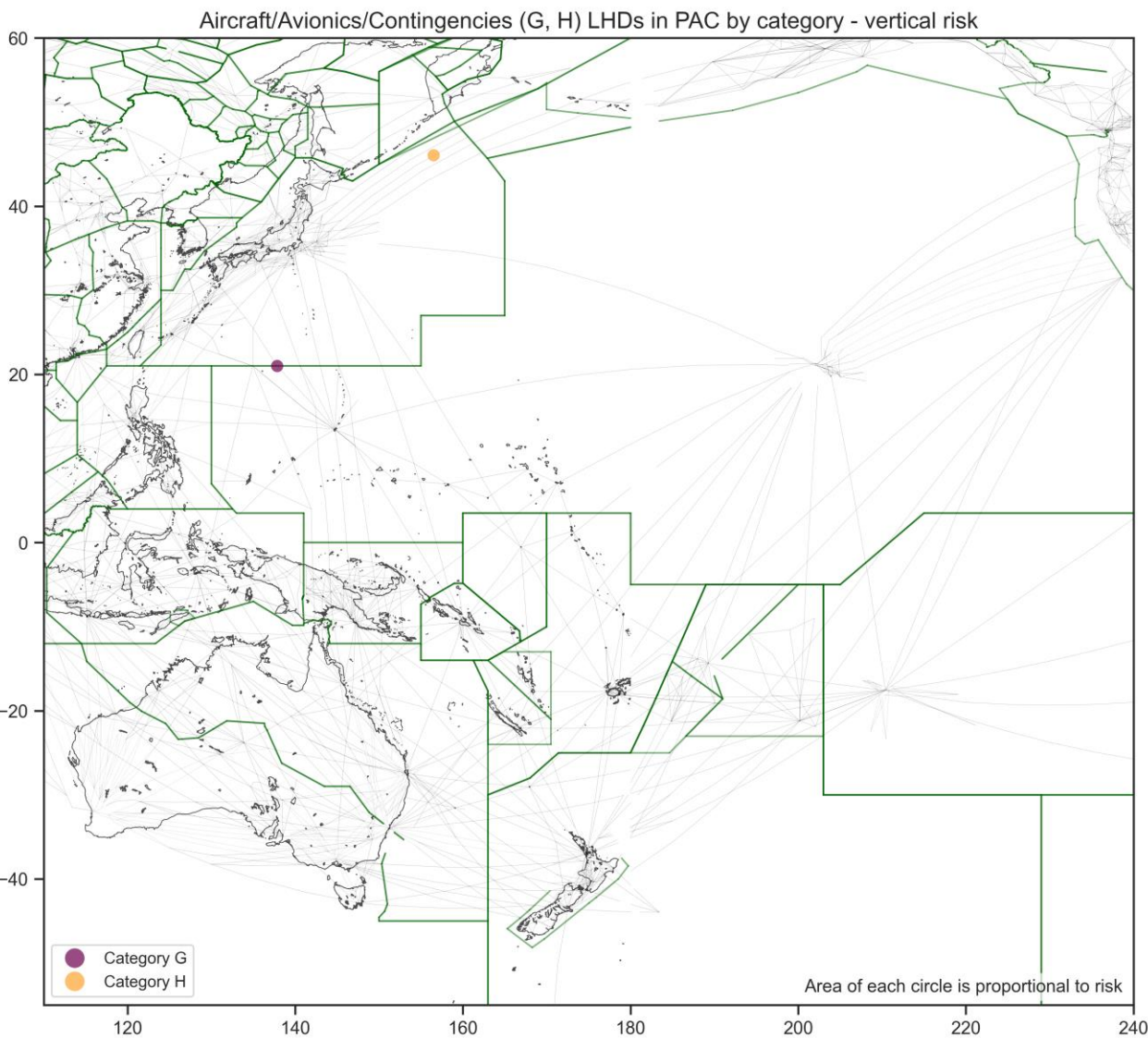


ATC (D, E, F) LLD/LLEs in PAC by category - horizontal risk



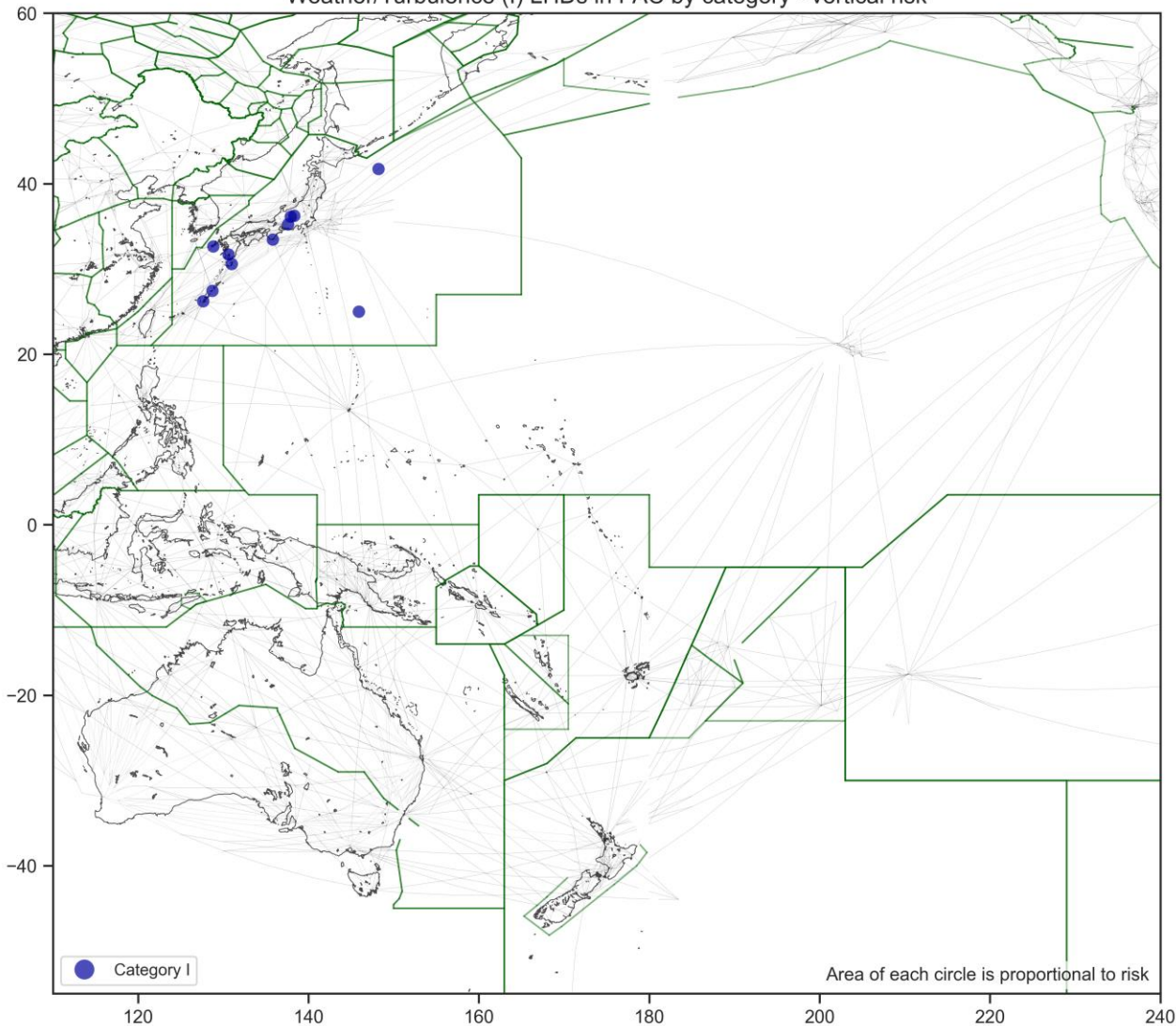
PAC: Aircraft Avionics/Contingencies

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

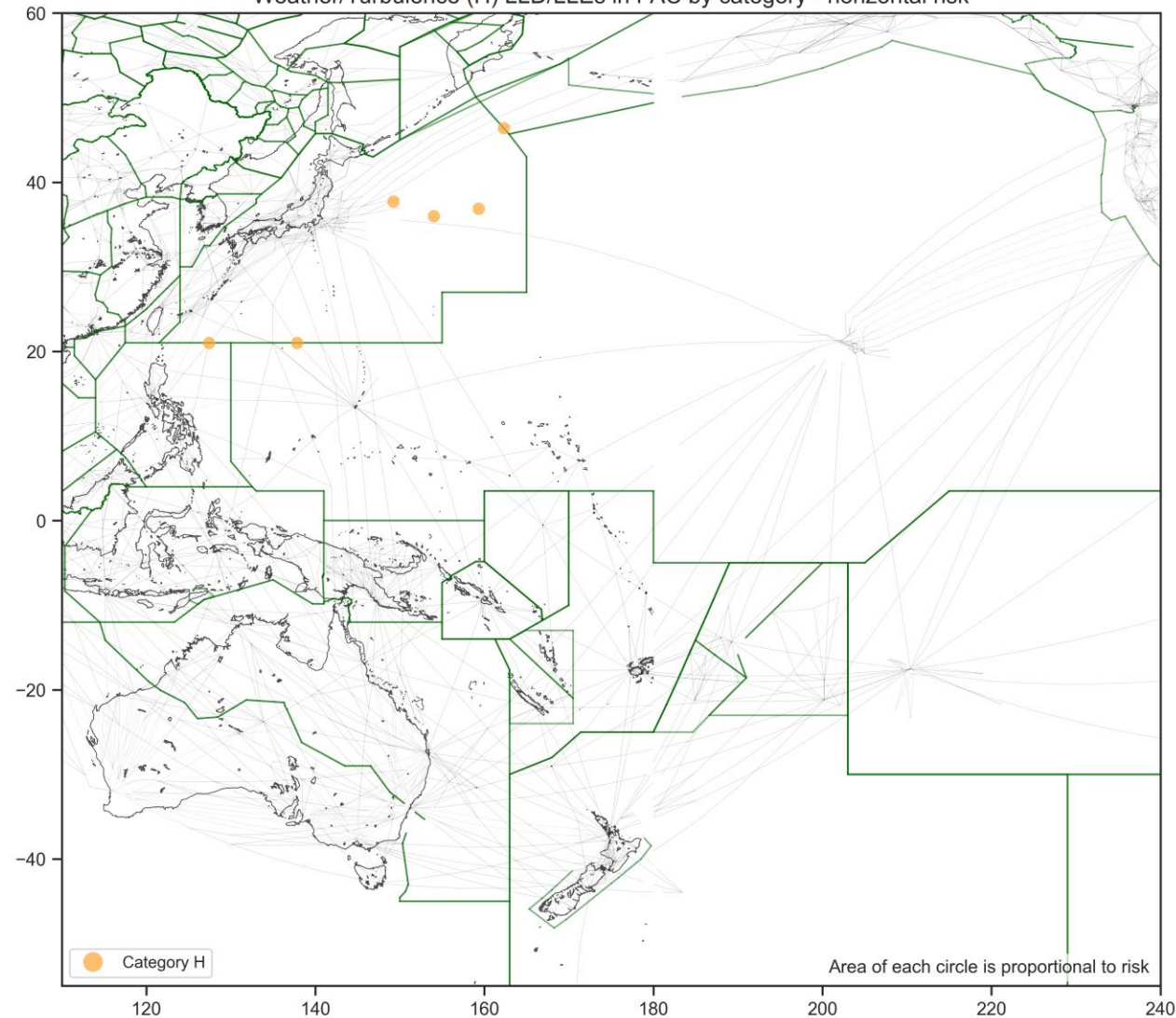


PAC: Weather/Turbulence (LHD:I, LLD/LLE:H)

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

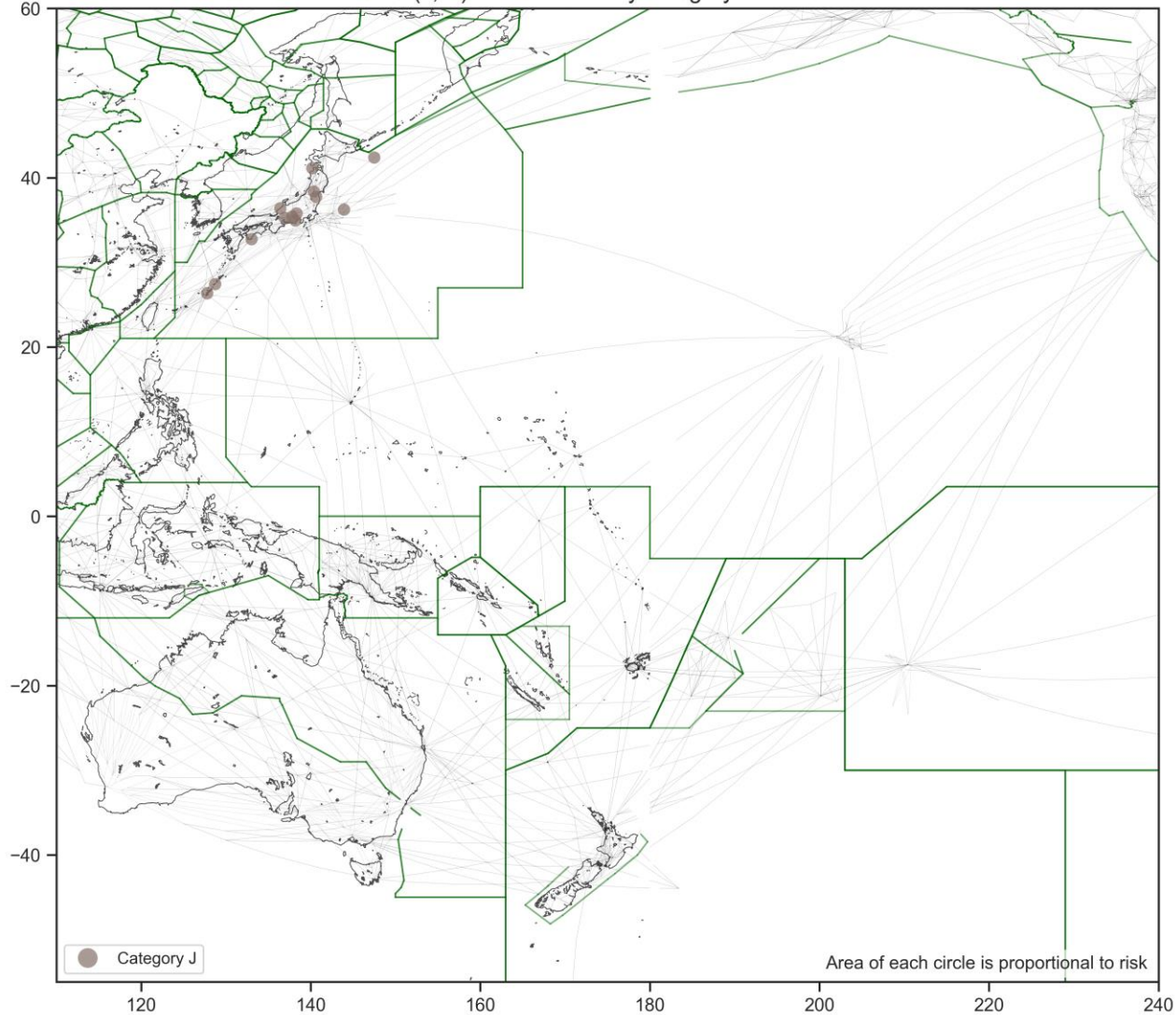


Weather/Turbulence (H) LLD/LLEs in PAC by category - horizontal risk

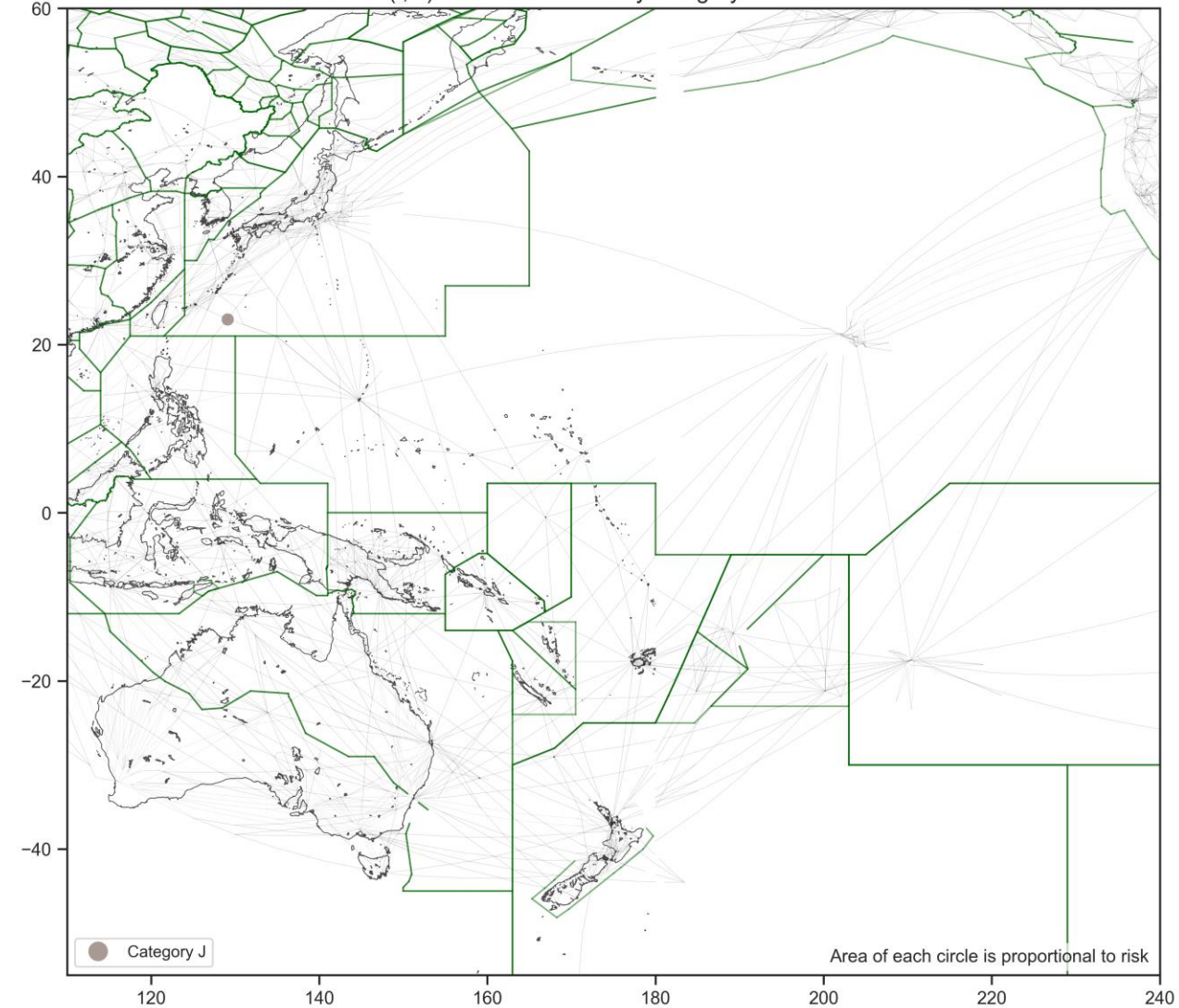


PAC: TCAS (LHD:J, K, LLD/LLE:I,J)

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 factors issues (Category E)

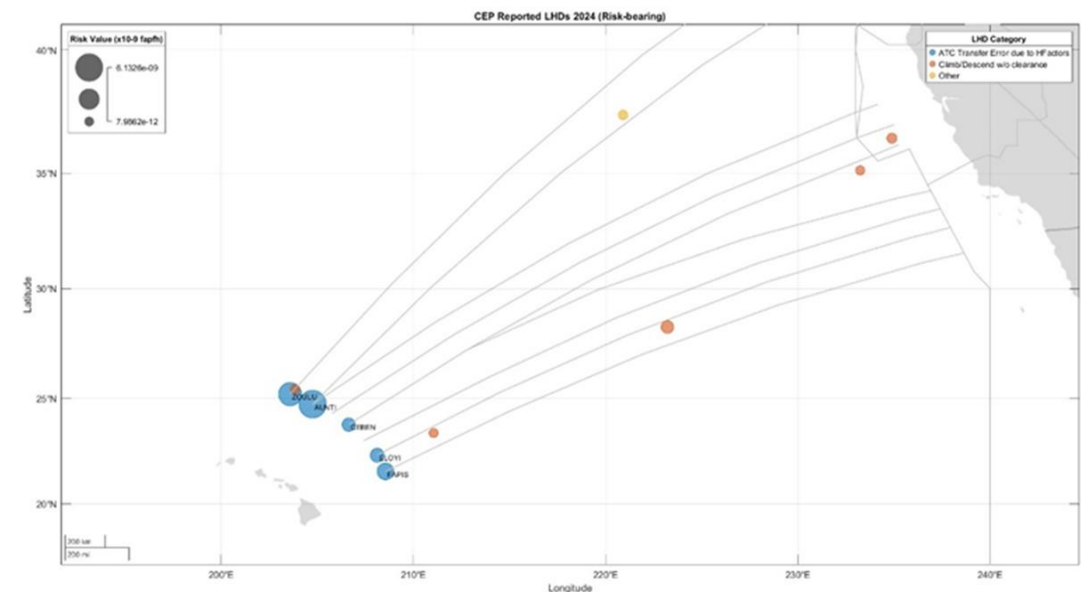
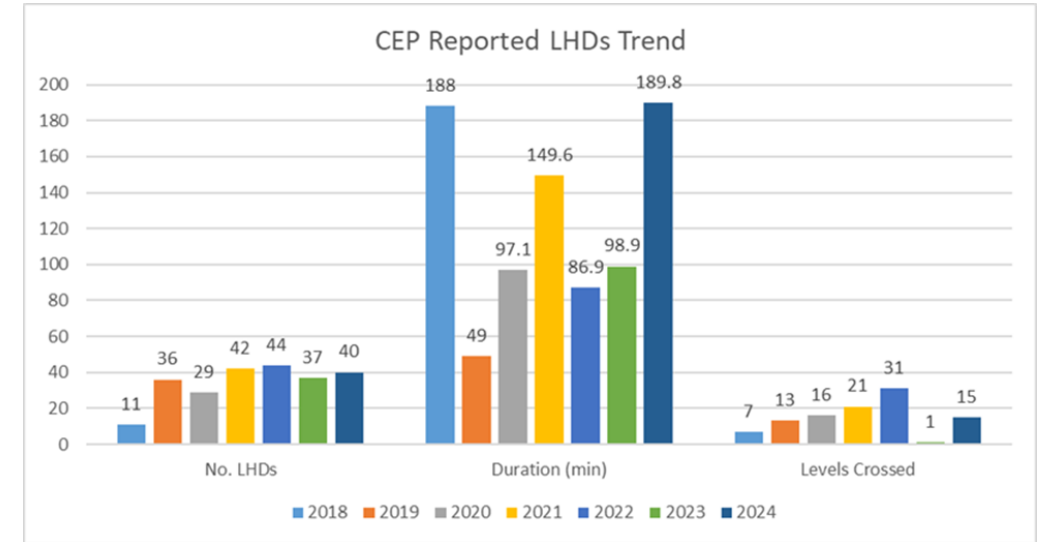
Contributing Factors : High-volume Central East Pacific (CEP) traffic flow and the user-preferred routes that cross the CEP airways.

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	0.70×10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	1.29×10^{-9} FAPFH	
Vertical Overall Risk	1.99×10^{-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

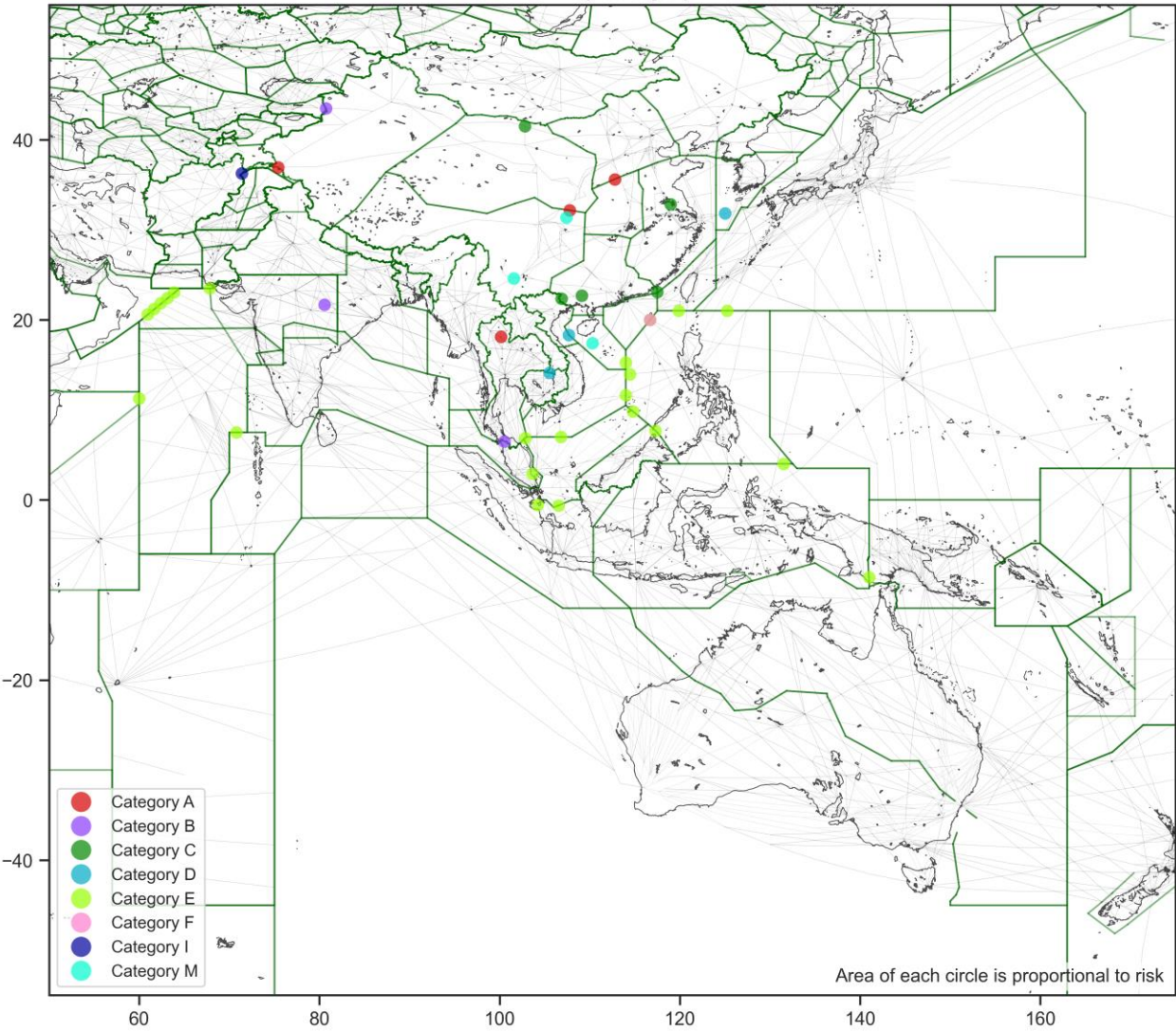
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	0	0	0
Weather/ Turbulence	H	Turbulence or other weather-related causes leading to a deviation in the horizontal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

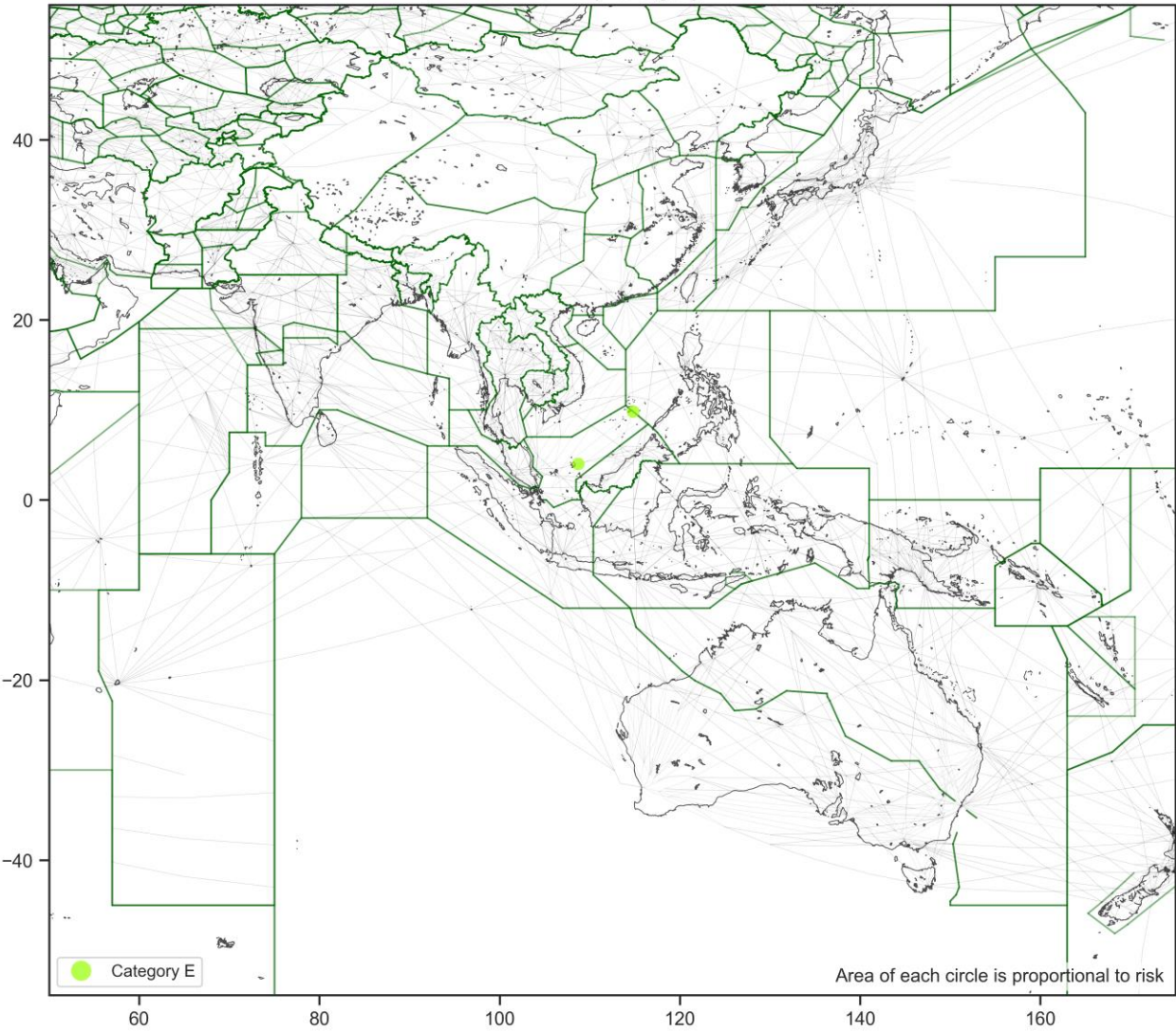


ASIA : All Categories

All LHDs in ASIA by category - vertical risk

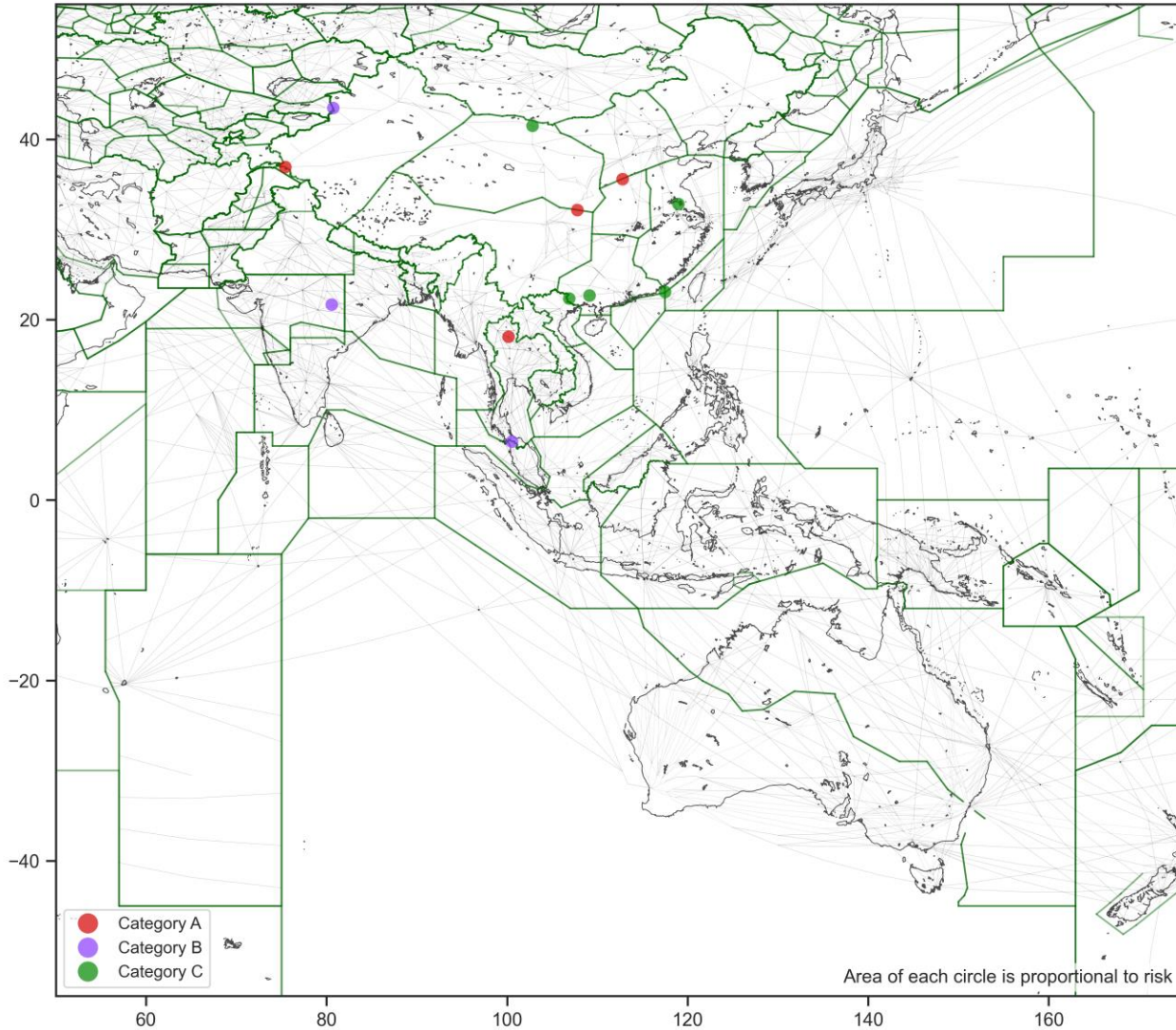


All LLD/LLEs in ASIA by category - horizontal risk

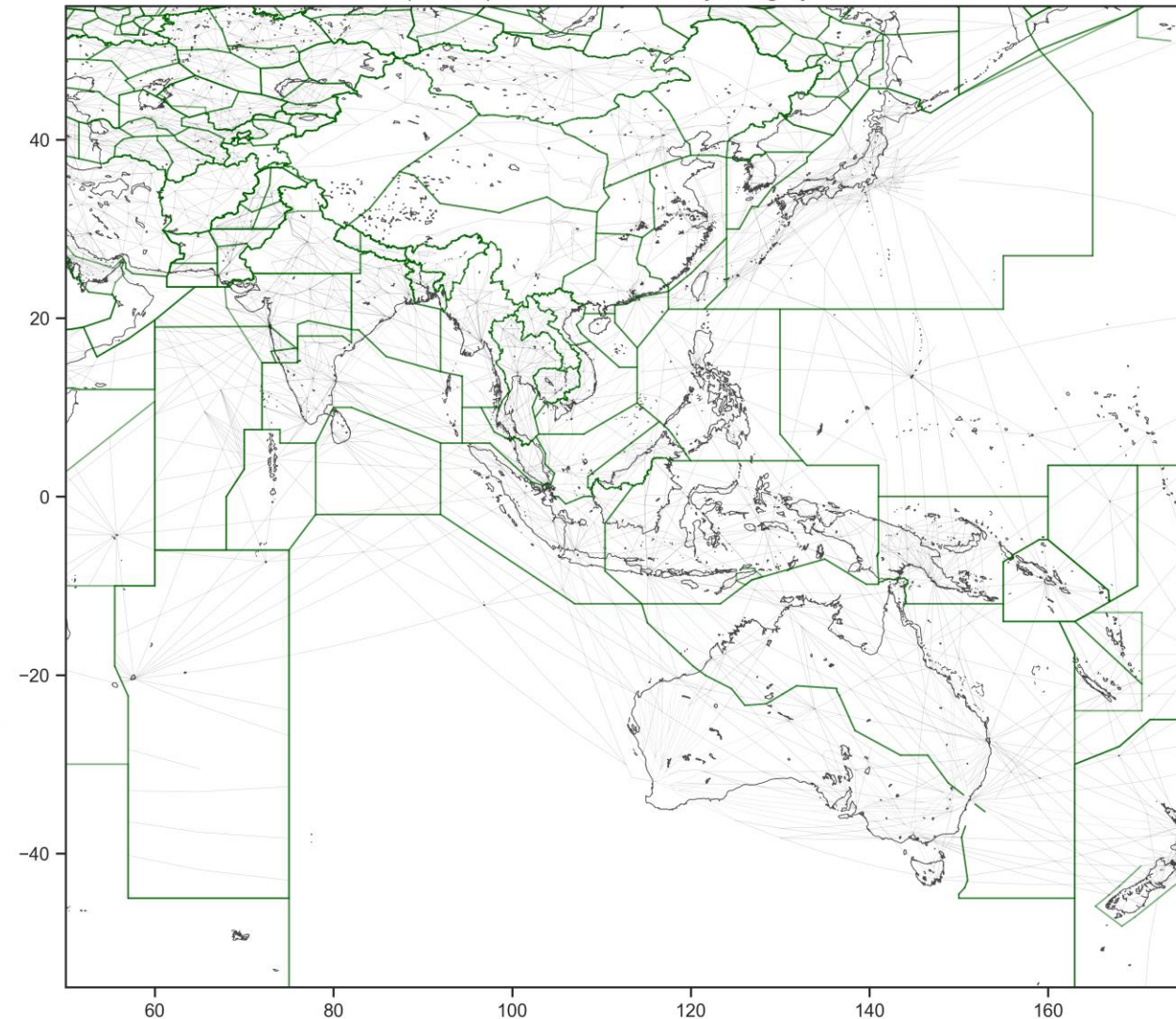


ASIA : Aircrew/Pilot (A, B, C)

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

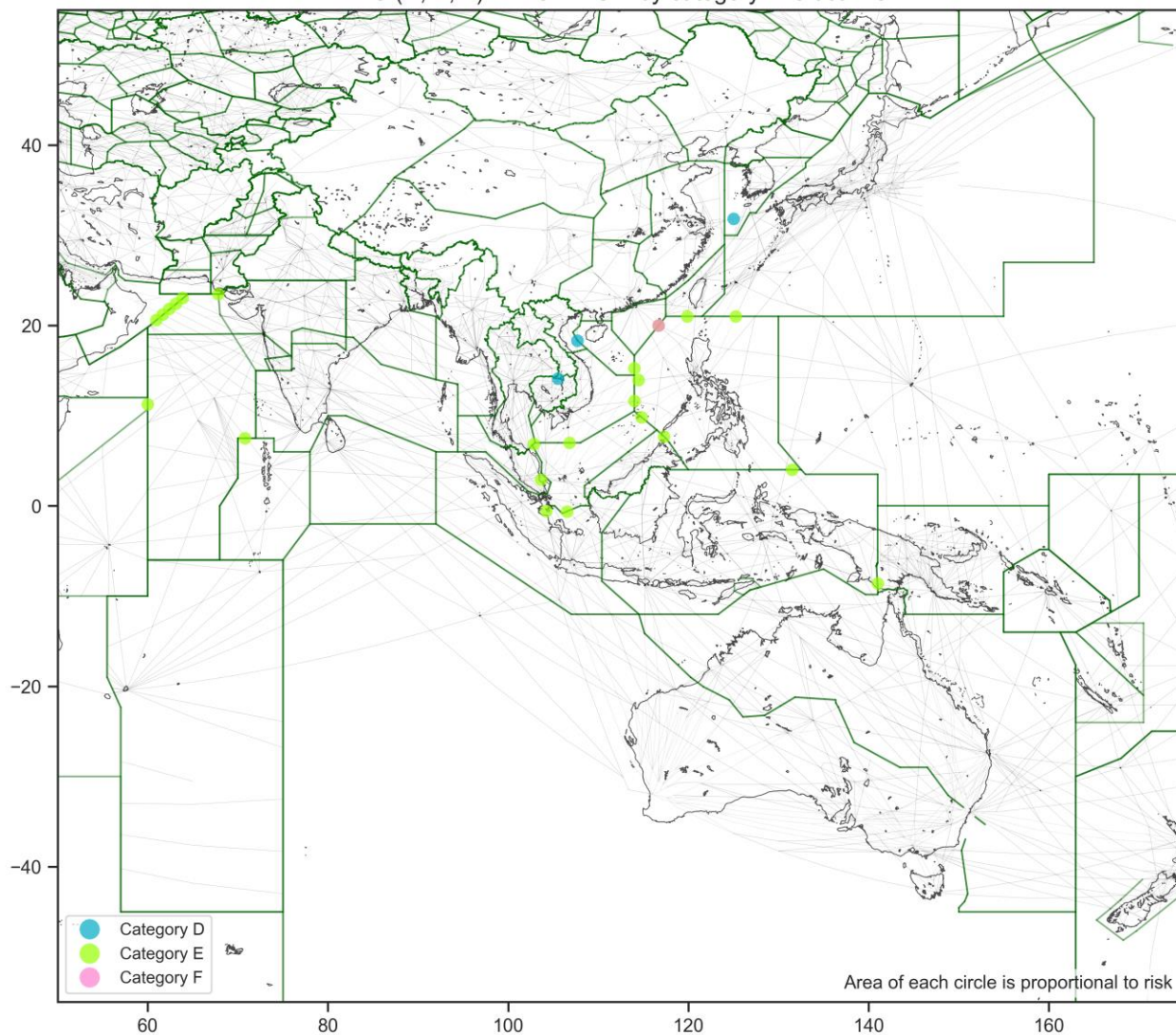


Aircraft/Pilot (A, B, C) LLD/LLEs in ASIA by category - horizontal risk

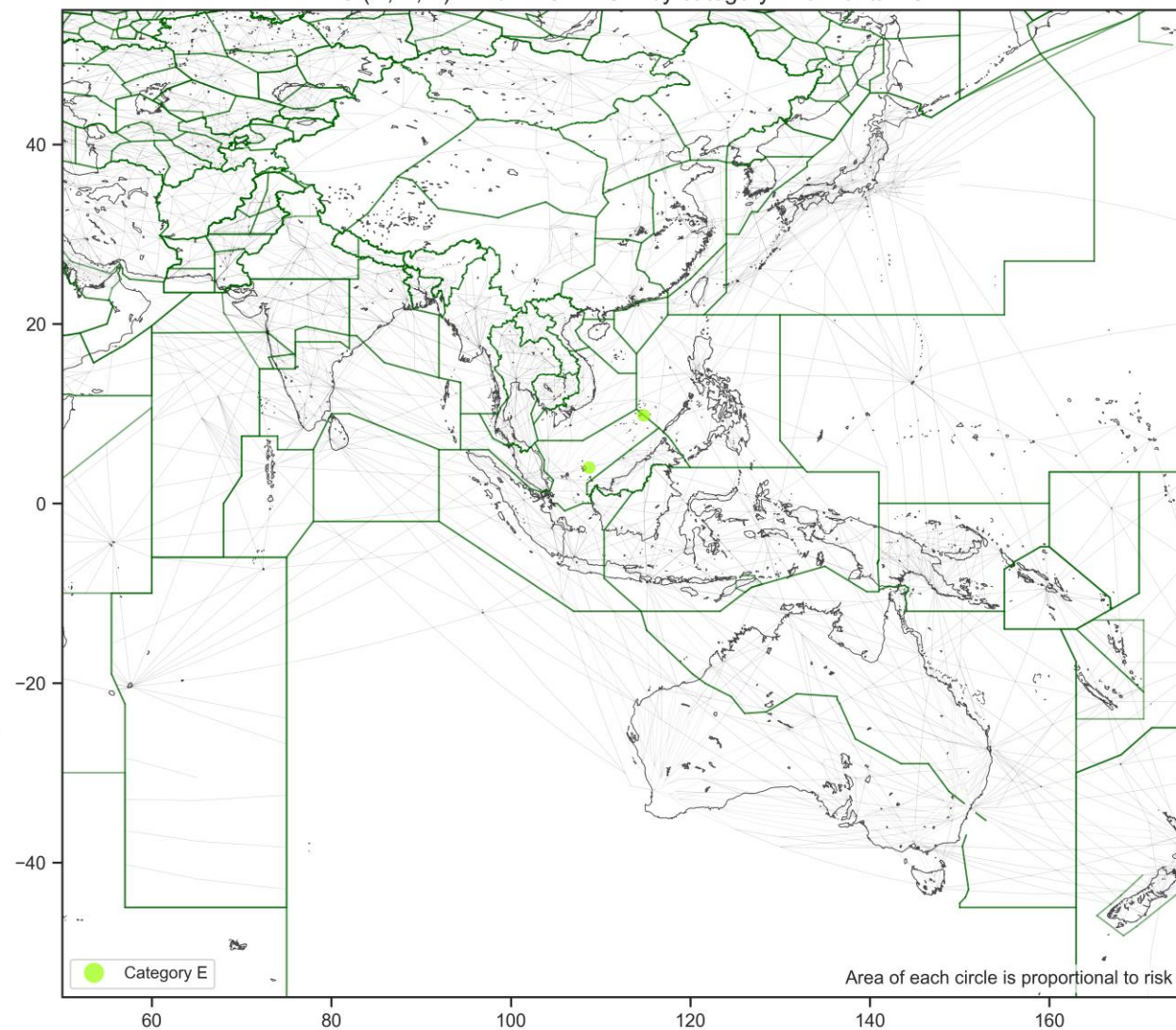


ASIA : ATC (D, E, F)

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



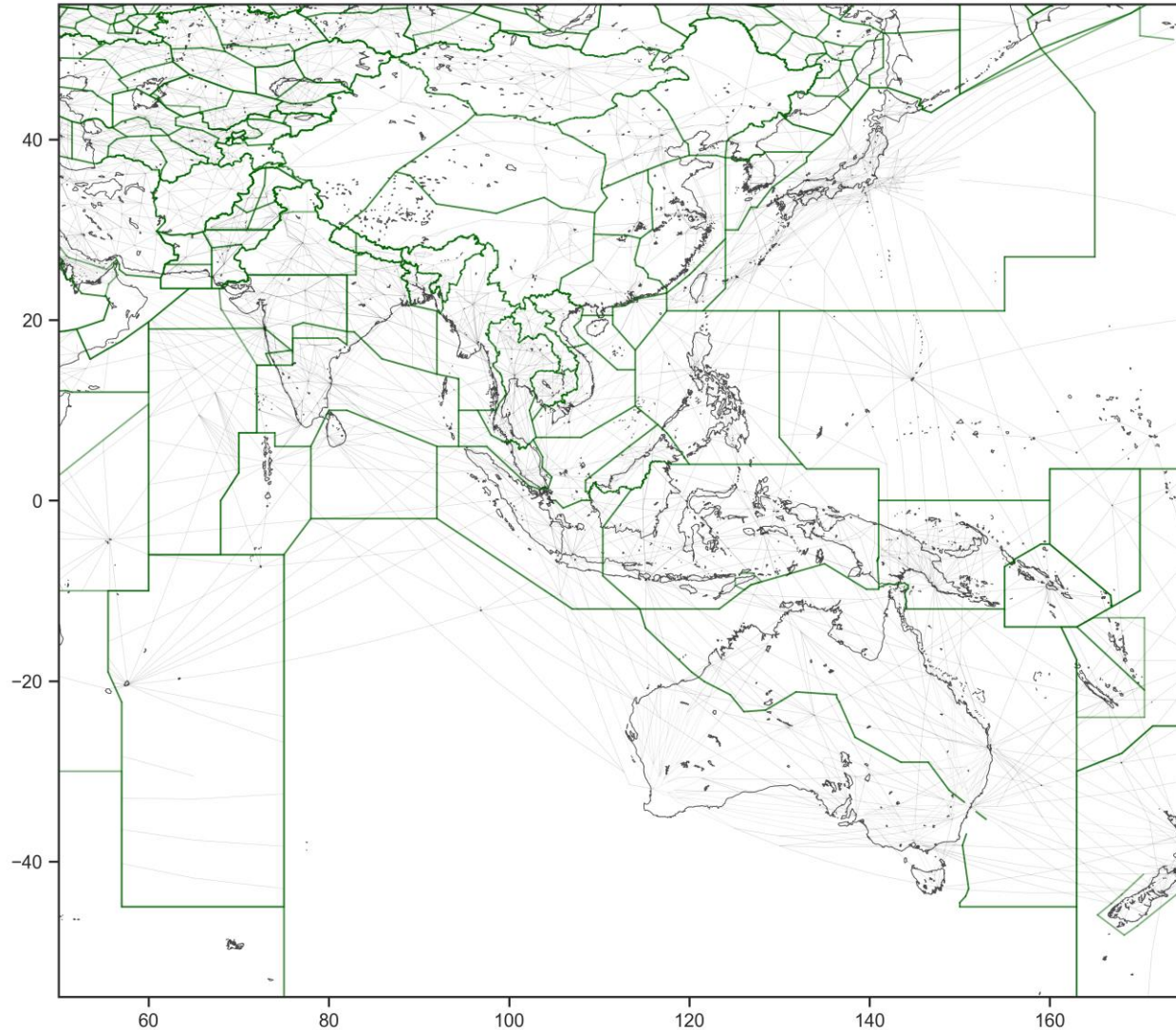
ATC (D, E, F) LLD/LLEs in ASIA by category - horizontal risk



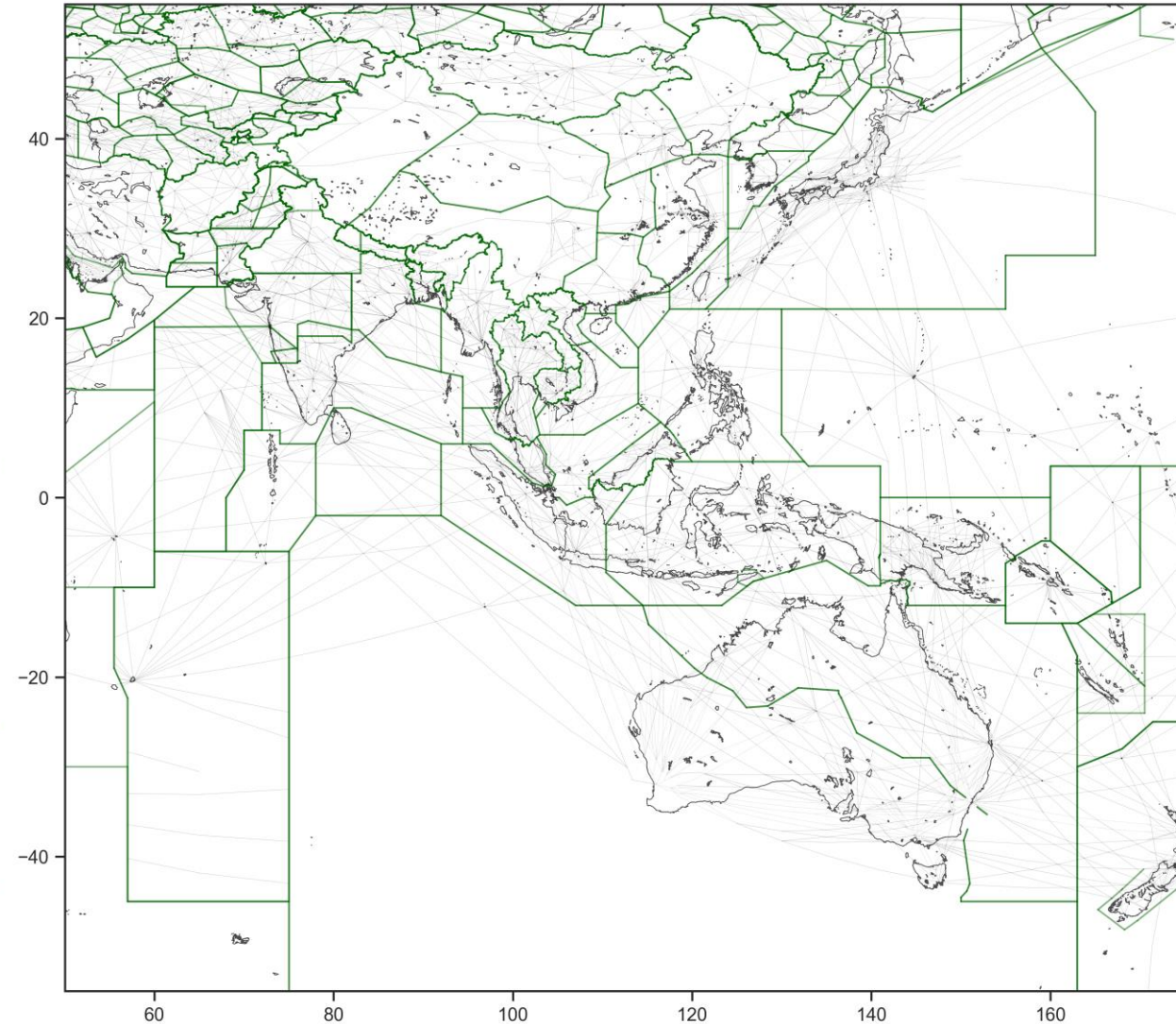
ASIA : Aircraft Avionics/Contingencies

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

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

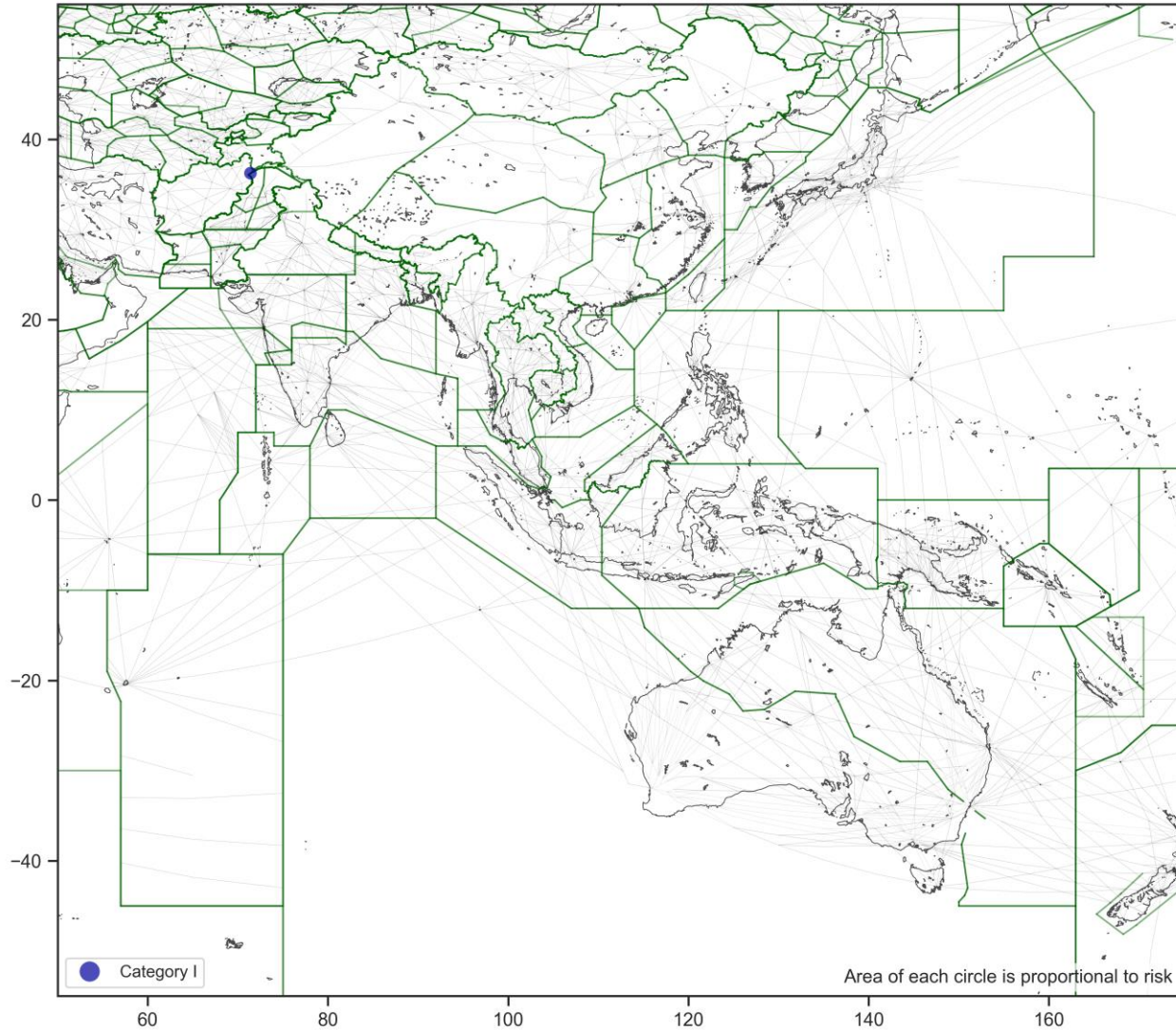


Aircraft/Avionics/Contingencies (H) LLD/LLEs in ASIA by category - horizontal risk

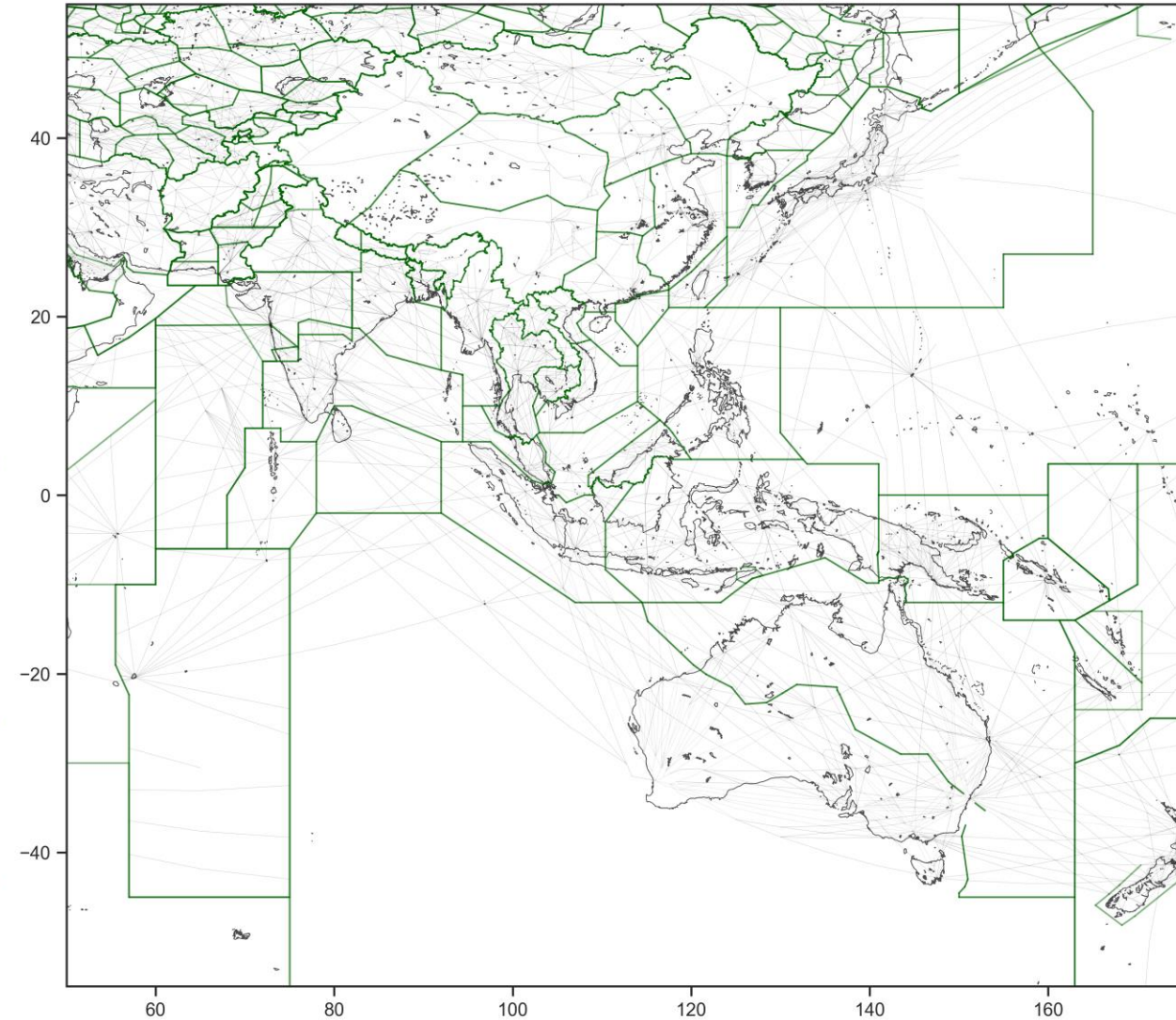


ASIA : Weather/Turbulence (LHD:I, LLD/LLE:H)

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

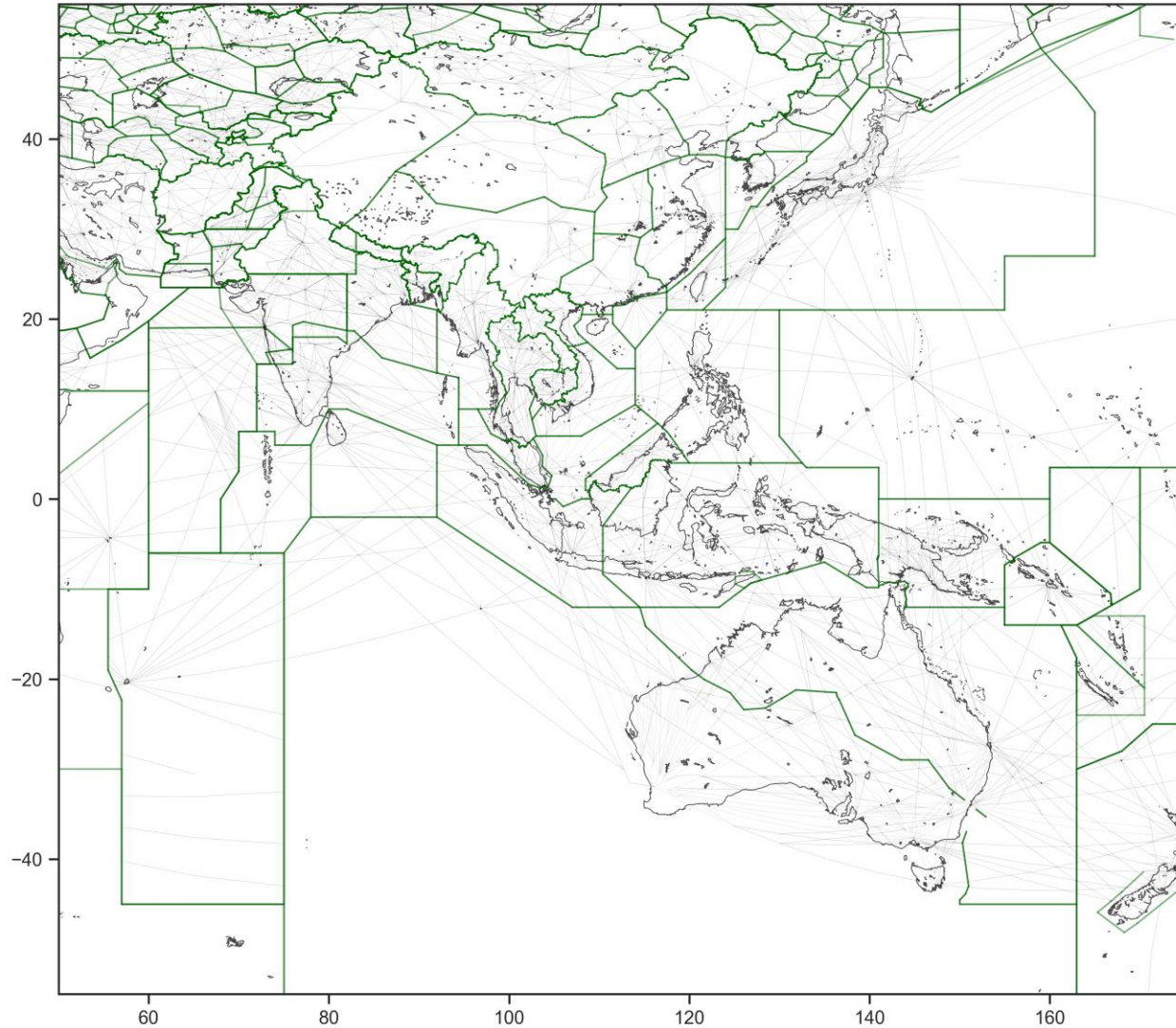


Weather/Turbulence (H) LLD/LLEs in ASIA by category - horizontal risk

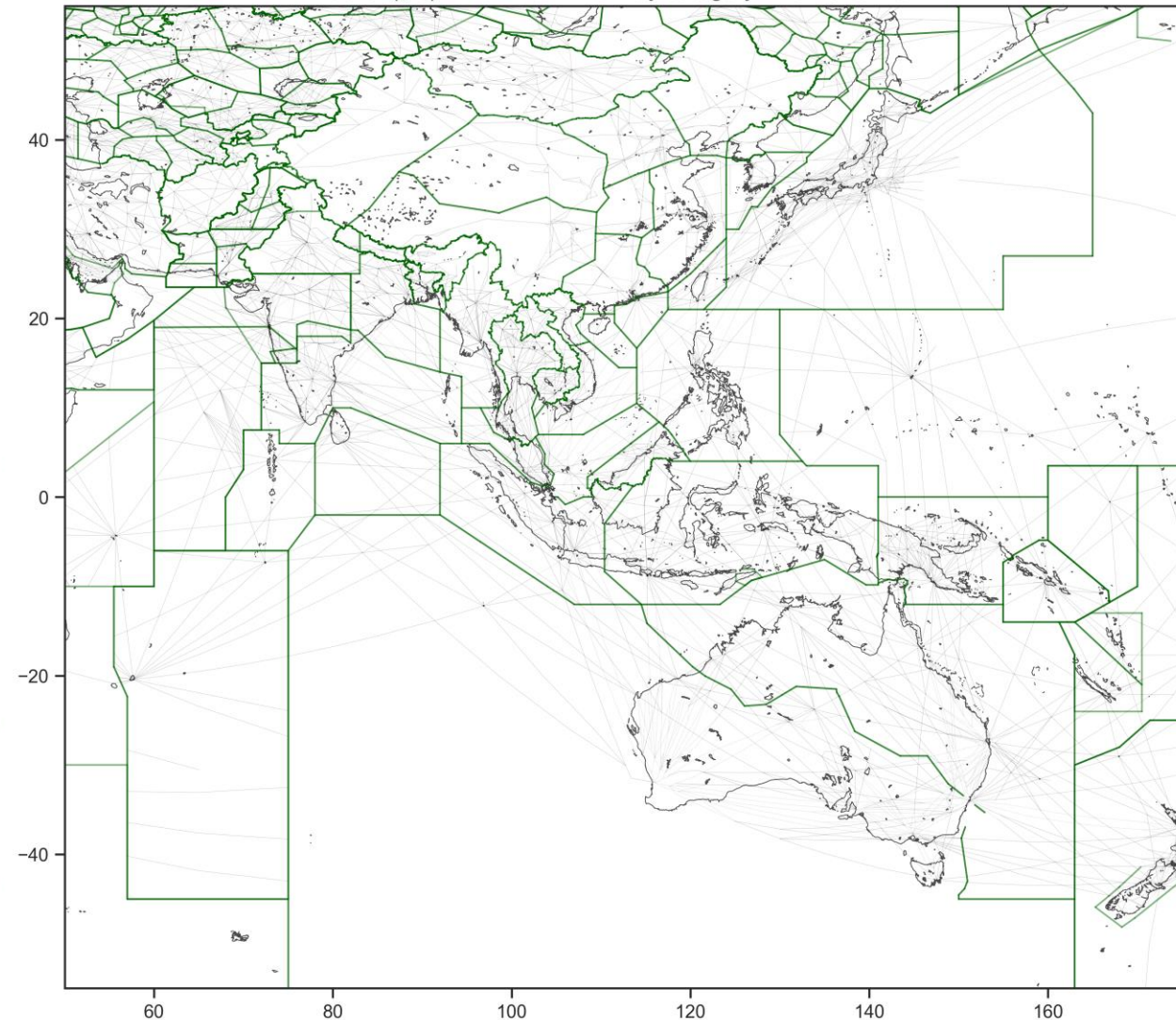


ASIA : TCAS (LHD:J, K, LLD/LLE:I,J)

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 reduced to zero.

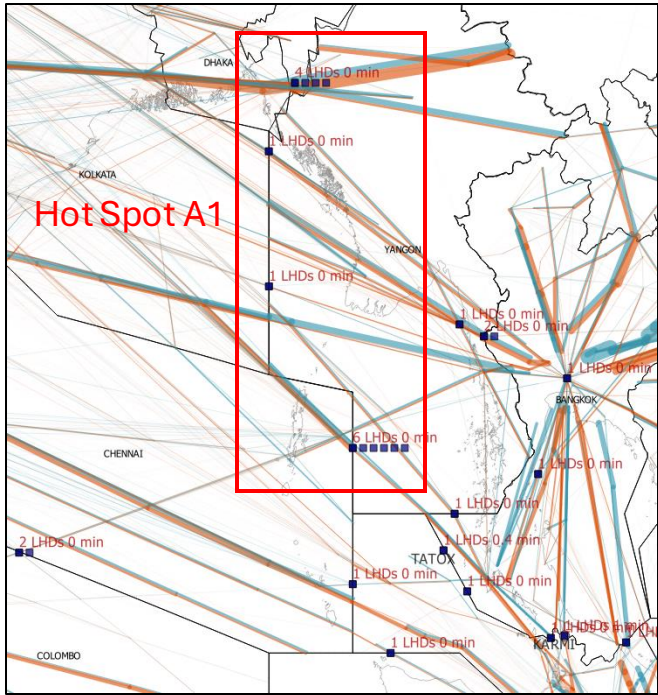
Mitigations:

- 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.

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



ASIA : LHD Hot Spot B1

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

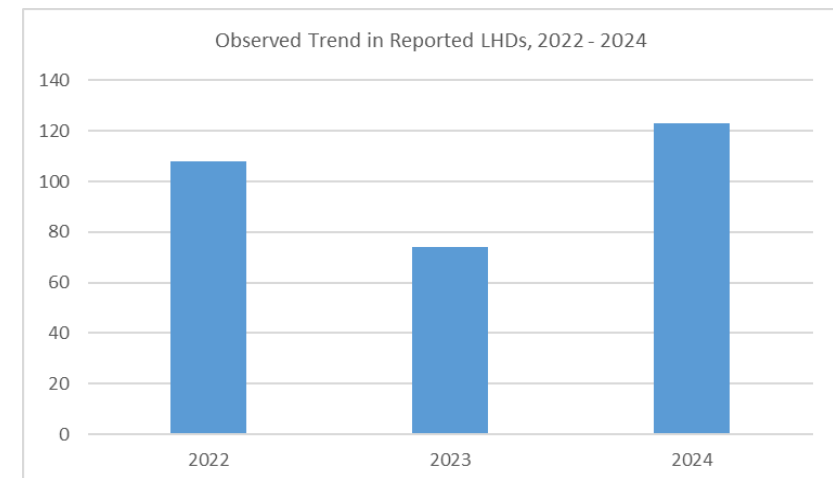
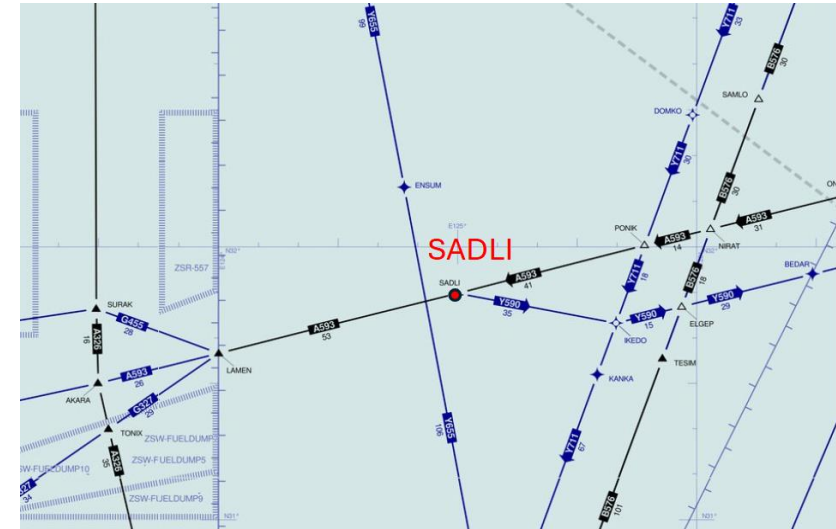
Nature of Occurrences: Coordination errors as a result of human factors issues (Category E)

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)

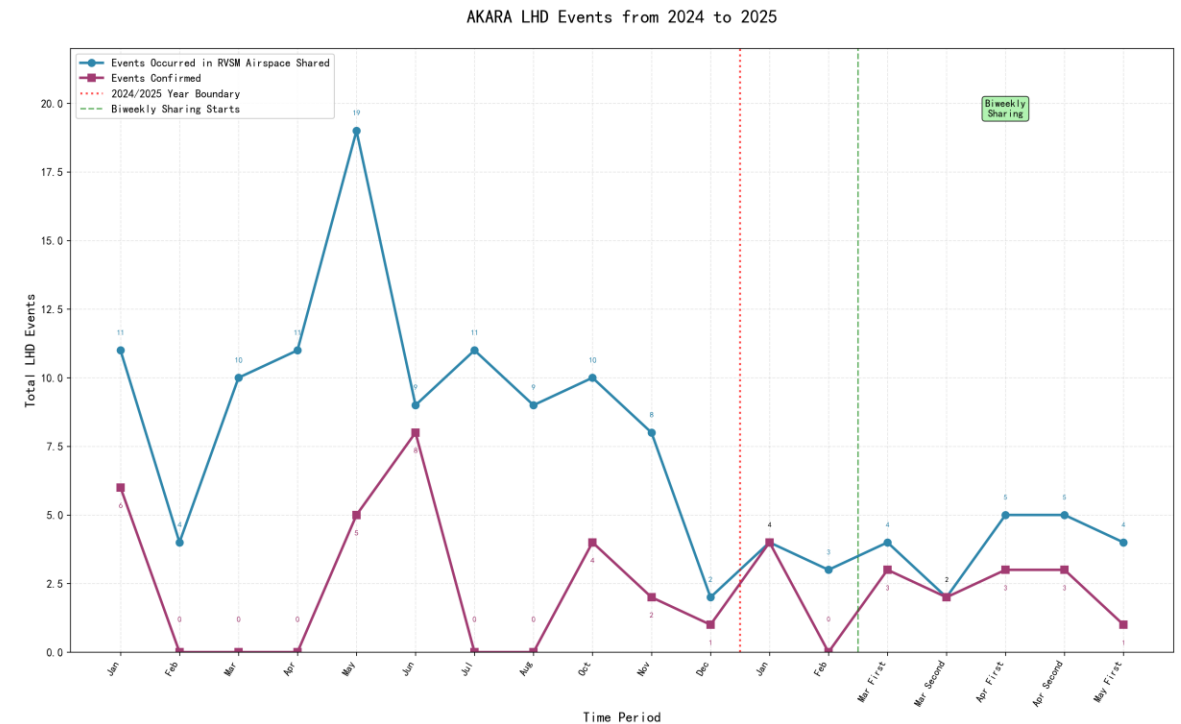
Mitigations :

- 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.

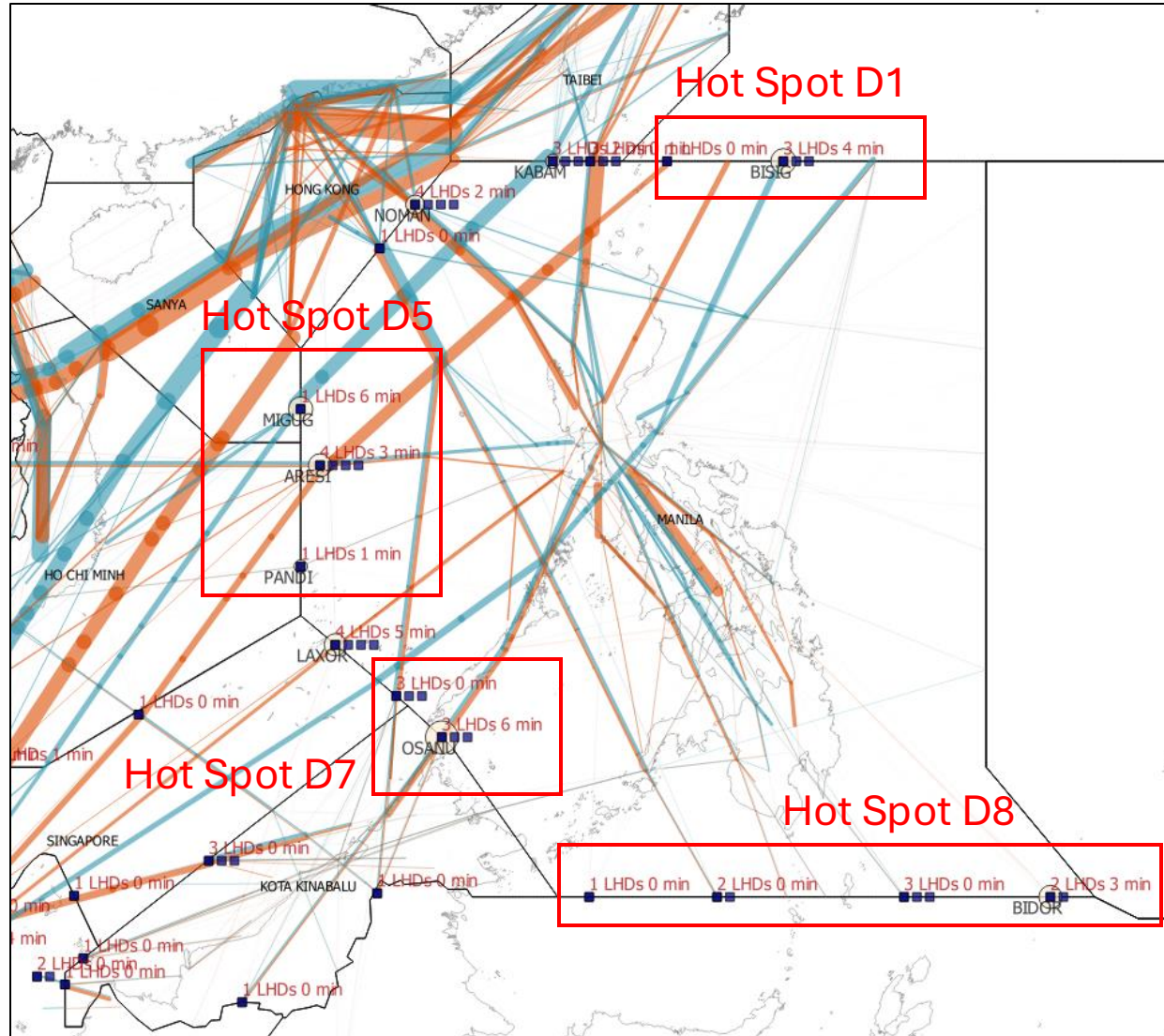
Result from the hot spot identification process:

- **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.

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.**

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).

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.

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.

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

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.

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.

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

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.

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.**

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

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.

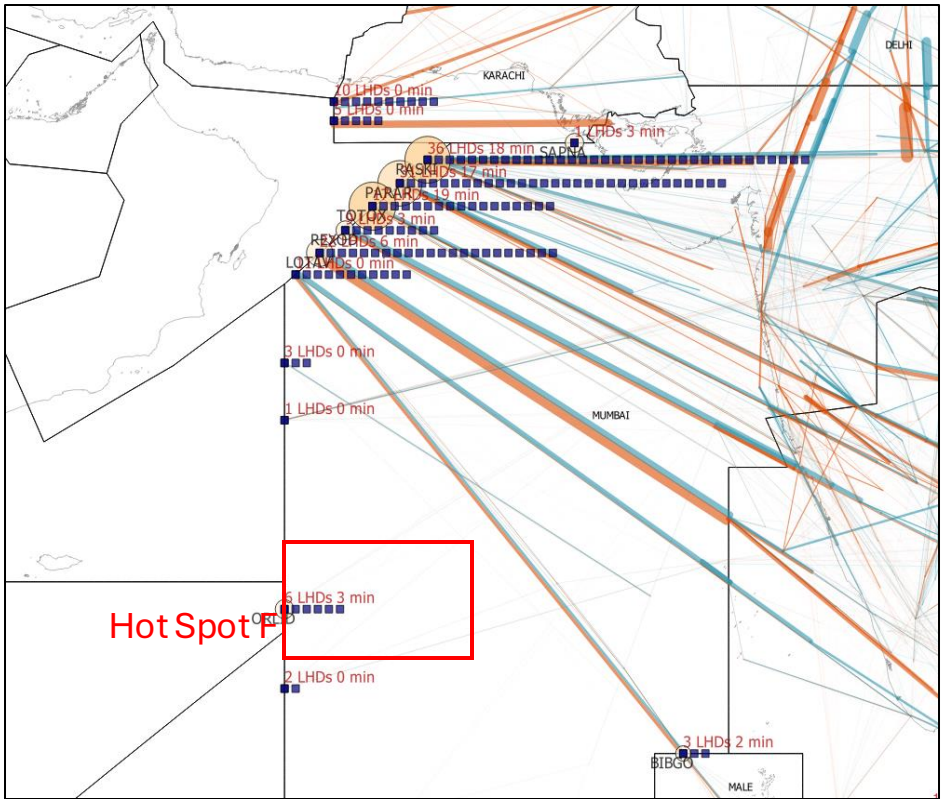
Mitigations:

- 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.

Trend:

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

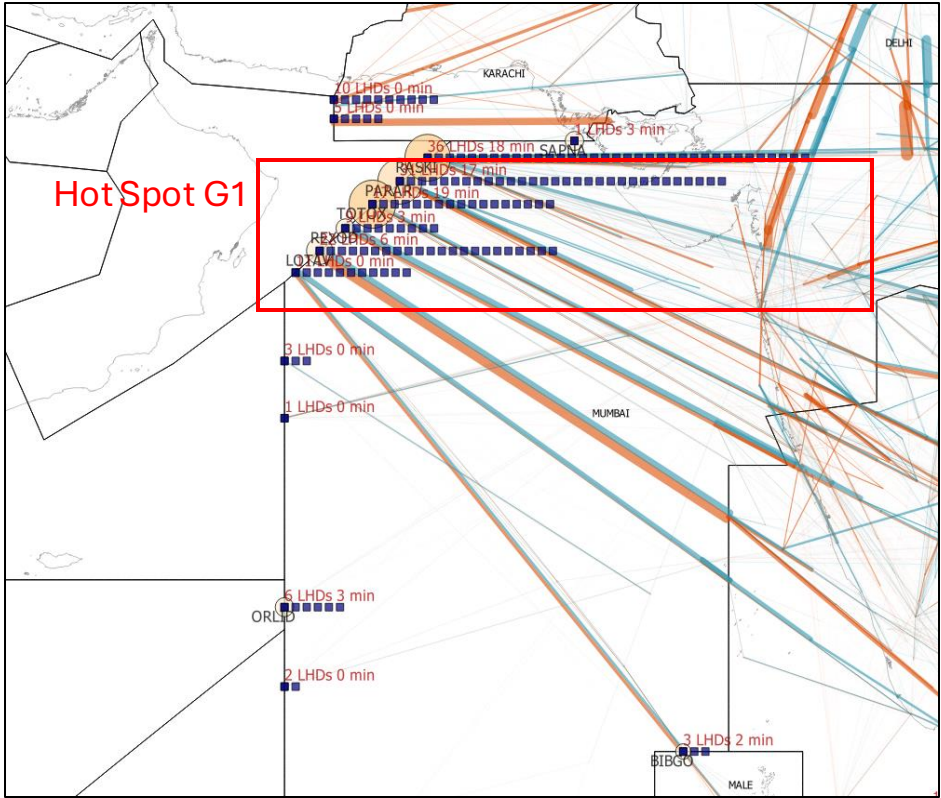
Mitigations:

- 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.

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



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 slightly increased
- Operational risk was zero.

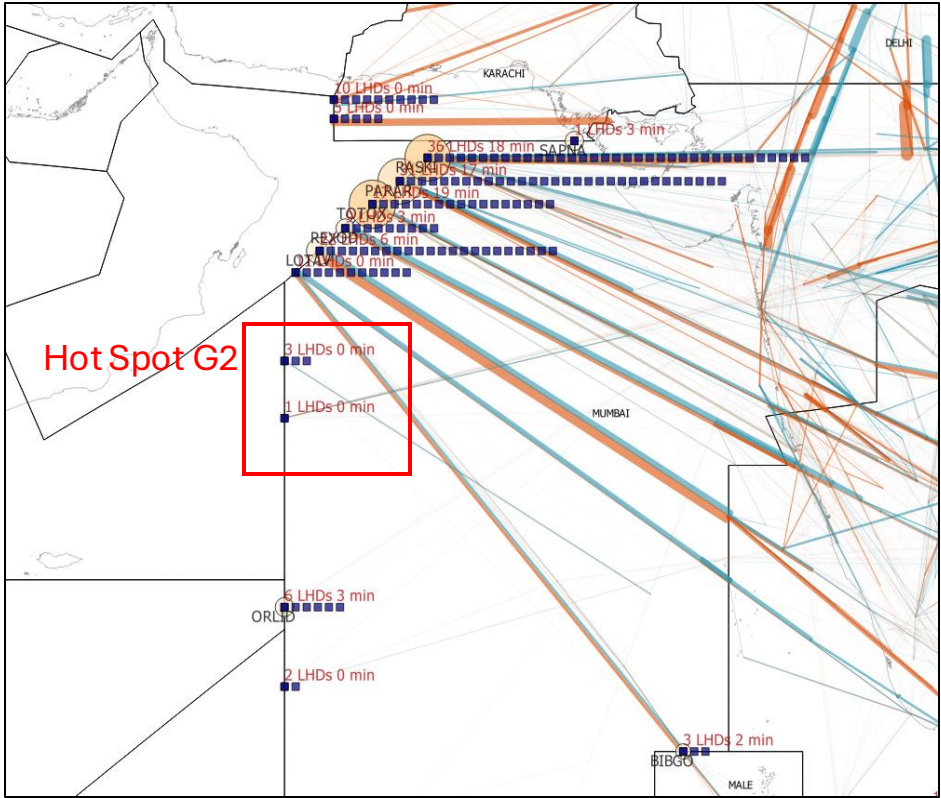
Mitigations:

- 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.

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



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.

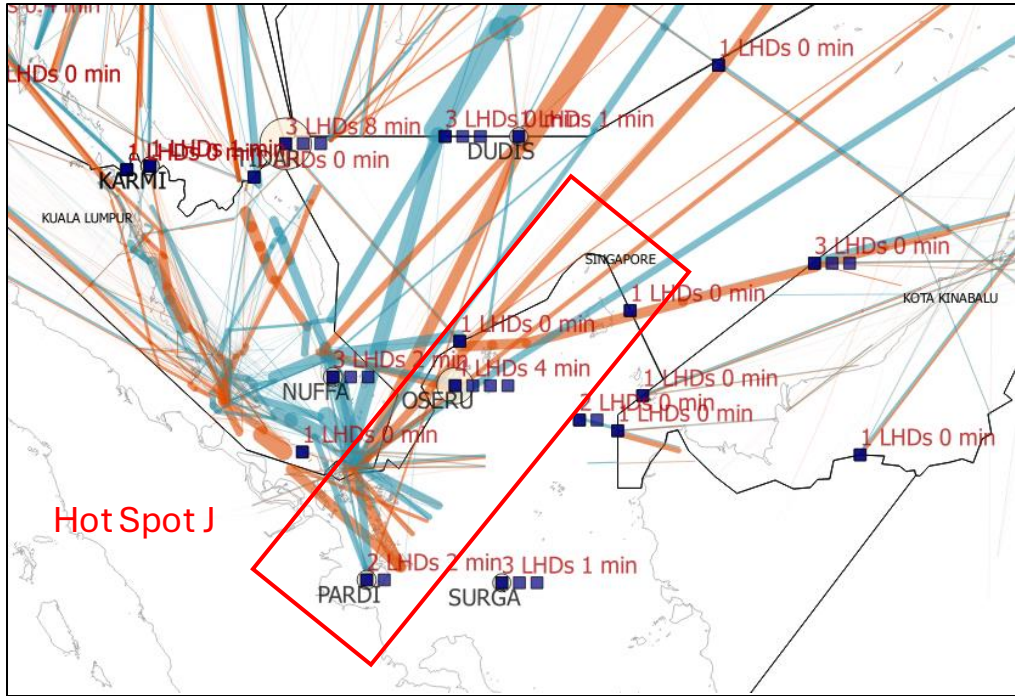
Mitigations:

- 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.

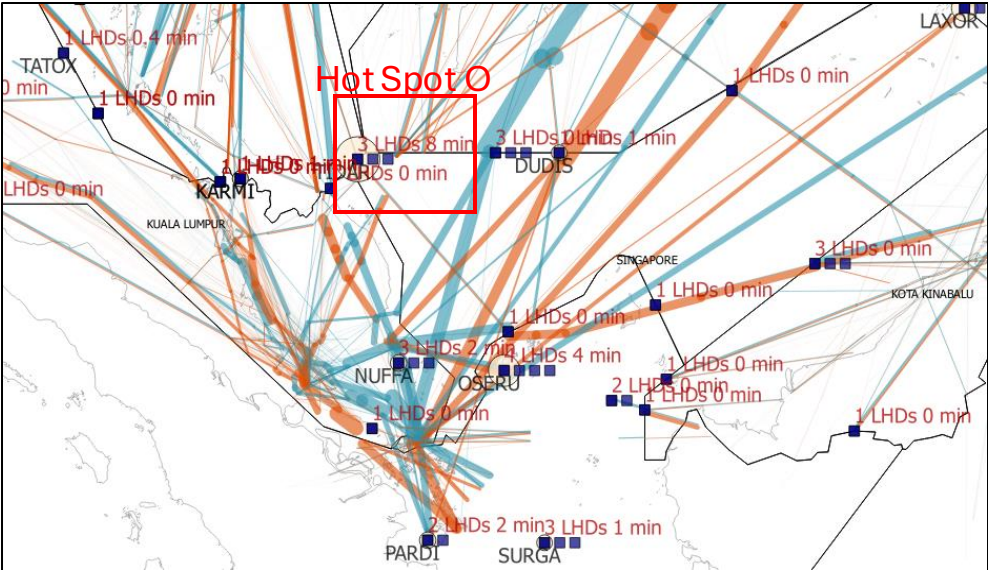
Mitigations:

- 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>