International Civil Aviation Organization

Thirty-Third Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/33)

Bali, Indonesia, Hybrid Meeting, 22 to 24 November 2022

Agenda Item 3: **Performance Framework for Regional Air Navigation Planning and Implementation**

3.3: **RASMAG**

RASMAG/27 OUTCOMES

(Presented by the RASMAG Chair)

SUMMARY

This paper provides a summary of the key outcomes from the Twenty-Seventh Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/27), including the RASMAG/27 discussion of the outcomes of its contributory body, Future Air Navigation Services (FANS) Interoperability Team – Asia (FIT-Asia/12).

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*

E***: Environmental Protection*** *— Minimize the adverse environment effects of civil aviation activities.*

1. INTRODUCTION

1.1 The Twelfth Meeting of the FANS Interoperability Team-Asia (FIT-Asia/12) and the Twenty-Seventh Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/27) were held by video teleconference from 25 to 28 July 2022 and 22 to 25 August 2022 respectively.

1.2 Meeting documentation and the final report of the meeting are available on the FIT-Asia/12 and RASMAG/27 can be found at the following web-pages:

i. https://www.icao.int/APAC/Meetings/Pages/2022-FIT-Asia12.aspx

ii. https://www.icao.int/APAC/Meetings/Pages/2022-RASMAG27.aspx

2. DISCUSSION

FIT-Asia Meeting Outcomes

FIT-Asia Problem Reports

2.1 The lower number of data link problem reports (PR)s submitted in the last 12 months reflected the dramatic decrease in air traffic due to the impact of the COVID-19 pandemic (**Figure 1**).

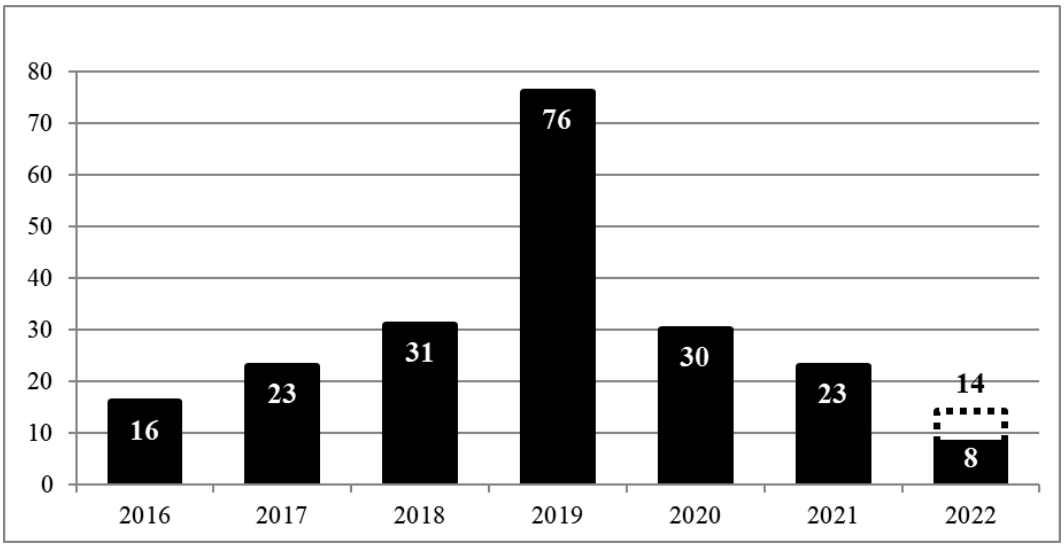


Figure 1: FIT-Asia PR Submissions per Year

2.2 The Central Reporting Agency (CRA) updated the status or progress of three old PRs that had occurred in the FIT-Asia States, and investigated nine significant new PRs and six less-significant new PRs.

Performance-Based Communications and Surveillance (PBCS) Developments and Implementation

2.3 At FIT-Asia/11, New Zealand proposed that a FANS1/A CPDLC Latency Timer value of 300 seconds as was currently being trialled in the North Atlantic (NAT) Region be adopted in the APAC Region for oceanic airspace. The meeting was also informed that the 300 seconds latency timer value had been implemented under trial for several years in the NAT Region, and was formalized in the North Atlantic Operations and Airspace Manual.

2.4 FIT-Asia/12 had agreed to adopt the latency timer value of 300 seconds. The RASMAG/27 meeting subsequently agreed to the following Conclusion drafted by FIT-Asia/12:

Conclusion RASMAG/27-1: CPDLC Latency Monitor value

That, recognizing:

1. *the need for aircraft to provide an appropriate indication when the age of the time stamp of a received CPDLC message exceeds a defined value (latency timer value), in accordance with ICAO Doc 9869 PBCS Manual safety requirement SR-15;*
2. *the need for a single, standardized global value.*

The Asia-Pacific Region adopts a latency timer value of 300 seconds for use in oceanic airspace.

Regional PBCS Implementation Update

2.5 The meeting was updated on the status of PBCS implementation among Asia/Pacific Administrations, as reported using the APAC regional Survey of the Status of Current and Planned Implementation of Performance-Based Horizontal Separation Minima form. The meeting was reminded of relevant Conclusions of APANPIRG and the RASMAG:

Conclusion APANPIRG/27-7: PBCS Operator Requirements

Conclusion RASMAG/22-3: Performance-Based Separation Implementation Survey

Conclusion APANPIRG/28-11: PBCS Operational Authorizations

Conclusion RASMAG/23-1: PBCS Compliance

2.6 A total of 19 APAC Administrations had responded to the survey prior to FIT-Asia/11. Only Australia, Indonesia, Singapore and Thailand provided their annual survey response for 2022. Following on from discussion of the survey form, ICAO provided further information on the need for an update of the Survey of the Status of Current and Planned Implementation of Performance-Based Separation Minima. ICAO further proposed that the annual submission date for both the survey form and the PBCS performance monitoring data (ANSP to FIT) be brought forward to 28 February each year.

2.7 The RASMAG/27 meeting agreed to the following Conclusion drafted by FIT-Asia/12:

Conclusion RASMAG/27-2: Updated Reporting of PBCS Implementation Status and Performance Monitoring Data:

That:

1) *the revised Survey of the Status of Current and Planned Implementation of Performance-Based Separation Minima at* ***Attachment C to RASMAG/27 report,*** *and the revised PBCS Action List for ANSPs at* ***Attachment D to RASMAG/27 report*** *be uploaded to the ICAO Asia/Pacific Regional Office website to replace the existing; and*

2) *States are urged to submit the following to the Asia/Pacific Regional Office by not later than 28 February each year:*

   a) *the completed Survey of the Status of Current and Planned Implementation of Performance-Based Separation Minima form; and*

   b) *PBCS performance data for inclusion in the aggregated regional PBCS performance data report, using the Data Link Performance Report Template – ANSP to FIT provided on the ICAO Asia/Pacific Regional Office website.*

   Note 1: Non-FIT-Asia States may submit their PBCS performance data through the relevant FIT.

   Note 2: This Conclusion supersedes Conclusions RASMAG/22-3, 23-1, 23-2, 23-3.

Asia/Pacific Region Combined PBCS Monitoring Report

2.8 The report highlighted consolidated performance data and issues associated with Automatic Dependent Surveillance – Contract (ADS-C) Actual Surveillance Performance (ASP) and Controller – Pilot Data Link Communications (CPDLC) Actual Communications Performance (ACP) for the region.

2.9 Overall ASP for the region had met the 95% criterion[1]. Overall ACP for the region also met the 95% criterion. While the volume of data count had slightly increased in 2021, the trend of regional performance in both the 95%[2] and 99.9%[3] criteria had generally improved.

APAC Consolidated Safety Report

2.10 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 Regional Monitoring Agencies (RMA)s and Enroute Monitoring Agencies (EMA)s. The report was divided into the Pacific (PAC) area and Asia area (**Figure 2**). The APAC Consolidated Safety Report can be found in **Appendix A**.

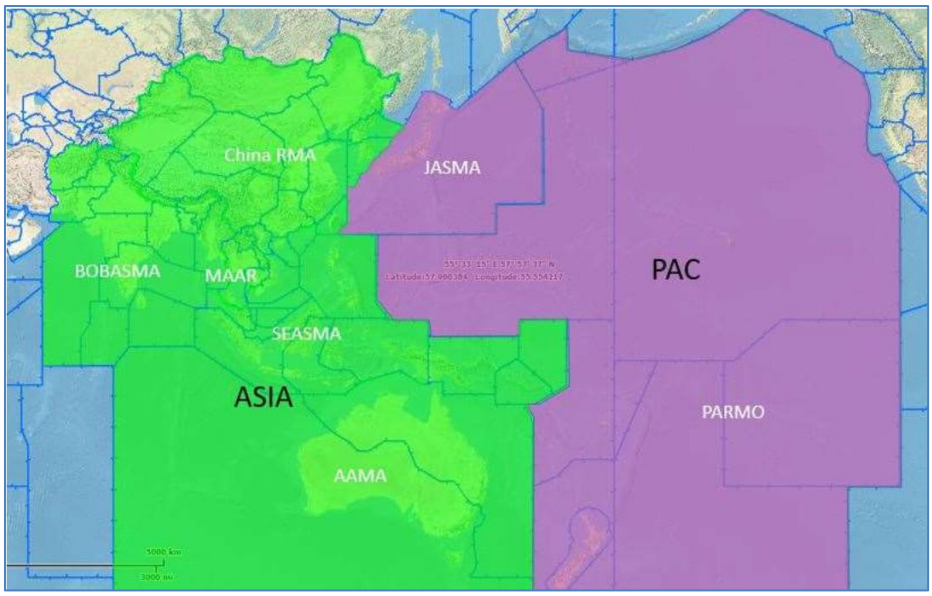


Figure 2: Asia and Pacific Safety Reporting Areas

[1] 95% of ADS-C transactions completed within 90 seconds
[2] 95% of CPDLC transactions completed within 90 seconds
[3] 99.9% of CPDLC transactions completed within 210 seconds

Pacific Area Vertical Collision Risk

2.11 The estimated vertical collision risk for 2021 for the PAC area did not meet TLS (**Table 1**).

Pacific Area – annual flying hours = 2,159,665			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Vertical Technical Risk	0.14×10^{-9}	2.5×10^{-9}	Below Technical TLS
Vertical Operational Risk	19.61×10^{-9}	-	-
2021 Vertical Overall Risk	19.74×10^{-9}	5.0×10^{-9}	Above TLS

Table 1: Pacific Area Vertical Collision Risk 2021

2.12 The PAC vertical collision risk estimates had been above TLS and trending upwards each year from 2016 to 2019 due to improvements in reporting culture. In 2020, there was a significant fall in the risk estimate, reflecting the reduction in traffic volumes caused by the COVID-19 pandemic, before resuming the upward trend in 2021 (**Table 2**).

Year	**Vertical Overall Risk Estimate (x 10^{-9} FAPFH)**	**Remark**
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

Table 2: Pacific Area Vertical Collision Risk Estimates 2016 – 2021

2.13 There was a total of 123 Large Height Deviations (LHDs) in the Pacific area in 2021 (increased from 91 in 2020), with total duration 508.40 minutes and 65 levels crossed. 16 of the occurrences were Category[4] A, B or C (13%), 80 were Category D, E or F (65%), six were Category G (5%), 11 were Category I (9%), and nine were Category J.

Pacific Area Horizontal Collision Risk

2.14 The estimated horizontal collision risk for 2021 for the PAC area met TLS in all longitudinal and lateral risk categories (**Table 3**).

[4] Category A; Flight crew fails to climb or descent the aircraft as cleared;
Category B: Flight crew climbing or descending without ATC clearance;
Category C: Incorrect operation or interpretation of airborne equipment;
Category D: ATC system loop error;
Category E: Coordination errors in ATC-to-ATC transfer of control responsibility as a result of human factors issues;
Category F: ATC transfer of control coordination errors due to technical issues;
Category G: Aircraft contingency leading to sudden inability to maintain level;
Category H: Airborne equipment failure and unintentional or undetected level change;
Category I: Turbulence or other weather-related cause leading to unintentional or undetected change of flight level;
Category J: TCAS RA – flight crew correctly climb or descend following the RA;
Category K: TCAS RA – flight crew incorrectly climb or descend following the RA;
Category L: An aircraft being provided with RVSM separation is not approved;
Category M: Others.

Pacific Area – annual flying hours = 939,628 hours			
2021 PAC Area	**Risk Estimation**	**Airspace**	**Remarks**
30NM Lateral Risk	1.74×10^{-9}	Pacific	Below TLS
50NM Lateral Risk	0.71×10^{-9}	Japan	Below TLS
30NM Longitudinal Risk	-	Pacific	Below TLS
30NM Longitudinal Risk	0.01×10^{-9}	Japan	Below TLS
50NM Longitudinal Risk	2.22×10^{-9}	Pacific	Below TLS
10MIN Longitudinal Risk	0.03×10^{-9}	Japan	Below TLS
2020 PAC Area	**Risk Estimation**	**Airspace**	**Remarks**
30NM Lateral Risk	0.09×10^{-9}	Pacific	Below TLS
50NM Lateral Risk	0.65×10^{-9}	Japan	Below TLS
30NM Longitudinal Risk	3.73×10^{-9}	Pacific and Japan	Below TLS
50NM Longitudinal Risk	2.22×10^{-9}	Pacific	Below TLS
10MIN Longitudinal Risk	0.25×10^{-9}	Japan	Below TLS

Table 3: Pacific Area Horizontal Collision Risk 2020 – 2021

2.15 There was a total of 137 Large Lateral Deviations (LLDs) and Large Longitudinal Errors (LLEs) in the Pacific area in 2021 (increased from 109 in 2020), with a total duration of 664 minutes and total horizontal deviation of 597NM. 105 of the occurrences were Category E (77%), 11 were Category A or B (8%), 1 was Category G (< 1%) and 5 were Category H (4%).

Asia Area Vertical Collision Risk

2.16 The estimated vertical collision risk for 2021 for the Asia area met TLS (**Table 4**). The overall risk continued to decline since 2017 due to various safety improvement initiatives.

Asia Area – annual flying hours = 5,404,154 hours			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Vertical Technical Risk	0.32×10^{-9}	2.5×10^{-9}	Below Technical TLS
Vertical Operational Risk	3.71×10^{-9}	-	-
2020 Vertical Overall Risk	**4.03×10^{-9}**	5.0×10^{-9}	**Below TLS**

Table 4: Asia Area Vertical Collision Risk 2021

2.17 The Asia vertical collision risk estimates had been above TLS each year from 2016 to 2019 and trending downwards since 2017. In 2020 there was a significant fall in the risk estimate, while still remaining above TLS, reflecting the reduction in traffic volumes caused by the COVID-19 pandemic (**Table 5**). The 2021 vertical collision risk estimate was below TLS. There was a total of 379 LHDs reported in the Asia area in 2021, with total duration 339 minutes and 115 levels crossed.

Year	**Vertical Overall Risk Estimate (x 10^{-9} FAPFH)**	**Remark**
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

Table 5: Asia Area Vertical Collision Risk Estimates 2016 – 2021

Asia Area Horizontal Safety Assessments

2.18 The estimated horizontal collision risk for 2021 for the Asia area met TLS in all longitudinal and lateral risk categories. There was one LLD reported in the Asia area in 2021, with a duration of 29 minutes.

Safety Reporting

2.19 **Table 6** shows the number of LHD, LLD and LLE reports for 2017 to 2021, and the number of reports per flying hours. Total estimated flying hours had decreased significantly due to the COVID-19 pandemic, from 15,677,369 in 2019 down to 7,234,881 in 2020 – an overall reduction of 54%. Flying hours in 2021 were marginally higher than 2020, at 7,604,927. The total number of reports approximately halved, from 1094 in 2019 down to 548 in 2020, but increased to 679 in 2021.

2.20 The number of reports per flying hours in 2021 significantly increased from 2020 in China, SEA, Indonesia, Japan, Republic of Korea/AKARA, leading to an overall reporting rate that was improved from the rate in 2020. Mongolia submitted one report in 2021. Data was not available for DPR Korea.

Airspace	# Reports					1 Report : Flying Hrs				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
DPRK	0	0	0	0	0	-	-	-	-	-
Mongolia	4	1	2	0	1	1: 37,771	1: 158,891	1: 82,138	-	1: 121,621
China	134	110	79	85	105	1: 18,248	1: 22,229	1: 31,119	1: 26,867	1: 15,477
ROK	5	12	34	5	70	1: 117,090	1: 28,365	1: 18,959	1: 25,965	1: 15,456
SEA	474	205	152	42	80	1: 6,548	1: 17,757	1: 22,275	1: 25,106	1: 13,528
Indonesia	34	23	37	18	47	1: 10,842	1: 53,603	1: 33,321	1: 17,346	1: 11,975
Japan	71	76	77	66	135	1: 21,510	1: 20,632	1: 20,762	1: 14,737	1: 11,167
SA/IO	935	681	439	152	41	1: 3,166	1: 3,783	1: 7,955	1: 7,907	1: 7,402
SW Pacific	51	53	101	46	176	1: 17,572	1: 17,817	1: 9,335	1: 6,954	1: 6,638
Pacific	42	43	173	134	24	1: 54,191	1: 45,064	1: 10,139	1: 6,404	1: 6,285
Total	**1,750**	**1,204**	**1,094**	**548**	**679**	**1: 8,180**	**1: 12,332**	**1: 14,330**	**1: 11,712**	**1: 11,200**

Table 6: Total LHD, LLD and LLE Reports, and Reports per Flying Hours, 2017 - 2021

LHD Hot Spots

2.21 **Table 7** summarizes current LHD Hot Spots, the FIRs involved, the year of identification, and status remarks. The meeting considered that all current hot spots should be retained due to the continuing reduced traffic resulting from the COVID-19 pandemic and would be reviewed at RASMAG/28.

Hot Spot	Involved FIRs	Identified	Remarks
A1	Kolkata/Dhaka-Yangon	2015	Cat. E LHDs improved. Mitigations to be completed.

A2	Chennai – Yangon/Kuala Lumpur	2015	Cat. E LHDs slightly increasing
B	Incheon (AKARA Airspace)	2015	Cat. E LHDs improved. Mitigations to be completed.
D	Manila – all adjacent FIRs	2015	Cat. E LHDs increasing
F	Mogadishu – Mumbai	2015	Cat. E LHDs improved. Mitigations to be completed.
G	Sanaa/Muscat – Mumbai	2015	Cat. E LHDs improved. Mitigations to be completed.
J	Jakarta – Singapore/Kota Kinabalu	2018	Cat. E LHDs increasing.
M	Colombo – Melbourne	2019	Proposed to re-classify as non-hot spot. Mitigations to be completed.
N	Oakland USA – Hawaii CEP	2019	Cat. E LHDs increasing

Table 7: LHD Hot Spots in the Asia/Pacific Region

2.22 The process of identifying, monitoring and removing LHD hot spots had been developed informally over several years, to focus RASMAG attention on areas that required special attention. MAAR, responding to RASMAG Task List Action Item 26/5, presented a draft process for identifying, monitoring and removing LHD hot spots which had been discussed at the Ninth meeting of the RASMAG-Monitoring Agencies Working Group (MAWG/9). The MAWG/9 meeting had agreed that the process should be conducted as a trial in 2022 before finalizing. All monitoring agencies trialled the draft approach in their safety reports for RASMAG/27. The meeting noted that the trial hotspot identification process was subjective to some degree, but difficult to standardize. Monitoring agencies were welcomed to propose ideas in this regard to the MAWG to fine tune the overall process. RASMAG supported continuation of this activity, with a view to its future formalization.

Side Meeting – Hot Spot D

2.23 A RASMAG/27 side meeting was held after the close of plenary discussion on 23 August 2022, to provide the opportunity for ANSPs to discuss Hot Spot D (Manila FIR and Adjacent FIRs). A summary of discussion was provided in **Appendix E to the RASMAG/27 report**.

AKARA Corridor

2.24 JASMA provided an update on the progress and proposals of the safety improvement plan for the AKARA – FUKUE Corridor. Phase 1 of the improvement plan had been implemented on 25 March 2021 (**Figure 3**), and remained the current status of the project.

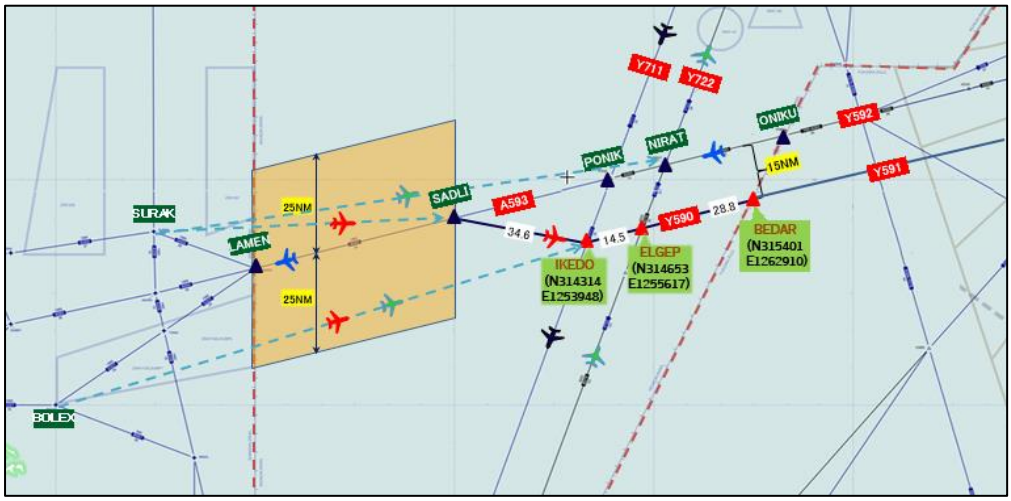


Figure 3: ATS route structure of AKARA-FUKUE Corridor in Phase 1

2.25 As reported to RASMAG/26, All Air Traffic Control (ATC) responsibility for ATS route A593 between ONIKU and SADLI had been handed over to Incheon Area Control Centre (ACC).

2.26 Japan and Republic of Korea had conducted bilateral discussion of the matter, and had agreed to an interim procedure to assign non-FLAS flight levels for requesting flights if the flight level was not already assigned to another aircraft.

2.27 Japan proposed that China and ROK should present and share information on the updated schedule for Phase 2 implementation and significant technical and operational issues at the ATM/SG/10 meeting. China replied that they welcomed open discussion with the related States to progress Phase 2 implementation (**Figure 4** shows the ATS route structure of Phase 2) at an appropriate time, within the Technical Working Group (TWG) framework.

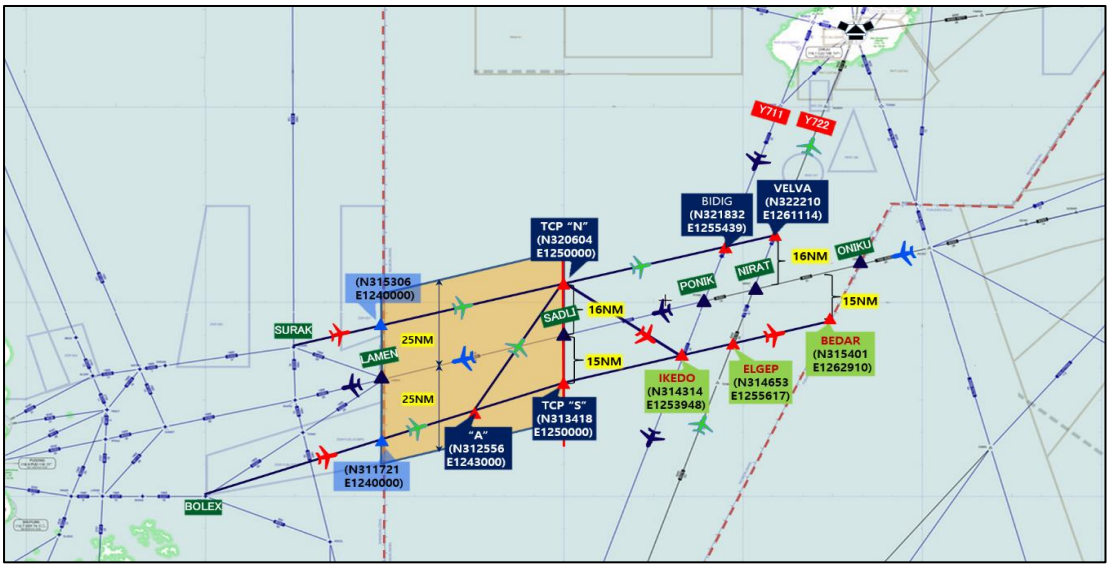


Figure 4: ATS route structure of AKARA-FUKUE Corridor Safety Improvement Plan Phase 2.

2.28 Republic of Korea informed the meeting that the coordination of a safety oversight scheme was being discussed with China in preparation for the route structure that would become more complicated in Phase 2. Republic of Korea was studying more efficient FLAS operations regardless of implementation of Phase 2, for example the flexible use of FLAS based on traffic volume. Republic of Korea would discuss this with States concerned through bilateral or trilateral channels when a proposal was ready.

South Asia Indian Ocean Airspace

2.29 The 2021 RVSM risk estimate for SAIO airspace indicated that the TLS had not been met at 5.62 x 10^{-9} (**Figure 5**).

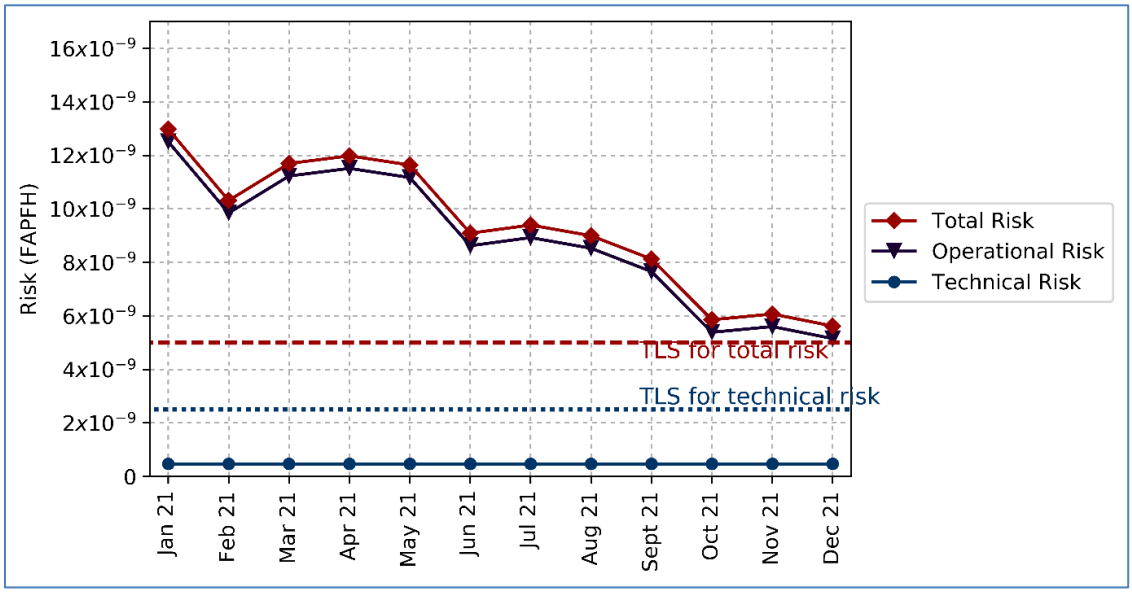


Figure 5: Trends of Risk Estimates for SA/IO Airspace.

2.30 As had been the case in previous years, the vast majority of the 134 LHD cases that had been reported were Category E events (123 or approx. 92%)

Identified Airspace Risk Occurrences in Indian FIRs

2.31 India presented identified risk occurrences in the four Indian FIRs as reported by ATC during the period 1 January to 31 December 2021, together with various mitigation measures.

2.32 There was one LLD and no LLE reported in the BOBASIO airspace. However, there were 149 LHDs including 143 category E LHDs, of which 100 were filed by Indian ACCs/OCCs and another 43 by adjacent accepting ACCs/OCCs.

2.33 As part of its efforts to reduce the risks due to coordination errors and other near boundary ATS incidents India had planned to implement ATS Interfacility Data Communication (AIDC) with all the neighbouring FIRs. AIDC Test/Trails were conducted during the past year with many of the neighbouring ATSUs.

PARMO Vertical and Horizontal Safety Monitoring Report

2.34 PARMO provided a vertical safety assessment for 2021 for the Pacific RVSM airspace and a portion of Northeast Asia RVSM airspace.

2.35 The 2021 RVSM risk estimate for Pacific airspace indicated that the TLS had not been met at 28.21×10^{-9} (**Figure 6**).

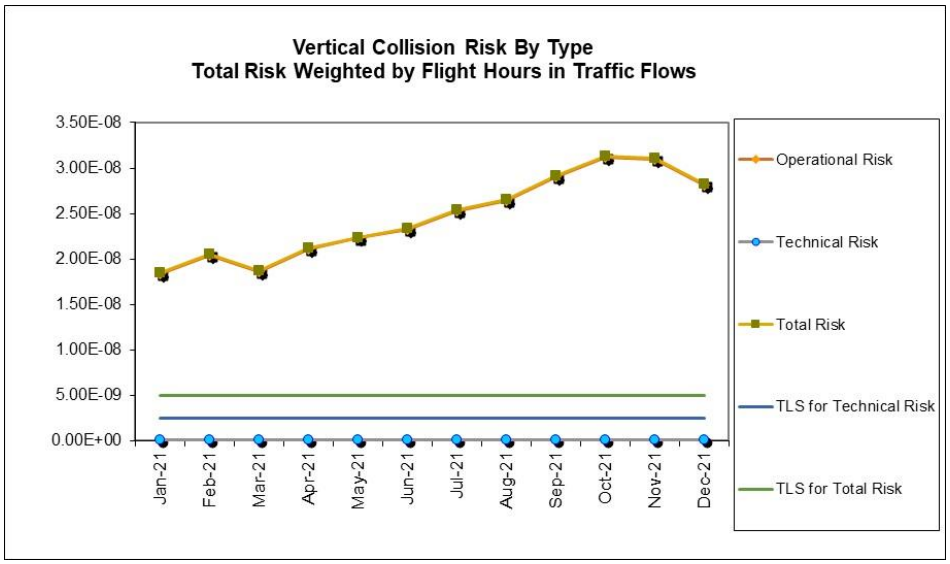


Figure 6: Pacific Airspace RVSM Risk Estimate Trends

2.36 The largest contributors to the vertical collision risk estimate were reported LHD category E occurrences involving Honolulu Control Facility (HCF) and Oakland Center. This specific set of reported LHDs account for 73 percent of the total risk estimate.

LHD Material Package

2.37 MAAR presented consolidated LHD material as a package to capture the current situation of LHD reporting processes. The package included LHD frequently asked questions (FAQ), LHD taxonomy, LHD reporting form and LHD points of contact (POCs).

2.38 ICAO Doc 9574 *RVSM Implementation Manual* Chapter 5 specified that ATC authorities were responsible for reporting LHDs to the responsible RMA. The LHD Material Package should be useful for States and ANSPs to better understand the LHD definition, criteria and reporting process. The LHD Material Package 2022 was provided in **RASMAG/27 WP/24 Attachments 1 to 7**.

Identification of Non-RVSM Approved Aircraft

2.39 **Table 8** lists the numbers of non-RVSM airframes reported annually by each RMA.

Report	AAMA	China RMA	JASMA	MAAR	PARMO	Total
RASMAG/20	8	45	15	234	26	328
RASMAG/21	5	6	15	106	11	143
RASMAG/22	7	40	11	163	25	246
RASMAG/23	5	20	9	43	38	115
RASMAG/24	5	4	17	34	1	61
RASMAG/25	2	24	6	26	9	67
RASMAG/26	10	19	21	19	3	72
RASMAG/27	Nil	61	17	21	18	117

Table 8: Trend of Non-RVSM Airframes Observed

2.40 MAAR proposed, and the meeting agreed, to include Brunei Darussalam on the APANPIRG List of Deficiencies in the ATM and Airspace Safety fields for failure to verify RVSM approval status for two consecutive years. The meeting also agreed that Lao PDR and Mongolia, both of which failed to submit the 2021 annual RVSM approval snapshot, should be informed that failure to submit the snapshot in 2022 may result in a Deficiency being recorded in 2023.

Survey Outcome for Continuance of 'W' Check for APAC State Aircraft

2.41 The meeting was informed of the results of a survey conducted by ICAO Regional Office in response to ***Conclusion APANPIRG/32-6: RVSM Approvals Data and Filing of RVSM Indicator in Flight Plans of State Aircraft***. The survey, prepared by MAAR on behalf of APANPIRG and APAC RMAs had been circulated by ICAO State Letter on 03 March 2022.

2.42 Fifteen States responded to the Survey. The majority of responses indicated that respondent States:

1) had coordination processes in place to support discussions of RVSM and other airspace-safety-related issues with State aircraft operators;

2) had rules or procedures in place to ensure that State aircraft operators did not file the RVSM-approved 'W' indicator in filed flight plans for non-RVSM-approved aircraft; and

3) would you like Asia Pacific RMAs to continue to cross-check 'W' in State Aircraft's flight plans against RMAs' RVSM database and try to resolve the discrepancies.

2.43 MAAR informed the meeting that they would present this result to the upcoming 17th Meeting of the Regional Monitoring Agencies Coordination Group (RMACG/17) Part II meeting.

MAAR Rogue State Aircraft on the European Bulletin

2.44 The meeting was provided a list of rogue State aircraft (from States under MAAR responsibility) that were reported on the European Air Navigation Region Bulletin (version 17.7, updated July 15 2022). These aircraft were identified as RVSM non-approved aircraft operating within the European region by filing 'W' in their flight plan but did not have matching RVSM approval records in the global RVSM approval combined snapshot.

2.45 Germany had requested that the EUROCONTROL Integrated Initial Flight Plan Processing System (IFPS) reject flight plans for such aircraft planning to operate in RVSM designated airspace over Germany. A proposal to extend the scheme throughout the area covered by the IFPS would be submitted to EANPG.

2.46 **Table 9** summarizes the number of aircraft from States under the MAAR responsibility that are listed on the European bulletin.

State of Operator	**Operator Name**	**Number of Registrations**
India	Air Force of India	5
	Government of India	2
	India Total	**7**
Pakistan	Air Force of Pakistan	6
	Pakistan Army	1
	Pakistan Total	**7**
Grand Total		**14**

Table 9: Number of Rogue Aircraft on the European Bulletin (States under MAAR responsibility)

2.47 India and Pakistan were urged to liaise with their State aircraft operators to explain the flight plan rejection mechanism and potential disruption to their flight operations. MAAR would assist in communications as much as possible.

2.48 India informed the meeting that the matter would be taken up with DGCA India. Pakistan had already approached the State aircraft operator on the matter.

2.49 ICAO noted the discussion of the matter of non-RVSM-approved State aircraft at ATM/SG/9 and APANPIRG/32 in 2021, which had resulted in Conclusion APANPIRG/32-6 not including key elements of the original drafted by RASMAG/26. States could also use the information to encourage more cooperative behaviour by their State aircraft operators.

APAC Consolidated Long Term Height Monitoring (LTHM) Compliance Status

2.50 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, which was based on RVSM approval data as of at 30 June 2022, yielded a remaining monitoring burden in the APAC Region of 528 aircraft, which was a 25% increase since 2020.

2.51 Pakistan had the highest percentage of remaining monitoring burden at 73%. It was noted that 70% of Pakistan operators had contacted the MAAR for Enhanced GPS-based Monitoring Unit (EGMU) service, but could not receive the service due to the travel restrictions during the pandemic. The Chair commented that, as an alternative, States could 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.

2.52 **Table 10** lists the States having a remaining monitoring burden of 30% or more, which could be subject to an APANPIRG ATM and Airspace Safety Deficiency.

State	2020	2021
Vanuatu (AAMA)	0%	100%
Pakistan (MAAR)	61%	73%
Indonesia (AAMA)	41%	52%
Solomon Islands (AAMA)	50%	50%
Papua New Guinea (AAMA)	31%	46%
India (MAAR)	51%	46%
The Philippines (MAAR)	48%	45%
Nepal (MAAR)	46%	45%

Table 10: List of States having monitoring burden over 30% as of 30 June 2022

2.53 Since the EGMU service had remained unavailable in the past year, MAAR proposed, and the meeting agreed, that consideration of States listed in **Table 10** to be included in the Deficiencies List should be delayed until RASMAG/28.

2.54 Information had been received indicating Afghanistan's remaining monitoring burden had dropped from 42% reported in RASMAG/26 to 14% this year. MAAR suggested that RASMAG propose APANPIRG consider removing Afghanistan from the List of Deficiencies. However, ICAO informed the meeting that the POC providing this information to MAAR was not the same person nominated by the current *de facto* aeronautical administration in Afghanistan that was in regular contact with ICAO. It was proposed that the Deficiency should remain, but comments reflecting this be included in the Deficiency List when presented to APANPIRG/33.

PBCS Non –compliance reporting

2.55 In relation to PBCS non-compliance reporting, the experience of FAA North Atlantic Approvals Registry and Monitoring Organization (NAARMO) and PARMO was that there had been a lack of reports received, some gaps in the data, and delayed receipt of reports. Further information was provided on the number of reports and timeliness of data received, the unavailability of specific PBCS contacts at State/Civil Aviation Authority (CAA) level, lack of State participation in RMA measures on PBCS, the manual nature of PBCS non-compliance reporting, and the tracking of non-compliant aircraft.

2.56 RASMAG agreed that further action on the development and formalization of non-compliance reporting and handling processes, possibly in the form of regional guidance, would be coordinated through FIT-Asia.

JASMA Assessment of Non-PBCS Approved Aircraft

2.57 JASMA presented a list of operator-aircraft combinations operating within the Pacific Ocean airspace of the Fukuoka FIR with no registration of PBCS approval.

2.58 The percentage of PBCS-filed flights increased gradually from 85 to 88 percent in 2021, then reached 90 percent in the first half of 2022. The percentage of PBCS-approved flights had remained 5 to 9 percent lower than the percentage of PBCS-filed flights. There were approximately 30 flights per day and 900 per month that filed 'P2' and 'RSP180' in their flight plans but were not confirmed to be PBCS approved/authorized, according to the approvals database.

2.59 Japan and USA informed the meeting that there was a plan to implement 23NM lateral separation minimum and new ATS routes requiring RNP4 and PBCS for aircraft operating in the North Pacific Ocean Airspace. Aircraft filing 'P2' and 'RSP180' in their flight plans that were also identified as non-PBCS approved may not be approved to operate on the new ATS routes or in the related flight level stratum.

ANS Deficiencies List

2.60 The meeting reviewed the APANPIRG ATM and Airspace Safety Deficiency List and agreed to make the following recommendation to APANPIRG/33, as presented separately under Agenda Item 4:

2.61 FIT-Asia/12 had proposed, and RASMAG/27 agreed, retention of the following data link-related ATM and Airspace Safety Deficiencies be recommended to APANPIRG/33:

a) Retention of the following data-link related deficiencies:

India: *Performance monitoring and analysis not reported for Mumbai FIRs.*

Maldives: *Problem reports not provided to CRA. Performance monitoring and analysis not reported to FIT.*

b) Retention of the following safety related data deficiency

Afghanistan: *non-provision of safety related data*

c) Addition of a new Deficiency:

Brunei Darussalam: non-provision of Safety-Related Data – Requirement of Paragraph 3.3.5.1 of Annex 11 (provision of data for monitoring the height keeping performance of aircraft).

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) note the **Conclusion RASMAG/27-1: CPDLC Latency Monitor value;**

b) note the **Conclusion RASMAG/27-2: Updated Reporting of PBCS Implementation Status and Performance Monitoring Data;**

c) note the trial hot spots identification process, and the retention of hot spots during the current period of significantly reduced traffic;

d) note the proposal to ICAO European Air Navigation Planning Group (EANPG) meetings for the rejection of RVSM non-approved aircraft listed in the European bulletins, particularly those that had been listed for extended periods;

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

f) discuss any relevant matters as appropriate.

— — — — — — — —

2021 Asia Pacific

Consolidated Safety Report

RASMAG/27
22 - 25 August 2022

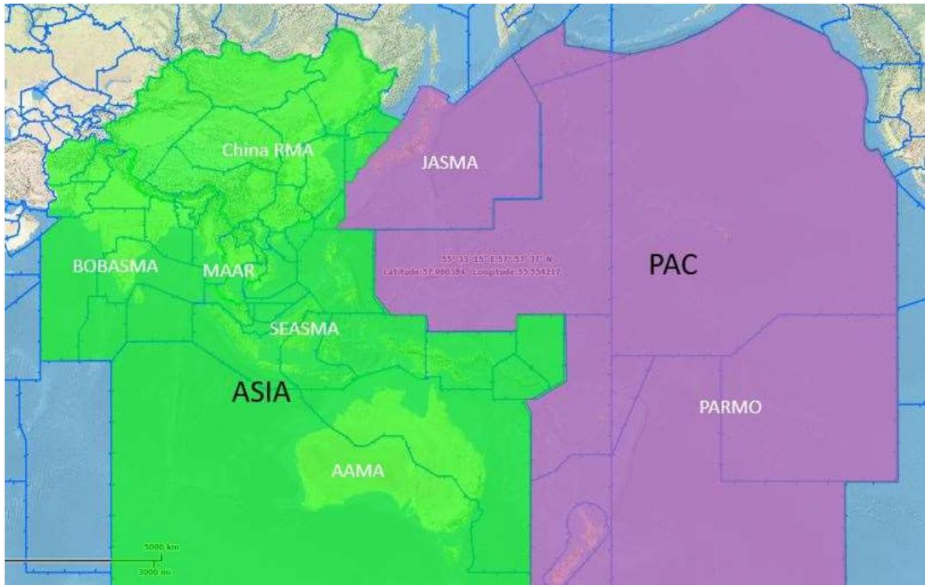
Outline

- 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
- Hot Spot identification process
- 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)

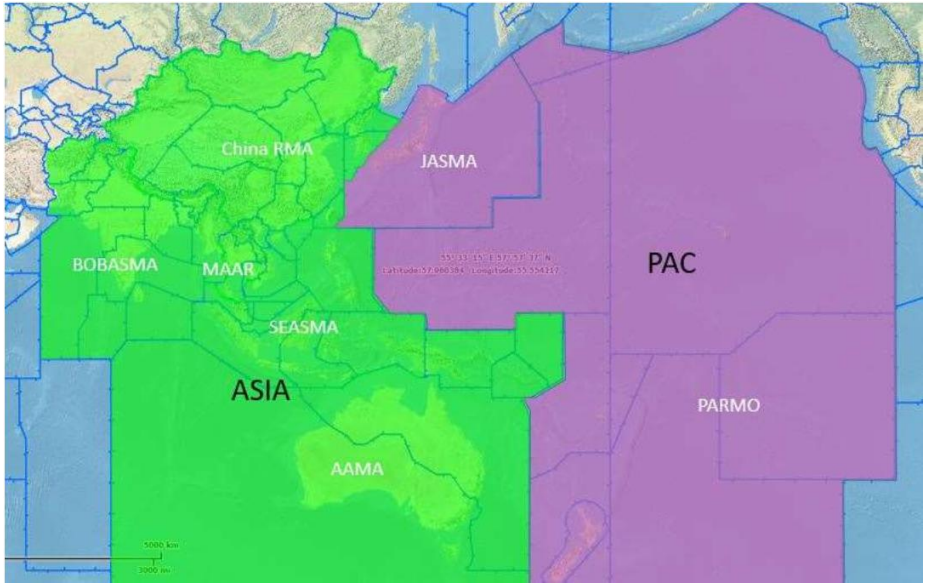
Traffic between North America and Asia, or North America and South Pacific States

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

Monitoring Agencies :

RMAs (Verical): JASMA, PARMO

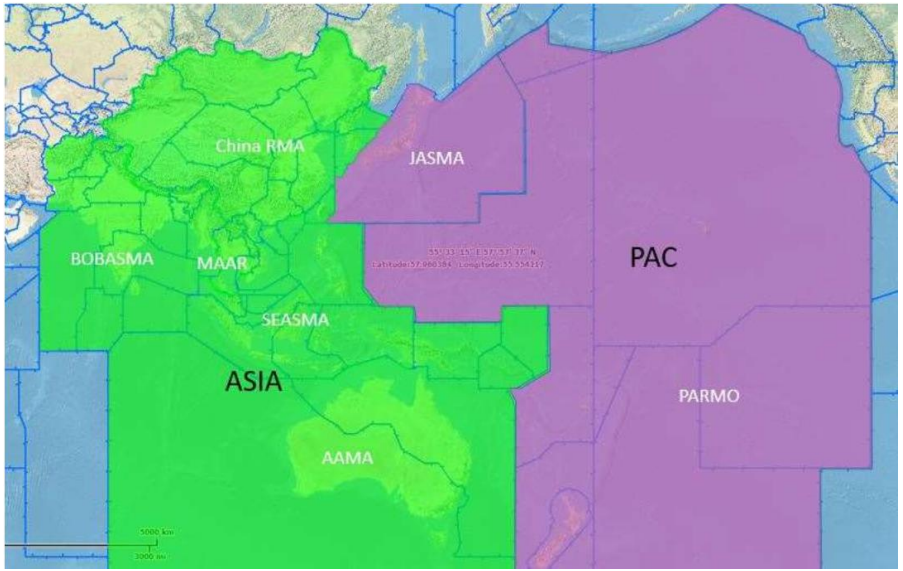
EMAs (Horizontal): JASMA, PARMO



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: 2,159,665 hours/year

2021 PAC Area	Vertical Risk Estimate (x 10^{-9} FAPFH)	Remark
Vertical Technical Risk	0.14	Below Technical TLS
Vertical Operational Risk	19.61	
Vertical Overall Risk	**19.74**	**Above TLS**

PAC : Vertical Collision Risk Estimates

2016 - 2021

Year	Vertical Overall Risk Estimate (x 10^{-9} FAPFH)	Remark
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

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	6	6.80	6
	B	Flight crew climbing/descending without ATC Clearance	8	26.00	22
	C	Incorrect operation or interpretation of airborne equipment	2	4.02	1
ATC	D	ATC system loop error	15	89.12	17
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	62	284.19	2
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	3	64	0
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	6	19.92	8
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	0	0	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	11	3.93	3
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	9	10.42	2
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	0	0	0
	M	Other	1	0	4
		Total	**123**	**508.40**	**65**

PAC : Horizontal Collision Risk

PAC : Horizontal Collision Risk Estimates

Number of annual flying hours: 1,259,048 hours/year

2021 PAC Area	Horizontal Risk Estimate (x 10^{-9} FAPFH)	Airspace	Remark
30NM Lateral Risk	1.74	Pacific	Below TLS
50NM Lateral Risk	0.71	Japan	Below TLS
30NM Longitudinal Risk	-	Pacific	Below TLS
30NM Longitudinal Risk	0.01	Japan	Below TLS
50NM Longitudinal Risk	2.22	Pacific	Below TLS
10MIN Longitudinal Risk	0.03	Japan	Below TLS
2020 PAC Area	**Horizontal Risk Estimate (x 10^{-9} FAPFH)**	**Airspace**	**Remark**
30NM Lateral Risk	0.09	Pacific	Below TLS
50NM Lateral Risk	0.65	Japan	Below TLS
30NM Longitudinal Risk	3.73	Pacific and Japan	Below TLS
50NM Longitudinal Risk	2.22	Pacific	Below TLS
10MIN Longitudinal Risk	0.25	Japan	Below TLS

PAC : Summary of LLDs and LLEs

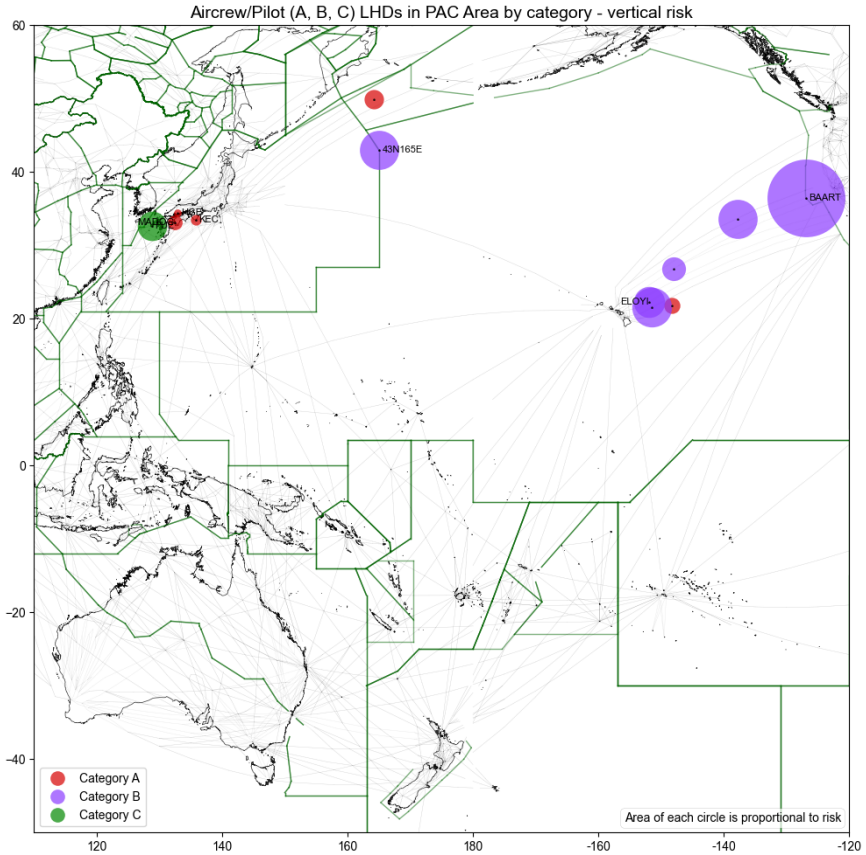
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	10	52	1	175
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	1	0	0	10
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	0	0	0	0
ATC	D	ATC system loop error	4	75	1	45
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	105	418	0	226
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	10	73	0	0

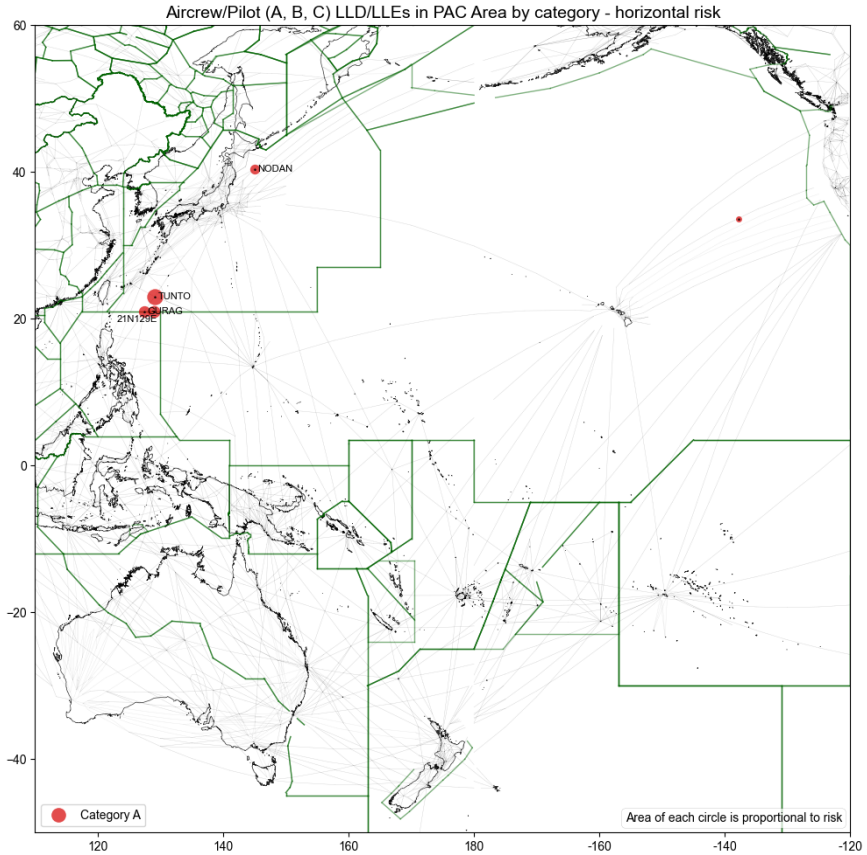
PAC : Summary of LLDs and LLEs

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	16	0	11
Weather/ Turbulence	H	Turbulence or other weather related causes leading to a deviation in the horizontal dimension	5	30	0	130
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0	0	0
	J	Other	1	0	0	0
		Total	**137**	**664**	**2**	**597**

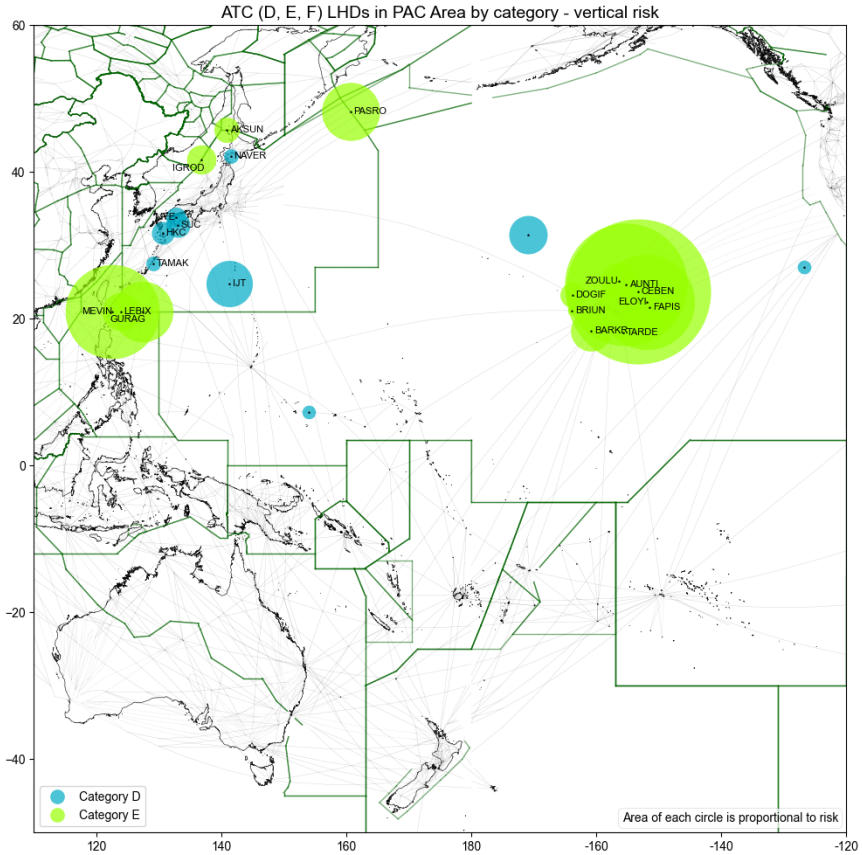
PAC : Geolocation of LHDs/LLDs/LLEs

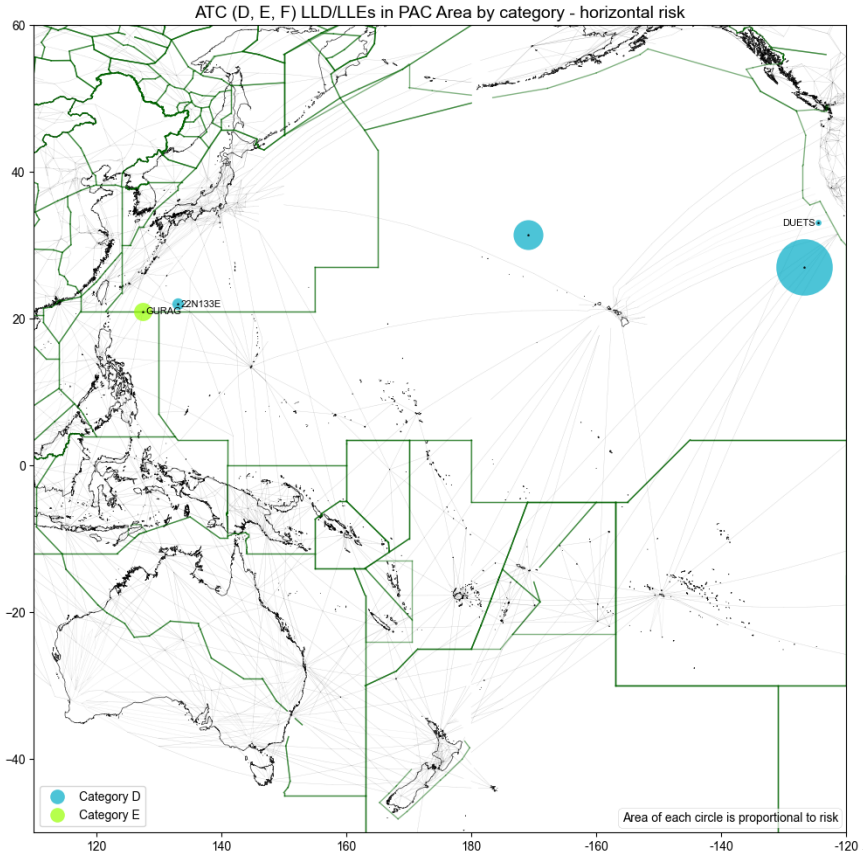
PAC : Aircrew/Pilot (A, B, C)



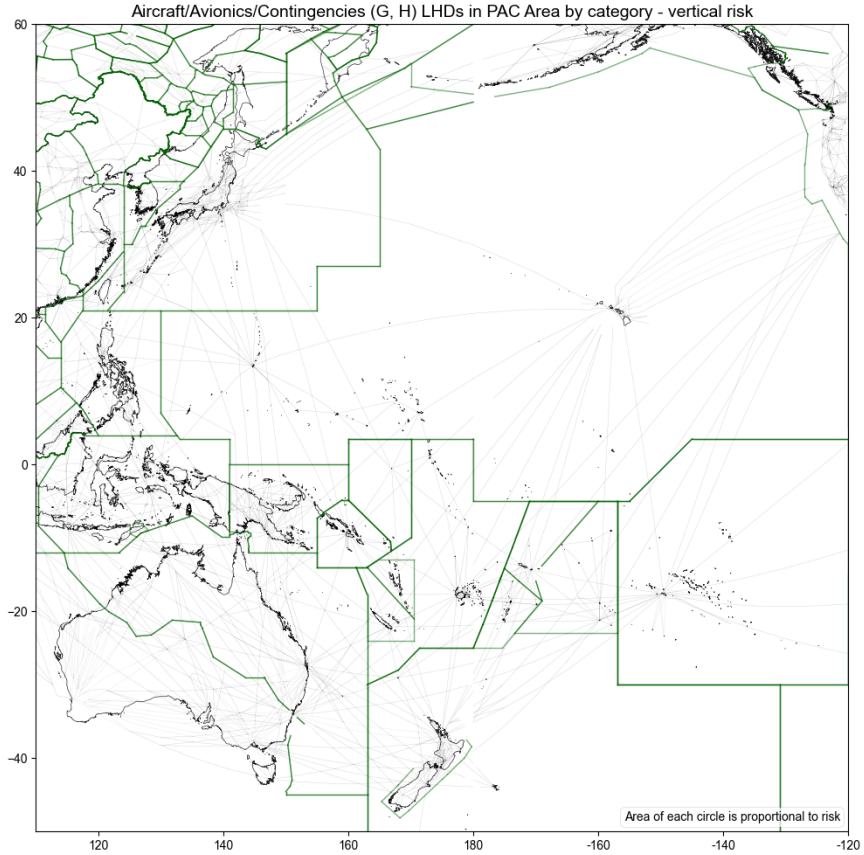


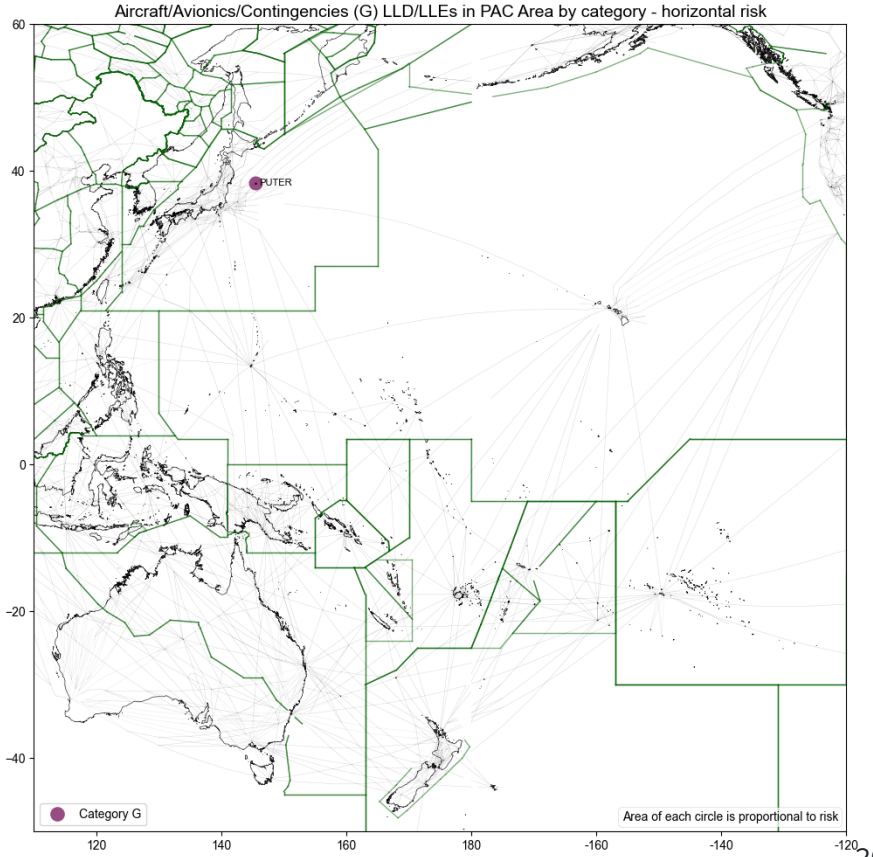
PAC : ATC (D, E, F)


ATC (D, E, F) LHDs in PAC Area by category - vertical risk
PASRO
AKSUN
NAVER
IGROO
HKC
TAMAK
IJT
MEVIN
LEBIX
GURAG
ZOULU
DOGIF
BRIUN
AUNTI
CEBEN
ELOYI
FAPIS
BARKE
TARDE
Category D
Category E
Area of each circle is proportional to risk

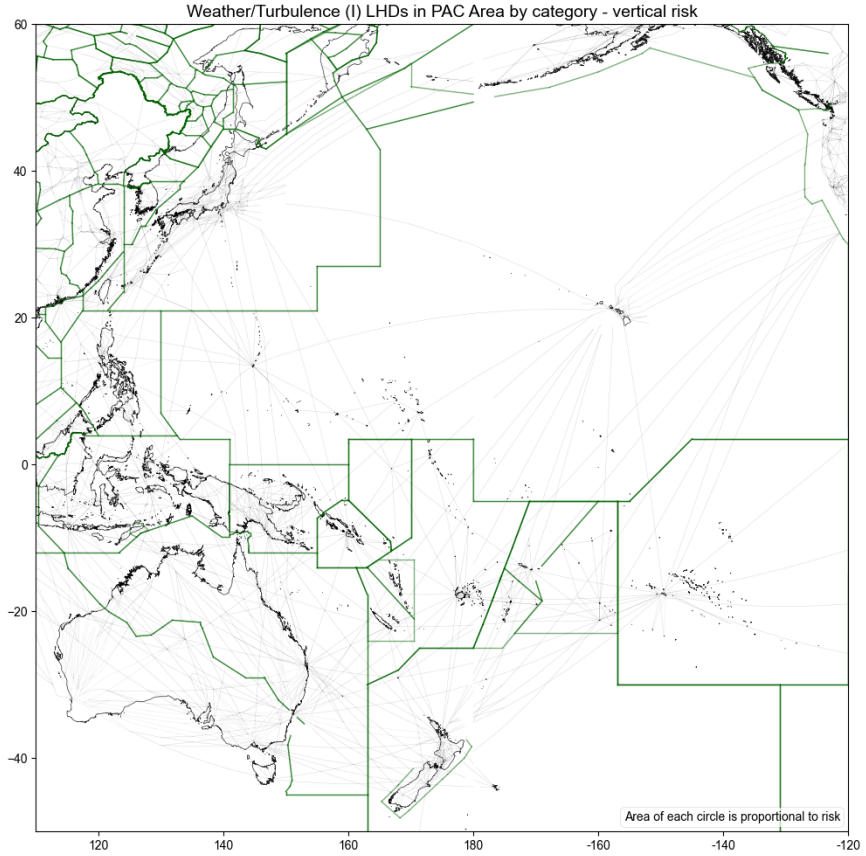

ATC (D, E, F) LLD/LLEs in PAC Area by category - horizontal risk
DUETS
22N133E
GURAG
Category D
Category E
Area of each circle is proportional to risk

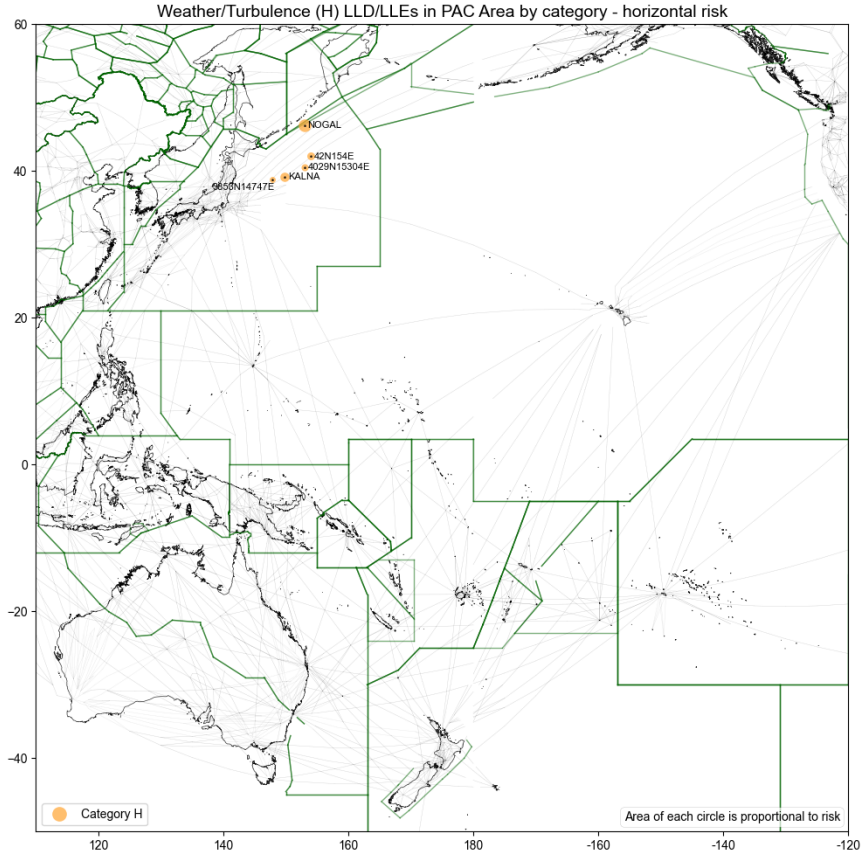
PAC : Aircraft Avionics/Contingencies (G, LHD:H)



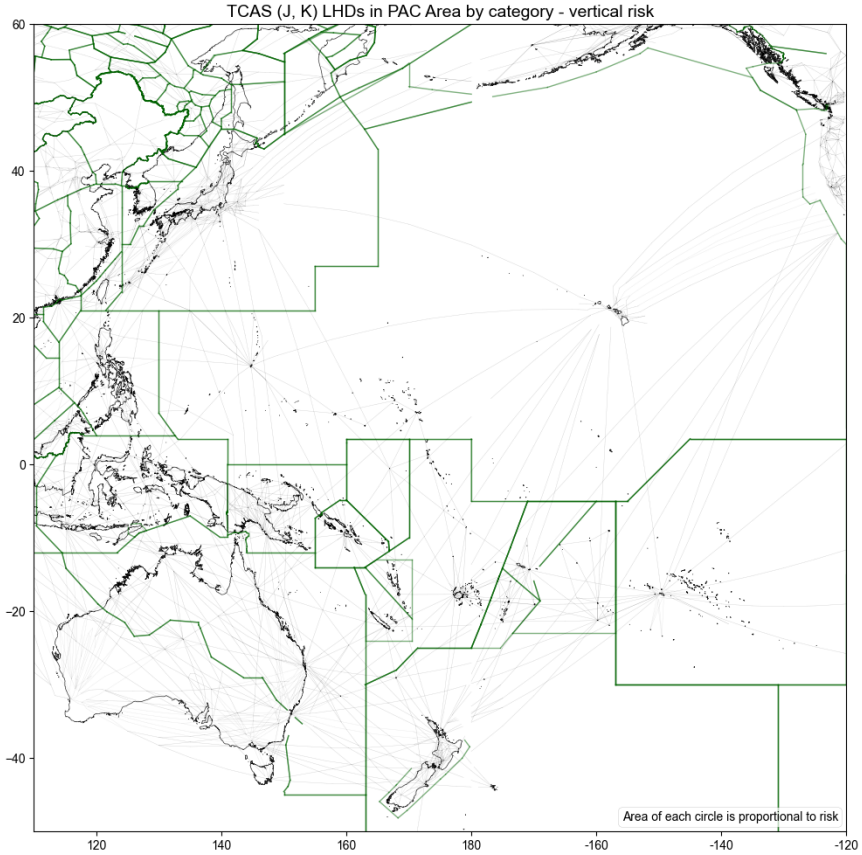


PAC : Weather/Turbulence (LHD:I, LLD/LLE:H)





PAC : TCAS (LHD:J, K)



PAC : Hot Spots

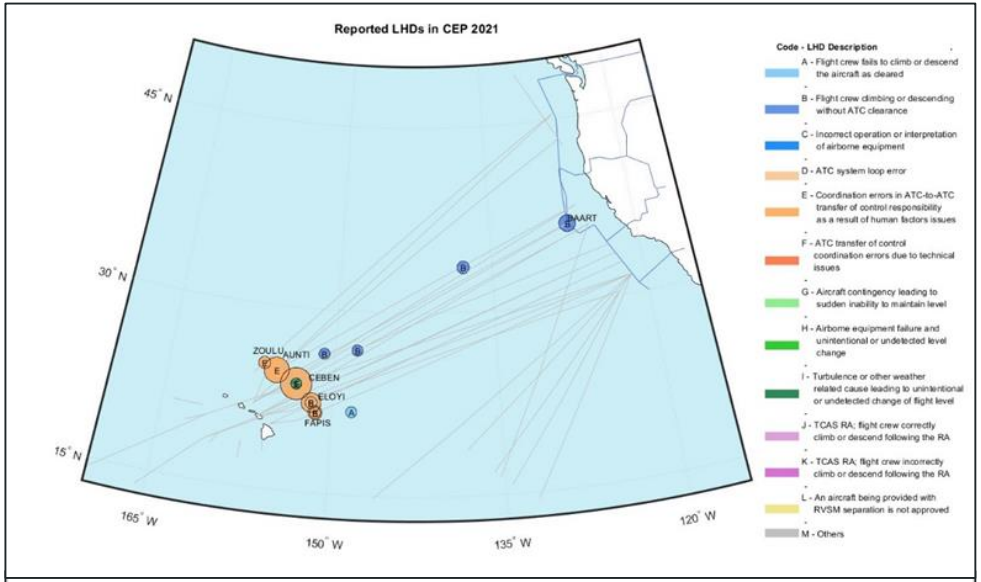
PAC : LHD Hot Spot N (North America - Hawaii CEP)

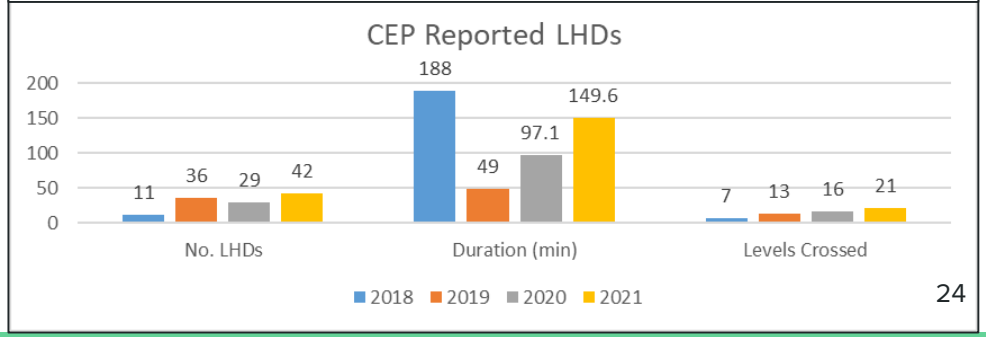
Nature of Occurrences : In 2018, several long duration LHDs were reported. Category E LHDs are the largest contribution to the estimate of risk in 2019, 2020 and 2021.

Contributing Factors : Central East Pacific (CEP) has high traffic volume. These occurrences affect the user preferred routes that cross the CEP airways.

Trend : Increasing trend continued in reported category E LHDs between Honolulu Control Facility (HCF) and Oakland center.

Mitigations : A task force was established and has developed a long-term plan to prevent these occurrences. The short-term strategies include a procedure for ATC to manually transfer the ETA to the next facility and ATC refresher training to update the aircraft profile in the automation system.





Asia Region

Asia : Vertical Collision Risk

ASIA : Vertical Collision Risk Estimates

Number of annual flying hours: 5,021,298 hours/year

2021 ASIA Area	Vertical Risk Estimate (x 10^{-9} FAPFH)	Remark
Vertical Technical Risk	0.32	Below Technical TLS
Vertical Operational Risk	3.71	
Vertical Overall Risk	4.03	**Below TLS**

Note:

The flying hours, technical risk and operational risk for Indonesian airspace were calculated based on the 2020 TSD.

ASIA : Vertical Collision Risk Estimates

2016 - 2021

The vertical overall risk was improved to be below the TLS in 2021.

Year	Vertical Overall Risk Estimate (x 10^{-9} FAPFH)	Remark
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 : 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	17	5	20
	B	Flight crew climbing/descending without ATC Clearance	12	0	12
	C	Incorrect operation or interpretation of airborne equipment	11	21.5	0
ATC	D	ATC system loop error	11	1.5	26
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	211	237	12
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	8	0	0
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	2	0	0
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	6	0	8

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	51	0	37
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	5	1	0
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	2	60	0
	M	Other	30	13	0
		Total	**379**	**339**	**115**

Asia : Horizontal Collision Risk

Asia : Horizontal Collision Risk Estimates

Number of annual flying hours: 333,153 hours/year

2021 Asia Area	**Horizontal Risk Estimate** (x 10^{-9} FAPFH)	**Remark**
30NM Lateral Risk	0.0015	Below TLS
50NM Longitudinal Risk	1.02	Below TLS
2020 Asia Area	**Horizontal Risk Estimate** (x 10^{-9} FAPFH)	**Remark**
30NM Lateral Risk	0.0004	Below TLS
50NM Longitudinal Risk	0.85	Below TLS
2019 Asia Area	**Horizontal Risk Estimate** (x 10^{-9} FAPFH)	**Remark**
30NM Lateral Risk	0.0001	Below TLS
50NM Longitudinal Risk	0.25	Below TLS

Asia : Summary of LLDs and LLEs

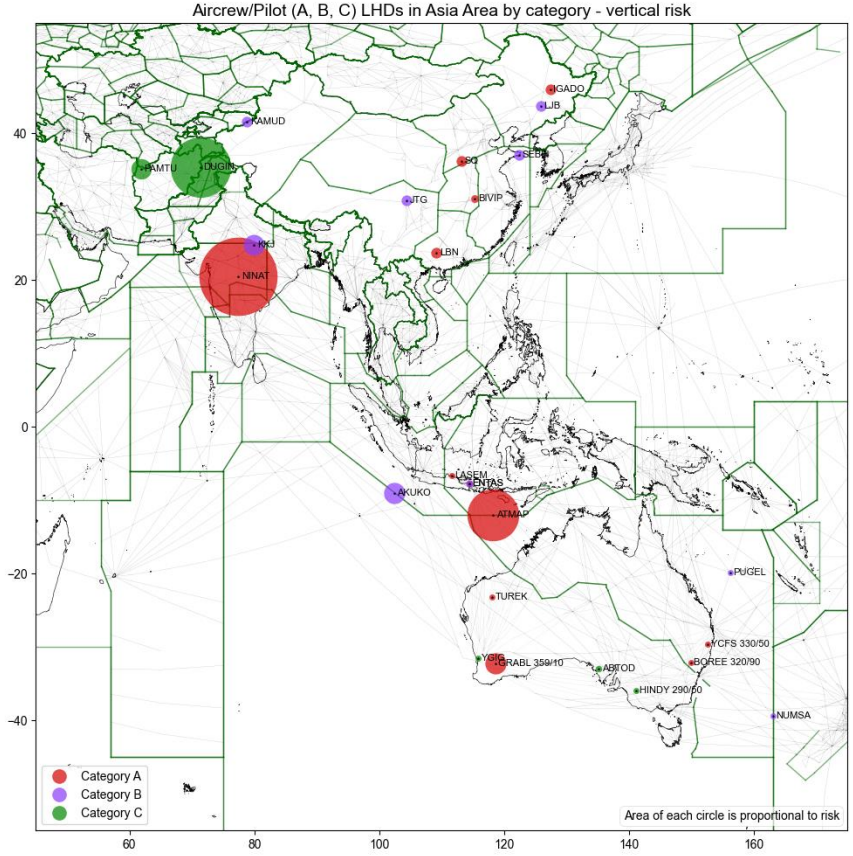
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	0	0	0	0
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	0	0	0	0
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	0	0	0	0
ATC	D	ATC system loop error	0	0	0	0
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	1	29	0	0
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	0	0	0	0

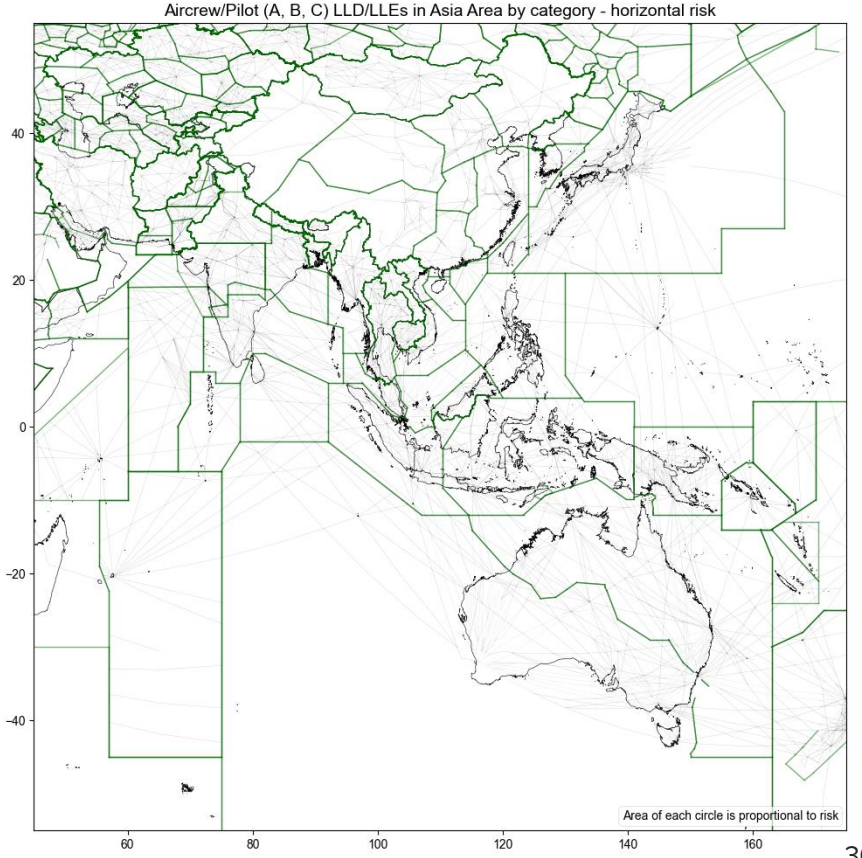
Asia : Summary of LLDs and LLEs

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	0	0
Weather/ Turbulence	H	Turbulence or other weather related causes leading to a deviation in the horizontal dimension	0	0	0	0
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0	0	0
	J	Other	0	0	0	0
		Total	**1**	**29**	**0**	**0**

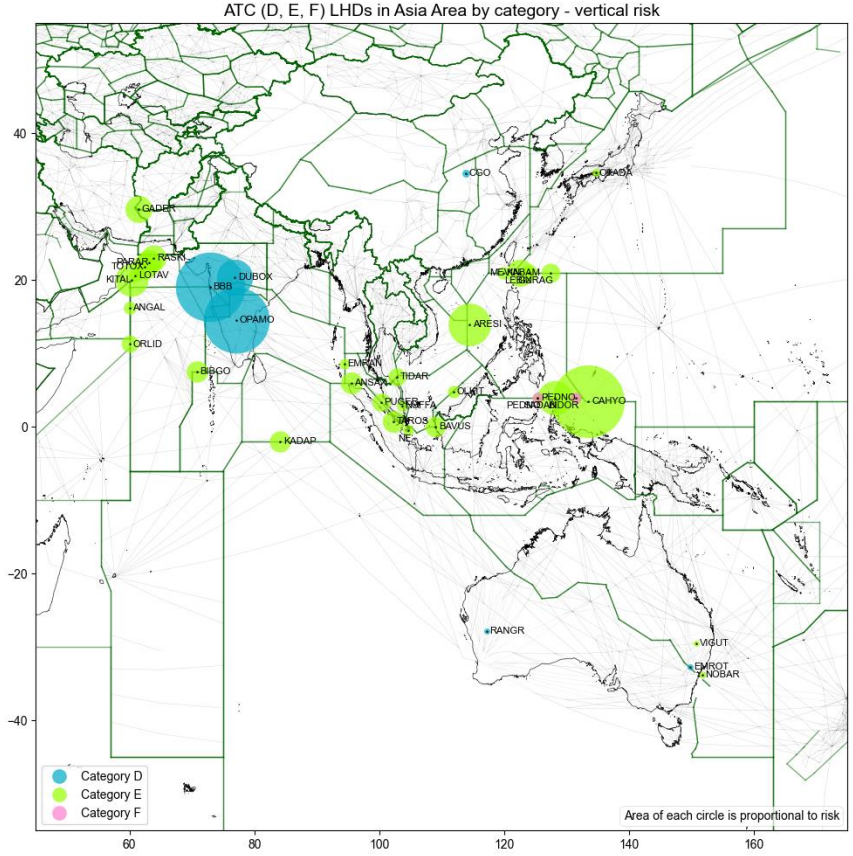
Asia : Geolocation of LHDs/LLDs/LLEs

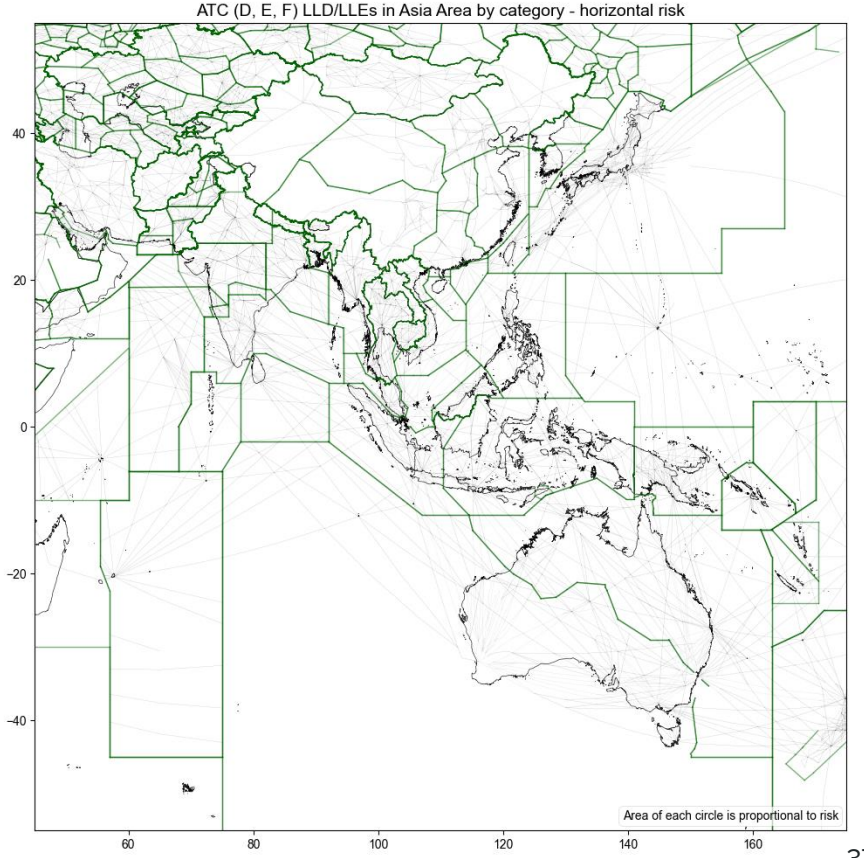
Asia : Aircrew/Pilot (A, B, C)



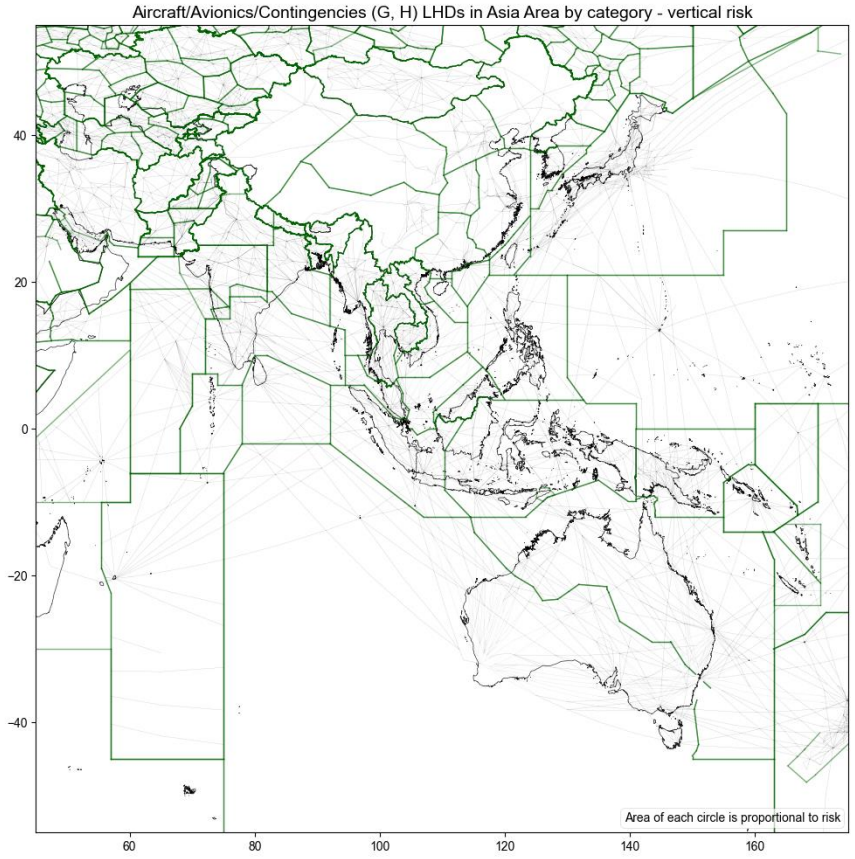


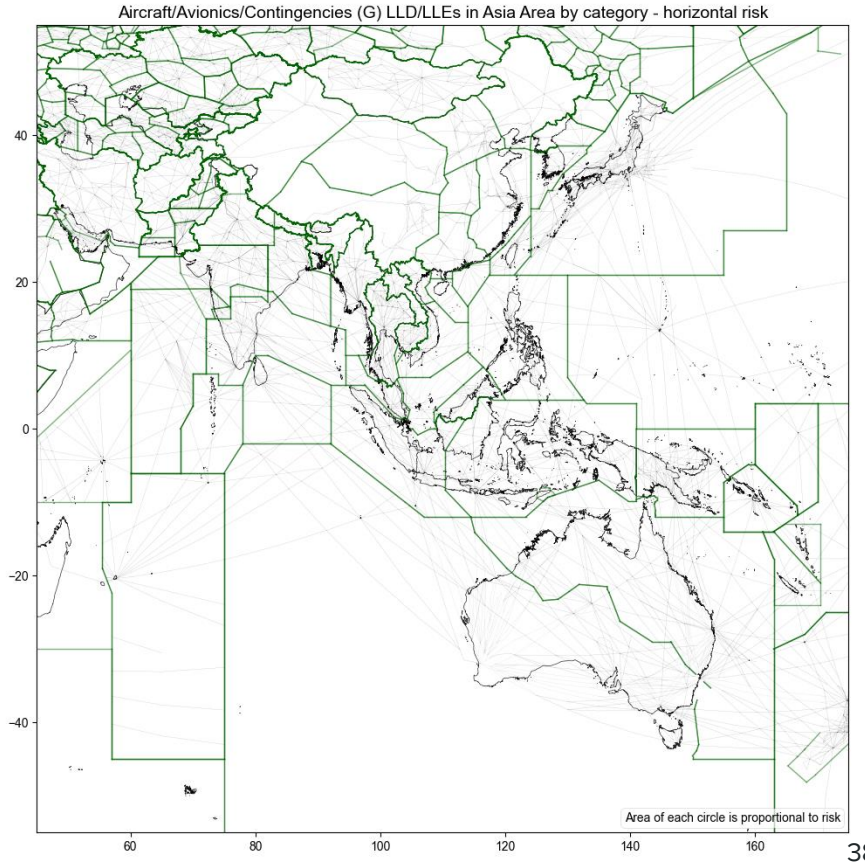
Asia : ATC (D, E, F)


ATC (D, E, F) LHDs in Asia Area by category - vertical risk
GADER
RASKI
DUBOX
BBB
LOTAV
ANGAL
OPAMO
ORLID
BIBGO
KADAP
CGO
ARESI
RANGR
VIGUT
EMROT
NOBAR
CAHYO
Category D
Category E
Category F
Area of each circle is proportional to risk
40
20
0
−20
−40
60
80
100
120
140
160

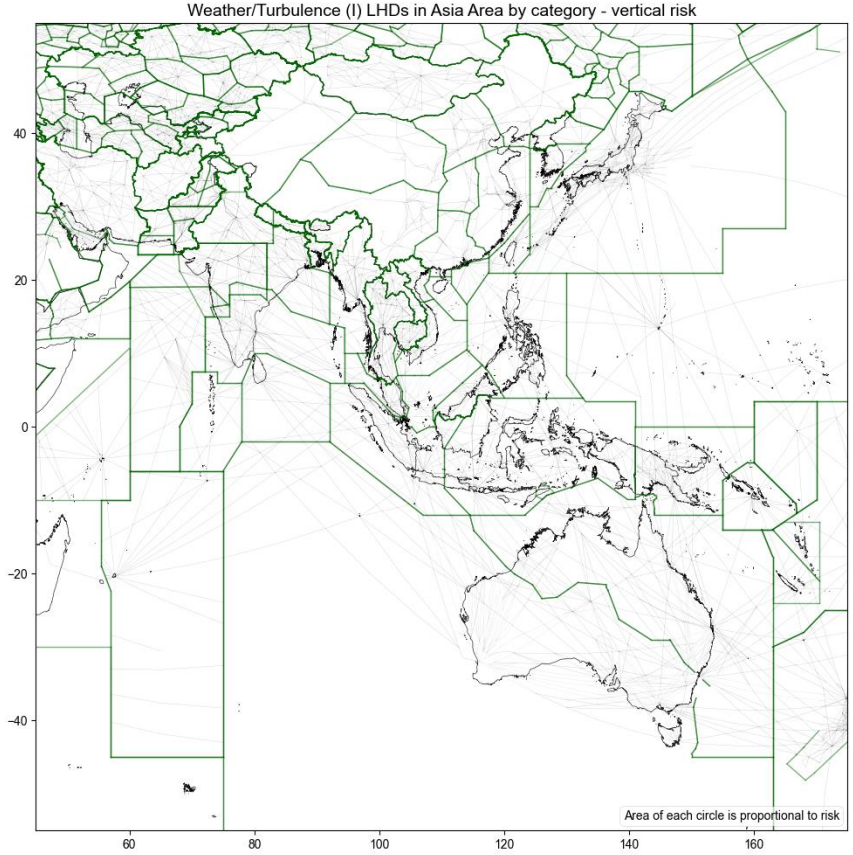

ATC (D, E, F) LLD/LLEs in Asia Area by category - horizontal risk
Area of each circle is proportional to risk
40
20
0
−20
−40
60
80
100
120
140
160

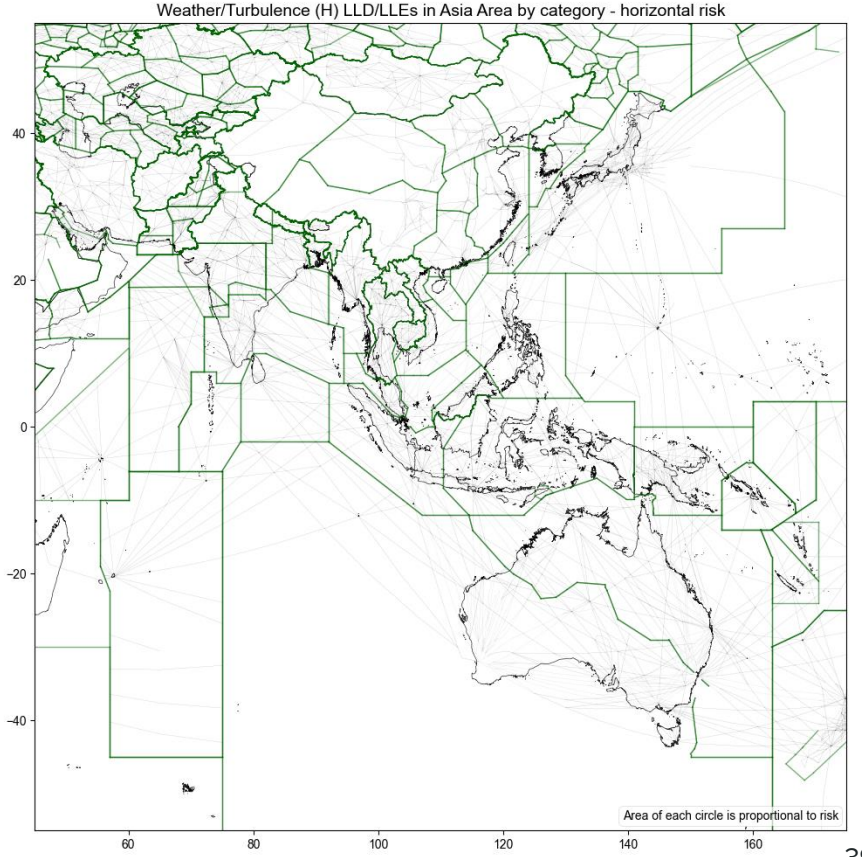
Asia : Aircraft Avionics/Contingencies (G, LHD:H)



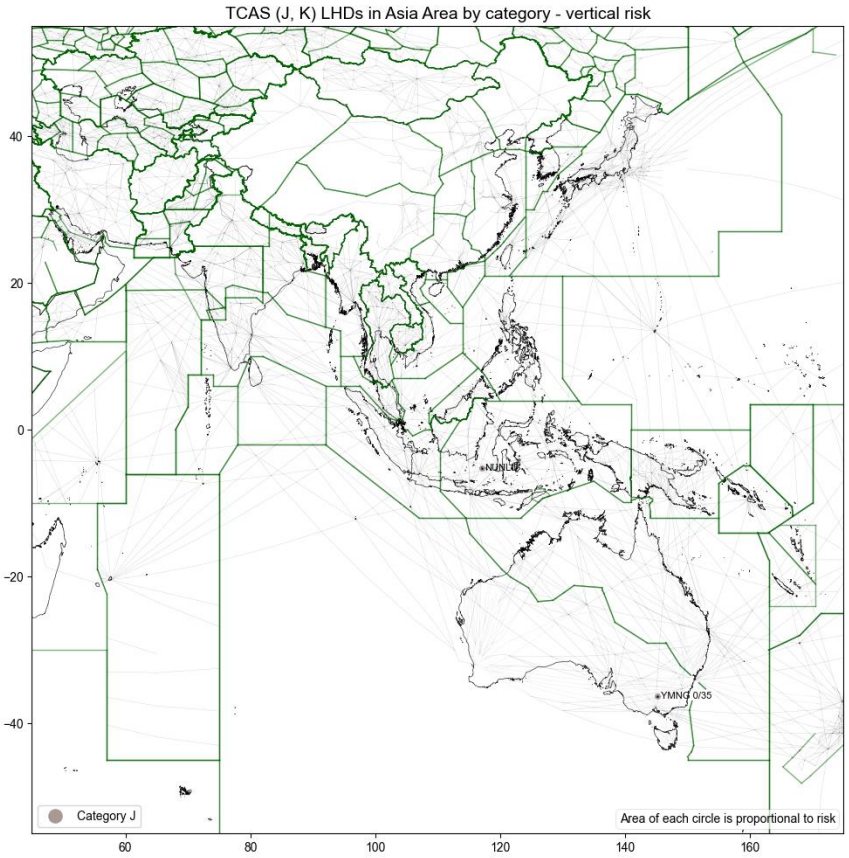


Asia : Weather/Turbulence (LHD:I, LLD/LLE:H)





Asia : TCAS (LHD:J, K)



Asia : Hot Spots

Asia : LHD Hot Spot A1 (Kolkata/Dhaka - Yangon)

Nature of Occurrences : The most commonly reported occurrences are classified as category E (coordination errors as a result of human factors issues.

Contributing Factors : The interfaces are the oceanic airspace with some gaps in communication and surveillance coverage.

Trend : The number of LHDs reduced from 8 in 2020 to 1 in 2021. However, the operational risk decreased to zero in 2020 and 2021.

Mitigations :

- The new procedure implemented over waypoint APAGO and CHILA (Dhaka-Yangon)
- ADS-B data sharing between Kolkata ACC and Yangon ACC was implemented.
- AIDC implementation between Kolkata ACC and Yangon ACC is in progress.
- Space-Based ADS-B is also used to detect errors in the oceanic airspace by India.

Boundary	The Number of LHDs		
	2019	2020	2021
Kolkata-Yangon	59	8	1
Boundary	**Operational Risk (x 10^{-9} FAPFH)**		
	2019	2020	2021
Kolkata-Yangon	0.31	0	0

Result from the identifying hot spots process: Hot Spot A1 does not satisfy any criteria in 2020 and 2021. However, some mitigation measures such as the AIDC between Kolkata ACC and Yangon ACC remain unfinished, thus this hot spot **remains on RASMAG's hot spot list**.

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

Nature of Occurrences : The most commonly reported occurrences are classified as category E (coordination errors as a result of human factors issues.

Contributing Factors : This interface is an oceanic airspace with some gaps in the communication and surveillance coverage.

Trend : The number of LHDs significantly decreased in 2020 and then slightly increased in 2021. The operational risk was 0 in 2020 and increased to 0.05 x 10^{-9} FAPFH in 2021.

Mitigations : The AIDC between Chennai OCC and Kuala Lumpur ACC commenced in January 2021 and the updated LOA was signed on 26 May 2021. The AIDC between Chennai OCC and Yangon ACC was trialed in January 2018 and did not have further update.

Result from the identifying hot spots process:
Hot Spot A2 satisfies hot spot criteria in terms of the number and **remains on RASMAG's hot spot list**.

Boundary	The Number of LHDs		
	2019	2020	2021
Chennai-Kuala Lumpur	88	13	21
Chennai-Yangon	16	3	8
Boundary	**The Operational Risk (x 10^{-9} FAPFH)**		
	2019	2020	2021
Chennai-Kuala Lumpur	1.14	0.00	0.05
Chennai-Yangon	0.49	0	0

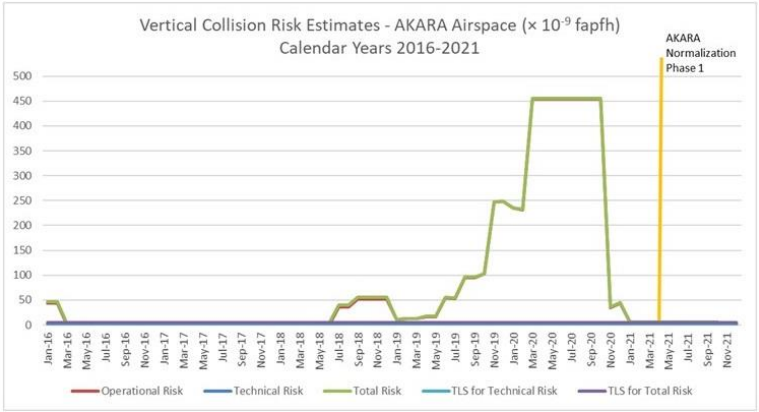
Asia : LHD Hot Spot B (AKARA Airspace)

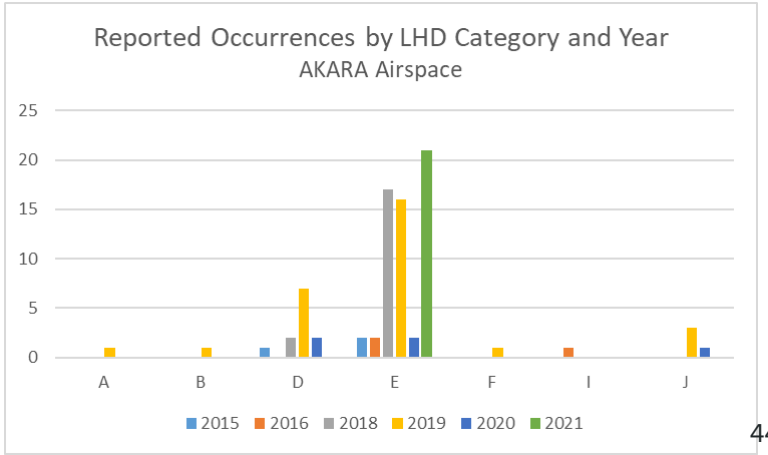
Nature of Occurrences :
Reported occurrences classified as category E are most common.

Contributing Factors :
- AKARA airspace is complex, with a unique arrangement of ATS provision.
- High traffic volume in the area with limited FLs from the Flight Level Allocation Scheme (FLAS)

Trend : Identified as a hot spot in 2015. All reported category E occurrences were mitigated/prevented in 2021, as can be observed from the decrease in vertical collision risk estimate in 2021.

Mitigations :
- Phase 1 of the AKARA airspace improvement project has been completed. Republic of Korea now has sole responsibility for ATS in the Incheon FIR east of SADLI.
- Phase 2 implementation has not yet been completed, and is subject to ongoing discussion between the States concerned..
- AIDC is also recommended between Incheon ACC and Shanghai ACC, in addition to the currently available surveillance and direct speech circuit.





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

Nature of Occurrences : The most reported occurrences are category E (coordination errors as a result of human factors issues. Category F LHDs (coordination errors as a result of equipment outage or technical issues) are emerging from AIDC failures.

Contributing Factors : Communication and surveillance coverage gaps along the boundaries of Manila FIR.

Trend : In 2021, the number of LHDs increased at Manila FIR boundaries interfacing with Kobe/Fukuoka, Ho Chi Minh and Manila-Ujung Pandang.

Mitigations :

- Reducing ATC workload by re-sectorization of Manila ACC into more sectors with the new ATM system.
- Enhancing the coverages of VHF radios, radars and ADS-B.
- ADS-C/CPDLC coverage was expanded, now covering the whole Manila FIR.
- AIDC has been successfully implemented with Hong Kong, Singapore, Taibei and Ujung Pandang ACC. The connection with Ho Chi Minh, Oakland, Kota Kinabalu, Kobe, and Fukuoka is also planned.

Boundary	Number of LHDs			Operational Risk (x 10^{-9} FAPFH)		
	2019	2020	2021	2019	2020	2021
Manila-Kobe/Fukuoka	15	5	**11**	1.36	0.49	**0.45**
Manila-Ho Chi Minh	20	4	**7**	0	0	**0.77**
Manila-Hong Kong	17	5	2	0	0.19	0
Manila-Kota Kinabalu	11	2	2	0.08	0.37	0
Manila-Sanya	0	2	0	0	0	0
Manila-Singapore	17	3	2	0.28	0	0
Manila-Taibei	16	3	4	0	0	0.07
Manila-Ujung Pandang	3	0	**7**	0.02	0	**0.36**
Manila-Oakland	0	0	2	0	0	0

Result from the identifying hot spots process:
The 3 boundaries highlighted in orange satisfy the hot spot criteria. Hot Spot D **remains on RASMAG's hot spot list.**

Asia : LHD Hot Spot D (Manila - Fukuoka FIR)

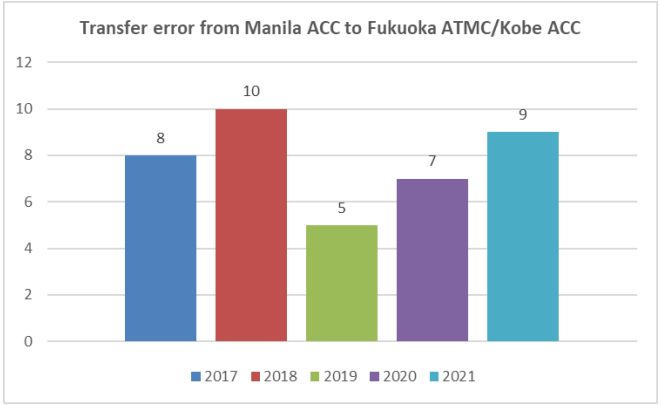
Nature of Occurrences : Transfer error due to human factors (Category E LHD)

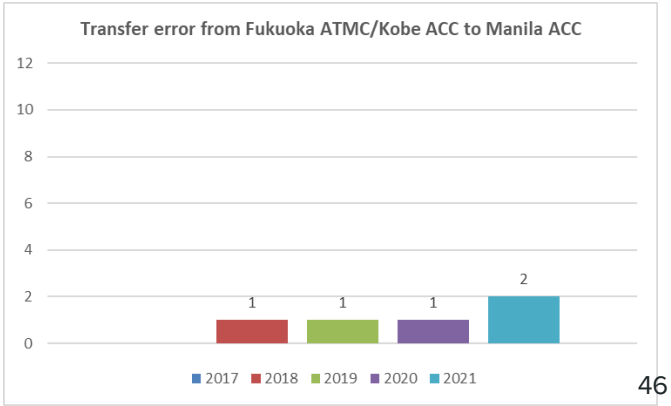
Contributing Factors : Total 11 LHDs occurred in 2021.
9 LHDs occurred on transfer from Manila ACC to Fukuoka ATMC/Kobe ACC.
2 LHDs occurred on transfer from Fukuoka ATMC/Kobe ACC to Manila ACC.

Trend : The highest number of LHDs was marked in 2021 despite of less traffic volume.

Mitigations :

- The sharing of LHD information between Kobe ACC/Fukuoka ATMC and Manila ACC, and JASMA and MAAR has been conducted.
- A scrutiny group meeting was held as a side meeting to RASMAG/27 to discuss possible further improvement in this hot spot. In addition to more training already planned by the Manila ACC, the meeting suggested a focus on team resource management.





Asia : LHD Hot Spot F (Mogadishu – Mumbai)

Nature of Occurrences : The most commonly reported occurrences are classified as category E (coordination errors as a result of human factors issues).

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

Trend : The number of LHDs slightly decreased in 2021. The operational risk significantly decreased from 4.8 x 10^{-9} FAPFH in 2020 to 0.12 x 10^{-9} FAPFH in 2021.

Mitigations :
- The Space-Based ADS-B may potentially reduce the LHDs and the operational risk at these Hot Spots in 2020 and 2021.
- The trial of AIDC between Mogadishu ACC and Mumbai ACC was conducted in March 2021 and still faced some minor issues. The problem has to be solved before proceeding to the next phase.

Result from the identifying hot spots process:
Hot Spot F does not satisfy any hot spot criteria as the first year. However, some mitigation measures remain unfinished, thus this boundary **remains on RASMAG's hot spot list**.

Boundary	The Number of LHDs		
	2019	2020	2021
Mogadishu-Mumbai	9	8	5

Boundary	The Operational Risk (x 10^{-9} FAPFH)		
	2019	2020	2021
Mogadishu-Mumbai	0.74	4.8	0.12

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

Nature of Occurrences : The most commonly reported occurrences are classified as category E (coordination errors as a result of human factors issues).

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

Trend : At Sanaa-Mumbai boundary, the number of LHDs increased from 1 in 2020 to 4 in 2021, however the operational risk remained very low.
At Muscat-Mumbai boundary, the number of LHDs slightly decreased, but the operational risk significantly decreased from 6.37 in 2020 to 1.35 in 2021.

Mitigations :
Awareness of the safety issues and the Space-Based ADS-B may potentially reduce the LHDs and the operational risk at these Hot Spots in 2020 and 2021.
It is also recommended that AIDC is implemented with Mumbai FIR.

Boundary	The Number of LHDs		
	2019	2020	2021
Sanaa-Mumbai	5	1	4
Muscat-Mumbai	143	48	44

Boundary	The Operational Risk (x 10^{-9} FAPFH)		
	2019	2020	2021
Sanaa-Mumbai	0.20	0	0.07
Muscat-Mumbai	24.71	6.37	1.35

Result from the identifying hot spots process:
Muscat-Mumbai boundary satisfies the hot spot criteria.
Sanaa-Mumbai boundary does not satisfy any hot spot criteria as the first year.
However, some mitigation measures such as the AIDC remain unfinished, thus both boundaries **remain on RASMAG's hot spot list**.

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

Nature of Occurrences : In 2021, there were 19 LHDs at Hot Spot J. All were Category E (coordination errors as a result of human factors issues). Of these,

- 2 occurred on the Jakarta–Kota Kinabalu FIR interface, with Jakarta and Kota Kinabalu being the accepting FIR one each.
- 17 occurred on the Jakarta–Singapore FIR interface. Jakarta was the accepting unit in two occurrences. Singapore was the accepting unit in the remaining 15 occurrences.
- 4 occurrences were assessed by AAMA as non-zero-duration in Indonesian airspace.

Contributing Factors : 6 occurrences involved negative transfer, 10 involved a late FL revision, and 3 involved an aircraft being transferred at the incorrect level.

Trend : The number of occurrences has increased significantly in the past year, from 5 in 2020. As such, this Hot Spot should continue to be monitored. The increase could partially be due to improved reporting and information sharing between AAMA and CAAS.

Mitigations : AAMA is working with CAAS to share and confirm the information about LHDs on the Jakarta–Singapore FIR interface. 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: The LHD cluster at the boundary between Singapore and Jakarta satisfies the criteria in terms of the number and **remains on RASMAG's hot spot list**.

Asia : LHD Hot Spot M (Colombo – Melbourne)

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

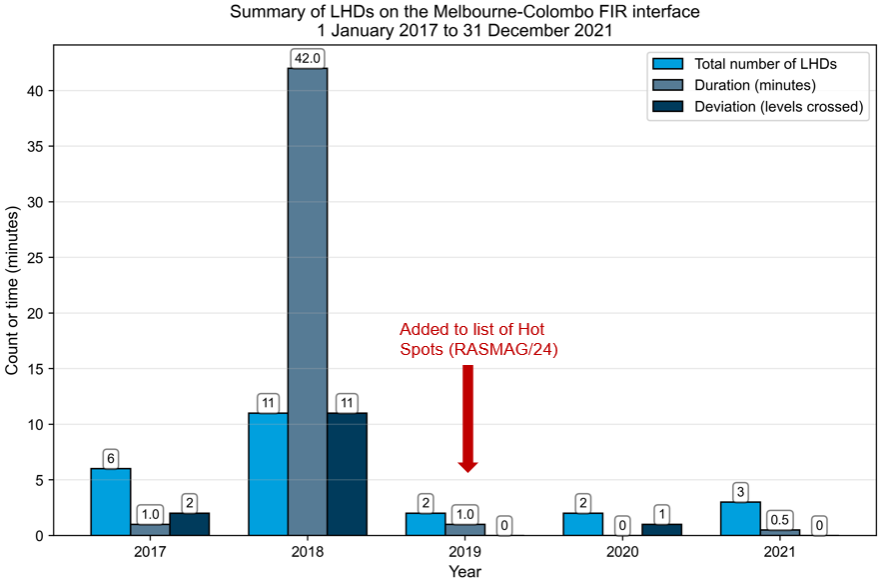
Contributing Factors : A large number were pilot errors involving the Indian Navy.

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 still does not have a suitable contact for the Indian Navy.

Mitigations : In 2020, a number of mitigation measures were introduced in Colombo FIR:

- Sectorisation of Colombo Oceanic airspace
- Safety Assessment for sectorisation
- ATC awareness and training

In March 2022, AAMA and MAAR sent a letter to DGCA India outlining the occurrences, in an effort to establish a point of contact with the Indian Navy (Action Item RASMAG 26/4). A response has not yet been received. For this reason, Hot Spot M **remains on RASMAG's hot spot list.**



Reporting Rate
of LHDs/LLDs/LLEs

Reporting Rate of LHDs/LLDs/LLEs

Airspace	# Reports						1 Report : Flying Hrs					
	2016	2017	2018	2019	2020	2021	2016	2017	2018	2019	2020	2021
DPRK	0	0	0	0	0	0	-	-	-	-	-	-
Mongolia	0	4	1	2	0	1	-	1: 37,771	1: 158,891	1: 82,138	-	1: 121,621
China	117	134	110	79	85	105	1: 20,413	1: 18,248	1: 22,229	1: 31,119	1: 26,867	1: 15,477
SEA	426	474	205	152	42	70	1: 5,884	1: 6,548	1: 17,757	1: 22,275	1: 25,106	1: 15,456
Japan	43	71	76	77	66	80	1: 33,834	1: 21,510	1: 20,632	1: 20,762	1: 14,737	1: 13,528
SW Pacific	52	51	53	101	46	47	1: 16,639	1: 17,572	1: 17,817	1: 9,335	1: 6,954	1: 11,975
SA/IO	778	935	681	439	152	135	1: 3,689	1: 3,166	1: 3,783	1: 7,955	1: 7,907	1: 11,167
Indonesia	32	34	23	37	18	41	1: 11,520	1: 10,842	1: 53,603	1: 33,321	1: 17,346	1: 7,402
Pacific	33	42	43	173	134	176	1: 63,500	1: 54,191	1: 45,064	1: 10,139	1: 6,404	1: 6,638
ROK and AKARA	6	5	12	34	5	24	1: 93,291	1: 117,090	1: 28,365	1: 18,959	1: 25,965	1: 6,285
Total	**1,487**	**1,750**	**1,204**	**1,094**	**548**	**679**	**1: 8,905**	**1: 8,180**	**1: 12,332**	**1: 14,330**	**1: 13,202**	**1: 11,200**

Notes:

The flying hours for Indonesian airspace were calculated based on the 2020 TSD.

2021 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	1143	0	-	0	-	0	-	0	-
Mongolia	121,621	0	-	1	1 : 121,621	0	-	1	1 : 121,621
China	1,625,084	9	1 : 180,565	9	1 : 180,565	87	1 : 18,679	105	1 : 15,477
SEA	1,081,885	1	1 : 1,081,885	67	1 : 16,148	2	1 : 540,943	70	1 : 15,456
Japan	1,082,239	10	1 : 108,224	44	1 : 24,596	26	1 : 41,625	80	1 : 13,528
SW Pacific	562,818	20	1 : 28,141	21	1 : 26,801	6	1 : 93,803	47	1 : 11,975
SA/IO	1,507,558	6	1 : 251,260	128	1 : 11,778	1	1 : 1,507,558	135	1 : 11,167
Indonesia	303,491	4	1 : 75,873	36	1 : 8,430	1	1 : 303,491	41	1 : 7,402
Pacific	1,168,237	17	1 : 68,720	151	1 : 7,737	8	1 : 146,030	176	1 : 6,638
ROK and AKARA	150,851	0	-	24	1 : 6,285	0	-	24	1 : 6,285
Total	7,604,927	67	1 : 113,506	481	1 : 15,811	131	1 : 56,901	679	1 : 11,200

Notes:

The flying hours in Indonesian airspace were calculated based on the 2020 TSD.

Conclusion

RVSM TLS Compliance - Vertical

- **The 2021 PAC vertical overall risk** was 19.74 x 10^{-9} FAPFH. The vertical overall risk slightly increased from 2020 and **higher than the target level of safety (TLS)**.
- **The 2021 ASIA vertical overall risk** was 4.03 x 10^{-9} FAPFH. The vertical overall risk decreased from 2020 and improved to be **below the TLS** for the first year. (However, some individual areas still have risk higher than than the TLS)

RVSM TLS Compliance - Horizontal

- **All horizontal risk estimates in 2021** were **below the TLS**.

RASMAG's Hot Spot List

Hot Spot	Involved FIRs	Identified	Remarks
A1	Kolkata/Chennai/Dhaka - Yangon	2015	Cat. E LHDs slightly increasing. Risk reducing.
A2	Chennai - Kuala Lumpur	2015	Cat. E LHDs slightly increasing. Risk reducing.
B	Incheon (AKARA Airspace)	2015	Cat. E LHDs increasing. Risk reducing.
D	Manila - all adjacent FIRs	2015	Cat. E LHDs partially reducing at some interfaces. Cat. F LHDs emerging.
F	Mogadishu - Mumbai	2015	Cat. E LHDs reducing. Risk reducing.
G	Sanaa/Muscat - Mumbai	2015	Cat. E LHDs reducing. Risk reducing.
J	Jakarta - Singapore/Kota Kinabalu	2018	Cat. E LHD increasing.
M	Colombo - Melbourne	2019	LHDs and risk reducing. Awaiting response to establish a POC before removing from the hot spot list.
N	Oakland USA - Hawaii CEP	2019	Cat. E LHDs increasing. Risk reducing.

Reporting Rate of LHDs/LLDs/LLEs

- In 2021, the flying hours slightly increased from 7,234,881 hours in 2020 to 7,604,927 in 2021.
- The overall reporting rate of LHDs/LLDs/LLEs improved from 1 report : 13,202 hours in 2020 to 1 report : 11,200 hours in 2021
- The reporting rate in Indonesia, ROK and AKARA airspace significantly improved the in 2021.
- DPRK had no LHD/LLD/LLE report since 2016.
- Mongolia reported 1 LHD in 2021.

Thank You