International Civil Aviation Organization

Twelfth Meeting of the Air Traffic Management Sub-Group (ATM/SG/12) of APANPIRG

Bangkok, Thailand, 23 – 27 September 2024

Agenda Item 3: Performance Frameworks and Metrics

FIT-ASIA AND RASMAG OUTCOMES

(Presented by Secretariat)

SUMMARY

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

1. INTRODUCTION

1.1 The 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.

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

1.3 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

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 for task 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).**

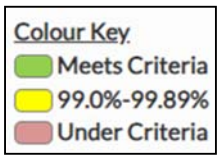


Figure 1: Revised Colour Key Code for Yellow Acceptable Performance

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 (**RASMAG/29 Appendix C**);*
2. *EXAMPLE - Data Link Performance Report Template – ANSP to FIT (**RASMAG/29 Appendix D**); and*

*3. Aggregated Regional Data Link Performance Report Template - FIT to RASMAG (**RASMAG/29 Appendix E**)*

Future Direction of FIT-Asia

2.8 The Secretariat provided information on the history and progress of FIT-Asia. The number of Working Papers (WP) and Information Papers (IP) provided by States/Administrations, International Organisations, CRA, and Regional Monitoring Agencies (RMAs) 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 following were proposed:

a) 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.

b) China, Japan, New Zealand, USA, Boeing, and Inmarsat expressed their support for the future seminar/workshop. Additionally, New Zealand expressed their willingness to support the PBCS implementation individually if a State required it, particularly in PBCS data analysis. Subsequently, States were encouraged to reach out to New Zealand.

2.10 In response to a query regarding the action by the meeting, it was clarified that some States provided only data collection and there was a lack of analysis and rectifications for PBCS non-compliance. Therefore, States are 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).

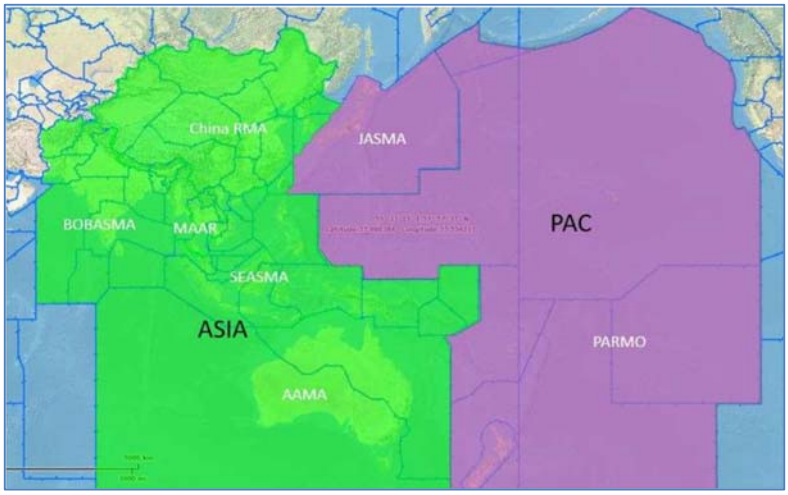


Figure 2: Asia and Pacific Safety Reporting Areas

Pacific Area Vertical Collision Risk

2.13 The estimated vertical collision risk for 2023 for the PAC area did not meet TLS. (**Table 3**).

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 and trending upwards each year from 2016 to 2019. 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. There was a total of 824 LHDs reported in the Asia area in 2023 (increased compared to 518 in 2022), with total duration 414.45 minutes and 237 levels crossed.

Table 6: Asia Area Vertical Collision Risk 2023

Asia Area – annual flying hours = 10,153,474 hours (38% increase from 2022)			
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 136 NM.

Table 8: Asia Area Horizontal Collision Risk 2023

Asia Area – annual flying hours = 503,528 hours (51% increase from 2021)			
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	# 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
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
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
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
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
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
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 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).
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 (Jakarta/Kota Kinabalu/Singapore) for the meeting of RASMAG/30 in 2025 or to the responsible RMAs before the meeting.

RVSM Risk Assessment in the Brisbane, Honiara, Melbourne, Nauru and Port Moresby, FIRs and the Indonesian FIRs – 1 January to 31 December 2023

2.24 The Australian Airspace Monitoring Agency (AAMA) provided an airspace safety review of RVSM airspace risk within the Brisbane, Honiara, Melbourne, Nauru and Port Moresby FIRs for the period 1 January to 31 December 2023. RVSM Risk Estimates for the period 1 January to 31 December 2023 was **1.51 x 10^{-9}**. The number of estimated annual flying hours was 1,182,067 based on the December 2023 TSD.

2.25 AAMA also provided an airspace safety review of RVSM airspace risk in the Jakarta and Ujung Pandang FIRs for the period 1 January to 31 December 2023. The total risk in 2023 (**5.35 x 10^{-9}**) had increased from the value reported for the period 1 January to 31 December 2022 at RASMAG/28 (then 3.24 x 10^{-9}). This appeared to be due to an improvement in reporting culture and a value marginally above the TLS was not of major concern and would be monitored closely in future analysis.

2.26 Almost 60% of the operational risk Jakarta and Ujung Pandang FIRs was represented by 36 Category E LHDs (ATC coordination error as a result of human factor issues). All involved aircraft flying on 2-way routes, and they reported an average of 2.9 flight levels crossed and 1.2 minutes in duration.

2.27 In the period 1 January to31 December 2023, the number of LHDs with Aircrew/Pilot attribution, 13, was almost 10% of the number of LHDs with ATC attribution, at 111. Of the 103 Category E LHDs, 63 reports corresponded to errors made by neighbouring ATCs, and 40 report correspond to errors made by Jakarta or Ujung Pandang ATCs.

Hot Spot Analysis

2.28 The updated mitigation measures for Hot Spot M (Colombo/Melbourne) were presented to the meeting for consideration and together with decreasing number of LHDs, enabled RASMAG to agree to the removal as a hot spot. They included:

a) Re-sectorisation in Colombo oceanic airspace since 2020; and

b) Awareness and training on topic of non-RVSM approved Indian military aircraft were also provided to ATCOs in both Colombo and Melbourne OCCs.

2023 Analysis for the Incheon FIR AKARA Corridor Interface with Shanghai/Fukuoka/Taibei FIRs

2.29 PARMO provided an update on the analysis of the Incheon FIR AKARA corridor airspace interface with Shanghai/Fukuoka/Taibei FIRs using TSD and LHD reports from calendar years 2015 – 2023. The China RMA, JASMA, MAAR and PARMO provided the relevant LHD reports to the PARMO for analysis.

2.30 There were 74 reported LHDs in 2023 for the AKARA airspace. A reduction in the number of reported LHDs compared noted in calendar year 2022. All reported LHDs were involved ATC coordination, and all reported occurrences were mitigated with available surveillance, direct speech circuit or other means. There was no contribution towards the vertical operational risk estimate from the reported LHDs in 2023. China RMA, JASMA and PARMO shared the reported occurrence details for this report.

2.31 The twelve-month rolling vertical collision risk estimates for AKARA airspace for 2017 through 2023 was shown in **Figure 3**. The 2023 vertical technical risk estimate of 0.57×10^{-9} fapfh met the TLS for vertical technical risk, the technical risk TLS is 2.5×10^{-9} fapfh. The overall vertical risk estimate of **0.57×10^{-9}** fapfh met the overall vertical TLS of 5×10^{-9} fapfh.

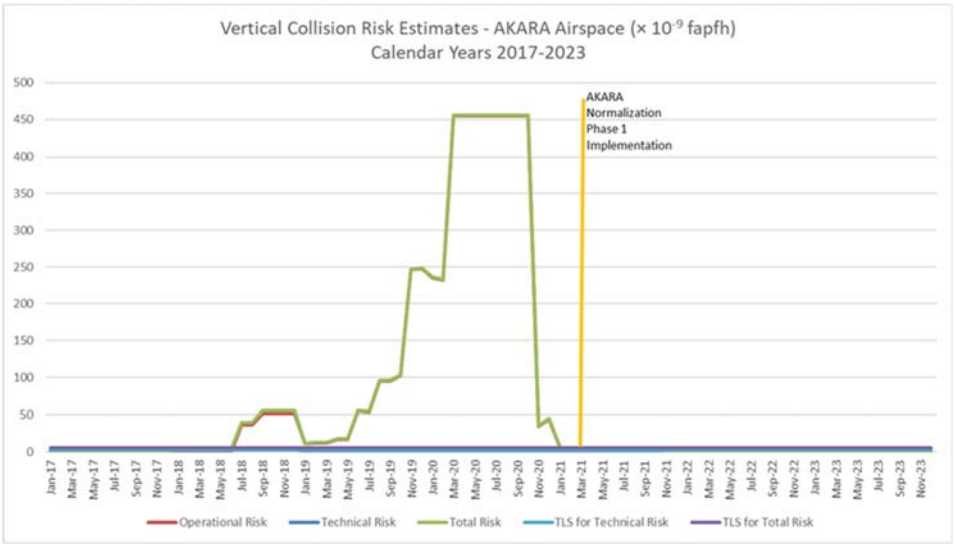


Figure 3: Twelve-month Rolling Vertical Collision Risk Estimates

Hot Spot Identification Process

2.32 The Hot Spot Identification process was applied to Hot Spot B. The RASMAG/MAWG/11 Meeting agreed to split Hot Spot B into smaller areas at the interface level. The Hot Spot B was divided into three smaller areas as follows (**Figure 4**):

a) B1 for Incheon (Transfer-of-control Point between Incheon ACC and Shanghai ACC);

b) B2 for Incheon (Intersection points of A593, Y590, Y711 and Y722; and

c) B3 for Fukuoka and Incheon.

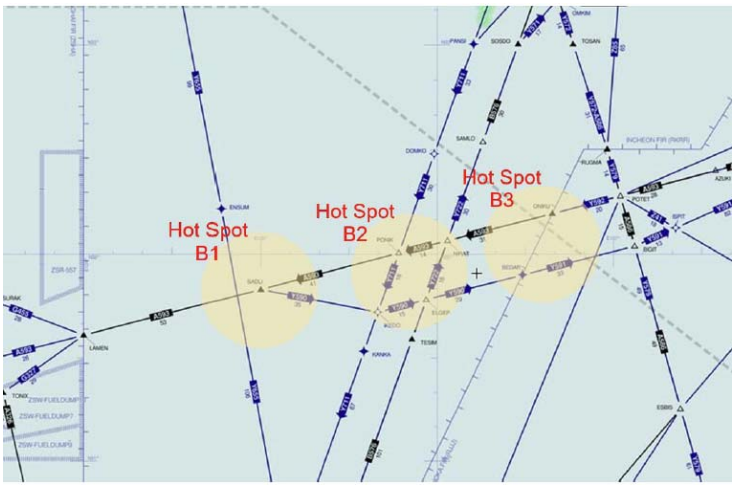


Figure 4: Subdivisions for Hot Spot B

2.33 The number of clusters for Hot Spot B reduced from 2 to 1 in calendar year 2021. This change was associated with the Phase 1 of the AKARA Corridor Improvement Plan implemented in March 2021. The change in the number of observed clusters contributed to the reason for the subdivision of Hot Spot B area. For RASMAG to remove an LHD hot spot, proof of mitigation measures should be presented, and the implementation results should reflect the effectiveness of risk controls in terms of reduction in the number of occurrences and operational risk of the hot spot. The observed results from

these mitigation measures have been reported zero occurrences since March 2021 when the mitigations at B2 and B3 areas were introduced.

2.34 For Hot Spot B1, the process to relay the reported occurrences began with the reporting ATC-unit sending the report to the designated RMA. That RMA emailed the other RMA with the received reported occurrences, and finally the RMA sent the reports to the adjacent ATC-unit. Due to the lag time built into the report relay process, data retention for the adjacent ATC-unit often had expired before the occurrence can be investigated. Without the identification of underlying causes, corrective action was not possible. The meeting was asked to consider ideas to provide the occurrence reports to the adjacent ATC-unit within a time that allowed for the determination of underlying causal factors.

2.35 The meeting was appraised on the two options available for data sharing:

a) MAAR's online LHD reporting platform; and

b) ICAO Secure Portal.

2.36 Another suggestion offered by the Chair was the consideration of enhancement to the current email exchange protocol among the China, China RMA, Republic of Korea and PARMO to assist with the timeliness of data sharing. Specifically, Republic of Korea proposed the exchange LHD information by email once it occurs (or weekly, 2 times a month, etc.) to facilitate analysis of LHD occurrence.

Measures to Reduce LHD Occurrence between Shanghai and Incheon ACCs

2.37 Republic of Korea presented the analysis of the current status of LHD occurrences after the implementation of Phase 1 of the A593 normalisation and proposed various measures to improve safety and reduce LHD in this area.

2.38 After the Phase 1 implementation, Incheon Area Control Center (ACC) has been providing air traffic services to the 125°E of the corridor area where Fukuoka ACC had been responsible for the provision of air traffic services. In addition, Incheon ACC established the Y590 route parallel to the A593, and signed the Letter of Agreement (LOA) and established direct communication lines with Shanghai ACC. LHDs have occurred continuously in this area since Incheon ACC began to provide air traffic control service in March 2021.

2.39 Republic of Korea suggested the following mitigation to reduce LHDs:

a) to implement ATS Inter-facility Data Communication (AIDC) between Incheon ACC and Shanghai ACC;

b) add more ATS routes through the implementation of the second phase of A593 normalization;

c) reduce separation minima between Incheon and Shanghai ACCs; and

d) share safety (oversight) information of the delegated airspace (SADLI-LAMEN) between the two States.

2.40 In response to a query, ICAO clarified that the AKARA Corridor Technical Working Group (TWG) was first organised by ICAO HQ with the relevant stakeholders in 2019 and the implementation of Phase 1 was completed in 2021 with the transition to Phase 2 to follow swiftly. As of this Meeting, the TWG secretariat has not received information from any of the TWG stakeholders for further discussion.

2.41 China RMA stated that Republic of Korea's proposal d) was beyond the interaction between RMAs and States. Shanghai ACC submitted LHDs to China RMA and confirm the information

in time for investigation. The meeting was also informed that China has been making efforts to improve the safety and efficiency in the area, the issue of AKARA airspace is complicated and includes more operational issues than LHD, and there are many ways to mitigate the issue in the area such as releasing more flight levels to Shanghai ACC. China also informed the meeting that the Stakeholders were discussing a "package of resolution" including but not limited to AIDC. However, Republic of Korea opined that a consolidated "package of resolution" approach might delay the mitigations for LHD occurrences.

2.42 The meeting was encouraged to hear of the annual bilateral meeting (resumed in 2022 after the pandemic) between China and Republic of Korea was planned in September 2024 to discuss various operational issues. Consequently, Republic of Korea has planned to table the above-mentioned topics for LHD mitigation discussion during the bilateral meeting.

China RMA Vertical Safety Report

2.43 The China RMA provided an RVSM safety report for nine Chinese FIRs (excluding Hong Kong and Taibei FIRs), and the Pyongyang FIR (Democratic People's Republic of Korea). The 2023 RVSM risk estimates for the Chinese FIRs indicated that the TLS had been met, at **0.75×10^{-9}** fapfh. In addition, there was no LHD event and zero flying hour in in Pyongyang FIR due to world public health crisis in 2023, so the operational risk, the technical risk and the total risk remained 0.

2.44 According to the result of cluster identification, there was no hot spot in Chinese airspace and there was also no high-risk event occurred in 2023. It was explained that the high number of CAT I LHDs was due to the requirement for pilots to report all deviations including turbulence and weather-related events to ATC.

JASMA Vertical Safety Report

2.45 JASMA provided the airspace safety oversight assessment of the RVSM implementation in the Fukuoka Flight Information Region (FIR). The total risk for the reporting period from 1 January to 31 December 2023 was **2.36×10^{-9}** fapfh, which met the TLS and was improved from the risk reported to RASMAG/27 (9.52×10^{-9} fapfh).

2.46 The traffic volume of Fukuoka FIR in 2023 was approximately 83% of it in 2019, which was a peak traffic volume before the COVID-19 pandemic. The traffic volume of Fukuoka FIR showed a solid recovery trend and estimated that the traffic volumes of the RVSM altitude stratum in 2024 would surpass 2019.

2.47 In 2023, there was no LHD reported at a part of Hot Spot B where the area located at the east edge of the AKARA – FUKUE corridor airspace and the FIR boundary between Fukuoka and Incheon FIRs.

2.48 The subdivision of Hot Spots B and D was discussed and agreed at the RASMAG/MAWG/11 meeting. JASMA had used the proposed Hot Spot Identification Process and presented the result of JASMA's analysis regarding current and former Hot Spots relating to the Fukuoka FIR. It revealed that Hot Spot B3 (interface between Fukuoka and Incheon FIRs) did not satisfy the hot spot criteria and will be removed but D1 (between Fukuoka and Manila FIRs) should be retain as hot spot.

JASMA Horizontal Safety Report

2.49 JASMA provided the horizontal risk assessment results of the Fukuoka FIR conducted by the Japan Airspace Safety Monitoring Agency (JASMA). The risk estimation results of the following three horizontal separation standards were reported:

a) 50 NM lateral separation (**1.16 x 10^{-9}**);

b) 10 minutes time-based longitudinal separation (without Mach number technique) (**10.01 x 10^{-9}**); and

c) 30 NM distance-based longitudinal separation (PBCS and RNP 4) (**0.003 x 10^{-9}**).

2.50 There was a total of 18 LLDs and LLEs reported to JASMA in 2023. The top contributor belonged to Category H (turbulence or weather-related causes leading to a deviation in the horizontal dimension – eleven occurrences).

2.51 To enhance airspace capacity in the Pacific Ocean airspace, 23 NM lateral separation minima based on PBCS and RNP 4 has been implemented in the airspace of Fukuoka FIR entirely since 15 June 2023 as an operational trial. The procedures and software to calculate "23 NM Lateral Risk" was still in development and further update would be provided to the RASMAG/30 next year.

2.52 In response to a query, JASMA would further analyse the calculation for the 10 minutes time-based longitudinal risk again and the meeting also noted that it was not typically included in the horizontal risk assessment.

MAAR Safety Report

2.53 MAAR presented the results of airspace safety oversight for RVSM operations in South Asia/Indian Ocean Airspace (SA/IO), Southeast Asia (SEA) Airspace, and Mongolian Airspace during 2023.

South Asia Indian Ocean Airspace

2.54 The 2023 RVSM risk estimate for SA/IO airspace indicated that the TLS had met at **4.05 x 10^{-9}** fapfh. 248 of the 254 reported LHDs in SEA airspace were classified as Category E in 2023.

2.55 In the analysis of hot spots, the following were proposed:

a) Hot Spot G (Mumbai-Muscat and Mumbai-Sanaa) should remain on the hot spot list and continue to be monitored until further safety improvement initiatives or prevention measures, such as AIDC, are completed and demonstrate their effectiveness;

b) Hot Spot F (Mogadishu-Mumbai) and A1(Kolkata-Yangon and Chennai-Yangon FIR boundaries) should remain on the hot spot list and be monitored until further safety improvement initiatives (specifically AIDC) are implemented even though the number of LHDs and the associated risks are currently below the hot spot criteria; and

c) Hot Spot A2 (the boundary between Chennai FIR and Kuala Lumpur FIR) which was proposed as a potential non-hot spot in the RASMAG/28 meeting held in August 2023, continued to not satisfy any criteria in 2023. Hence, Hot Spot A2 was proposed for removal from the hot spot list.

Southeast Asia Airspace

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

2.57 RASMAG MAWG/11 agreed that hot spot could be subdivided into smaller interfaces between FIR boundaries or ATS sectors, if applicable. Therefore, Hot Spot D was subdivided into nine (9) shown in **Figure 5**.

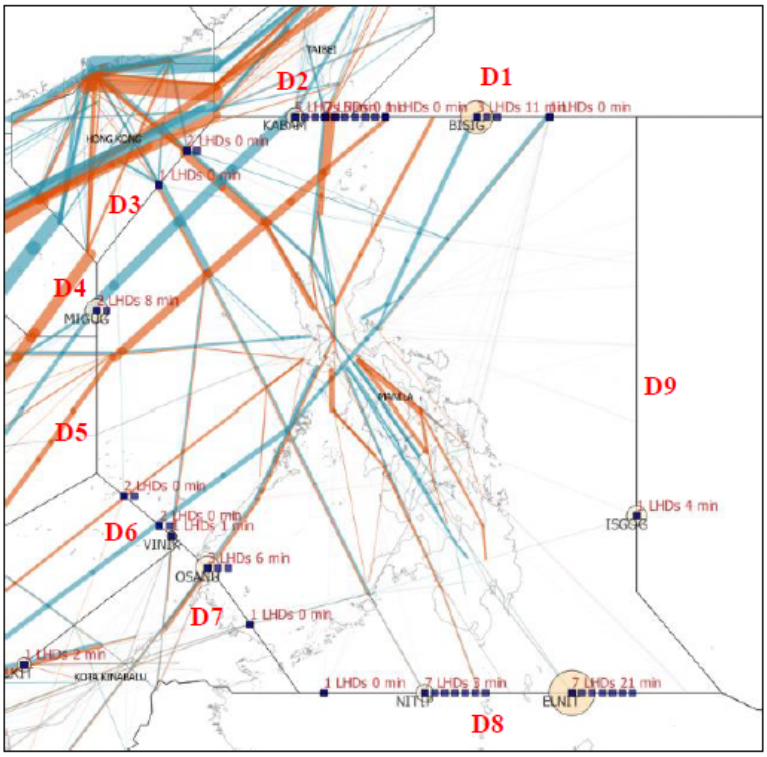


Figure 5: The Subdivision of Hot Spot D

2.58 Based on the Hot Spot identification process, analysed statistics, and existing AIDC implementation, the status of each subdivision of Hot Spot in SEA was proposed as follows:

a) D1 (Fukuoka and Manila FIR boundary) should remain on the Hot Spot list because the number of LHDs and operational risk met the 2022 criteria in JASMA's analysis even though it did not meet any criteria in MAAR's analysis. The AIDC implementation between Manila ACC and Kobe/Fukuoka ACC has not operated yet.

b) D2 (Manila and Taibei FIR boundary), D3 (Hong Kong and Manila FIR boundary), D4 (Manila and Sanya FIR boundary), D6 (Manila and Singapore FIR boundary) and D9 (Manila and Oakland FIR boundary) were proposed for removal from the Hot Spot list because they had not met the hot spot criteria since 2020, and AIDC implementation had been completed.

c) D5 (Ho Chi Minh and Manila FIR boundary) should remain on the Hot Spot list because AIDC implementation remained incomplete, even though it has not met the hot spot criteria since 2022.

d) D7 (Kota Kinabalu and Manila FIR boundary) should remain on the Hot Spot list because AIDC implementation remained incomplete, even though it has not met the hot spot criteria since 2021.

e) D8 (Manila and Ujung Pandang FIR boundary) should remain on the Hot Spot list because it met the hot spot criteria in 2023.

f) Singapore-Jakarta boundary (LHD Hot Spot J) should remain on the hot spot list.

g) Bangkok/Ho Chi Minh/Kuala Lumpur-Singapore FIR Boundary (Hot Spot O) should remain in the Hot Spot list.

Mongolian Airspace

2.59 In 2023, no LHD was reported within or at the boundary of the Mongolian Airspace. Hence, the analysis of operational errors cannot be conducted. As a result, the total risk was estimated as **0.58 x 10^{-9}** fapfh.

BOBASMA Horizontal Safety Monitoring Report

2.60 On behalf of BOBASMA, the secretariat presented the horizontal safety assessment for the Bay of Bengal/Arabian Sea Indian Ocean airspace during the period January to December 2023. The 50NM lateral risk of **1.57 x 10^{-9}** and longitudinal risk of **4.59 x 10^{-9}** remained below the TLS.

2.61 It was noted that due to the COVID-19 pandemic and associated restrictions, the number of flights drastically reduced all over the world in 2020, and this trend largely continued in 2021. In 2023, flight levels have recovered to, and perhaps exceeded, pre-pandemic levels for the first time.

SEASMA Safety Report

2.62 The Southeast Asia Safety Monitoring Agency (SEASMA) provided a horizontal safety assessment report for operations on ATS routes N892, L625, N884 and M767 over the South China Sea from 1 January to 31 December 2023. The assessment met the TLS values for lateral and longitudinal separation standards applicable for RNP 10 and RNP 4 operations.

2.63 ATS routes M767 and N884 supported a hybrid mode of RNP 4 and RNP 10 operations. The lateral and longitudinal collision risk estimate trends for RNP 4 operation presented in this paper contained the risk assessment of these two ATS routes. The lateral and horizontal risk for RNP10 were **0.569 x 10^{-9}** and **0.384 x 10^{-9}** respectively and lateral and horizontal risk for RNP 4 were 0**.123 x 10-9** and **0.786 x 10-9** respectively, all met the TLS.

2.64 The number of LLDs increased from one in CY2022 to five in CY2023, while LLEs increased from zero in CY2022 to one in CY2023. All LLDs reported in CY2023 were categorised as Category ‘A’ LLDs, where the flight crew deviated in the horizontal dimension without receiving ATC clearance. The LLE reported in CY2023 was a Category ‘B’ LLE, attributed to an incorrect estimate provided by the flight crew.

PARMO Vertical Safety Monitoring Report

2.65 PARMO provided a vertical safety assessment for 2023 for the Pacific RVSM airspace and a portion of Northeast Asia RVSM airspace.

Pacific Airspace

2.66 The 2023 RVSM risk estimate for Pacific airspace indicated that the TLS had not been met at **18.6 × 10^{-9}**.

2.67 The highest contributor towards the vertical risk estimate continued to be errors in ATC coordination between Oakland Center and Honolulu Control Facility (HCF). These reports were part of the Hot Spot N area and were covered in a separate paper RASMAG/29 WP/15.

2.68 Various mitigations were explained prior to the implement the En Route Automation Modernization (ERAM) system at the HCF which was planned for implementation by the end of 2025. The ongoing efforts might see a reduction in the number of Category E LHDs reported during the third quarter of calendar year 2024.

Northeast Asia Airspace

2.69 North East Asia airspace RVSM technical, operational, and total risks was $\mathbf{0.17 \times 10^{-9}}$ which met the TLS. There were 74 reported occurrences, consisting of 36 reported occurrences affected the Incheon FIR, the remaining 38 reported occurrences affected the adjacent FIR. All reported LHDs occurred at the SADLI fix location. The reported LHDs for this area contributed towards the observed trend in the airspace which part of Hot Spot B1 and was covered in RASAMG/29 WP/04.

PARMO Horizontal Safety Monitoring Report

2.70 PARMO submitted the 2023 horizontal safety monitoring report for the Anchorage, Auckland, Nadi, Oakland, and Tahiti FIRs. The lateral, longitudinal risks were all estimated to meet the TLS (Table 20). Of the 120 reported LLDs and LLEs, 106 (90%) were Category E.

2.71 The meeting noted the absence of LHD, LLE and LLD reports submission from Tahiti for 2023 and the first half of 2024 and proposed to include French Polynesia to the ATM deficiency list recorded for the non-provision of Safety Data. ICAO would conduct the verification check with French Polynesia to seek their response prior to the recommendation of inclusion into the Deficiency list during APANPIRG/35 meeting in November for consideration.

Outcomes of RASMAG/MAWG and RMACG Meetings

2.72 Eleventh Meeting of the Regional Airspace Safety Monitoring Advisory Group Monitoring Agencies Working Group (RASMAG/MAWG/11) Meeting was held from 29 January to 1 February 2024 in Bangkok, Thailand. The Nineteenth RMA Coordination Group Meeting (RMACG/19) was held at the headquarters of the International Civil Aviation Organization (ICAO) in Montreal, Canada from 11 to 14 June 2024 in hybrid format.

2.73 Some salient points discussed during MAWG/11 and RMACG/19:

- RVSM Minimum Monitoring Requirements (MMR);
- PBCS Format for Approval File;
- Procedure of Submitting LHD Report from Operator;
- Management Process of Hot Spots for RASMAG; and
- RASMAG Safety Bulletin

RVSM Minimum Monitoring Requirements (MMR)

2.74 The RVSM Minimum Monitoring Requirements (MMR) Version 2024 was reviewed and adopted by the RMACG meeting (RASMAG/29 WP/3 Attachment 1). There were various changes due to new entrants to Civilian and Military MMR, changes to existing monitoring groups in the Civilian MMR and also changes to the category in the Civilian MMR.

Process of Hot Spots for RASMAG

2.75 The MAWG agreed that the process as detailed in RASMAG/29 Attachment 2 was ready and would be presented to the RASMAG/29 meeting for endorsement and its application by APAC

RMAs and EMAs. The MAWG meeting agreed with JASMA's proposal to allow the splitting of a hot spot into smaller areas depending on the FIR interfaces, the contributing factors, implementation of mitigation measures, etc. The meeting decided to split Hot Spot B and Hot Spot D into smaller areas at the interface level.

2.76 It was highlighted to the meeting that the naming of the hot spot may not reflect the actual situation, and the changes could be discussed in WP/16 - Asia Pacific Consolidated Safety Report.

2.77 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. The meeting agreed to the following conclusion:

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, 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

2.78 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).

2.79 A working paper was submitted to FIT-Asia/14 held on 16 – 19 July 2024 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.

2.80 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.

2.81 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.

Assessment of Non-RVSM/ Non-PBCS Approved Aircraft

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

Survey Results for Asia Pacific States PBCS Approval Process

2.83 ICAO presented survey summary aimed to improve understanding by RASMAG and FIT-Asia of the PBCS approval process from APAC member states. However, there were no provisions for applying a specific approval to PBCS operations at this time, PBCS Manual (Doc 9869) refers.

2.84 There were 13 responses to the survey, seven administrations claimed to have aircraft operators with PBCS approvals and of which six administration conducted direct approvals.

2.85 Two Administrations did not issue specific operational approvals for PBCS. One example showed that for aircraft to be eligible for PBCS separation, they must achieve RCP 240 and RSP 180 requirements and register on the FANS CRA website. Another State required that any pilot in command intending to file a PBCS indicator in their flight plan were to meet a set of regulatory requirements.

2.86 Therefore, for EMAs conducting the PBCS approval checks, aircraft from Australia and French Polynesia could be deemed to have the PBCS approvals. Furthermore, Australia had plans to update the PBCS database with PBCS approvals in the future. The meeting was also noted that the UK did not issue specific PBCS approvals for their aircraft.

APAC Consolidated LTHM Compliance Status

2.87 MAAR presented the overview of LTHM compliance status in the APAC Region, including assessments of five APAC RMAs – AAMA, China RMA, JASMA, MAAR and PARMO. The assessment, based on RVSM approval data as of 30 June 2024, yielded a remaining monitoring burden in the APAC Region of 307 aircraft, which was a 39% decrease compared to the previous year. The detailed LTHM burden estimate updates by individual RMAs can be found on the RASMAG/29 website.

APANPIRG List of Deficiencies Consideration

2.88 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**

State	2022	2023	RASMAG Recommendation
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

2.89 The paper also outlined some recommendations for states and operators such as:

a) APAC States are encouraged to inform their RMAs about any changes (such as transferred or de-registered aircraft) in a timely manner, as this will affect the number of aircraft required to be height-monitored.

b) APAC States are encouraged to provide their RMA with a list of aircraft meeting the 1,000 flight hour criteria. This will enable the RMA to subtract these aircraft from the remaining monitoring burden calculation, thereby decreasing the overall percentage.

c) APAC States should encourage aircraft operators to retrofit ADS-B-Out capability where feasible, as it would provide a more efficient and more cost-effective solution for height monitoring in the long run.

d) The operators that have ADS-B-Out equipped aircraft but still have not fulfilled their monitoring requirements should consult the respective RMAs for other feasible arrangements.

e) APAC States are encouraged to actively engage in sharing their ADS-B data with their designated RMA as another means to alleviate the monitoring burden.

2.90 MAAR requested that APAC RMAs 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

2.91 The meeting reviewed the APANPIRG ATM and Airspace Safety Deficiency List and agreed to make the following recommendation to APANPIRG/35, as recorded in RASMAG/29 Appendix I. 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.

2.92 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.

2.93 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:

Safety Reporting Deficiencies

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

Long Term Height Monitoring Requirement Deficiencies

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

ATS Datalink Deficiencies

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

b) Removal of Deficiency:

Long Term Height Monitoring Requirement Deficiencies

- **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).

ATS Datalink Deficiencies

- **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:

Safety Reporting Deficiencies

- **French Polynesia** (Failure to submit Tahiti FIR LHD data).

Long Term Height Monitoring Requirement Deficiencies

- **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 and discuss

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

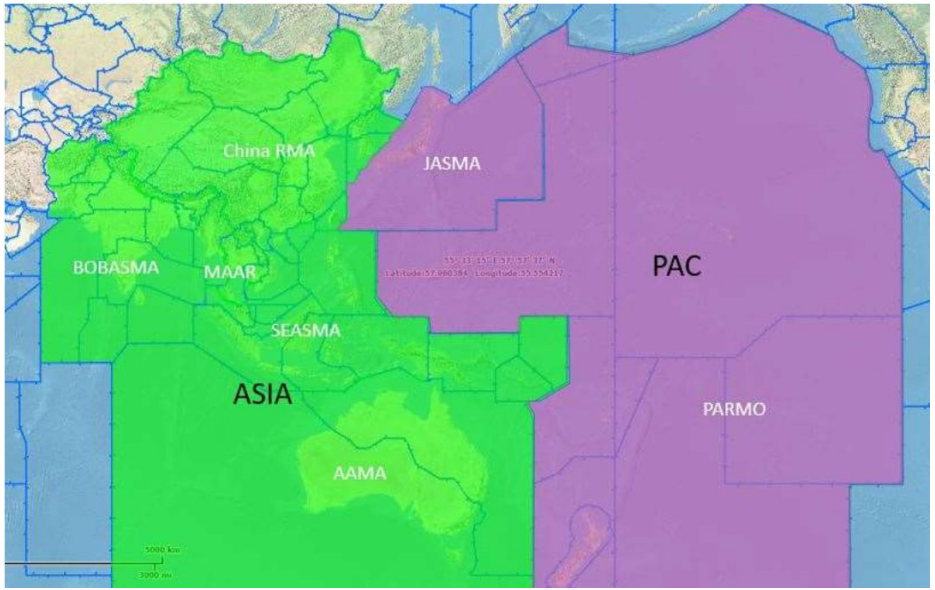
Outline

- 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).

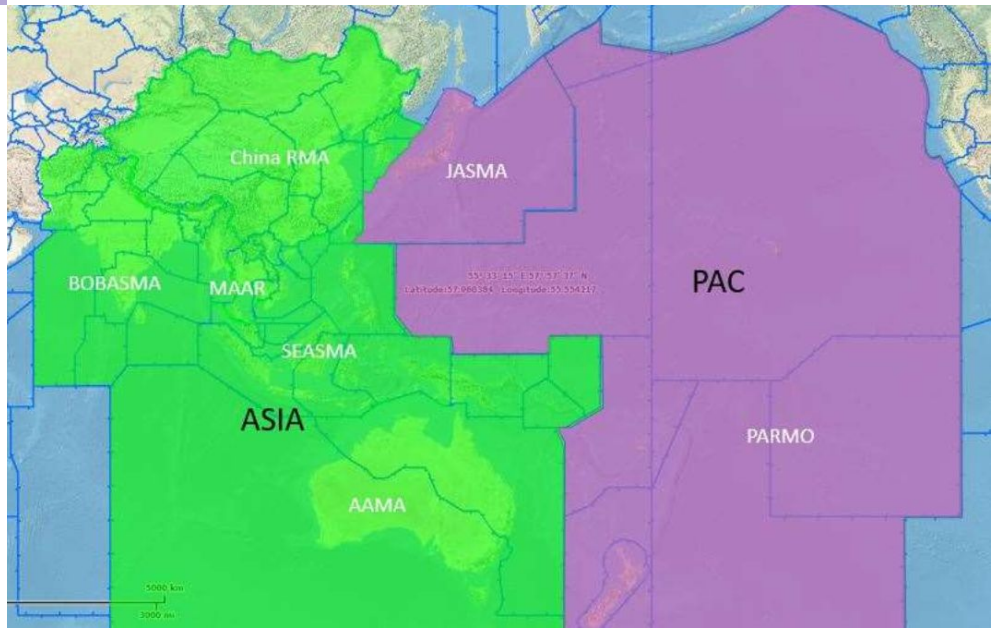
Pacific Area (PAC)

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

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

Monitoring Agencies :

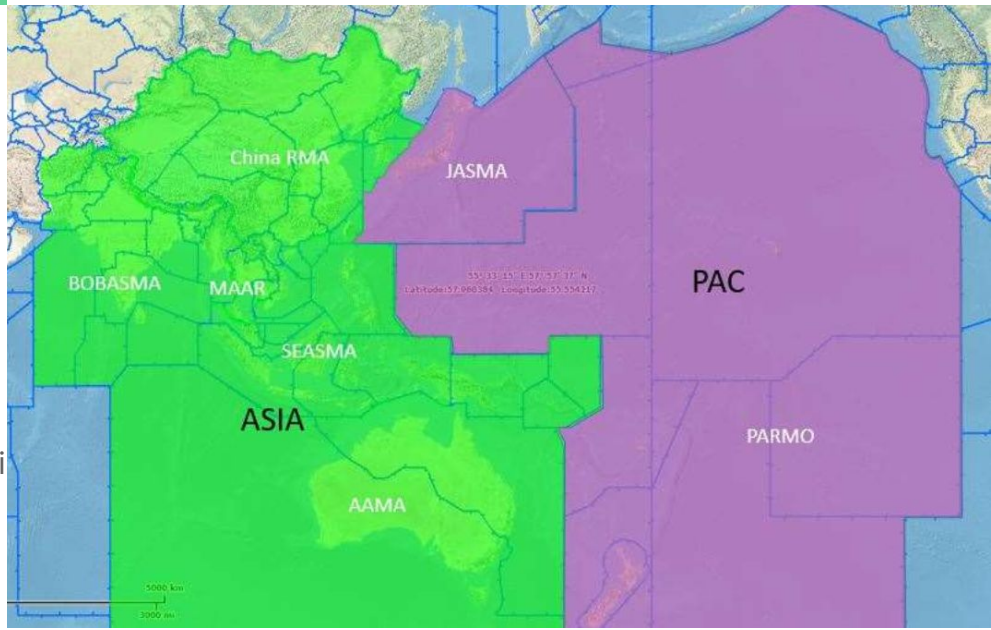
RMAs (Verical): JASMA, PARMO
EMAs (Horizontal): JASMA, PARMO



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

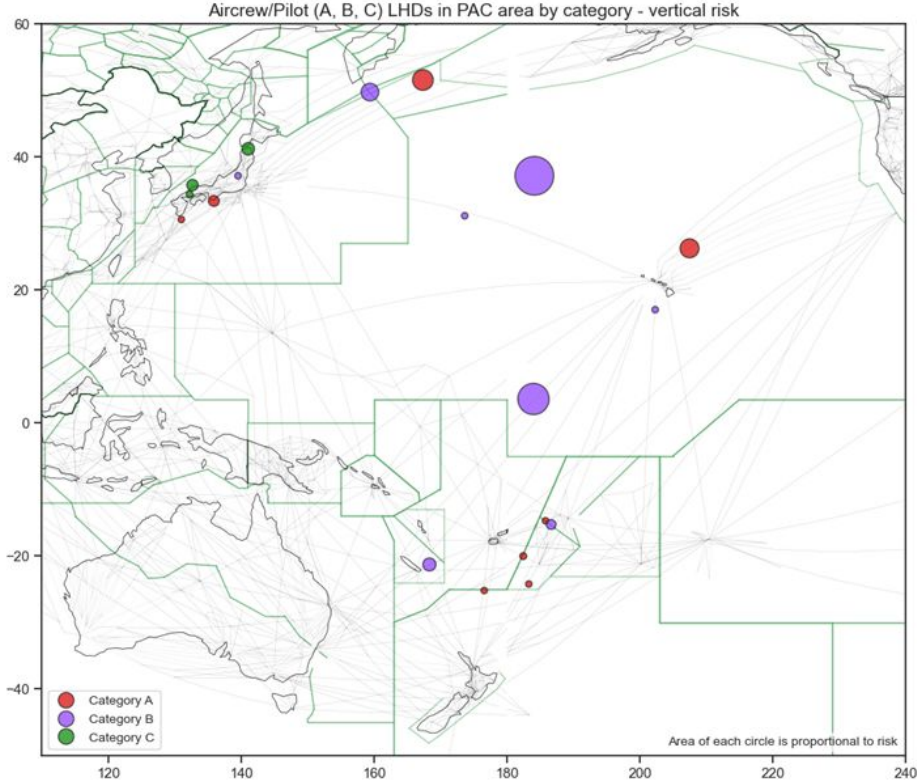
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	**10**	**10.00**	**3**	**100**
	B	Incorrect estimate or route provided due to incorrect operation or interpretation 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**

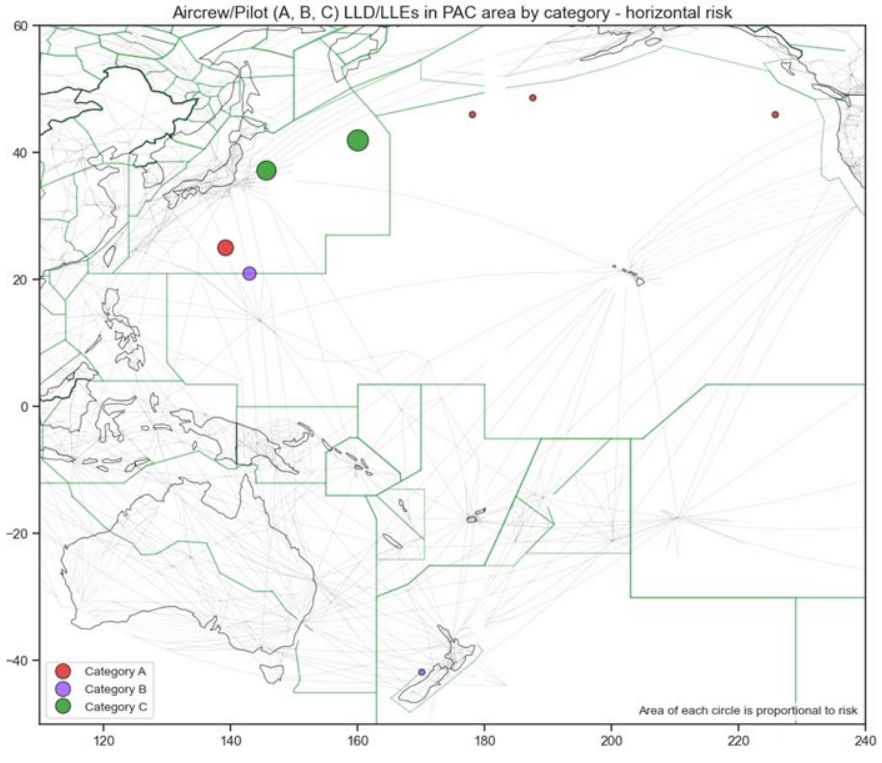
PAC : Summary of LLDs and LLEs

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

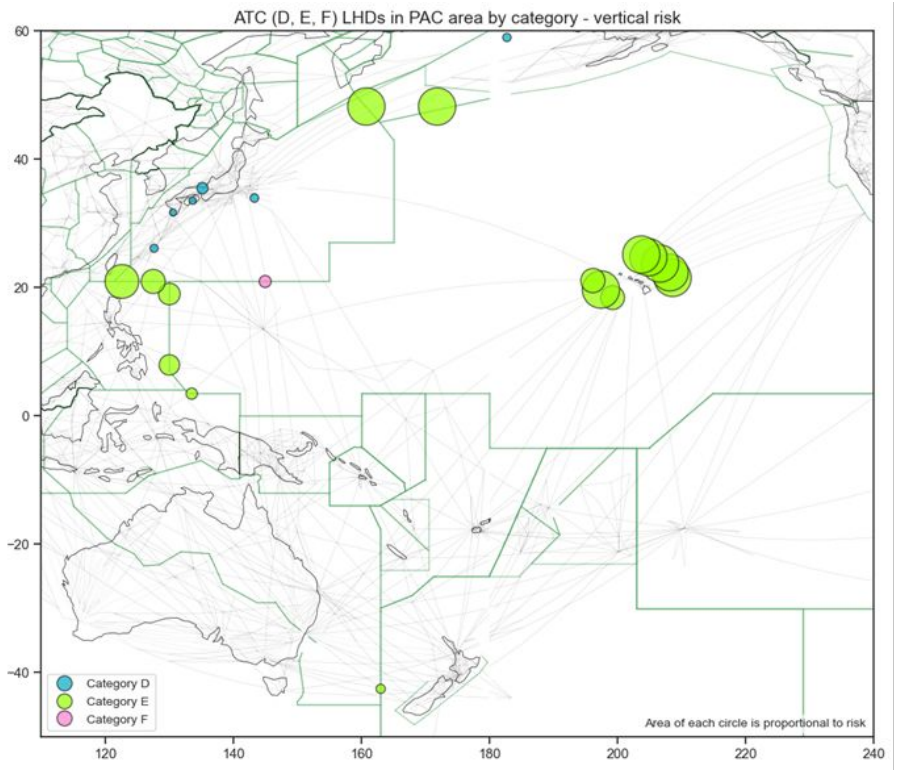
PAC : Geolocation of LHDs/LLDs/LLEs

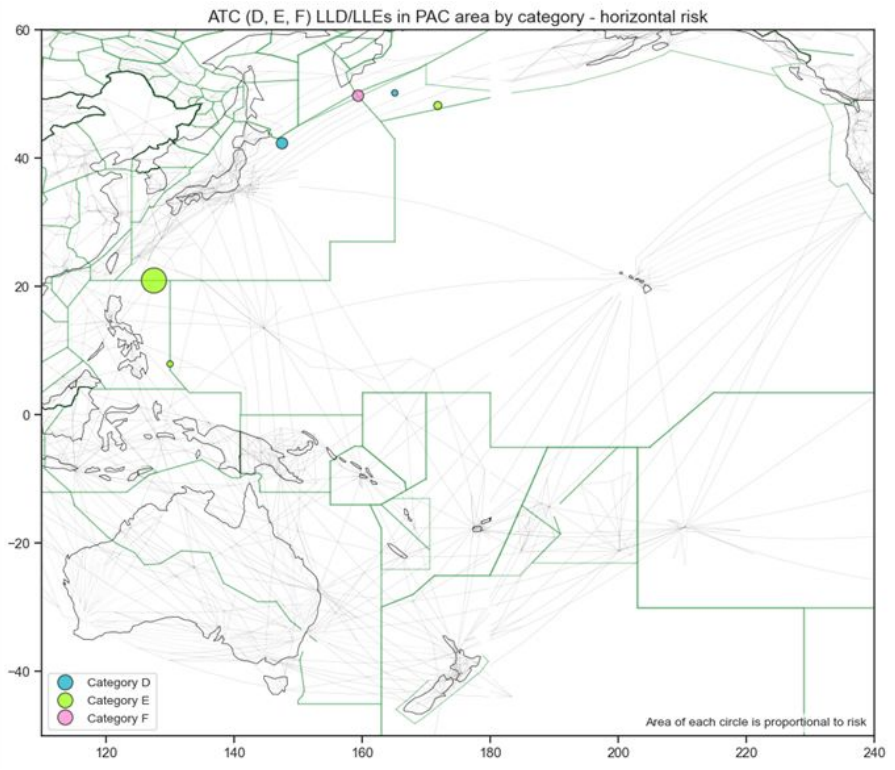
PAC : Aircrew/Pilot (A, B, C)



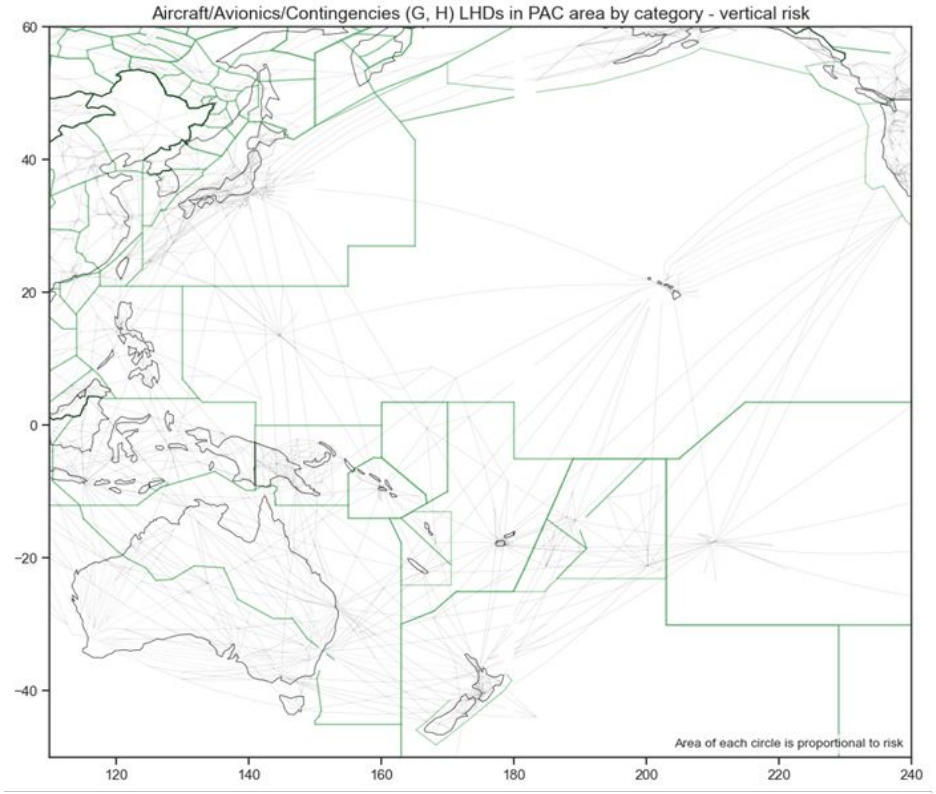


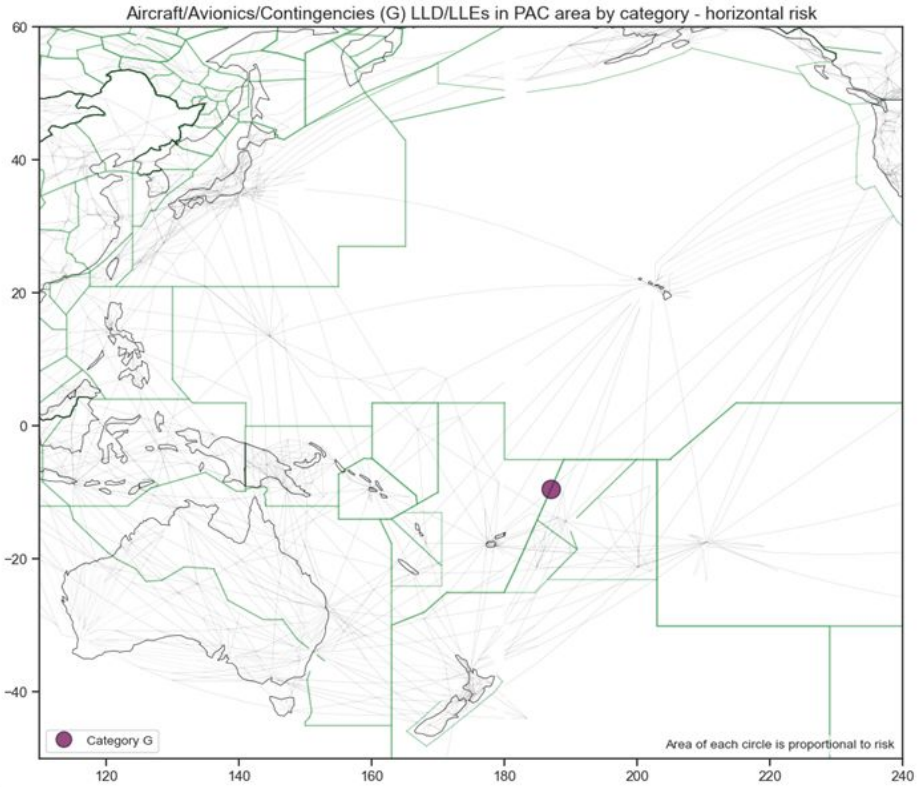
PAC : ATC (D, E, F)


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


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

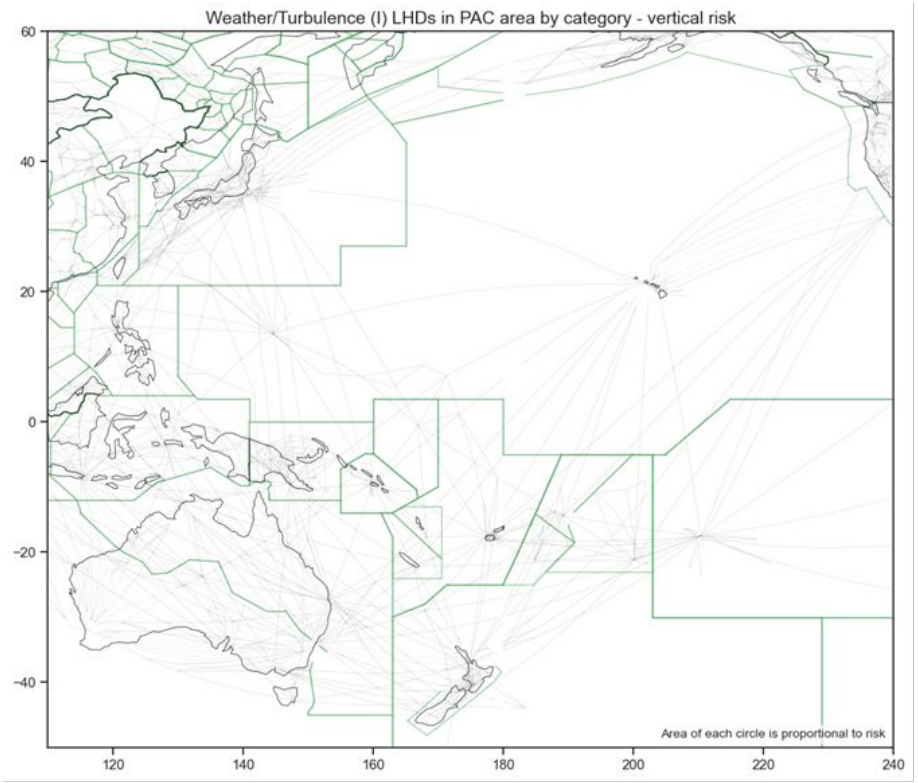
PAC : Aircraft Avionics/Contingencies (LHD:G,H, LLD/LLE:H)

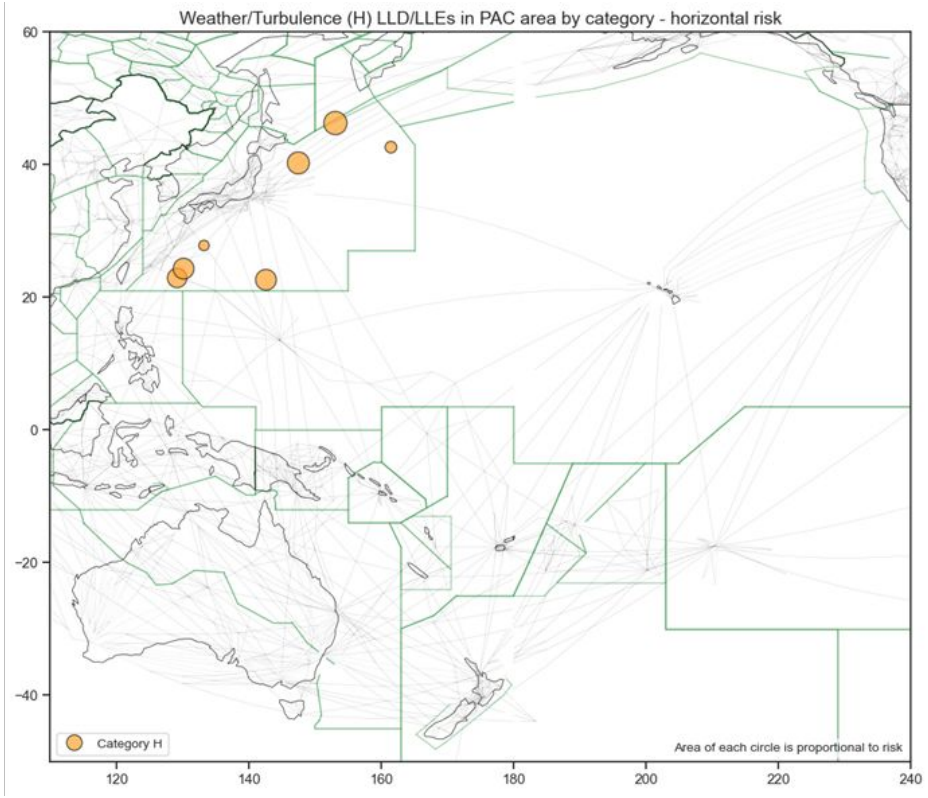




Note: No non-zero Category G and H LHD in 2023

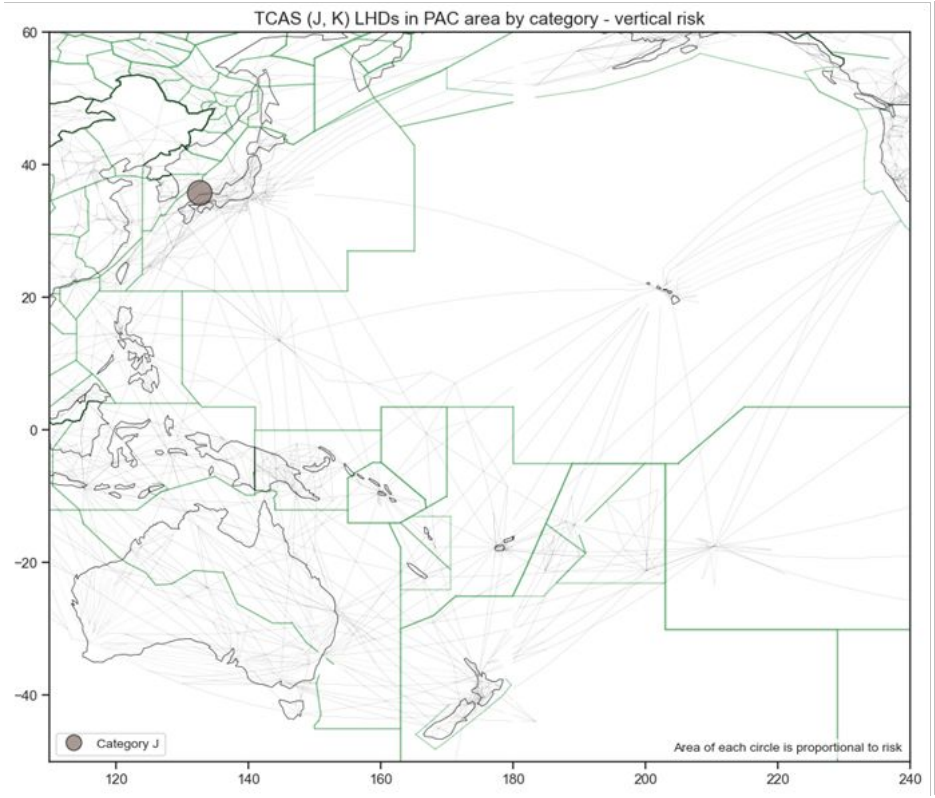
PAC : Weather/Turbulence (LHD:I, LLD/LLE:H)



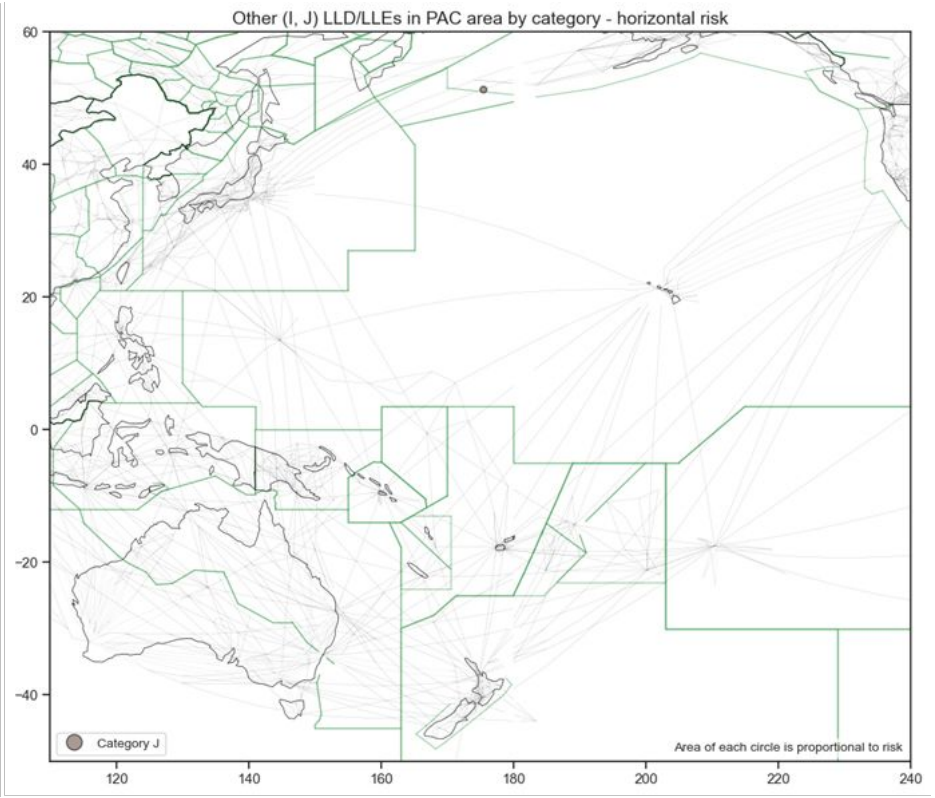


Note: No non-zero Category I LHD in 2023

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)

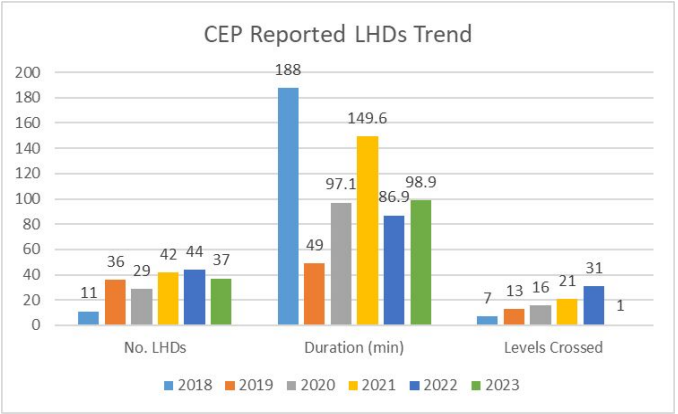
Nature of Occurrences : Coordination errors as a result of human factors issues (Category E)

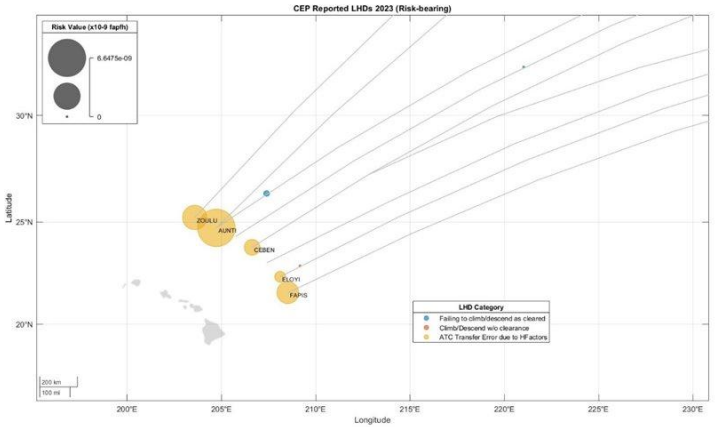
Contributing Factors : The reported LHDs occur within the high traffic volume in the Central East Pacific (CEP). These occurrences affect the CEP traffic and the user-preferred routes that cross the CEP airways.

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

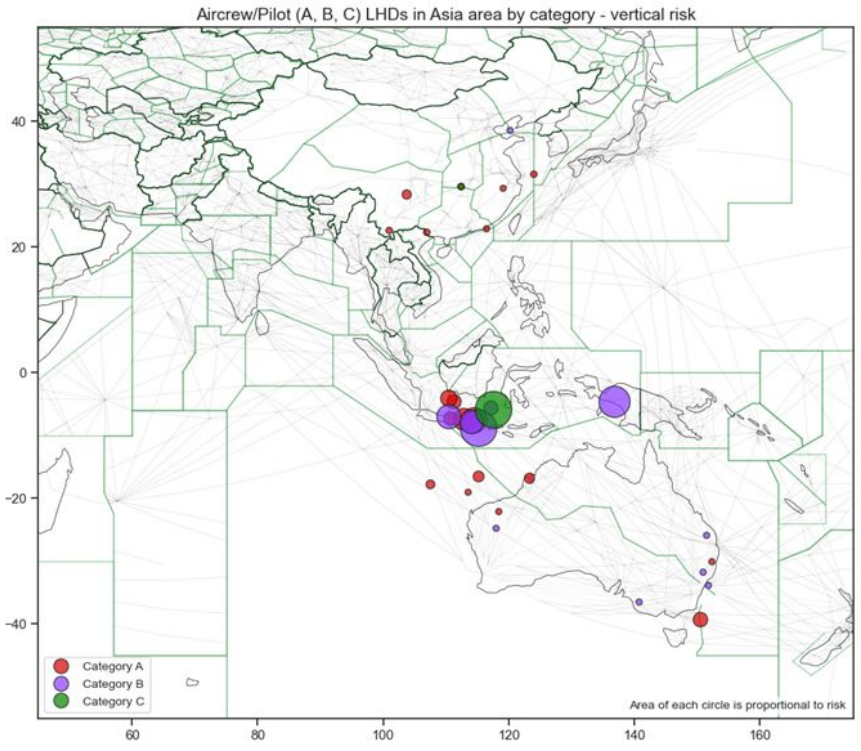
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	**5**	**0.00**	**0.00**	**104.00**
	B	Incorrect estimate or route provided due to incorrect operation or 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[A - 33]	**0**	**0.00**	**0.00**	**0.00**

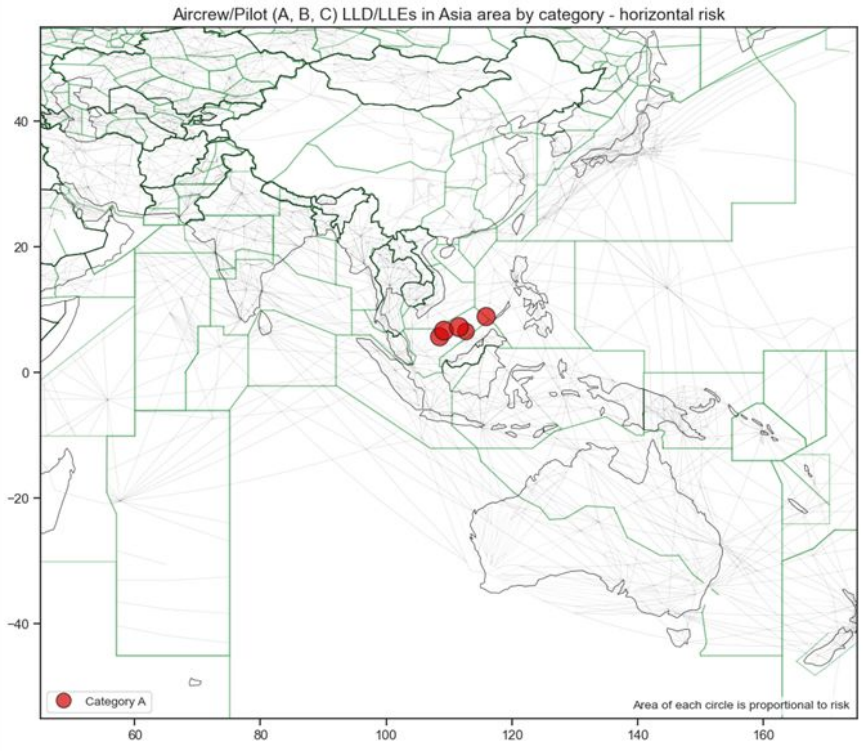
Asia : Summary of LLDs and LLEs

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

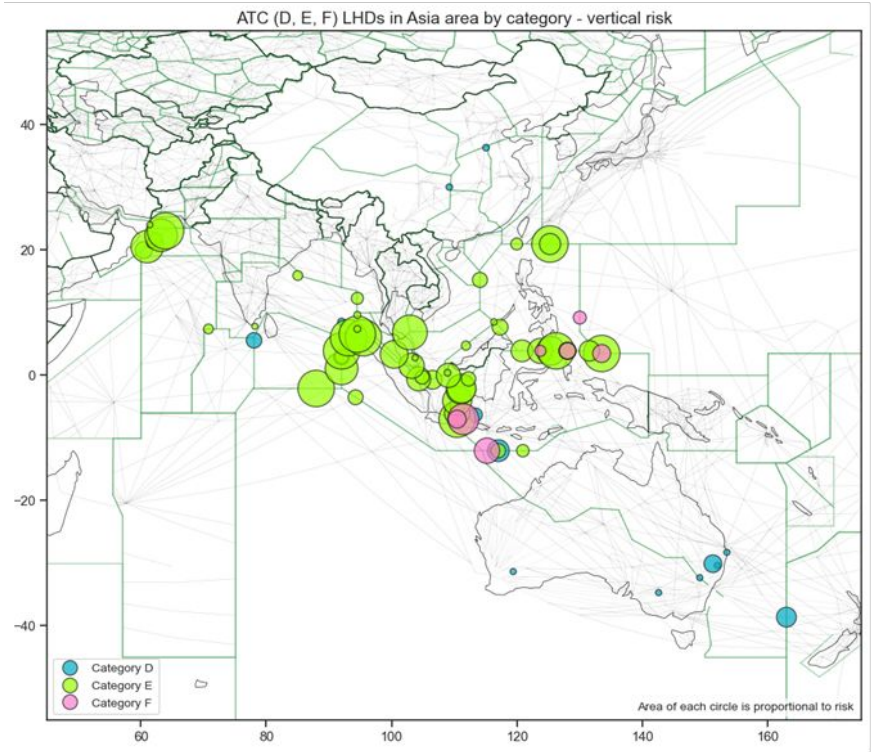
Asia : Aircrew/Pilot (A, B, C)

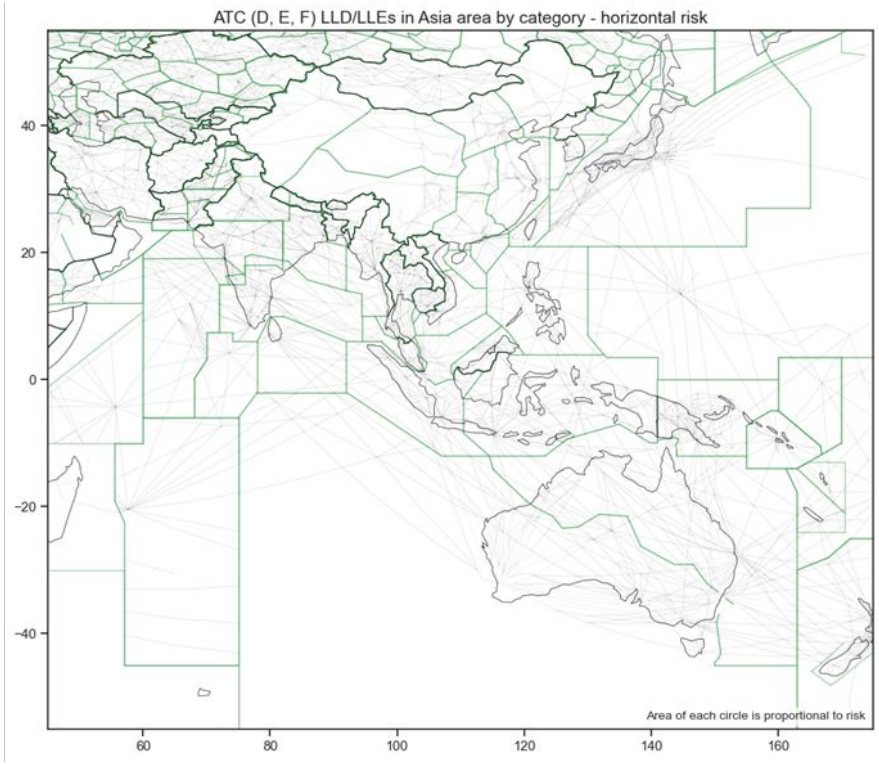




Note: No non-zero Category B and C LLD/LLE in 2023

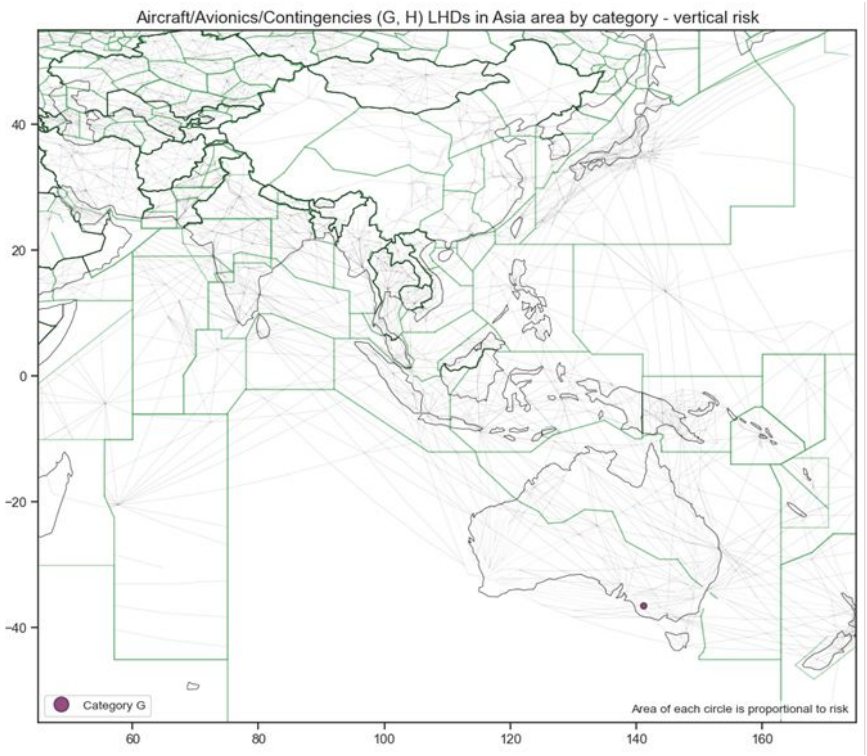
Asia : ATC (D, E, F)



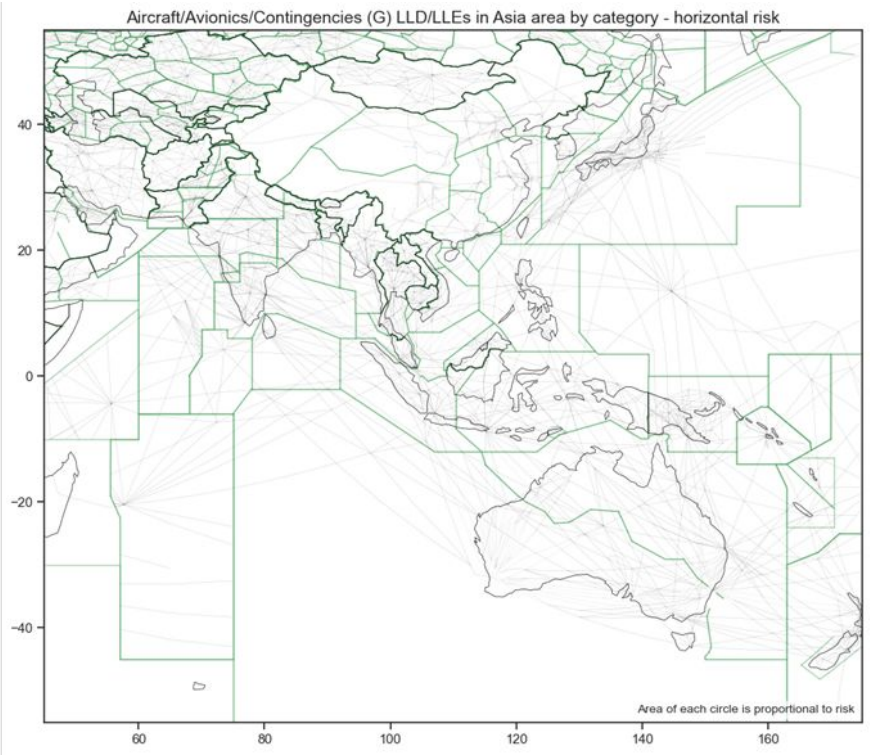


Note: No non-zero Category D, E and F LLD/LLE in 2023

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

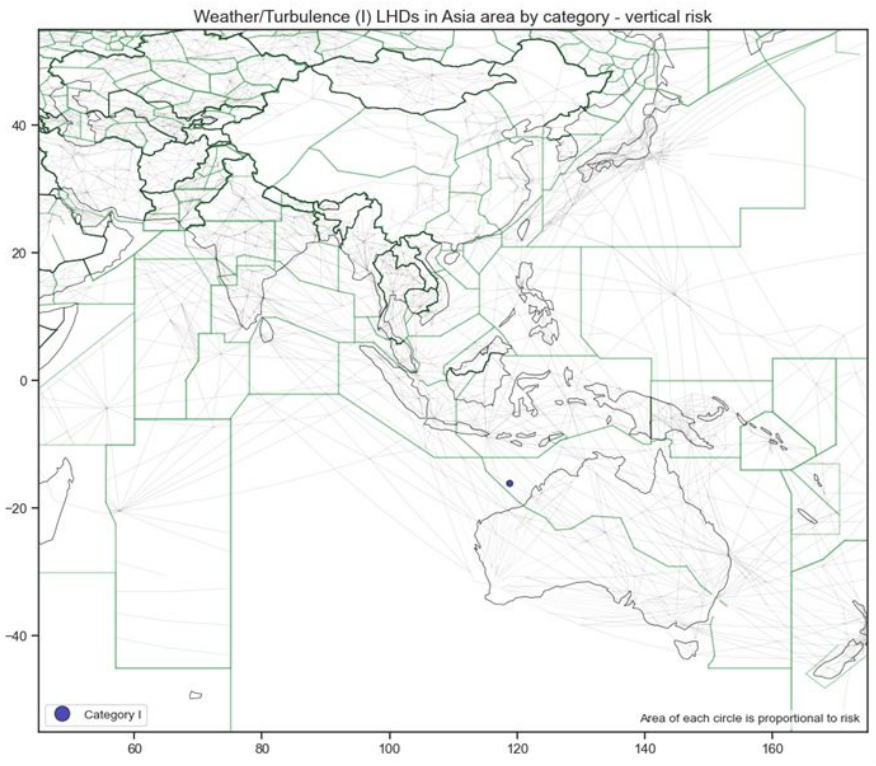


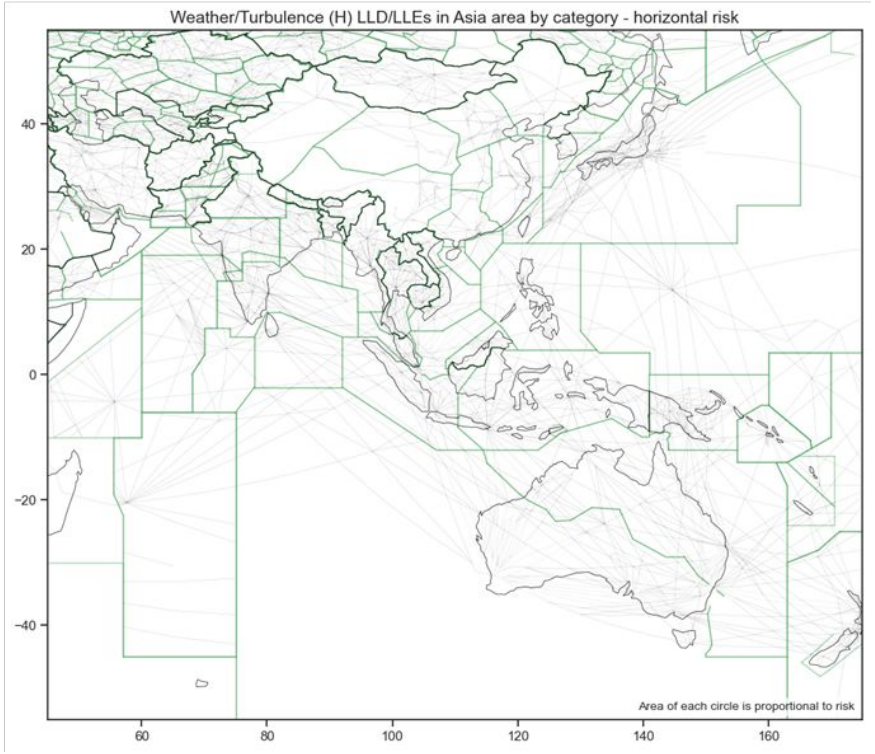
Note: No non-zero Category H LHD in 2023



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

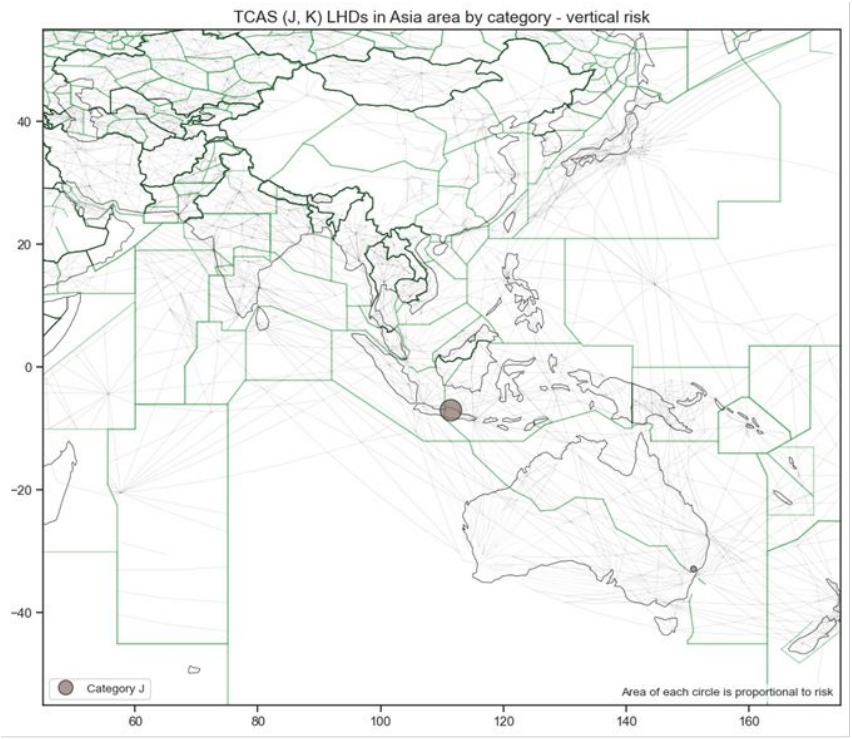
Asia : Weather/Turbulence (LHD:I, LLD/LLE:H)



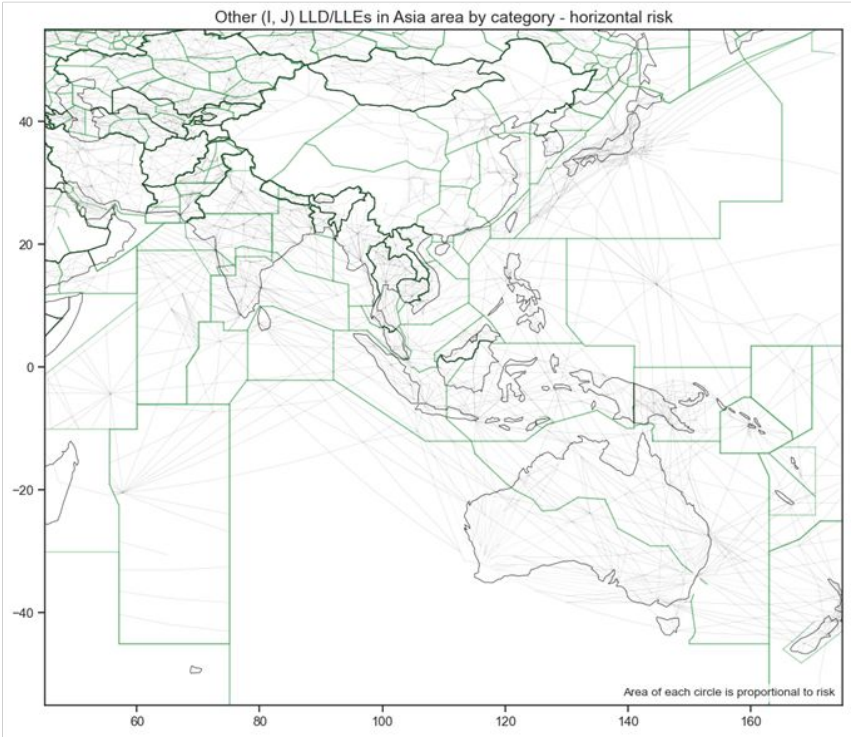


Note: No non-zero Category H LLD/LLE in 2023

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	0.02×10^{-9}	0.06×10^{-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}

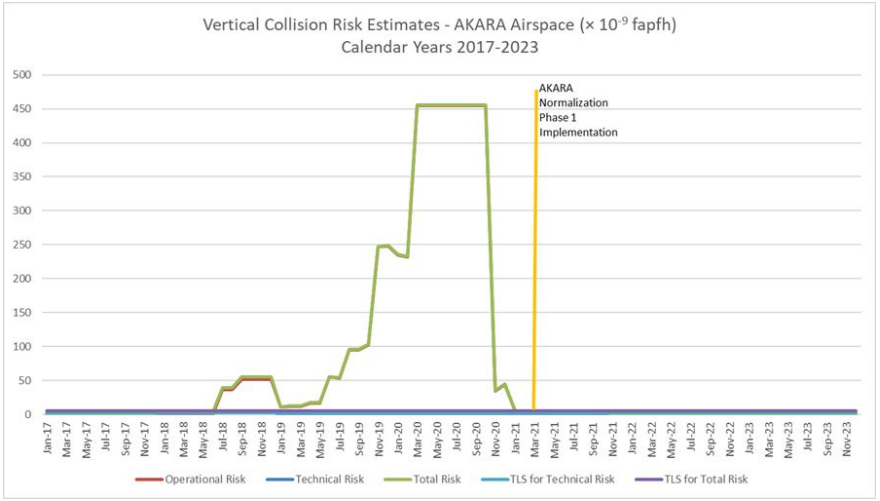
Asia : LHD Hot Spot B (AKARA Airspace)

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)

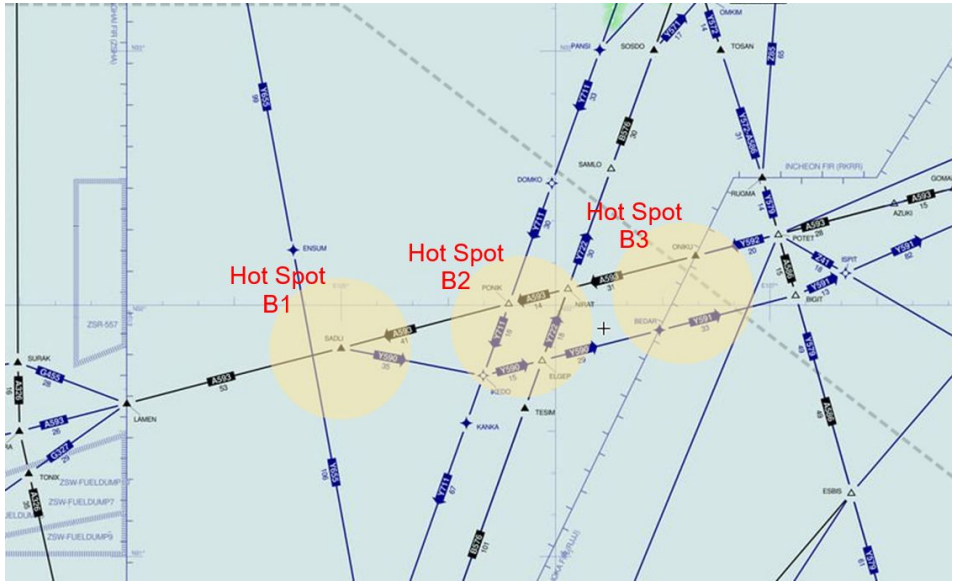
Subdivision of Hot Spot B :
During RASMAG MAWG/11, APAC monitoring agencies agreed to subdivide Hot Spot B into :

- 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.

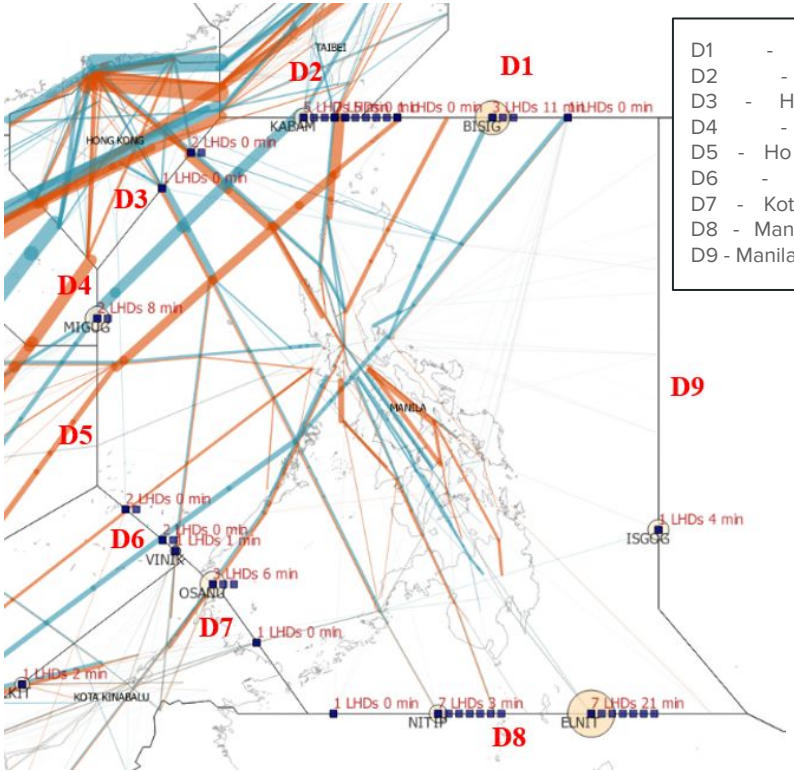
Mitigations :
- Several safety improvement activities such as the new ATM system, ACC sector re-sectorization, enhanced surveillance, and ADS-C/CPDLC have been implemented.

- 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)

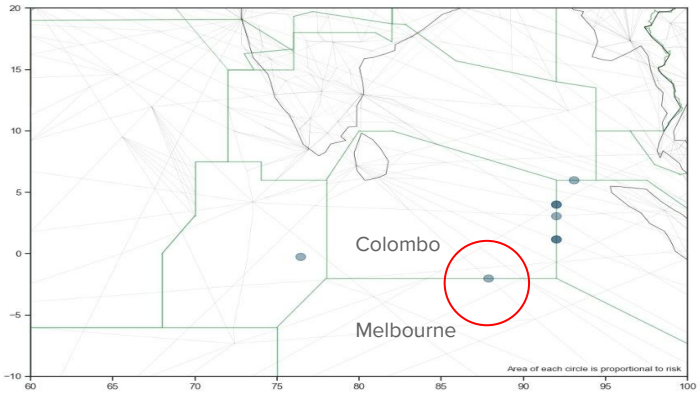
Nature of Occurrences : Category A, B, and E LHDs.

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