International Civil Aviation Organization

Thirty-Fifth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/35)

Bangkok, Thailand, 25 to 27 November 2024

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 Twenty-Ninth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/29), including the RASMAG/29 discussion of the outcomes of its contributory body, Future Air Navigation Services (FANS) Interoperability Team – Asia (FIT-Asia/14).

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 Fourteenth Meeting of the FANS Interoperability Team-Asia (FIT-Asia/14) and the Twenty-Ninth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/29) were held in Bangkok, Thailand, from 16 to 19 July 2024 and 19 to 22 August 2024 respectively. RASMAG is a Sub-Group of APANPIRG, and the FIT-Asia reports to RASMAG.

1.2 Meeting documentations and the final reports of FIT- Asia/14 and RASMAG/29 can be found at the following webpages:

a) icao.int/APAC/Meetings/Pages/2023-FIT-Asia14.aspx

b) icao.int/APAC/Meetings/Pages/2023-RASMAG-29.aspx

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

Competent Airspace Safety Monitoring Organisations List

2.1 The FIT-Asia meeting was reminded that APANPIRG/34 agreed the following Conclusion proposed by RASMAG/28.

Conclusion APANPIRG/34/8: Formal Service Arrangements with CRA

That, States are urged to ensure that formal service arrangements are made with an APANPIRG-recognised, competent Central Reporting Agency for the submission and analysis of data link problem reports.

2.2 The United States informed the meeting that the Federal Aviation Administration (FAA) contract for Informal Pacific ATC Coordinating Group (IPACG), Informal South Pacific Air Traffic Services Coordinating Group (ISPACG), and North Atlantic (NAT) would be expanded to include FIT-Asia States without formal service arrangements with a CRA. The Secretariat stated that they would reach out to each State to assess the suitability of the United States' proposed arrangement.

Asia/Pacific Region Combined PBCS Monitoring Report

2.3 Japan prepared and provided the aggregated data link performance monitoring report for the Asia/Pacific Region. From 2025, the FIT-Asia meeting noted that Indonesia and Malaysia had volunteered to compile the data jointly for two years. States/Administrations were invited to double-check the data before submission each year to avoid format errors and consistency issues.

2.4 In the combined data shown in **Table 1** for RSP across all media types in 2023. The 95 percent standard was achieved in all FIRs. None of the FIRs met the 99.9 percent standard, but all FIRs except Chennai achieved a clearance rate of 99.0 percent.

Table 1: RSP Aggregated Data (All Media Types) in 2023

ACTUAL SURVEILLANCE PERFORMANCE - FIR AGGREGATE (ALL MEDIA TYPES)						
Region	**Asia-Pacific Region**					
Performance Criteria	**RSP180**					
Time Period	**2023 January-June**			**2023 July-December**		
Colour Key Meets Criteria 99.0%-99.84% Under Criteria	**Message Counts**	**Criteria**		**Message Counts**	**Criteria**	
		95%	**99.90%**		**95%**	**99.90%**
FIR		**% < = 90sec**	**% <= 180sec**		**% < = 90sec**	**% <= 180sec**
PAZA	1510971	98.85%	99.65%	1774333	98.33%	99.48%
RJJJ	2371615	98.41%	99.62%	3057643	98.43%	99.58%
KZAK	5103764	98.85%	99.73%	5040555	98.68%	99.58%
NFFF	271083	99.11%	99.61%	197629	98.99%	99.53%
NTTT	95276	99.58%	99.80%	103928	99.56%	99.82%
NZZO	414330	98.97%	99.70%	471687	98.81%	99.64%
YBBB	1116402	99.52%	99.83%	1286584	99.50%	99.82%
YMMM	846180	99.05%	99.55%	913946	99.50%	99.81%
RPHI	431079	98.39%	99.31%	563565	98.37%	99.35%
VCCF	255585	98.79%	99.59%	321497	98.59%	99.73%
VABF				522944	97.49%	99.15%
VOMF	226298	97.16%	98.72%	287769	99.11%	99.14%
VECF	470003	98.21%	99.23%	417838	98.36%	99.25%
VVTS	227123	98.85%	99.75%	254460	98.92%	99.75%
WAAF	169637	98.94%	99.43%	158334	99.14%	99.58%
WSJC	694972	98.99%	99.80%	813004	99.07%	99.84%
ZLLL	323166	98.60%	99.70%	463475	98.50%	99.60%
ZWWW	193406	98.60%	99.70%	252168	98.50%	99.60%
WMFC	503742	98.85%	99.68%	487506	99.01%	99.73%

2.5 The 95 percent ACP criteria were met in all FIRs except for the second half of 2023 in Ho Chi Minh FIR. Although Urumqi FIR achieved all criteria in the whole of 2023, the numbers of message counts were below one hundred (**Table 2**).

Table 2: RCP Aggregated Data (All Media Types) in 2023

ACTUAL COMMUNICATION PERFORMANCE - FIR AGGREGATE (ALL MEDIA TYPES)										
Region	Asia-Pacific Region									
Performance Criteria	RCP240									
Time Period	2023 January-June					2023 July-December				
Colour Key: Meets Criteria / 99.0%-99.84% / Under Criteria	Message Counts	ACP Criteria		ACTP Criteria		Message Counts	ACP Criteria		ACTP Criteria	
		95%	99.90%	95%	99.90%		95%	99.90%	95%	99.90%
FIR		% < = 180sec	% <= 210sec	% < = 120sec	% <= 150sec		% < = 180sec	% <= 210sec	% < = 120sec	% <= 150sec
PAZA	96168	99.24%	99.51%	99.35%	99.55%	108973	99.22%	99.47%	99.32%	99.52%
RJJJ	51322	99.70%	99.83%	99.74%	99.81%	64259	99.67%	99.80%	99.72%	99.80%
KZAK	319665	99.32%	99.57%	99.52%	99.68%	362176	99.31%	99.54%	99.49%	99.65%
NFFF	10739	99.43%	99.66%	99.65%	99.73%	6856	99.64%	99.75%	99.72%	99.78%
NTTT	9370	99.55%	99.59%	99.80%	99.83%	9848	99.63%	99.70%	99.77%	99.80%
NZZO	78677	99.07%	99.36%	99.53%	99.71%	84773	99.13%	99.40%	99.49%	99.65%
YBBB	31567	99.53%	99.67%	99.54%	99.70%	36095	99.45%	99.67%	99.45%	99.60%
YMMM	38482	99.44%	99.60%	99.45%	99.62%	39375	99.69%	99.81%	99.71%	99.80%
RPHI	16263	98.01%	98.26%	98.74%	98.91%	34167	98.04%	98.30%	98.60%	98.77%
VCCF	17768	99.19%	99.50%	99.88%	99.94%	26493	99.49%	99.64%	99.88%	99.91%
VABF						84996	98.66%	99.16%	99.38%	99.68%
VOMF	92927	99.72%	99.81%	99.79%	99.85%	103692	99.74%	99.83%	99.83%	99.88%
VECF	22343	98.63%	98.98%	99.01%	99.15%	27550	99.15%	99.36%	99.42%	99.60%
VVTS	70225	95.19%	95.78%	99.41%	99.60%	76131	94.76%	95.37%	99.60%	99.74%
WAAF	27512	99.19%	99.73%	99.36%	99.80%	30676	99.28%	99.44%	99.65%	99.72%
WSJC	45547	98.94%	99.19%	99.05%	99.32%	57158	99.21%	99.44%	99.31%	99.53%
ZLLL	1178	97.96%	98.13%	99.06%	99.32%	1475	98.03%	98.16%	99.05%	99.45%
ZWWW	13	100.00%	100.00%	100.00%	100.00%	19	100.00%	100.00%	100.00%	100.00%
WMFC	83576	98.98%	99.18%	99.31%	99.52%	91156	99.04%	99.28%	99.37%	99.56%

Asia/Pacific PBCS Reporting Templates

2.6 It was noted from Asia/Pacific Region Combined PBCS Monitoring Report that the colour codes used by FIT-Asia were slightly different to other FIT's therefore a correction was proposed to the templates to resolve this error. A revised yellow acceptable performance showing as between 99.0% and 99.89% was proposed (**Figure 1**).

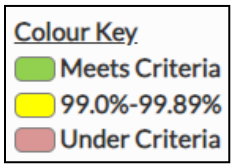


Figure 1: Revised Colour Key Code for Yellow Acceptable Performance

2.7 FIT-Asia meeting agreed to revised colour key codes in the following files on the ICAO APAC eDocument webpage shown below and RASMAG agreed to the following Conclusion, drafted by FIT-Asia/14.

Conclusion RASMAG/29-1: Revised colour key codes for Asia/Pacific PBCS reporting templates

That, the following PBCS reporting templates and example were revised to correctly reflect the criteria colour key code for yellow acceptable performance and be uploaded to the Asia/Pacific Regional Office to replace the existing ones.

1. Data Link Performance Report Template – ANSP to FIT (**Appendix C to the RASMAG/29 report**);
2. EXAMPLE - Data Link Performance Report Template – ANSP to FIT (**Appendix D to the RASMAG/29 report**); and
3. Aggregated Regional Data Link Performance Report Template - FIT to RASMAG (**Appendix E to the RASMAG/29 report**)

Future Direction of FIT-Asia

2.8 The Secretariat provided information on the history and progress of FIT-Asia. The number of Working Papers (WPs) at the previous FIT-Asia meetings were mainly WPs provided by States/Administrations for Data Link Performance Reports, and a few papers addressed technical matters at the FIT-Asia meetings by the champion States in the region.

2.9 The FIT-Asia meeting agreed to conduct a workshop/seminar in conjunction with the FIT-Asia meeting, at least in 2025, including the subjects such as safety risk assessment for PBCS implementation, PBCS Charter, etc.

2.10 It was noted that some States provided only data collection and there was a lack of analysis and rectifications for PBCS non-compliance. Therefore, States were encouraged to fully analyse PBCS performance that fails to meet RCP/RSP specifications, take the rectification action, and report them to FIT-Asia.

2.11 In addition, States were encouraged to also submit the annual PBCS implementation survey to provide the APAC region with a better understanding of the status of PBCS implementation.

RASMAG/29 Meeting Outcomes

APAC Consolidated Safety Report

2.12 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 2**). 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).

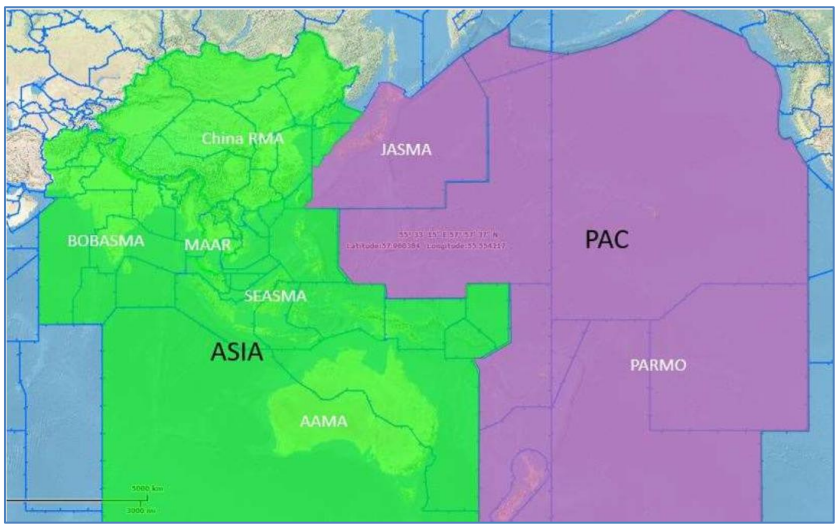


Figure 2: Asia and Pacific Safety Reporting Areas

Pacific Area Vertical Collision Risk

2.13 The estimated vertical collision risk for 2023 for the PAC area did not meet TLS. (**Table 3**), mostly driven by Hot Spot N (Hawaii CEP/Oakland USA). The responsible units have already implemented mitigation procedures while planning for an ATM system upgrade to begin in 2025 to resolve the issues at this hot spot.

Table 3: Pacific Area Vertical Collision Risk 2023

Pacific Area – annual flying hours = 3,462,071			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Vertical Technical Risk	0.22×10^{-9}	2.5×10^{-9}	Below Technical TLS
Vertical Operational Risk	10.55×10^{-9}	-	-
2023 Vertical Overall Risk	**10.77×10^{-9}**	5.0×10^{-9}	**Above TLS**

2.14 The PAC vertical collision risk estimates had been above TLS for the last few years and in 2023, there was a slight decrease when compared to the previous year (**Table 4**).

Table 4: Pacific Area Vertical Collision Risk Estimates 2016 – 2023

Year	**Vertical Overall Risk Estimate (x 10^{-9} fapfh)**	**Remark**
2023	10.77	Above TLS
2022	19.62	Above TLS
2021	19.74	Above TLS
2020	16.71	Above TLS
2019	30.21	Above TLS
2018	19.40	Above TLS
2017	7.30	Above TLS
2016	5.01	Above TLS

2.15 There was a total of 134 LHDs in the Pacific area in 2023 (increased from 118 in 2022), with total duration 362 minutes and 36 levels crossed. 33 of the occurrences were Category A, B or C (25%), 64 were Category D, E or F (48%), zero were Category G or H, 20 in Category I (15%), 16 were Category J or K (12%), and one were Category L or M (1%).

Pacific Area Horizontal Collision Risk

2.16 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

Pacific Area – annual flying hours = 1,892,881 hours			
2023 PAC Area	**Risk Estimation**	**Airspace**	**Remarks**
Total Lateral Risk	**0.09×10^{-9}**	Pacific	Below TLS
Total Longitudinal Risk	**0.17×10^{-9}**	Pacific	Below TLS
2022 PAC Area	**Risk Estimation**	**Airspace**	**Remarks**
Lateral Risk	2.09×10^{-9}	Pacific	Below TLS
50NM Lateral Risk	0.456×10^{-9}	Japan	Below TLS
30NM Longitudinal Risk	0.0008×10^{-9}	Japan	Below TLS
10MIN Longitudinal Risk	1.754×10^{-9}	Japan	Below TLS

2.17 There was a total of 141 LLDs and LLEs in the Pacific area in 2023 (decreased from 146 in 2022), with a total duration of 1774 minutes and total horizontal deviation of 812NM. 16 occurrences were Category A, B or C (11%), 112 of the occurrences were Category D, E or F (79%), one was Category G (1%), 11 were Category H (8%) and one in Category I or J (1%).

Asia Vertical Collision Risk

2.18 The estimated vertical collision risk for 2023 for the Asia area met TLS (**Table 6 and Table 7**). The overall risk continued to decline since 2017 due to various safety improvement initiatives and was below the TLS since 2021. There was a total of 824 LHDs reported in the Asia area in 2023 (increased compared to 518 in 2022), with total duration 414 minutes and 237 levels crossed.

Table 6: Asia Area Vertical Collision Risk 2023

Asia Area – annual flying hours = 10,153,474 hours			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Vertical Technical Risk	0.56×10^{-9}	2.5×10^{-9}	Below Technical TLS
Vertical Operational Risk	2.84×10^{-9}	-	-
2023 Vertical Overall Risk	**3.40×10^{-9}**	5.0×10^{-9}	**Below TLS**

Table 7: Asia Area Vertical Collision Risk Estimates 2016 –2023

Year	**Vertical Overall Risk Estimate (x 10^{-9} fapfh)**	**Remark**
2023	3.40	Below TLS
2022	1.53	Below TLS
2021	4.03	Below TLS
2020	7.42	Above TLS
2019	12.88	Above TLS
2018	15.50	Above TLS
2017	27.30	Above TLS
2016	12.53	Above TLS

Asia Area Horizontal Collision Risk

2.19 The estimated horizontal collision risk for 2023 for the Asia area met TLS in all longitudinal and lateral risk categories (**Table 8**). There were ten LLDs and LLEs reported in the Asia area in 2023, with the total horizontal deviation of 136NM.

Table 8: Asia Area Horizontal Collision Risk 2023

Asia Area – annual flying hours = 503,528 hours			
2023 Asia Area	**Risk Estimation**	**Airspace**	**Remarks**
Total Lateral Risk	**1.517×10^{-9}**	ASIA	Below TLS
Total Longitudinal Risk	**4.444×10^{-9}**	ASIA	Below TLS
2022 Asia Area	**Risk Estimation**	**Airspace**	**Remarks**
30NM Lateral Risk	0.068×10^{-9}	SEA	Below TLS
50NM Longitudinal Risk	0.096×10^{-9}	SEA	Below TLS
30NM Lateral Risk	0.786×10^{-9}	SEA	Below TLS
50NM Longitudinal Risk	0.475×10^{-9}	SEA and SA/IO	Below TLS

Reporting Rate of LHDs, LLDs and LLEs

2.20 **Table 9** showed the number of LHD, LLD and LLE reports for 2017 to 2023, and the number of reports per flying hours. Total estimated flying hours had been increasing since 2020, 7,234,881 hours in 2020, 7,604,927 in 2021 to 10,240,138 hours in 2022 and 13,615,545 in 2023.

2.21 The reporting rate for SEA, China, SA/IO and Indonesia improved in 2023. The reporting rate for SW Pacific dropped because of the huge increase in the estimated flying hours. No aircraft flying in the RVSM airspace of DPRK due to public health crisis in 2023. As a result, there were no flying hours and no reported LHDs, LLDs, nor LLEs for DPRK.

Table 9: Total LHD, LLD and LLE Reports, and Reports per Flying Hours, 2017 - 2023

Airspace	**The Number of Reports**							**1 Report: Flying Hours**						
	2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
DPRK	0	0	0	0	0	0	0	-	-	-	-	-	-	-

Airspace	The Number of Reports							1 Report: Flying Hours						
	2017	2018	2019	2020	2021	2022	2023	2017	2018	2019	2020	2021	2022	2023
Mongolia	4	1	2	0	1	0	0	1: 37,771	1: 158,891	1: 82,138	-	1: 121,621	-	-
SEA	474	205	152	42	70	62	95	1: 6,548	1: 17,757	1: 22,275	1: 25,106	1: 15,456	1: 32,620	1:29,400
Japan	71	76	77	66	80	75	67	1: 21,510	1: 20,632	1: 20,762	1: 14,737	1: 13,528	1: 18,751	1:23,452
SW Pacific	51	53	101	46	47	81	65	1: 17,572	1: 17,817	1: 9,335	1: 6,954	1: 11,975	1: 5,352	1:18,186
China	134	110	79	85	105	72	223	1: 18,248	1: 22,229	1: 31,119	1: 26,867	1: 15,477	1: 18,003	1:10,525
SA/IO	935	681	439	152	135	143	254	1: 3,166	1: 3,783	1: 7,955	1: 7,907	1: 11,167	1: 21,018	1:10,242
Pacific	42	43	173	134	176	179	193	1: 54,191	1: 45,064	1: 10,139	1: 6,404	1: 6,638	1: 8,280	1:8,736
Indonesia	34	23	37	18	41	54	125	1: 10,842	1: 53,603	1: 33,321	1: 17,346	1: 7,402	1: 8,060	1:6,099
ROK and AKARA	5	12	34	5	24	108	75	1: 117,090	1: 28,365	1: 18,959	1: 25,965	1: 6,285	1: 1,056	1:2,220
Total	**1,750**	**1,204**	**1,094**	**548**	**679**	**774**	**1,122**	**1: 8,180**	**1: 12,332**	**1: 14,330**	**1: 11,712**	**1: 11,200**	**1:13,230**	**1:12,135**

Hot Spots

2.22 **Table 10** summarised the current LHD Hot Spots, the FIRs involved, the year of identification, and status remarks.

Table 10: 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 reducing.
A2	Chennai/Kuala Lumpur	2015	Cat. E LHDs reducing. Risk slightly increasing. Removed from the Hot Spot list in 2024 (RASMAG/29).
B1	Incheon (Transfer-of-control point between Incheon ACC and Shanghai ACC)	2015	Cat. E LHDs and risk reducing.
B2	Incheon (Intersection points of A593, Y590, Y711 and Y722)	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
B3	Fukuoka/Incheon	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D1	Fukuoka/Manila	2015	Cat. E LHDs reducing. Risk slightly increasing.
D2	Manila/Taibei	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D3	Hong Kong/Manila	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D4	Manila/Sanya	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D5	Ho Chi Minh/Manila	2015	Cat. E LHDs reducing. Risk slightly increasing.
D6	Manila/Singapore	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).

Hot Spot	Involved FIRs	Identified	Remarks
D7	Kota Kinabalu/Manila	2015	Cat. E LHDs and risk slightly increasing.
D8	Manila/Ujung Pandang	2015	Cat. E & F LHDs and risk increasing.
D9	Manila/Oakland	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
F	Mogadishu/Mumbai	2015	Cat. E LHDs slightly increasing. Risk reducing.
G	Mumbai/Muscat/Sanaa	2015	Cat. E LHDs and risk increasing.
J	Jakarta/Kota Kinabalu/Singapore	2018	Cat. E LHDs and risk increasing.
M	Colombo/Melbourne	2019	Removed from the Hot Spot list in 2024 (RASMAG/29).
N	Hawaii CEP/Oakland USA	2019	Cat. E LHDs and Risk reducing.
O	Bangkok/Ho Chi Minh/Kuala Lumpur/Singapore	2023	Cat. E LHDs and Risk reducing.

2.23 The Chair asked the relevant States to provide an analysis/update in relation to Hot Spot J for the meeting of RASMAG/30 in 2025 or to the responsible RMAs before the meeting.

Process of Hot Spots for RASMAG

2.24 The Monitoring Agency Working Group (MAWG) agreed that the process was ready and presented to the RASMAG/29 meeting for endorsement and its application by APAC RMAs and EMAs. The MAWG meeting agreed to split Hot Spot B and Hot Spot D into smaller areas at the interface level.

2.25 RASMAG agreed to adopt the application of the Hot Spot Management Process and agreed to the changes to Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace version 3 and to be uploaded to the APAC ICAO Asia/Pacific Regional Office eDocuments webpage to replace the previous version.

Conclusion RASMAG/29-2: Revised Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace

That,

the revised Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace, containing the Hot Spot Management process, **RASMAG/29 WP/03 - Attachment 3**, be uploaded to the Asia/Pacific Regional Office eDocuments webpage to replace the existing version

Review of Guidance Material for End-To-End Safety and Performance Monitoring of ATS Data Link Systems in the APAC region

2.26 ICAO Secretariat, China, New Zealand and USA were tasked with RASMAG Task item *RASMAG28/1 - Review and develop Draft of new version of Guidance Material for End-to-End Safety and Performance Monitoring of ATS Data Link Systems in the APAC Region in cooperation with CNS subject matter experts. Include region-specific matters from Appendix B to the GOLD Manual (to be removed from the manual in 2020)*.

2.27 A working paper was submitted to FIT-Asia/14 and FIT-Asia/14 agreed to the ***Draft Conclusion FIT-Asia/14-1: Revised Guidance Material for End-to-End Safety and Performance Monitoring of ATS Data Link Systems in the APAC Region and Additional PBCS Guidance Material NAT Doc 011***.

2.28 In addition, Boeing CRA submitted supplementary amendments after the FIT-Asia/14 meeting. Therefore, the updated Guidance Material for End-to-End Safety and Performance Monitoring of ATS Data Link Systems in the APAC Region included all changes were shown in RASMAG/29 WP17 Attachment A. A summary of the proposed amendments, including reasons for each proposed amendment, was provided in WP17 Attachment B and the EUR NAT Doc 011 could be found in WP17 Attachment C.

2.29 The meeting agreed to the proposed changes, and to adopt the following Conclusion:

Conclusion RASMAG/29-3: Revised Guidance Material for End-to-End Safety and Performance Monitoring of ATS Data Link Systems in the APAC Region and Additional PBCS Guidance Material NAT Doc 011

That,

1. the revised Guidance Material for End-to-End Safety and Performance Monitoring of ATS Data Link Systems in the APAC Region at **Appendix F to the RASMAG/29 report** be uploaded to the Asia/Pacific Regional Office eDocuments webpage to replace the existing version; and
2. the EUR NAT Doc 011 – PBCS Monitoring and Reporting Guidance, 1st Ed.-Amdt. 2, at RASMAG/29 WP/17 Attachment C be uploaded on the ICAO Asia/Pacific Regional Office eDocuments webpage.

APANPIRG List of Deficiencies Consideration

2.30 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 11**.

Table 11: List of States that Could be subject to add, remove, and retain their APANPIRG deficiency status based on RVSM approval data as of 30th June 2024

State	2022	2023	RASMAG Recommendation
Pakistan (MAAR)	**45%**	**27%**	**Remove**
Mongolia (MAAR)	**43%**	**18%**	**Remove**
Papua New Guinea (AAMA)	**69%**	**15%**	**Remove**
Solomon Islands (AAMA)	**50%**	**0%**	**Remove**
New Zealand (PARMO)	**36%**	**11%**	**Remove**
India (MAAR)	**24%**	**48%**	**Add**
Philippines (MAAR)	**26%**	**40%**	**Add**
Nepal (MAAR)	**45%**	**45%**	**Retain**
Afghanistan (MAAR)	**0%**	**50%**	**Retain**

2.31 APAC Regional Monitoring Agencies were requested to subtract airframe data meeting the 1,000 flight hour criteria before submitting the burden data to MAAR for the APAC consolidated LTHM Compliance Status.

ATM and Airspace Safety Deficiencies List

2.32 The meeting reviewed the APANPIRG ATM and Airspace Safety Deficiency List and agreed to make the following recommendation to APANPIRG/35. The meeting was informed that the deadline for submission of information on reduction of the remaining monitoring burden must reach MAAR by 25 Oct 2024 in order to be processed in time for APANPIRG/35.

2.33 ICAO had sent an email to French Polynesia on 21 Aug 2024 and requested for LHD, LLE & LLD data for 2023 to be submitted to ICAO and PARMO by 18 Nov 2024 to facilitate the withdrawal of the deficiency for APANPIRG's review. On 22 Oct 2024, PARMO had confirmed receipt of the occurrence reports for the Tahiti FIR for 2023 and up till September 2024. Therefore, French Polynesia would not be recommended for inclusion in the deficiencies list.

2.34 As Bangladesh and Nepal failed to submit the 2023 annual RVSM approval snapshot, MAAR recommended RASMAG to propose to APANPIRG to inform these two States that failure to submit the annual RVSM approval snapshot this year would result in an inclusion in the APANPIRG List of Deficiencies in the ATM and Airspace Safety fields next year.

a) To be retained in the Deficiencies list:

<u>Safety Reporting Deficiencies</u>

- **Afghanistan** (Failure to submit Kabul FIR Large Height Deviation (LHD) data).

<u>Long Term Height Monitoring Requirement Deficiencies</u>

- **Afghanistan** (Remaining monitoring burden of 50%, RASMAG/29).
- **Nepal** (Remaining monitoring burden of 45%, RASMAG/29).

<u>ATS Datalink Deficiencies</u>

- **India**: Post implementation monitoring not implemented (insufficient data/evidence).

b) Removal of Deficiency:

<u>Long Term Height Monitoring Requirement Deficiencies</u>

- **Mongolia** (Remaining monitoring burden of 18%, RASMAG/29).
- **New Zealand** (Remaining monitoring burden of 11%, RASMAG/29).
- **Pakistan** (Remaining monitoring burden of 27%, RASMAG/29).
- **Papua New Guinea** (Remaining monitoring burden of 15%, RASMAG/29).
- **Solomon Islands** (Remaining monitoring burden of 0%, RASMAG/29).

<u>ATS Datalink Deficiencies</u>

- **Maldives:** It was confirmed that Maldives had disabled the ADS-C function from the ATM system due to an application issue, and CPDLC/HF is used beyond VHF coverage

c) Add new Deficiency:

<u>Long Term Height Monitoring Requirement Deficiencies</u>

- **India** (Remaining monitoring burden of 48%, RASMAG/29).
- **Philippines** (Remaining monitoring burden of 40%, RASMAG/29).

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) note the FAA contract for CRA services in the IPACG, ISPACG, and NAT would be expanded to include FIT-Asia States without formal service arrangements with a CRA;

b) note the current LHD hot spots and removal of hot spots;

c) note the technical Conclusions:

i) **Conclusion RASMAG/29-1 Revised colour key codes for Asia/Pacific PBCS reporting templates**;

ii) **Conclusion RASMAG/29-2 Revised Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace**;

iii) **Conclusion RASMAG/29-3 Revised Guidance Material for End-to-End Safety and Performance Monitoring of ATS Data Link Systems in the APAC Region and Additional PBCS Guidance Material NAT Doc 011**;

d) note the retention of existing, deletion and addition of new, ATM and Airspace Safety Deficiencies; and

e) discuss any relevant matters as appropriate

— — — — — — — —

2023 Asia Pacific
Consolidated Safety Report

RASMAG/29
19 - 22 August 2024

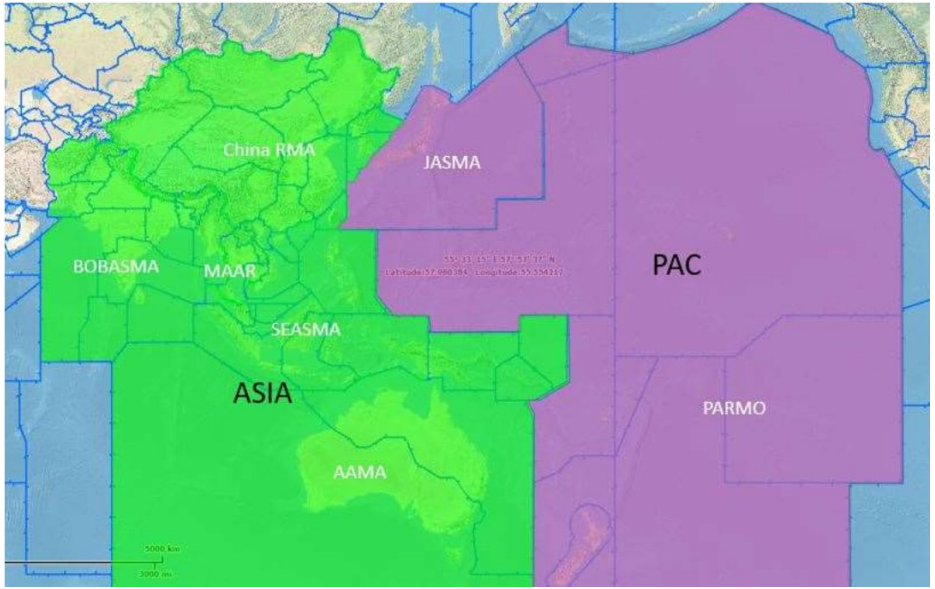
Outline

- 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

Background

In MAWG/5, 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**

For each area, there will be a summary of:

- vertical collision risk estimates, LHD summary, and their hot spots (if any);
- horizontal collision risk estimates, LLD & LLE summary, and their hot spots (if any); and
- reporting rates in 3 groups: Category A + B + C (related to the pilot/aircrew), D + E + F (related to ATC), and G + H + I + J + K + L + M (Other).

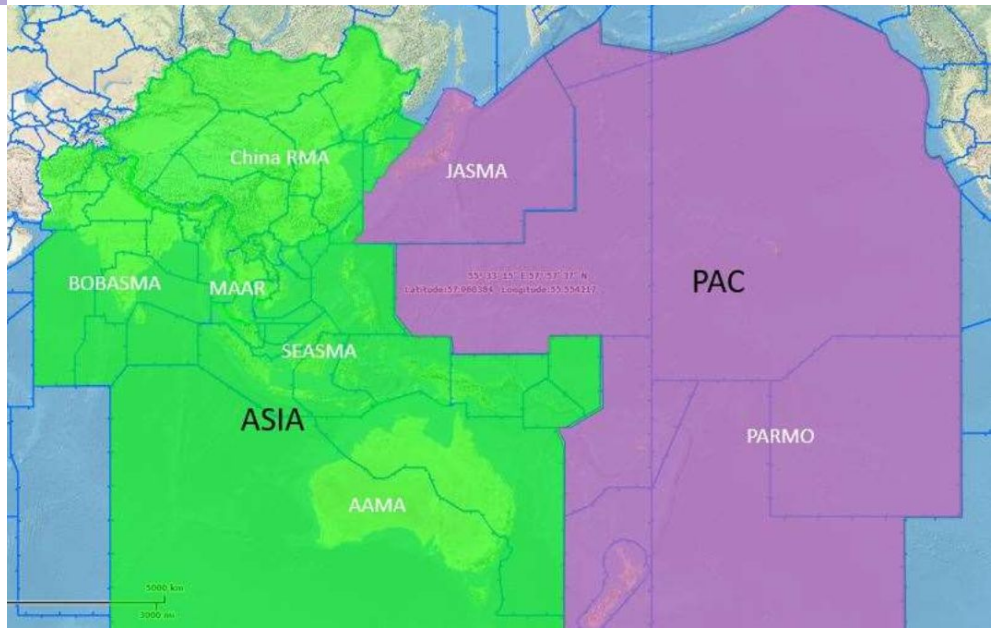
Pacific Area (PAC)

Traffic between North America and Asia, or North America and South Pacific States

FIRs : Anchorage, Auckland, Fukuoka, Nadi, Oakland, and Tahiti

Monitoring Agencies :

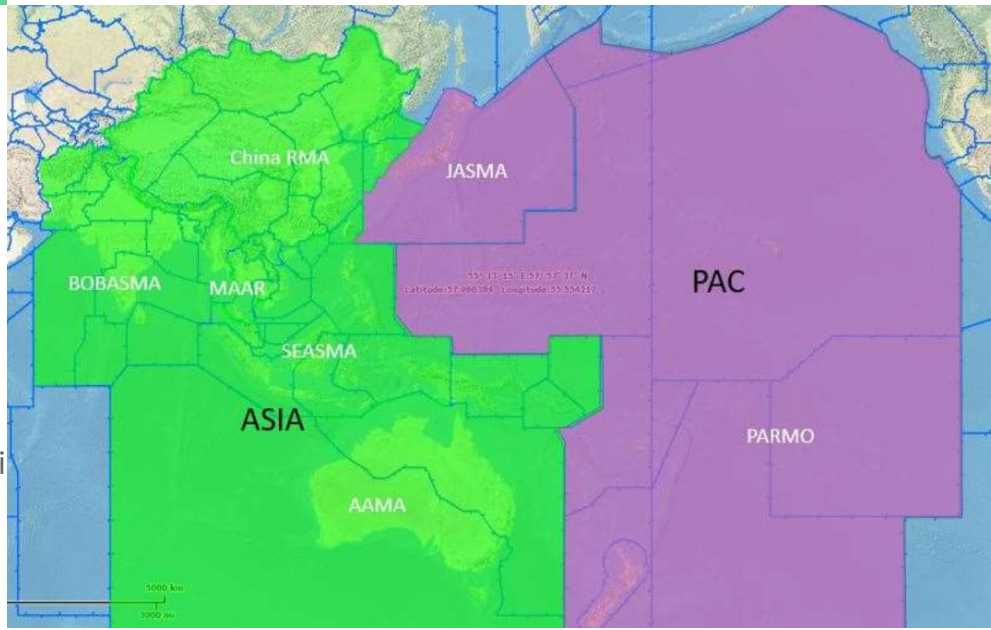
RMAs (Verical): JASMA, PARMO
EMAs (Horizontal): JASMA, PARMO



Asia Area (Asia)

Traffic flows between between Asia and Middle East, Europe and South Pacific States.

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): AAMA, BOBASMA, PARMO, SEASMA

PAC Area

PAC : Vertical Collision Risk

PAC : Vertical Collision Risk Estimates

Number of annual flying hours: 3,462,071 hours/year

2023 PAC Area	Vertical Risk Estimate	Remark
Vertical Technical Risk	0.22×10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	10.55×10^{-9} FAPFH	
Vertical Overall Risk	10.77×10^{-9} FAPFH	Above TLS

PAC : Vertical Collision Risk Estimates

2016 - 2023

Year	Vertical Overall Risk Estimate	Remark
2023	10.77×10^{-9} FAPFH	Above TLS
2022	19.62×10^{-9} FAPFH	Above TLS
2021	19.74×10^{-9} FAPFH	Above TLS
2020	16.71×10^{-9} FAPFH	Above TLS
2019	30.21×10^{-9} FAPFH	Above TLS
2018	19.40×10^{-9} FAPFH	Above TLS
2017	7.30×10^{-9} FAPFH	Above TLS
2016	5.01×10^{-9} FAPFH	Above TLS

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	**16**	**4.98**	**9**
	B	Flight crew climbing/descending without ATC Clearance	**14**	**14.22**	**13**
	C	Incorrect operation or interpretation of airborne equipment	**3**	**2.13**	**2**
ATC	D	ATC system loop error	**6**	**2.50**	**3**
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	**57**	**224.18**	**6**
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	**1**	**7.00**	**0**
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	**0**	**0.00**	**0**
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	**0**	**0.00**	**0**

PAC : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Weather/ Turbulence	I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level	20	59.93	1
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	16	21.63	2
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0.00	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	0	0.00	0
	M	Other	1	25.00	0
		Total	134	361.58	36

PAC : Horizontal Collision Risk

PAC : Horizontal Collision Risk Estimates

Number of annual flying hours: 1,892,881 hours/year

2023 PAC Area	Horizontal Risk Estimate	Airspace	Remark
Total Lateral Risk	0.09×10^{-9} FAPFH	Pacific	Below TLS
Total Longitudinal Risk	0.17×10^{-9} FAPFH	Pacific	Below TLS
2022 PAC Area	**Horizontal Risk Estimate**	**Airspace**	**Remark**
Lateral Risk	2.09×10^{-9} FAPFH	Pacific	Below TLS
50NM Lateral Risk	0.456×10^{-9} FAPFH	Japan	Below TLS
30NM Longitudinal Risk	0.008×10^{-9} FAPFH	Japan	Below TLS
10MIN Longitudinal Risk	1.754×10^{-9} FAPFH	Japan	Below TLS

Notes:

- The 2023 Horizontal collision risk estimates are combined into a single value using a weighted average.

PAC : Summary of LLDs and LLEs

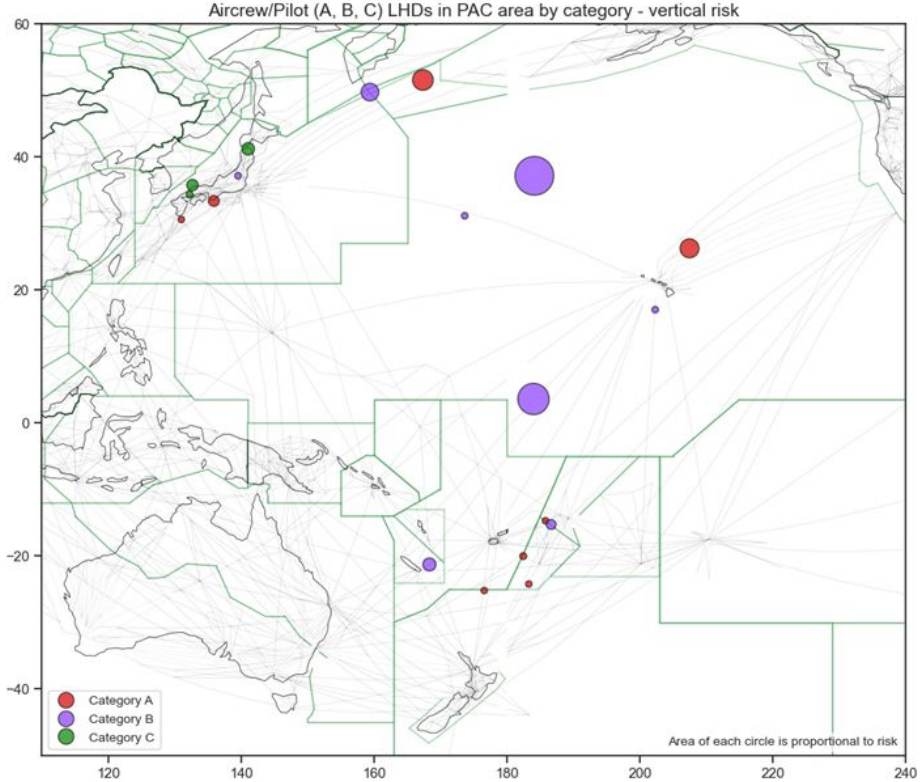
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	**10**	**10.00**	**3**	**100**
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	**3**	**1.00**	**1**	**15**
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	**3**	**15.00**	**0**	**75**
ATC	D	ATC system loop error	**2**	**5.00**	**1**	**61**
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	**109**	**1614.00**	**0**	**158**
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	**1**	**11.00**	**0**	**0**

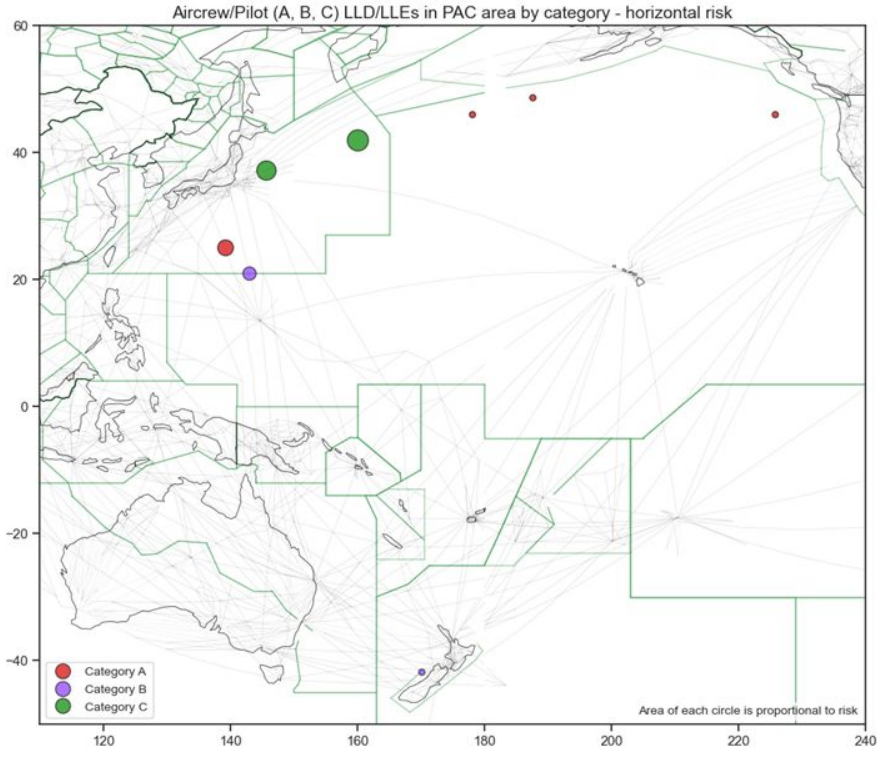
PAC : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	1	20.00	0	128
Weather/ Turbulence	H	Turbulence or other weather related causes leading to a deviation in the horizontal dimension	11	98.00	0	255
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0.00	0	0
	J	Other	1	0.00	1	20
		Total	141	1774.00	6	812

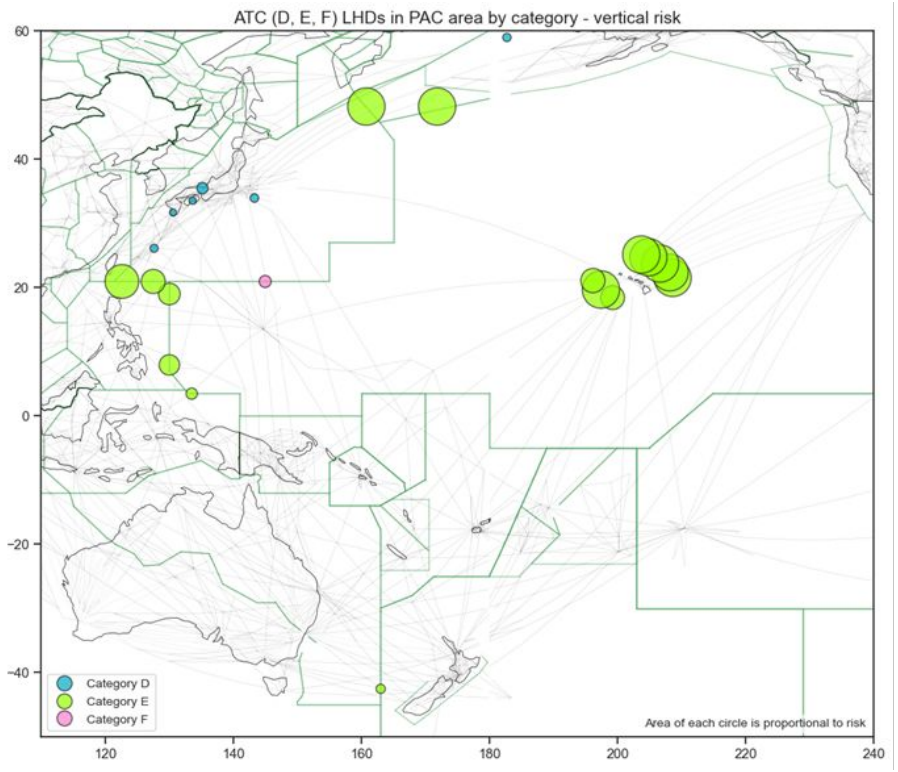
PAC : Geolocation of LHDs/LLDs/LLEs

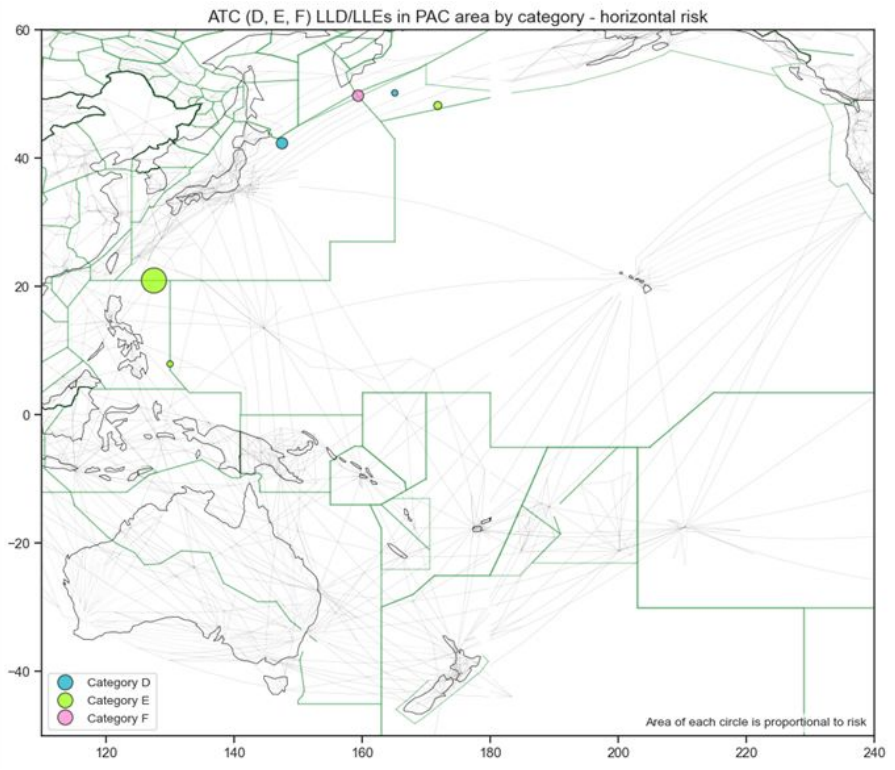
PAC : Aircrew/Pilot (A, B, C)



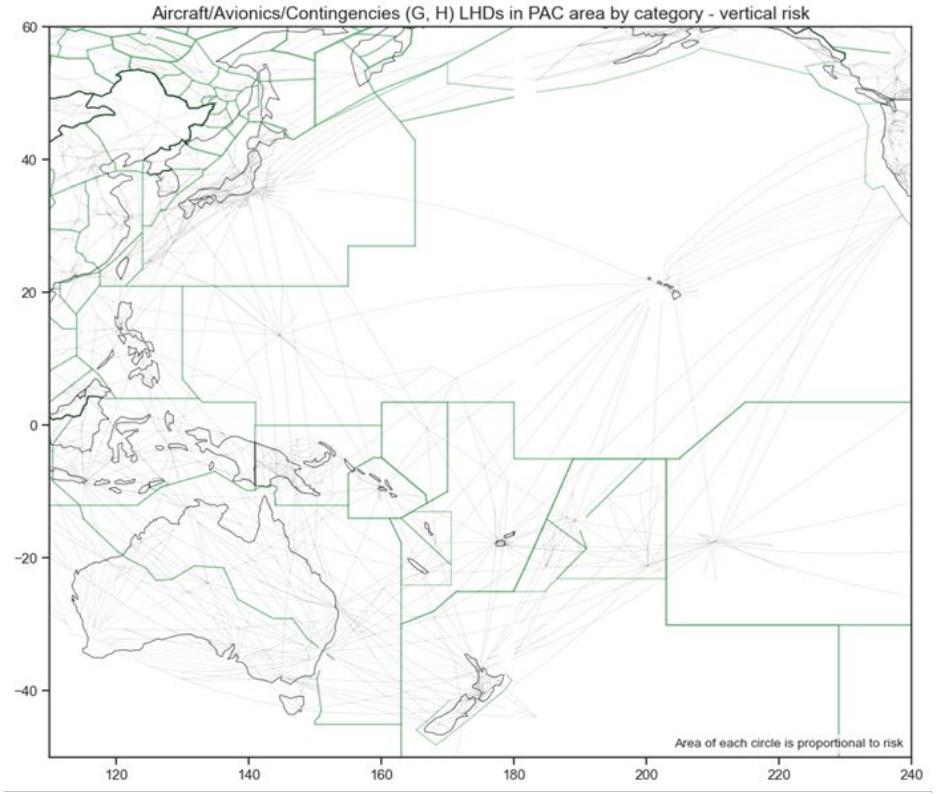


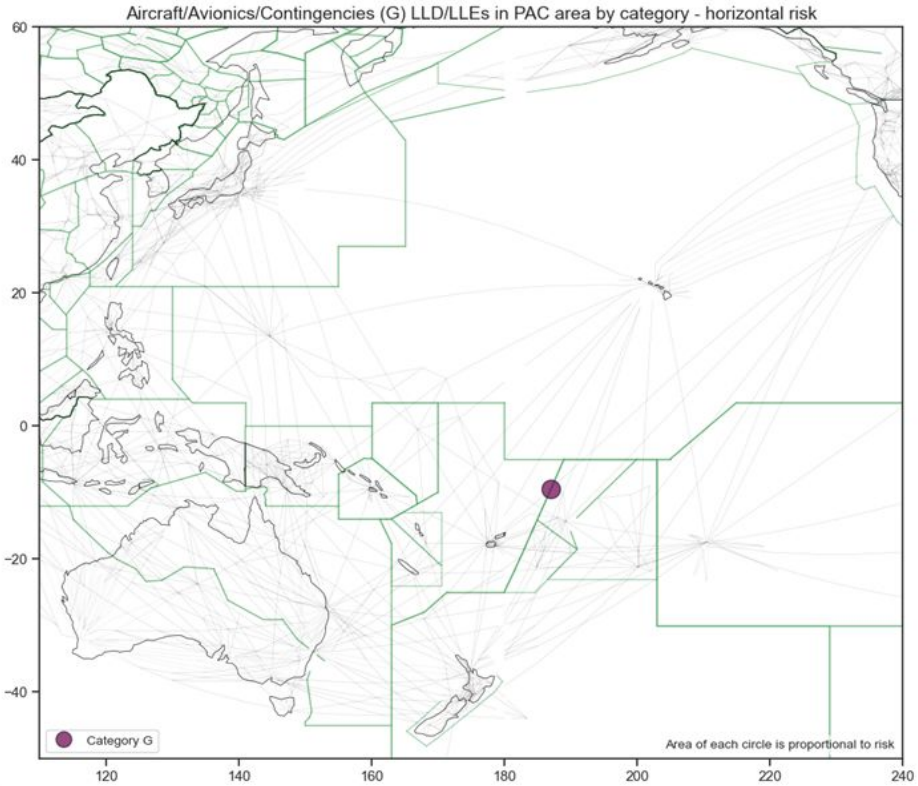
PAC : ATC (D, E, F)


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


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

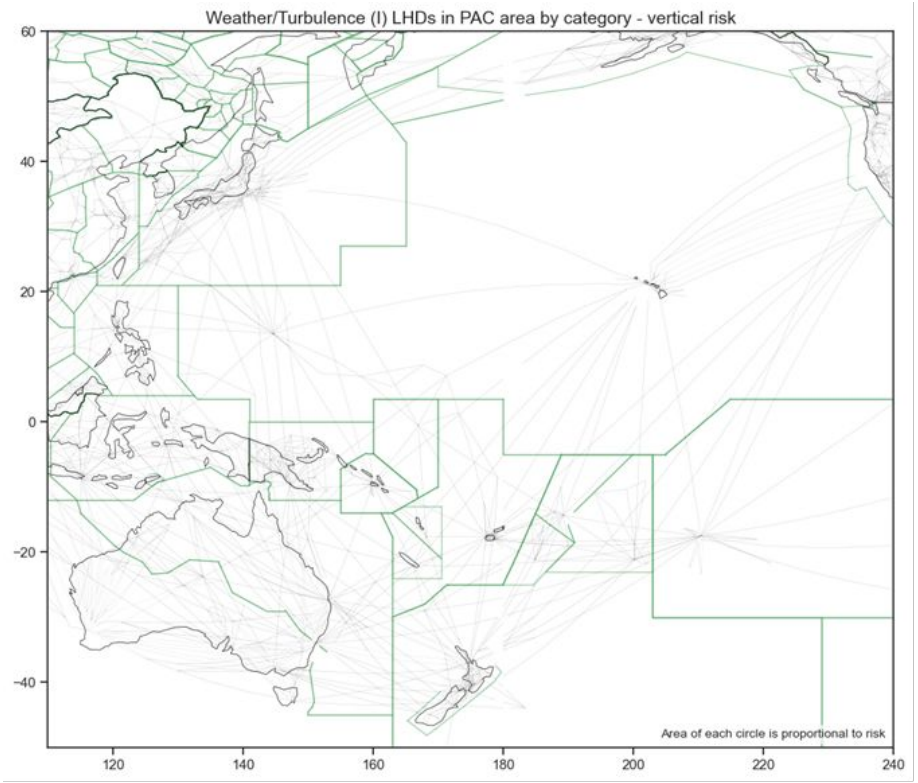
PAC : Aircraft Avionics/Contingencies (LHD:G,H, LLD/LLE:H)

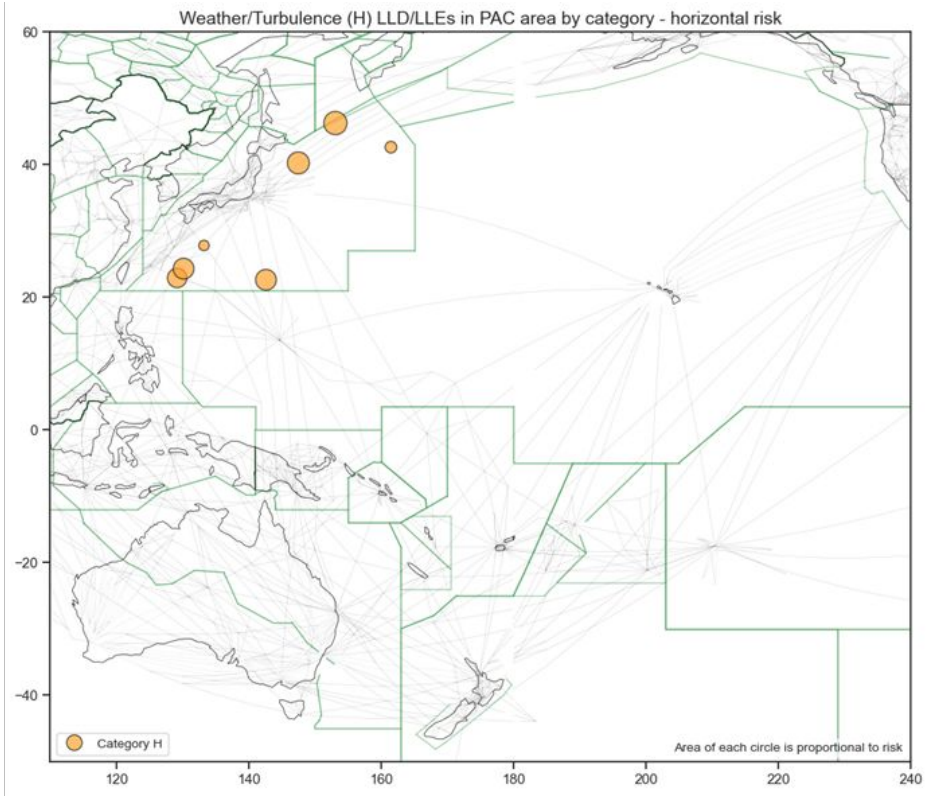




Note: No non-zero Category G and H LHD in 2023

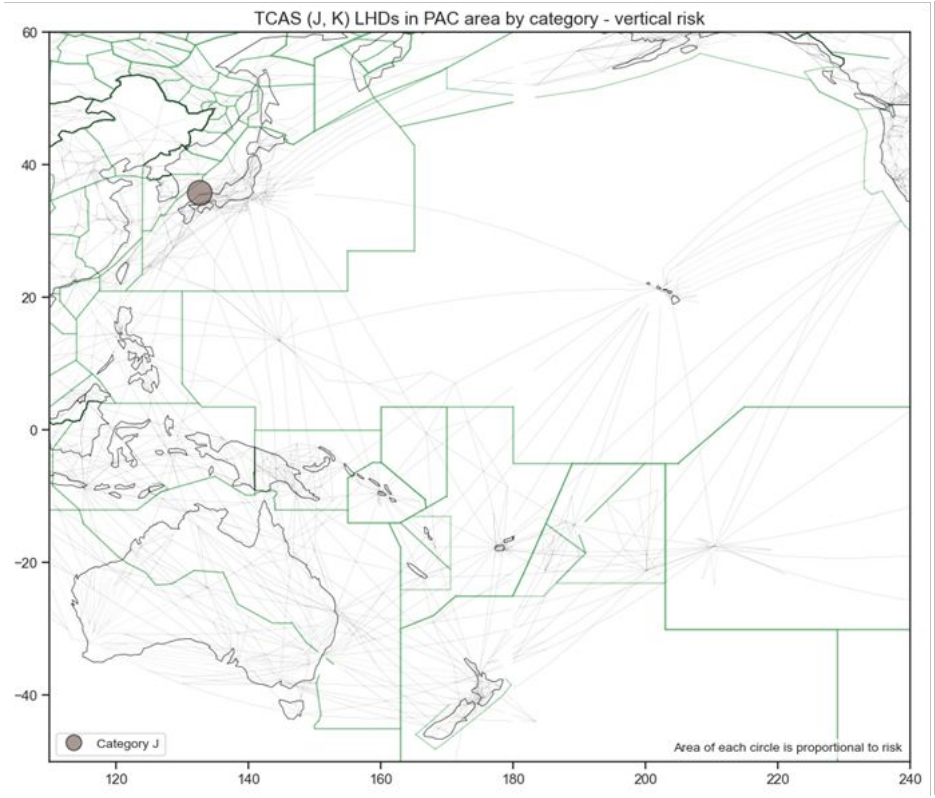
PAC : Weather/Turbulence (LHD:I, LLD/LLE:H)



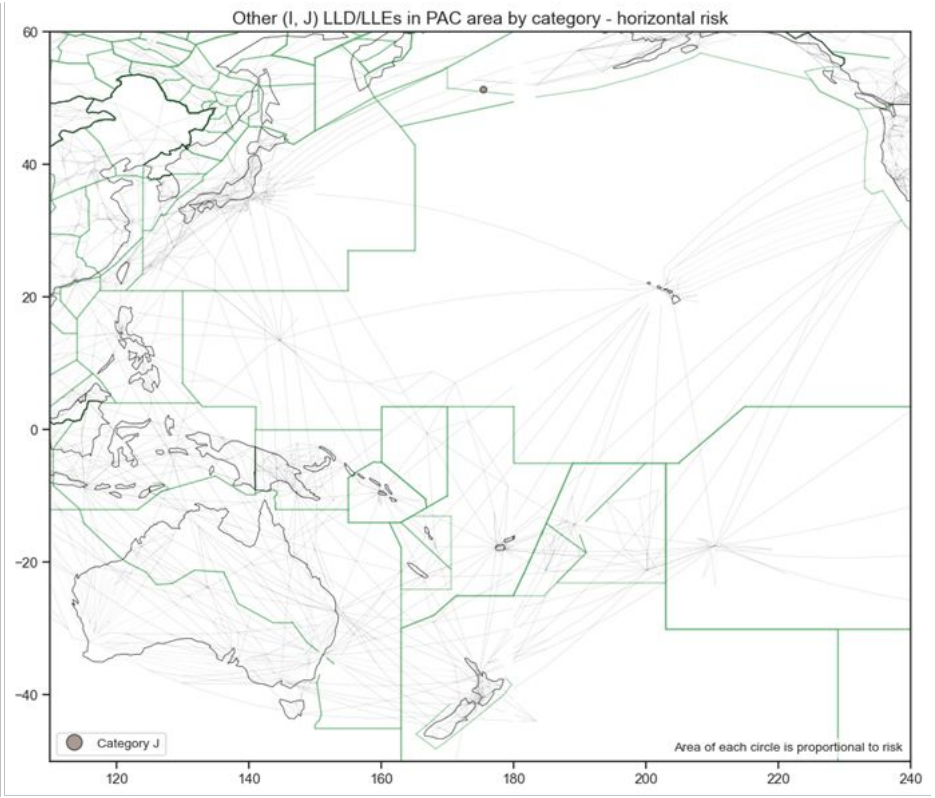


Note: No non-zero Category I LHD in 2023

PAC : TCAS (LHD:J, K)



Note: No non-zero Category K LHD in 2023



Note: No non-zero Category I LLD/LLE in 2023

PAC : Hot Spots

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

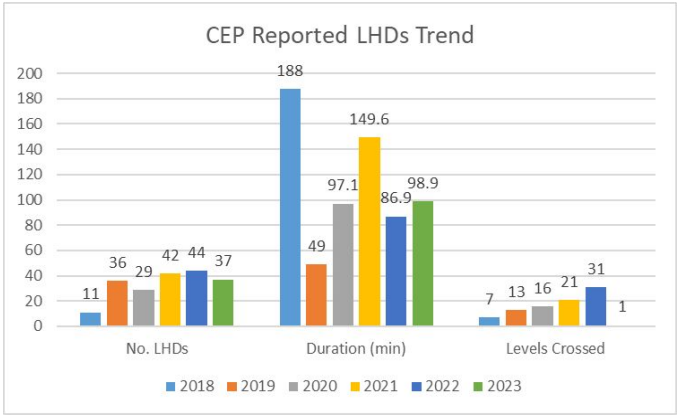
Nature of Occurrences : Coordination errors as a result of human factors issues (Category E)

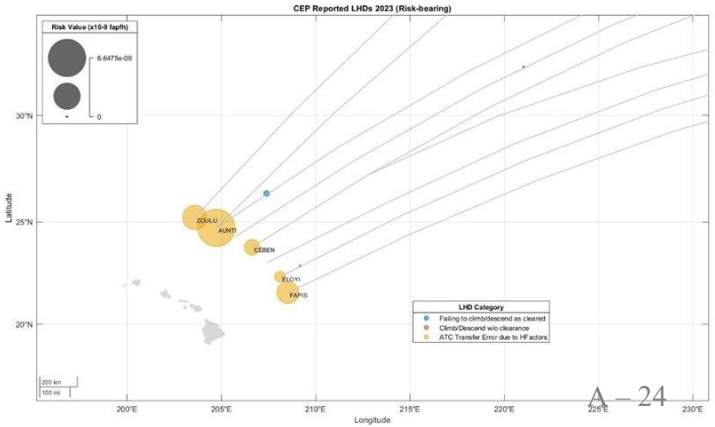
Contributing Factors : The reported LHDs occur within the high traffic volume in the Central East Pacific (CEP). These occurrences affect the CEP traffic and the user-preferred routes that cross the CEP airways.

Trend : Modifications were made to the vertical risk calculations to account for the one-way routes in the traffic flow. These adjustments have resulted in a lower vertical collision risk estimate, but still exceeds the TLS.

Mitigations : North America and Hawaii CEP have developed mitigation procedures. The long term mitigation is a new ATC system scheduled to be implemented at the Honolulu Control Facility in 2025.

Result from the hot spot identification process : This boundary continues to satisfy the hot spot criteria. Therefore, **Hot Spot N remains on the hot spot list**.





Asia Region

Asia : Vertical Collision Risk

ASIA : Vertical Collision Risk Estimates

Number of annual flying hours: 10,153,474 hours/year

2023 ASIA Area	Vertical Risk Estimate	Remark
Vertical Technical Risk	0.56×10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	2.84×10^{-9} FAPFH	
Vertical Overall Risk	3.40×10^{-9} FAPFH	Below TLS

ASIA : Vertical Collision Risk Estimates

2016 - 2023

Year	Vertical Overall Risk Estimate	Remark
2023	3.40 x 10^{-9} FAPFH	Below TLS
2022	1.53 x 10^{-9} FAPFH	Below TLS
2021	4.03 x 10^{-9} FAPFH	Below TLS
2020	7.42 x 10^{-9} FAPFH	Above TLS
2019	12.88 x 10^{-9} FAPFH	Above TLS
2018	15.50 x 10^{-9} FAPFH	Above TLS
2017	27.30 x 10^{-9} FAPFH	Above TLS
2016	12.53 x 10^{-9} FAPFH	Above TLS

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	**25**	**15.00**	**19**
	B	Flight crew climbing/descending without ATC Clearance	**12**	**12.75**	**12**
	C	Incorrect operation or interpretation of airborne equipment	**19**	**26.00**	**1**
ATC	D	ATC system loop error	**25**	**26.00**	**6**
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	**519**	**304**	**106**
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	**21**	**21.00**	**0.00**
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	**1**	**1.00**	**1**
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	**6**	**0.00**	**6**

Asia : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Weather/ Turbulence	I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level	82	0.20	62
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	19	1.50	19
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0.00	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	0	0.00	0
	M	Other	95	7.00	5
		Total	824	414.45	237

Asia : Horizontal Collision Risk

Asia : Horizontal Collision Risk Estimates

Number of annual flying hours: 503,528 hours/year

2023 Asia Area	Horizontal Risk Estimate	Airspace	Remark
Total Lateral Risk	1.517 x 10^{-9} FAPFH	ASIA	Below TLS
Total Longitudinal Risk	4.444 x 10^{-9} FAPFH	ASIA	Below TLS
2022 Asia Area	**Horizontal Risk Estimate**	**Airspace**	**Remark**
30NM Lateral Risk	0.068 x 10^{-9} FAPFH	SEA	Below TLS
50NM Lateral Risk	0.096 x 10^{-9} FAPFH	SEA	
30NM Longitudinal Risk	0.786 x 10^{-9} FAPFH	SEA	Below TLS
50NM Longitudinal Risk	0.475 x 10^{-9} FAPFH	SEA and SA/IO	Below TLS

Notes:

- The 2023 Horizontal collision risk estimates are combined into a single value using a weighted average.

Asia : Summary of LLDs and LLEs

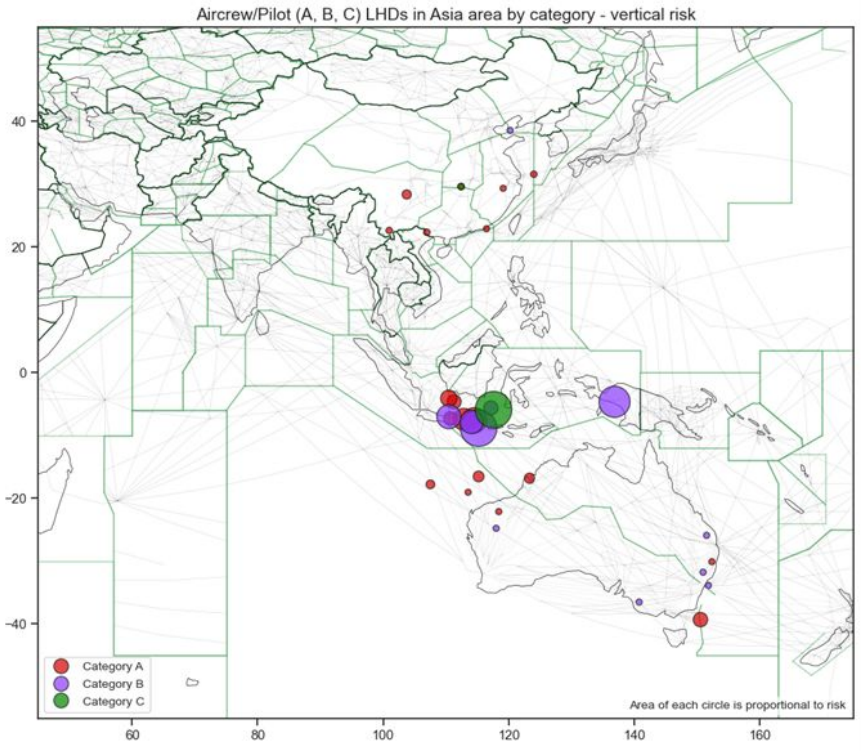
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	**5**	**0.00**	**0.00**	**104.00**
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	**1**	**0.00**	**0.00**	**32.00**
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	**0**	**0.00**	**0.00**	**0.00**
ATC	D	ATC system loop error	**0**	**0.00**	**0.00**	**0.00**
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	**4**	**0.00**	**1.00**	**0.00**
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	**0**	**0.00**	**0.00**	**0.00**

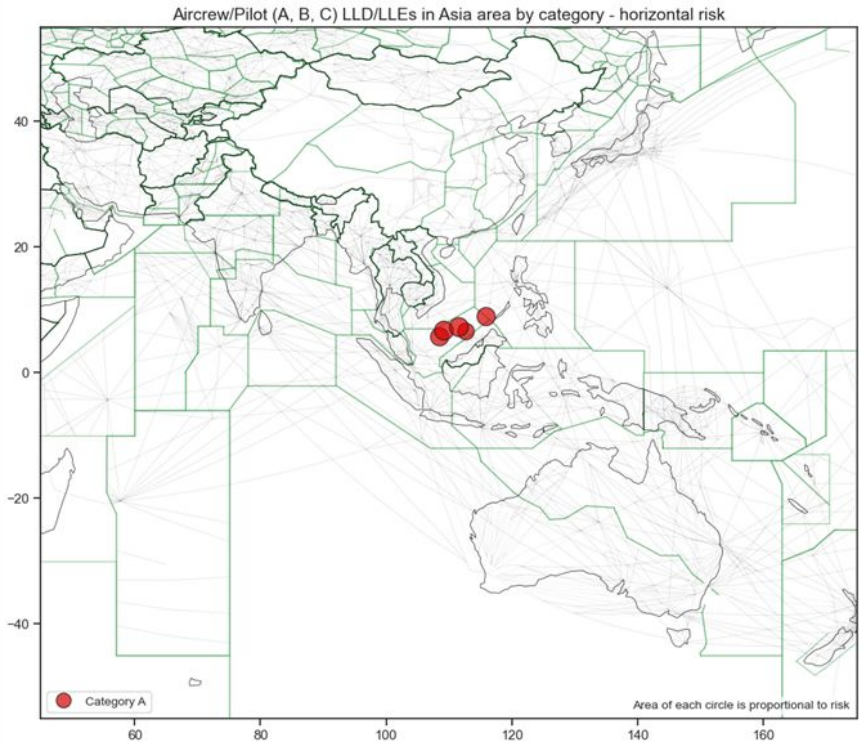
Asia : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	0	0.00	0.00	0.00
Weather/ Turbulence	H	Turbulence or other weather related causes leading to a deviation in the horizontal dimension	0	0.00	0.00	0.00
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0.00	0.00	0.00
	J	Other	0	0.00	0.00	0.00
		Total	**10**	**0.00**	**1.00**	**136.00**

Asia : Geolocation of LHDs/LLDs/LLEs

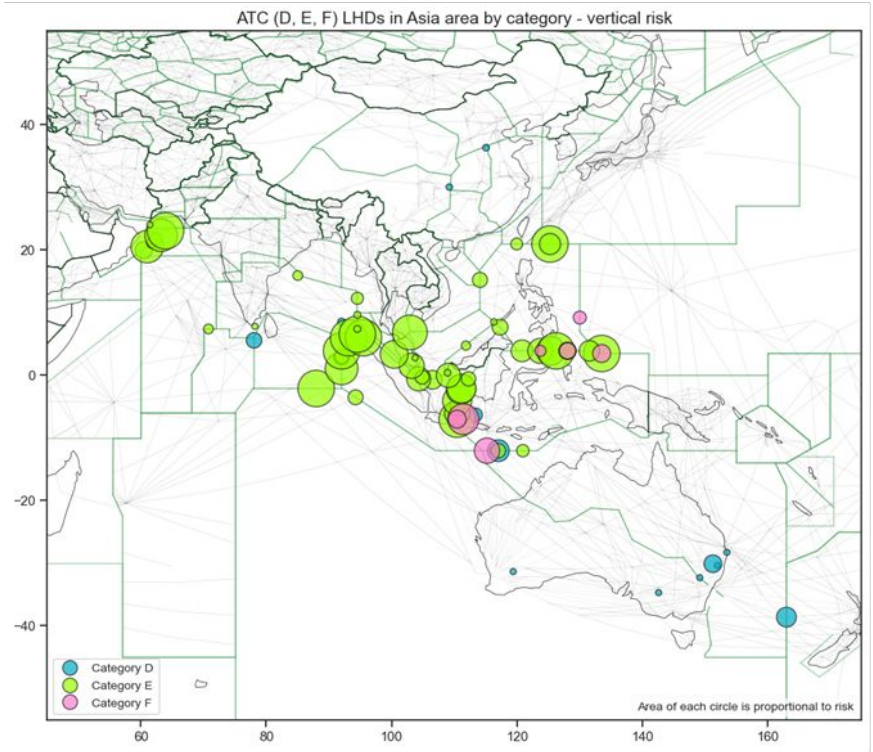
Asia : Aircrew/Pilot (A, B, C)

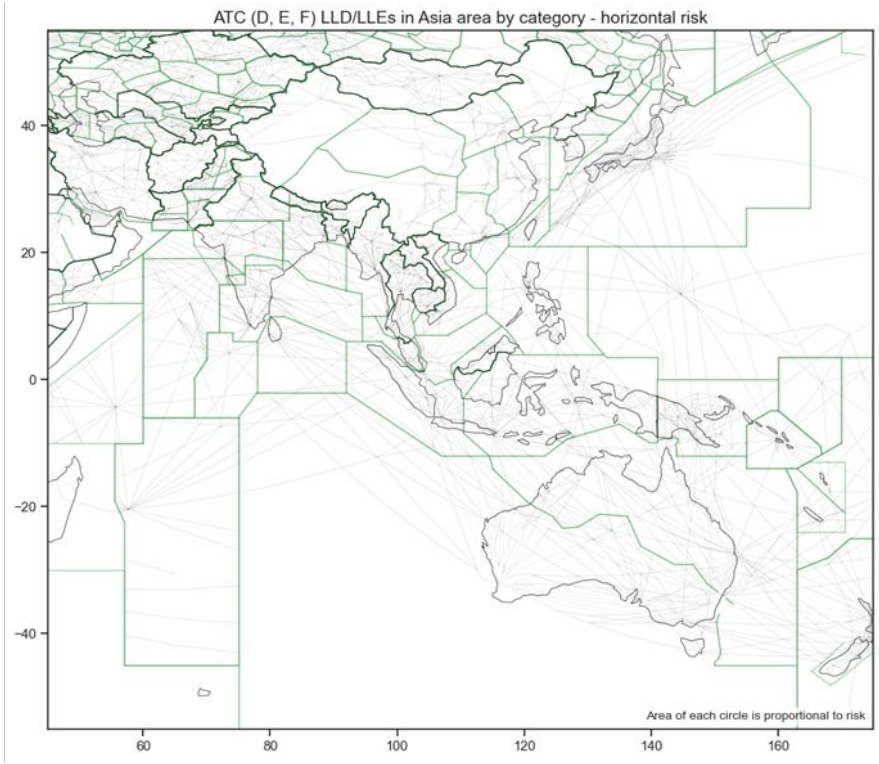




Note: No non-zero Category B and C LLD/LLE in 2023

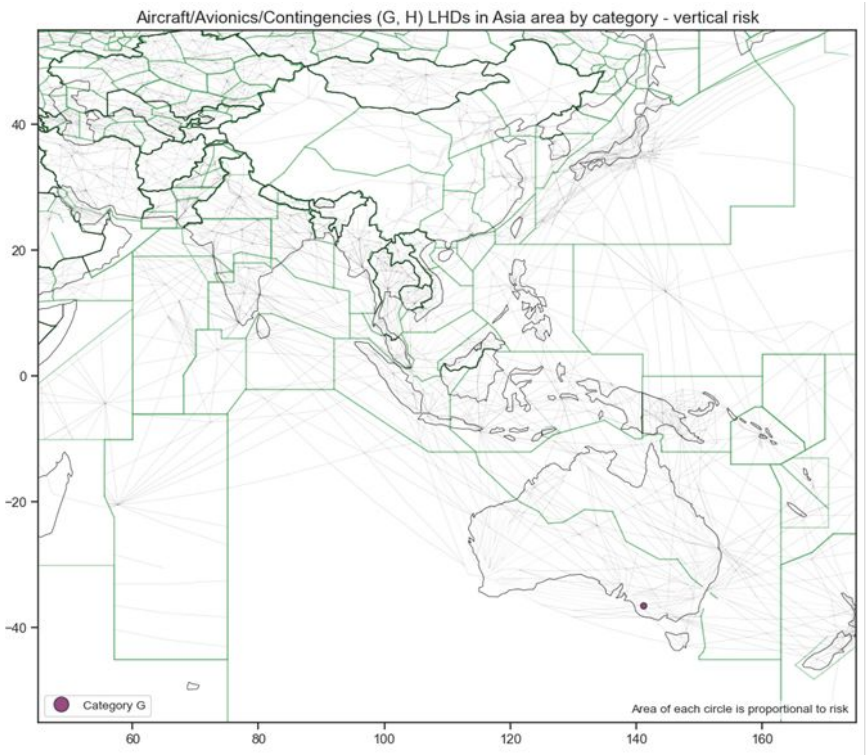
Asia : ATC (D, E, F)



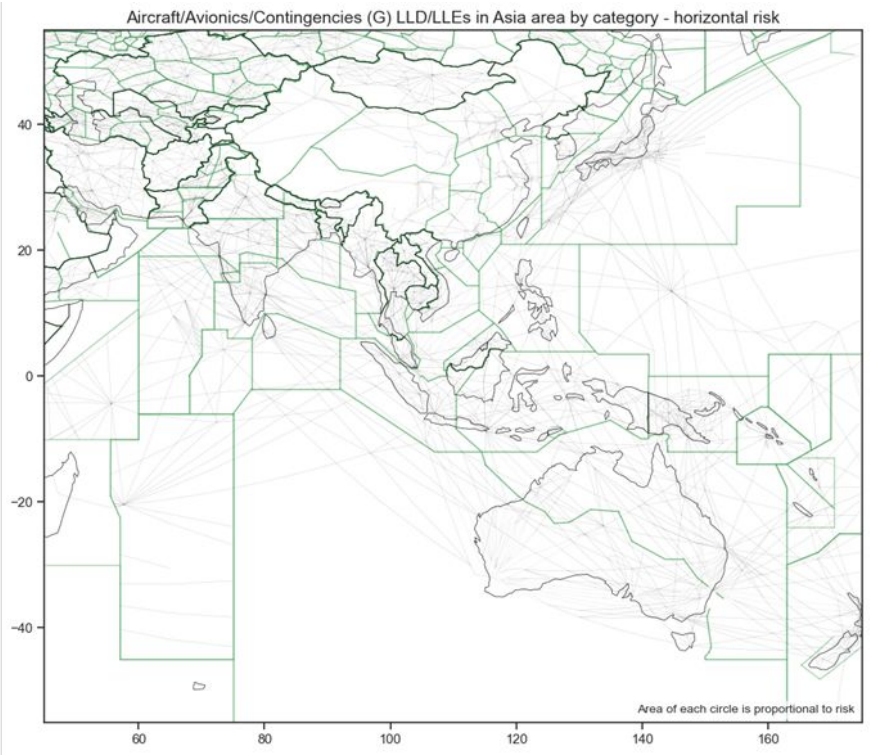


Note: No non-zero Category D, E and F LLD/LLE in 2023

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

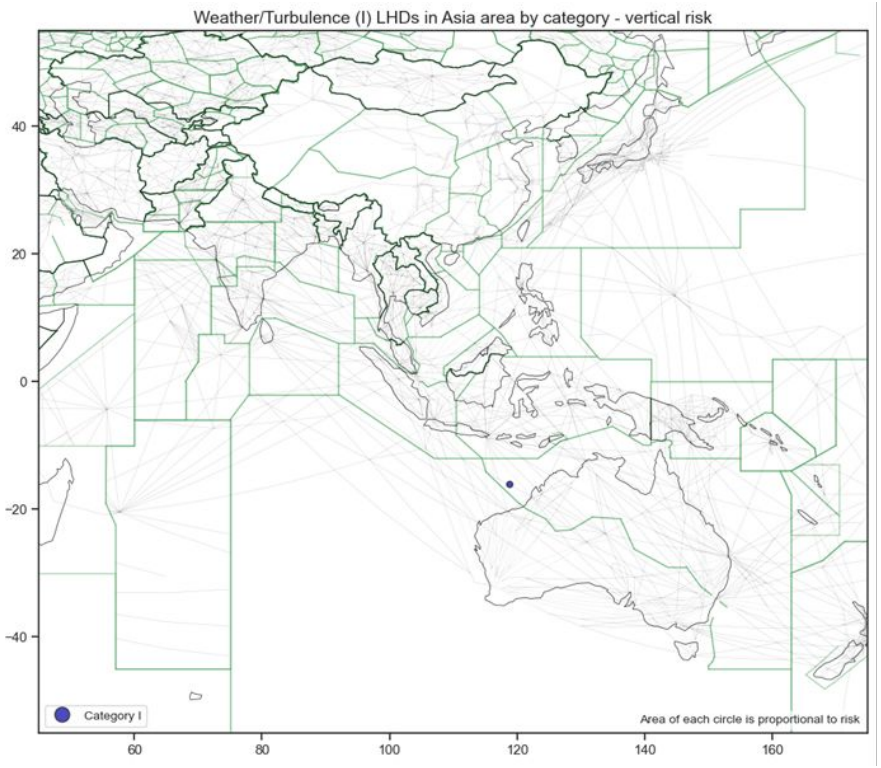


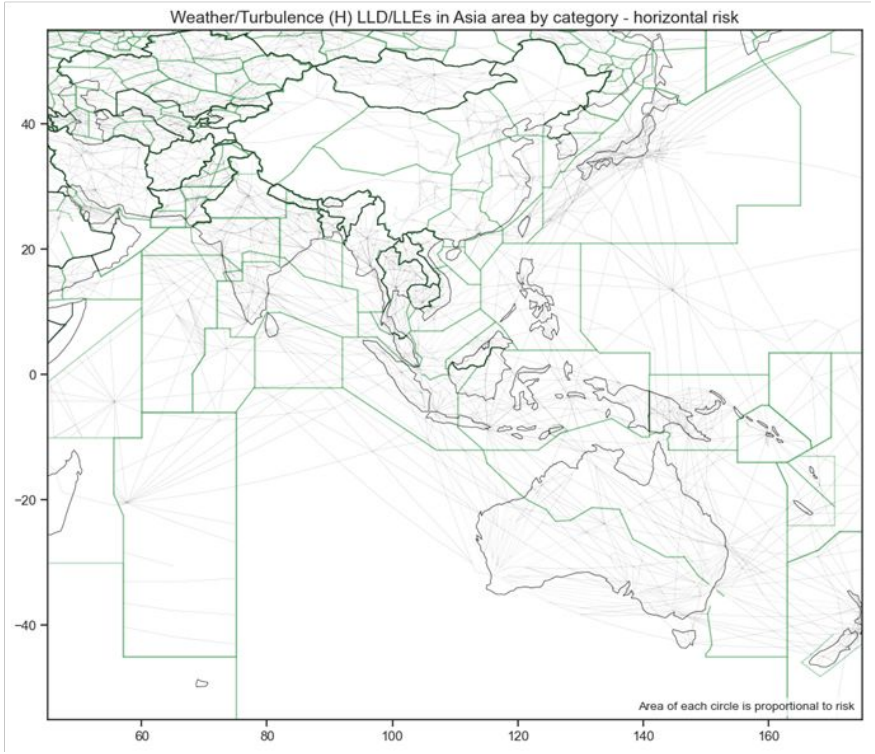
Note: No non-zero Category H LHD in 2023



Note: No non-zero Category G LLD/LLE in 2023

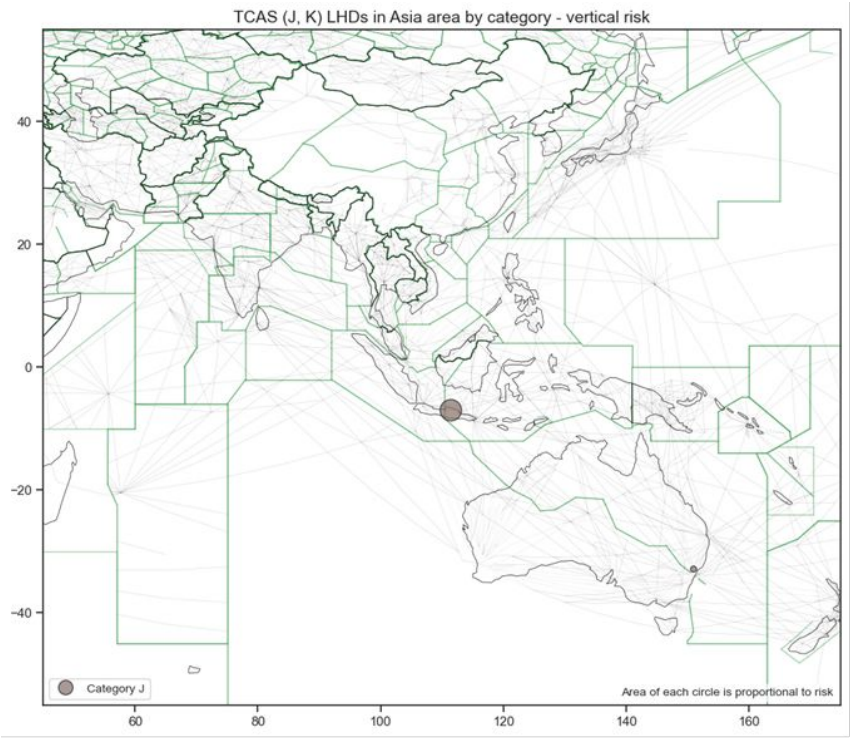
Asia : Weather/Turbulence (LHD:I, LLD/LLE:H)



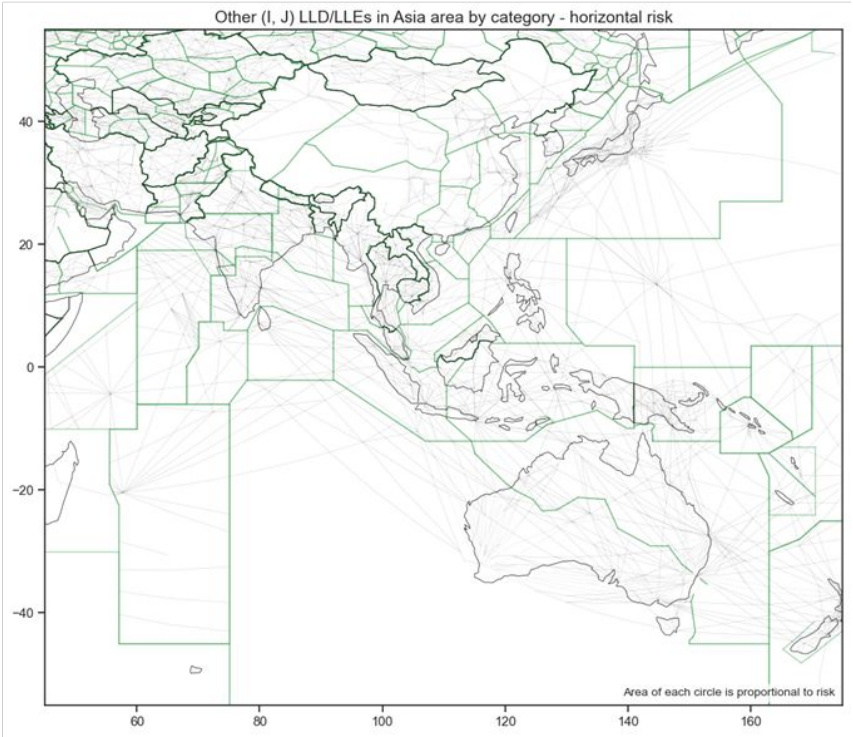


Note: No non-zero Category H LLD/LLE in 2023

Asia : TCAS (LHD:J, K)



Note: No non-zero Category K LHD in 2023



Note: No non-zero Category I and J LLD/LLE in 2023

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 : Some gaps in communication and surveillance coverage.

Trend : The number of LHDs slightly decreased in 2023. There was one non-zero-duration LHD, contributing to the operational risk of 0.06 x 10^{-9} FAPFH.

Mitigations :
- The surveillance was enhanced by Space-Based ADS-B of Indian FIRs and ADS-B data sharing among Kolkata ACC, Chennai ACC and Yangon ACC.
- The AIDC is initiated between Kolkata ACC/Chennai ACC and Yangon ACC, but has not been successfully operated yet.

Result from the hot spot identification process :
- Hot Spot A1 does not meet the hot spot criteria.
- However, **Hot Spot A1 remains on the hot spot list** and should be monitored until further safety improvement initiatives are implemented.

Boundary	The Number of LHDs		
	2021	2022	2023
Kolkata-Yangon	1	17	11
Chennai-Yangon	8	23	15
Boundary	**Operational Risk (FAPFH)**		
	2021	2022	2023
Kolkata-Yangon	0	0	0.00
Chennai-Yangon	0	0.02x10^{-9}	0.06x10^{-9}

Asia : LHD Hot Spot A2 (Chennai/Kuala Lumpur)

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

Contributing Factors : Some gaps in communication and surveillance coverage.

Trend : The number of LHDs decreased in 2023, but the operational risk increased from 0 to 0.23 x 10^{-9} FAPFH.

Mitigations :
- The surveillance was enhanced by Space-Based ADS-B of Indian FIRs.
- The AIDC operation was successfully implemented between Chennai ACC and Kuala Lumpur ACC since January 2021

Result from the identifying hot spots process :
- Hot Spot A2 does not satisfy any hot spot criteria for two consecutive years.
- **Hot Spot A2 is removed from the hot spot list,** because the safety improvement initiatives such as Spaced-Based ADS-B and the AIDC have been successfully operated.

Boundary	The Number of LHDs		
	2021	2022	2023
Chennai-KL	21	22	13
Boundary	**Operational Risk (FAPFH)**		
	2021	**2022**	**2023**
Chennai-KL	0.05 x 10^{-9}	0	0.23 x 10^{-9}

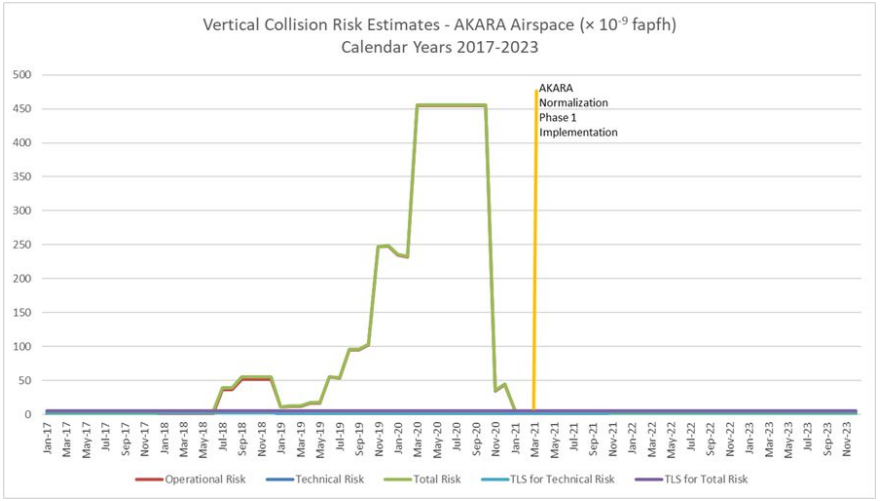
Asia : LHD Hot Spot B (AKARA Airspace)

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

Contributing Factors : The Flight Level Allocation Scheme (FLAS) limits available flight levels due to high traffic volume in the area. Existing LOA for provision of ATS.

Trend :
- Continued trend in the number of LHDs at Incheon-Shanghai TOC point.
- No reported LHD at Fukuoka-Incheon FIR boundary and within the Incheon FIR from 2021 to 2023. As a result, the vertical operational risk estimate was zero.

Mitigations :
- Significant route structure change was implemented in March 2021. The Phase I implementation included a parallel airway (Y590/Y591) to A593.
- Mitigations provided by the available surveillance and direct speech circuit.



Asia : LHD Hot Spot B (AKARA Airspace)

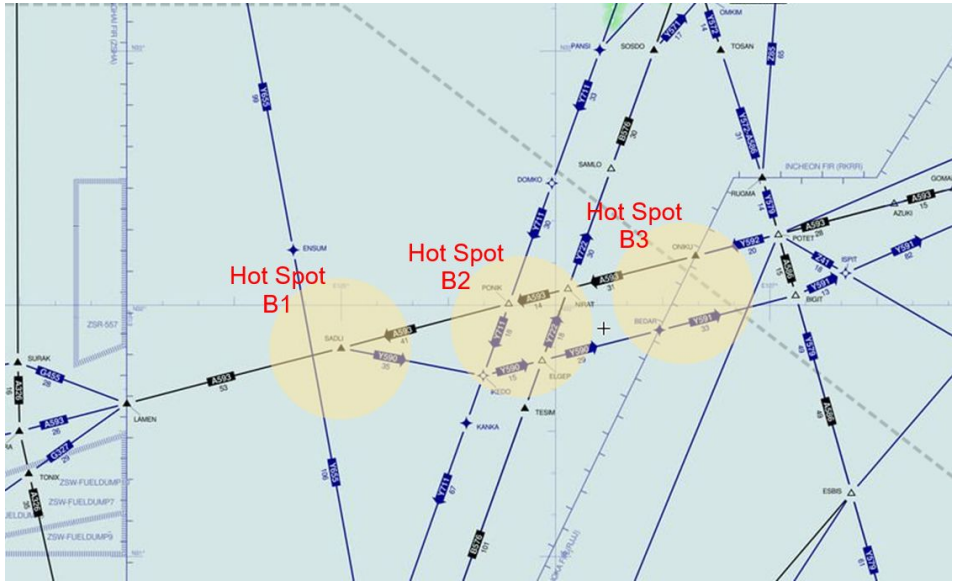
Subdivision of Hot Spot B :
During RASMAG MAWG/11, APAC monitoring agencies agreed to subdivide Hot Spot B into :

- B1 - Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)
- B2 - Incheon (Intersection points of A593, Y590, Y711, and Y722)
- B3 - Fukuoka/Incheon

Result from the identifying hot spots process :
In 2022 and 2023, only B1 met the criteria in terms of the number of LHDs.

B1 remains on the Hot Spot list, because it still meets the hot spot criteria and should be monitored until further safety improvement initiatives are implemented (such as AIDC and route structure reorganization as suggested by PARMO and ROK).

B2 and B3 are removed from the Hot Spot list, because no LHD has been reported at those areas for more than two years and the reorganization of route structure in Phase I was completed.



Asia : LHD Hot Spot D (Manila and adjacent FIRs)

Nature of Occurrences :
- Coordination errors as a result of human factors issues(Category E)
- Several coordination errors as a result of equipment outage or technical issues (Category F) emerging from AIDC failures.

Contributing Factors :
- Communication and surveillance coverage gaps along the boundaries of Manila FIR
- Verbal exchange of transfer information
- Sectors configuration of Manila ACC
- New ATM system and new infrastructure implementation such as AIDC

Trend : In 2023, the total number of LHDs and the operational risk increased.

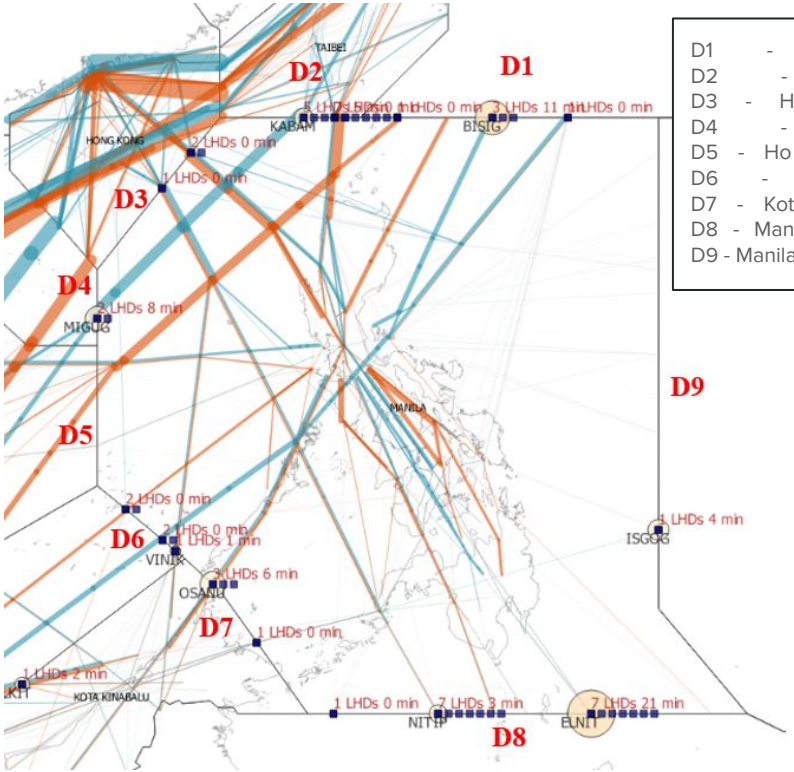
Mitigations :
- Several safety improvement activities such as the new ATM system, ACC sector re-sectorization, enhanced surveillance, and ADS-C/CPDLC have been implemented.

- Manila ACC and Fukuoka ACC have bilateral meetings regularly and agreed to implement a mitigation measure that would contribute to a reduction of transfer error due to human factors.

Boundary	Number of LHDs			Operational Risk (x 10^{-9} FAPFH)		
	2021	2022	2023	2021	2022	2023
Fukuoka/Manila	11	4	4	0.45	0.03	0.19
Ho Chi Minh/Manila	7	3	2	0.77	0.05	0.10
Hong Kong/Manila	2	1	3	0.00	0.00	0.00
Kota Kinabalu/Manila	2	3	5	0.00	0.04	0.13
Manila/Sanya	0	0	0	0.00	0.00	0.00
Manila/Singapore	2	2	4	0.00	0.04	0.00
Manila/Taibei	4	3	12	0.07	0.00	0.06
Manila/Ujung Pandang	7	2	15	0.36	0.11	0.41
Manila/Oakland	2	0	1	0.00	0.00	0.07
Total	**37**	**18**	**46**	**1.65**	**0.27**	**0.96**

Note: The number of LHDs and the operational risk in this table are based solely on the LHDs collected in MAAR's analysis.

Asia : LHD Hot Spot D (Manila and adjacent FIRs)



D1 - Fukuoka/Manila
D2 - Manila/Taibei
D3 - Hong Kong/Manila
D4 - Manila/Sanya
D5 - Ho Chi Minh/Manila
D6 - Manila/Singapore
D7 - Kota Kinabalu/Manila
D8 - Manila/Ujung Pandang
D9 - Manila/Oakland

Subdivision of Hot Spot D :
During RASMAG MAWG/11, APAC monitoring agencies agreed to subdivide Hot Spot D to 9 interfaces (D1 to D9).

Result from the identifying hot spots process :
D1 met the criteria in terms of the operational risk in 2023 (JASMA).
D8 met the criteria in terms of the operational risk in 2023.

The remaining subdivisions did not meet any of the hot spot criteria in the last two years. However, AIDC was successfully implemented at D2, D3, D4, D6, and D9.

Thus, D2, D3, D4, D6, and D9 are removed from the Hot Spot list.

D1, D5, D7, and D8 remain on the Hot Spot list and should be monitored until further safety improvement initiatives such as AIDC are implemented.

Asia : LHD Hot Spot F (Mogadishu/Mumbai)

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

Contributing Factors : The Mogadishu-Mumbai FIR boundary (Waypoint: ORLID, Route: G450) is in the oceanic airspace with poor communication and surveillance coverage.

Trend : The number of LHDs slightly increased in 2023. The operational risk conversely decreased to 0 FAPFH.

Mitigations :
- The Space-Based ADS-B enhances surveillance capability of Indian FIRs.
- AIDC implementation between Mumbai and Mogadishu ACC remains in the testing phase.

Boundary	The Number of LHDs		
	2021	2022	2023
Mogadishu-Mumbai	5	9	10
Boundary	**The Operational Risk (FAPFH)**		
	2021	**2022**	**2023**
Mogadishu-Mumbai	0.12×10^{-9}	0.02×10^{-9}	0.00×10^{-9}

Result from the identifying hot spots process :
- Even though this area does not satisfy any hot spot criteria, **Hot Spot F remains on the hot spot list** until further safety improvement initiatives or prevention measures such as AIDC are completed and demonstrate their effectiveness.

Asia : LHD Hot Spot G (Mumbai/Muscat/Sanaa)

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

Contributing Factors : Mumbai-Muscat and Mumbai-Sanaa FIR boundaries are oceanic airspace with poor communication and surveillance coverage.

Trend : At Mumbai-Muscat, the number of LHDs and the operational risk significantly increased in 2023. Conversely, at Mumbai-Sanaa, the number of LHDs remained low over the past three years, with the operational risk being zero in both 2022 and 2023.

Mitigations :
- The Space-Based ADS-B enhances surveillance capability of Indian FIRs.
- AIDC implementation between Mumbai ACC and Muscat ACC remains in the testing phase.

Result from the identifying hot spots process :
- Hot Spot G, particularly at Mumbai-Muscat FIR boundary, met the criteria in terms of both the number of LHDs and the operational risk in 2023.
- **Hot Spot G remains on the hot spot list** until further safety improvement initiatives or prevention measures such as AIDC are completed and demonstrate their effectiveness.

Boundary	The Number of LHDs		
	2021	2022	2023
Mumbai-Muscat	44	43	138
Mumbai-Sanaa	4	2	3
Boundary	**The Operational Risk (FAPFH)**		
	2021	**2022**	**2023**
Mumbai-Muscat	1.35×10^{-9}	0.79×10^{-9}	2.79×10^{-9}
Mumbai-Sanaa	0.07×10^{-9}	0.00×10^{-9}	0.00×10^{-9}

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

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

Contributing Factors : To be analysed

Trend : The number of LHDs and operational risk significantly increased in 2023. However, the operational risk remained below the TLS.

Mitigations : AAMA is working with SEASMA to share and confirm the information about LHDs on the Jakarta–Singapore FIR boundary. AirNav Indonesia is working towards implementation of AIDC, which could mitigate coordination errors due to human factors issues.

Result from the identifying hot spots process :
This boundary satisfied the hot spot criteria in terms of the number of LHDs from 2021 to 2023. Therefore, **Hot Spot J remains on the hot spot list**.

Boundary	The Number of LHDs		
	2021	2022	2023
Jakarta – Singapore	16	14	27
Boundary	**The Operational Risk (FAPFH)**		
	2021	**2022**	**2023**
Jakarta – Singapore	0.23×10^{-9}	0.18×10^{-9}	0.33×10^{-9}

Asia : LHD Hot Spot M (Colombo/Melbourne)

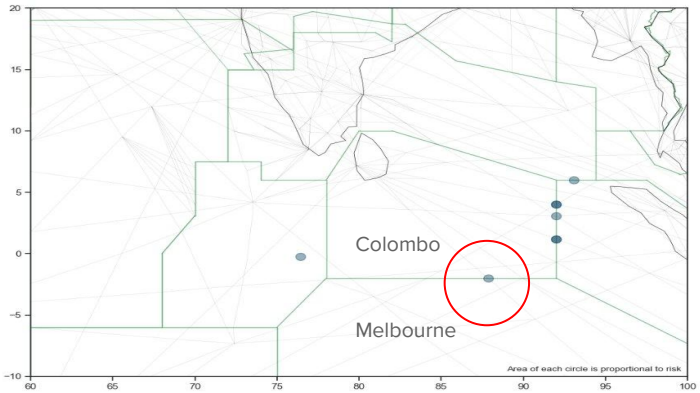
Nature of Occurrences : Category A, B, and E LHDs.

Contributing Factors : A large number were pilot errors involving the Indian Navy.

Trend : Since 2019, the number of LHDs at Hot Spot M has been decreasing, so RASMAG/26 proposed to re-classify as a non-Hot Spot. However, AAMA and MAAR still do not have a suitable contact for the Indian Navy.

Mitigations : In 2020, the re-sectorisation was implemented at Colombo oceanic airspace. The awareness and training on this issue were also provided to ATCOs in both Colombo and Melbourne OCCs.

For this reason, **Hot Spot M is removed from the Hot Spot list.**



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 operational risk and the number of LHDs slightly decreased in 2023. However, the proportion of operational risk, at 28%, remains high compared to the total operational risk in SEA airspace.

Result from the identifying hot spots process : This area satisfied the hot spot criteria in terms of the operational risk in 2022 and 2023. Therefore, **Hot Spot O remains on the hot spot list**.

Boundary	The Number of LHDs		
	2021	2022	2023
Hot Spot O	5	7	5
Boundary	**The Operational Risk (FAPFH)**		
	2021	**2022**	**2023**
Hot Spot O	0.14×10^{-9}	0.58×10^{-9}	0.51×10^{-9}

Reporting Rate
of LHDs/LLDs/LLEs

2023 Reporting Rate of LHDs/LLDs/LLEs

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	83,708	0	-	0	-	0	-	0	-
SEA	2,969,413	6	1: 494,902	92	1: 32,276	3	1: 98,804	101	1: 29,400
Japan	1,688,572	12	1: 140,714	16	1: 105,536	44	1: 38,377	72	1: 23,452
SW Pacific	1,182,067	33	1: 35,820	28	1: 42,217	4	1: 295,517	65	1: 18,186
China	2,346,976	9	1: 260,775	19	1: 123,525	195	1: 12,036	223	1: 10,525
SA/IO	2,642,401	1	1: 2,642,41	256	1: 10,322	1	1: 2,642,401	258	1: 10,242
Pacific	1,773,499	37	1: 47,932	160	1: 11,084	6	1: 295,583	203	1: 8,736
Indonesia	762,410	13	1: 58,647	111	1: 6,869	1	1: 762,410	125	1: 6,099
ROK and AKARA	166,500	0	-	75	1: 2,220	0	-	75	1: 2,220
Total	13,615,545	111	1: 122,663	757	1: 17,986	254	1: 53,605	1,122	1: 12,135

Notes:

- No aircraft flying in the RVSM airspace of DPRK due to public health crisis in 2023. As a result, there were no flying hours and no reported LHDs, LLDs, or LLEs for DPRK.

Reporting Rate of LHDs/LLDs/LLEs

Airspace	# Reports							1 Report : Flying Hrs						
	2017	2018	2019	2020	2021	2022	2023	2017	2018	2019	2020	2021	2022	2023
DPRK	0	0	0	0	0	0	0	-	-	-	-	-	-	-
Mongolia	4	1	2	0	1	0	0	1: 37,771	1: 158,891	1: 82,138	-	1: 121,621	-	-
SEA	474	205	152	42	70	62	95	1: 6,548	1: 17,757	1: 22,275	1: 25,106	1: 15,456	1:32,620	1:29,400
Japan	71	76	77	66	80	75	67	1: 21,510	1: 20,632	1: 20,762	1: 14,737	1: 13,528	1:18,751	1:23,452
SW Pacific	51	53	101	46	47	81	65	1: 17,572	1: 17,817	1: 9,335	1: 6,954	1: 11,975	1:5,352	1:18,186
China	134	110	79	85	105	72	223	1: 18,248	1: 22,229	1: 31,119	1: 26,867	1: 15,477	1:18,003	1:10,525
SA/IO	935	681	439	152	135	143	254	1: 3,166	1: 3,783	1: 7,955	1: 7,907	1: 11,167	1:21,018	1:10,242
Pacific	42	43	173	134	176	179	193	1: 54,191	1: 45,064	1: 10,139	1: 6,404	1: 6,638	1:8,280	1:8,736
Indonesia	34	23	37	18	41	54	125	1: 10,842	1: 53,603	1: 33,321	1: 17,346	1: 7,402	1:8,060	1:6,099
ROK and AKARA	5	12	34	5	24	108	75	1: 117,090	1: 28,365	1: 18,959	1: 25,965	1: 6,285	1:1,056	1:2,220
Total	**1,750**	**1,204**	**1,094**	**548**	**679**	**774**	**1,122**	**1: 8,180**	**1: 12,332**	**1: 14,330**	**1: 13,202**	**1: 11,200**	**1:13,230**	**1:12,135**

The reporting rate for SEA, China, SA/IO and Indonesia improved in 2023.
The reporting rate for SW Pacific dropped because of the huge increase in the estimated flying hours.

Notes:

- The flying hours for Indonesian airspace in 2021 was calculated based on the 2020 TSD.
- The flying hours for SW Pacific and Indonesian airspace in 2022 were calculated based on the 2021 TSD.

Conclusion

RVSM TLS Compliance - Vertical

- **The 2023 PAC vertical overall risk is 10.77 x 10^{-9} FAPFH, above the TLS,** mostly driven by Hot Spot N (Hawaii CEP/Oakland USA). To address this hot spot, the responsible units have already implemented mitigation procedures while planning for an ATM system upgrade to begin in 2025 to resolve the issue.
- **The 2023 ASIA vertical overall risk is 3.40 x 10^{-9} FAPFH, below the TLS.**

RVSM TLS Compliance - Horizontal

- **All horizontal risk estimates in 2023 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 reducing.
A2	Chennai/Kuala Lumpur	2015	Cat. E LHDs reducing. Risk slightly increasing. Removed from the Hot Spot list in 2024 (RASMAG/29).
B1	Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)	2015	Cat. E LHDs and risk reducing.
B2	Incheon (Intersection points of A593, Y590, Y711, and Y722)	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
B3	Fukuoka/Incheon	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D1	Fukuoka/Manila	2015	Cat. E LHDs reducing. Risk slightly increasing.
D2	Manila/Taibei	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D3	Hong Kong/Manila	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D4	Manila/Sanya	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D5	Ho Chi Minh/Manila	2015	Cat. E LHDs reducing. Risk slightly increasing.
D6	Manila/Singapore	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).

RASMAG's Hot Spot List

Hot Spot	Involved FIRs	Identified	Remarks
D7	Kota Kinabalu/Manila	2015	Cat. E LHDs and risk slightly increasing.
D8	Manila/Ujung Pandang	2015	Cat. E & F LHDs and risk increasing.
D9	Manila/Oakland	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
F	Mogadishu/Mumbai	2015	Cat. E LHDs slightly increasing. Risk reducing.
G	Mumbai/Muscat/Sanaa	2015	Cat. E LHDs and risk increasing.
J	Jakarta/Kota Kinabalu/Singapore	2018	Cat. E LHDs and risk increasing.
M	Colombo/Melbourne	2019	Removed from the Hot Spot list in 2024 (RASMAG/29).
N	Hawaii CEP/Oakland USA	2019	Cat. E LHDs and Risk reducing.
O	Bangkok/Ho Chi Minh/Kuala Lumpur/ Singapore	2023	Cat. E LHDs and Risk reducing.

Reporting Rate of LHDs/LLDs/LLEs

- The estimated flying hours significantly increased from

  7,604,927 hours in 2021 and
  10,240,138 hours in 2022 to
  13,615,545 hours in 2023.

- The overall reporting rate of LHDs/LLDs/LLEs slightly improved from

  1 report per 13,230 hours in 2022 to
  1 report per 12,135 hours in 2023.

- The reporting rate for SEA, China, SA/IO and Indonesia improved in 2023.
- The reporting rate for SW Pacific dropped because of the huge increase in the estimated flying hours.
- The reporting rate for DPRK could not be calculated because there were no flying hours and no reported LHDs, LLDs, or LLEs due to a public health crisis (no aircraft flying in DPRK's RVSM airspace in 2023.)
- The reporting rate for Mongolia could not be calculated because no LHDs, LLDs, or LLEs were reported. Mongolia submitted NIL reports for all months in 2023.

Thank You